PALEOPOLYPLOIDY AND MOLECULAR SYSTEMATICS OF SOUTHERN AFRICAN CHLORIDOIDEAE

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Promoter: Prof. J.J. Spies

Dedicated, with love, to my parents
Maarten and Lea

'Considering the widespread occurrence and ecological diversity of grasses, their dominance over vast regions of our globe, and their prime importance to humankind, we, the experts, may congratulate ourselves on having become authorities on the most important single family of organisms in the world of life, rivaled only by the human family itself.'

G.L. STEBBINS 1987

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Abbreviations[1]

A	Adenine
ABI	Applied Biosytems Incorporated, Foster City, California, USA
Adh	Alcohol Dehydrogenase
*atp*B	ATP Synthase Beta Subunit
BEP	Bambusoideae-Ehrhartoideae-Pooideae
BOP	Bambusoideae-Oryzoideae-Pooideae
BLFU	Geo Potts Herbarium, Department of Plant Sciences, University of the Free State, Bloemfontein
bp	Basepair
*Bgl*I	*Bacillus grobigi* II
BS	Bootstrap Index
C	Cytosine
cpDNA	Chloroplast DNA
CI	Consistency Index
CTAB	Hexadecyl-Trimethyl-Ammonium Bromide
DMSO	Dimethyl Sulfoxide
DNA	Deoxyribonucleic Acid
dNTP	Deoxynucleotide Triphosphate
EDTA	(Ethylenediamine) Tetra-Acetic Acid
Ethanol	Ethylalcohol
F	Coefficient of Similarity
G	Guanine
GBSS1	Granule Bound Starch Synthase Subunit 1
GPWG	Grass Phylogeny Working Group
HCl	Hydrochloric Acid
*Hinf*I	*Haemophilus influenzae* RF I
IGS	Intergenic Spacer Region
ILD	Incongruence Length Difference Test
Indels	Insertions/Deletions
ITS	Internal Transcribed Spacer Region

[1] SI units not included in abbreviation list

kb	Kilobase
M	Molar
*mat*K	Maturase K
$MgCl_2$	Magnesium Chloride
mM	Millimolar
mmol	Millimoles
m/m	Mass per Mass
m/v	Mass per Volume
n	Gametic Chromosome Number
2n	Somatic Chromosome Number
NaCl	Sodium Chloride
NAD	Non-reduced form of Nicotine Amideadenine Dinucleotide
NADH	Reduced form of Nicotine Amideadenine Dinucleotide
NAD-ME	NAD-Malic Enzyme
*ndh*F	NADH Dehydrogenase, Subunit F
NNI	Nearest Neighbor Interchange Branch Swapping
nrDNA	Nuclear Ribosomal Deoxyribonucleic Acid
PACC	Panicoideae-Arundinoideae-Centothecoideae-Chloridoideae
PACCAD	Panicoideae-Arundinoideae-Centothecoideae-Chloridoideae-Aristidoideae-Danthonioideae
PAUP	Phylogenetic Analysis Using Parsimony
pBR328	*E. coli* Plasmid pBR328
PCK	Phosphoenol Pyruvate Carboxikinase
PCR	Polymerase Chain Reaction
*phy*B	Phytochrome B
pmol	Picomoles
PRE	National Herbarium, Pretoria
*psb*A	DII Protein of Photosystem II Reaction Center
PVP	Polyvinyl Pyrrolidone
*rbc*L	Ribulose -1,5- Bisphosphate Carboxylase/Oxygenase Large Subunit
rDNA	Ribosomal Deoxyribonucleic Acid
RI	Retention Index
RNA	Ribonucleic Acid

*rpl*16	Ribosomal Plastid Protein 16
*rpo*C1	RNA Polymerase Beta' Subunit
*rpo*C2	RNA Polymerase Beta" Subunit
*rps*4	Ribosomal Plastid Small Subunit Protein 4
rRNA	Ribosomal Ribonucleic Acid
SNL	Signal to Noise Ratio
T	Thymine
TAE	Tris-Acetic Acid-EDTA
Taq polymerase	*Thermus aquaticus* DNA Polymerase
TBR	Tree Bisection and Reconnection Branch Swapping
Tris	2-Amino-2-(Hydroxymethyl)-1,3-Propanediol
*trn*L	tRNA – Leu (UAA)
*trn*L-F	Region including *trn*L intron, *trn*L 3' exon, *trn*L-F spacer
*trn*F	tRNA – Phe (GAA)
*trn*T	tRNA – Thr (UGU)
u	Units
µl	Microlitre
µm	Micrometre
U	Uracil
UV	Ultraviolet
V	Volt
v/v	Volume per Volume
waxy	GBBS1
x	Basic Chromosome Number
3'	3 prime position
5'	5 prime position

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Noteworthy

Several chapters of this thesis dealing with the results obtained in this study have been submitted to various journals as manuscripts. Some of these (Chapter 3) have already been published, others are in press (Chapters 4 and 5) and Chapters 6 and 7 are still with the referees. As not to duplicate sections of the thesis, the materials and methods as well as references for each manuscript have been omitted from these five chapters. Two separate chapters (Chapter 2 and 9) are devoted to these subjects. Because the different journals require different formats, these chapters have been adapted to a universal format that is used throughout this thesis and these will differ from the format prescribed by each journal. Furthermore, due to the fact that each of these chapters is seen as separate manuscripts, taxonomic authorities are cited in each chapter. Throughout this thesis, American English was used.

Summary

This study dealt with systematics of southern African representatives of the grass subfamily Chloridoideae. The group was studied on molecular and cytogenetic levels.

Two main basic chromosome numbers in the Chloridoideae, namely x = 9 and 10, were confirmed by this study. The basic chromosome number of x = 10 is the most prevalent and is seen as the original number from which other aneuploid deviations in the group arose. The basic chromosome number of x = 10 is, however, a paleopolyploid number as specimens with 2n = 2x = 10 have been found in the subfamily. Most of the chromosome numbers found in the Chloridoideae are derived from the original basic chromosome number, x = 5, or the paleopolyploid number, x = 10.

Polyploidy is frequent in the grasses and subfamily Chloridoideae. In this study more than 70% of the southern African Chloridoideae was found to be polyploid. This polyploidy is largely attributed to hybridization, as many of the studied specimens were segmental allopolyploids or allopolyploids. This is facilitated by an effective asexual reproduction system in the form of apomixis.

Two genomic regions were sequenced in this study, i.e. the nuclear *ITS* and chloroplast *trn*L-F regions. These two regions represent two different genomes and are inherited differently (maternal versus biparental), which have phylogenetic implications for studying hybridization, a frequent phenomenon in the Chloridoideae.

The regions studied differed in the amount of resolution they provided. The *ITS* phylogeny was well resolved, but the *trn*L-F region had less variation and less resolution, especially at species level. Despite this no hard incongruence was found between the two phylogenies and they could be combined.

The phylogenetic analyses indicated the monophyletic nature of the Chloridoideae. The two large tribes, Cynodonteae and Eragrostideae were polyphyletic, although a general division into two separate groups was evident. The monophyly of all the generic groups in the subfamily was well supported, except for the two largest genera in the study, *Eragrostis* and *Sporobolus*. These two genera are very variable and taxonomically difficult groups, probably related to interspecific and -generic hybridization.

The morphologically distinct tribe Pappophoreae was well supported in all analyses. The two genera *Entoplocamia* and *Fingerhuthia* was found basal in the combined analysis, a finding that supports the derivation of the Chloridoideae from arundinoid ancestors as these two genera are seen as a link to *Spartochloa*, *Styppeiochloa* and *Tribolium* in the Arundinoideae and Danthonioideae.

Despite the frequency of hybridization in the subfamily, hybrids could not be positively identified based on sequence polymorphisms or their phylogenetic behavior. This is possibly related to the age of hybridization in the group or the close relationship of the groups between which hybridization occurs.

This study provides cytogenetic and molecular systematic support for paleopolyploidy in the Chloridoideae. This is based mainly on the occurrence of $x = 5$ in the subfamily and the close relationship of the Chloridoideae to the Arundinoideae and Danthonioideae which have a main basic chromosome number of $x = 6$ and from which $x = 5$ in the Chloridoideae was derived. This chromosome number was probably highly unstable and subsequent polyploidization lead to the now frequent $x = 10$ found in the majority of the subfamily.

Keywords: Chloridoideae, DNA sequencing, hybridization, *ITS* region, paleopolyploidy, phylogenetic relationships, *trn*L-F region

Opsomming

Hierdie studie het gehandel oor die sistematiek van Suid-Afrikaanse verteenwoordigers van die gras subfamilie Chloridoideae. Die groep is bestudeer op molekulêre en sitogenetiese vlak.

Hoofsaaklik twee basiese chromosoomgetalle word in die Chloridoideae gevind, naamlik x = 9 en 10 en is bevestig deur hierdie studie. Laasgenoemde basiese chromosoomgetal is die mees algemene en word gesien as die oorspronklike basiese chromosoomgetal waaruit ander aneuploïdiese afwykings in die groep ontstaan het. Die basiese chromosoomgetal van x = 10 is egter 'n paleopoliploïede getal aangesien eksemplare met 2n = 2x = 10 al in die subfamilie gevind is. Meeste van die chromosoomgetalle wat in die Chloridoideae gevind word het ontstaan uit die oorspronklike basiese chromosoomgetal, x = 5 of die paleopoliploïede basiese chromosoomgetal, x = 10.

Poliploïdie kom algemeen voor in die grasse en die subfamilie Chloridoideae. In hierdie studie was meer as 70% van die Suid-Afrikaanse Chloridoideae poliploïed. Hierdie poliploïdie word toegeskryf aan verbastering, aangesien meeste van die bestudeerde spesies segmenteel allopoliploïed of allopoliploïed was. Dit word bewerkstelling deur 'n effektiewe ongeslagtelike voortplantingsisteem in die vorm van apomiksie.

Die nukleotiedvolgordes van twee genomiese gebiede, die kern *ITS* en chloroplas *trn*L-F gebiede, is bepaal. Hierdie twee gebiede verteenwoordig verskillende genome en word verskillend oorgeërf (moederlik teenoor oorerwing vanaf albei ouers) wat filogenetiese implikasies vir die bestudering van verbastering, wat 'n algemene verskynsel in die Chloridoideae is, inhou.

Die gebiede bestudeer verskil in die hoeveelheid resolusie wat hulle verskaf. Die *ITS* filogenie het goeie resolusie verskaf, maar die *trn*L-F gebied het minder variasie en swakker resolusie verskaf, veral op spesievlak. Ten spyte hiervan is geen sterk onverenigbaarheid tussen die twee filogenieë gevind nie en kon hulle gekombineer word.

Die filogenetiese analise toon aan dat die Chloridoideae monofileties is. Die twee groot tribusse, Cynodonteae en Eragrostideae, was polifileties, alhoewel 'n algemene skeiding in twee groepe sigbaar is. Die monofilie van al die genera in die

subfamilie word goed ondersteun, behalwe die twee grootste genera in die studie, *Eragrostis* en *Sporobolus*. Hierdie twee genera toon baie variasie en is taksonomiese moeilike groepe wat moontlik as gevolg van verbastering tussen spesies en genera is.

Die morfologiese kenmerkende tribus Pappophoreae is goed ondersteun in alle analises. Die twee genera *Entoplocamia* en *Fingerhuthia* was basaal in die gekombineerde analise. Dit ondersteun die ontwikkeling van die Chloridoideae vanaf arundinoid voorouers, aangesien hierdie twee genera gesien word as naverwant aan *Spartochloa*, *Styppeiochloa* en *Tribolium* in die Arundinoideae en Danthonioideae.

Ongeag die groot hoeveelheid verbastering wat in die subfamilie voorkom kon basters nie met sekerheid geïdentifiseer word op grond van nukleotiedvolgorde polimorfismes of hulle filogenetiese gedrag nie. Dit hou moontlik verband met die ouderdom van die verbastering in die groep of die noue verwantskap van die groepe waarin daar verbastering voorkom.

Hierdie studie lewer sitogenetiese en molekulêre sistematiese ondersteuning vir paleopoliploïdie in die Chloridoideae. Dit word grootliks gegrond op die voorkoms van $x = 5$ in die subfamilie en die noue verwantskap van die Chloridoideae met Arundinoideae en Danthonioideae met 'n basiese chromosoomgetal van $x = 6$ en waaruit $x = 5$, wat in die Chloridoideae voorkom, kon ontwikkel het. Hierdie chromosoomgetal was moontlik hoogs onstabiel en poliploïdisering het gelei tot die ontstaan van $x = 10$ in die meeste genera en spesies in die subfamilie.

Sleutelwoorde: Chloridoideae, DNA nukleotiedvolgordebepaling, filogenetiese verwantskappe, *ITS* gebied, paleopoliploïdie, *trn*L-F gebied, verbastering

CHAPTER 1
Introduction

The grass family and in particular the subfamily Chloridoideae is well represented in southern Africa. Phenomena such as hybridization and polyploidization (>70%), as well as apomictic reproduction, have a high frequency in southern Africa. The evolution of the subfamily, as well as the grass family, is characterized by these events and nuclear and chloroplast DNA might tell different evolutionary stories, depending on the extent of these events.

1.1 Grasses

Poaceae (R.Br.) Barnhart inhabit the earth in greater magnitude than any other corresponding plant group (Gould 1968). According to Watson and Dallwitz (1992 onwards), there are about 700 genera and approximately 12 000 species of grasses in the world. They are the fourth largest flowering plant family (Liang and Hilu 1996), after Asteraceae Dumort., Orchidaceae Juss. and Fabaceae Lindl. (Tzvelev 1989) and are the second largest monocot family after Orchidaceae (Watson 1990). When comparatives are drawn between completeness of representation and percentage of the world's total vegetation, Poaceae far outnumbers any other family (Gould 1968). It is economically the most important and ecologically the most dominant plant family (Liang and Hilu 1996).

Grasses are the world's most important agricultural plants. This family includes (Chapman and Peat 1992; Van Oudtshoorn 1999):

- Cereals.
- Forage grasses.
- Grasses used as industrial raw materials.
- Bamboos with an abundance of uses.
- Grasses essential in soil conservation.
- Grasses utilized for the essential volatile oils they produce.
- A large group of ornamental grasses used in horticultural practices and used on, for example, sports grounds, lawns, parks, etc.

Direct utilization of grasses includes (Watson 1990):

- Modification of natural grasslands, along with improvement by the addition of management techniques and fertilizers.

- The creation of grasslands, lawns, etc.
- Intentional cultivation, together with selection, for genetic enhancement and the subsequent distribution and planting of pastures, cereal crops, etc.
- Cultivation of species such as sugarcane, culinary herbs, raw materials for the rope and paper industry.
- Exploitation of certain specialized forms as soil binders and stabilizers
- Applications of bambusoids as barrier plants.
- Use of various plant parts as construction material, etc.
- As a food source.

Except for their usefulness to man and livestock, they are also capable of serving as alternative hosts for pathogens and pests, which could affect crops. Some of the most invasive weeds belong to Poaceae. Seven of the top ten (May 1981) are species of the genera *Cynodon* Rich., *Echinochloa* P.Beauv., *Eleusine* Gaertn., *Imperata* L., *Panicum* L. and *Sorghum* Moench (Watson 1990).

The relative success of the grass family can be ascribed to features such as their morphology, anatomy, habit and reproductive cycles, which gives this family an advantage over its main enemies, namely man and herbivorous animals (Watson 1990). Furthermore the grasses have unusual adaptability. This allowed the first grasses to invade a wide range of habitats, and the ability to rapidly and effectively exploit changes in the environment (Watson 1990). This is exemplified by the evolution of the C_4 photosynthetic pathway, and its different types, more than once in the family (Clayton and Renvoize 1986; Sinha and Kellogg 1996; Kellogg 1999, 2000, 2001). Furthermore, the family is characterized by hybridization and polyploidization, along with great versatility in reproductive strategy (Watson 1990).

Grasses probably evolved during the Paleocene between 60 and 55 million years ago. This is based on grass pollen records from South America and Africa (Jacobs *et al.* 1999). The first grasses were probably mostly adapted to forest and shade habitats. The shift to drought tolerance and open habitats marked the major diversification of the family during the mid-Miocene, corroborated by the increase in the amount of pollen in the fossil record (Jacobs *et al.* 1999).

Currently 12 subfamilies are recognized: Anomochlooideae Pilg. ex Potzal, Aristidoideae Caro, Arundinoideae Burmeist., Bambusoideae Luerss., Centothecoideae Soderstr., Chloridoideae Kunth ex Beilschm., Danthonioideae Barker & H.P.Linder, Ehrhartoideae Link, Panicoideae Link, Pharoideae (Stapf) L.G.Clark & Judz., Pooideae Benth. and Puelioideae L.G.Clark, M.Kobay, S.Mathews, Spangler & E.A.Kellogg [Grass Phylogeny Working Group (GPWG) 2001].

1.2 Subfamily Chloridoideae

1.2.1 Classification

Brown (1810, 1814) divided the grasses into two major groups or tribes (now known as subfamilies): the 'Paniceae' (mostly tropical grasses, spikelets with two florets of which the lower is imperfect, generally comparable with the modern Panicoideae) and the 'Poaceae' (grasses with temperate distribution, spikelets with one to many florets, imperfect florets never basal, generally comparable with Festucoideae Link of Hitchcock (1971) or the modern Pooideae). Various taxonomists through the previous two centuries upheld this division.

The modern chloridoid grasses were located in the Pooideae. Zoysieae Benth. was only later moved from their initial position in Panicoideae to the Pooideae (Stapf 1900; Hitchcock 1936). In the early 1900's, Krause (1909, 1910, 1913) stated that the Chlorideae Rchb. was more closely related to the Panicoideae based on anatomical and epidermal studies, and advocated its removal from the Pooideae. Van Teighem (1897) drew the same conclusion based on his embryological studies in which he distinguished panicoid and festucoid embryo types.

In 1936, Prat recognized the Chloridoideae on the bases of grass leaf anatomy and epidermal structure. Tateoka *et al.* (1959) described the inflated spherical (egg-shaped) microhairs as the chloridoid type. Reeder (1957) described the characteristic chloridoid embryo features (P+PF).

Details of embryo structure are believed to be of great importance in the classification of grass subfamilies and are still in use at the genus level or higher (Hilu and Wright 1982; Watson *et al.* 1985). The formula that Reeder (1957, 1961,

1962) proposed is based on the embryo types described by Van Teighem (1897) and uses the following four features:

- Elongation of the vascular system in the embryo, with a mesocotyl present (P) or absent (F).
- The presence (+) or absence (-) of an epiblast.
- The presence (P) or absence (F) of a groove or cleft between the lower part of the scutellum and the coleorhiza.
- The position of the margins of the first embryonic leaves either rolled (P) or folded (F).

The concept of the chloridoid subfamily as now perceived became widely accepted when Pilger (1956) presented the group as the Eragrostoideae.

Over the last fifty years, various classifications for the Chloridoideae have been proposed (Table 1.1). These differences center on whether the Eragrosteae Benth (or Eragrostideae Stapf), Sporoboleae Stapf or the other smaller tribes should be included in the Cynodonteae Dumort. (or Chlorideae) (Jacobs 1987). Campbell (1985) included the two larger tribes Eragrosteae and Sporoboleae in the Cynodonteae. The recognition of two main tribes, which are based on the large genera *Eragrostis* Wolf and *Chloris* Sw., remains an important theme in all the proposed classifications. This concept was inherited from Pilger (1956) and is a division between paniculate inflorescences with two of more floreted spikelets on the one hand, versus inflorescences with spike-like main branches and one-floreted spikelets, on the other. The other subtribes and additional groups are usually segregated from one of these two groups (Table 1.1).

Only a few of the above mentioned classifications are worldwide treatments (Pilger 1956; Prat 1960; Clayton and Renvoize 1986; Watson and Dallwitz 1992 onwards). However, even within this context, the contents of similarly named tribes, subtribes and even generic composition differ greatly between different classifications (Van den Borre and Watson 1997).

In 1997, Van den Borre and Watson proposed a new classification for the Chloridoideae. In their study, cladistic and phenetic analyses were done on 166 genera in the subfamily, by using 120 selected leaf anatomical and morphological characters. This analysis did not give support for the Eragrosteae and Chlorideae,

Table 1.1. A summary of 16 classifications for the subfamily Chloridoideae (1956 onwards) in which tribes, subtribes or equivalent groups in the subfamily are indicated [Adapted from Van den Borre and Watson (1997)].

Author	**Pilger (1956)**	**Tateoka (1957)**	**Prat (1960)**	**Stebbins and Crampton (1961)**	**Parodi (1961)**	**Jacques-Felix (1962)**	**Hubbard (1966)**	**Tutin (1980)**
Subfamily	Eragrostoideae	Eragrostoideae	Chloridoideae	Eragrostoideae	Eragrostoideae	No subfamilies	Group XVIII	No subfamily
			Group 3					
		Pappophoreae	Pappophoreae	Pappophoreae	Pappophoreae	Pappophoreae	Pappophoreae	Pappophoreae
							Orcuttieae	
	Eragrosteae	Chlorideae	Eragrosteae	Eragrosteae	Eragrosteae	Eragrosteae	Eragrostideae	Eragrostideae
	Eragrostinae					Eragrostinae		
	Scleropogoninae					Aeluropinae		
	Lycurinae							
	Gainotiinae							
	Sporobolinae		Sporobolinae		Sporoboleae	Sporoboleae	Sporoboleae	
	Muhlenbergiinae							
	Jouveae			Aeluropodeae			Aeluropodeae	Aeluropodeae
	Phaenospermeae							
		Spartineae						
	Chlorideae		Chlorideae	Chlorideae	Chlorideae	Chlorideae	Chlorideae	Chlorideae
	Lepturinae							
	Chloridinae							
				Spartineae		Spartineae	Spartineae	
						Leptureae	Leptureae	
						Tripogoninae		
						Lepturinae		Spartineae
	Lappagineae	Lappagineae	Zoysieae	Zoysieae	Zoysieae	Zoysieae	Zoysieae	Zoysieae
							Pommereulleae	
							Sphaerocarieae	
	Aristideae				Aristideae			
Excluded from the Chloridoideae				(Arundinoideae) Unioleae Aristideae	(Danthonieae) Uniola		(Centotheceae) Uniolae (Danthonieae) Triodia	

Gould and Shaw (1983)	Dahlgren, Clifford and Yeo (1985)	Campbell (1985)	Clayton and Renvoize (1986)	Tzvelev (1989)	Wheeler, Jacobs and Norton (1990)	Watson and Dallwitz (1992 onwards)	Van den Borre and Watson (1997)	GPWG (2001)
-	Chloridoideae	Chloridoideae	Chloridoideae	Within the Poeae	Eragrostoideae	Chloridoideae	Chloridoideae	Chloridoideae
Pappophoreae	*Pappophorum* Group		Pappophoreae	Pappophoreae	Pappophoreae	Pappophoreae	Pappophoreae	Pappophoreae
Orcuttieae			Orcuttieae			Orcuttieae	Orcuttieae	Orcuttieae
Eragrosteae	*Eragrostis* group	Cynodonteae	Eragrostideae	Cynodonteae	Eragrostideae	Chlorideae s.l.	*Eragrostis* group I	Eragrostideae
			Eleusininae	Eleusinae			*Eragrostis* group II	
			Triodiinae	Eragrostinae		Triodeae	Triodieae	
			Monanthochloinae	Muhlenbergiinae				
			Uniolinae	Chloridinae				
Sporoboleae			Sporobolinae		Sporoboleae			
	Muhlenbergia group							
Aeluropodeae		Aeluropodeae		Aeluropodeae				
Chlorideae	*Chloris* group		Cynodonteae		Chlorideae		*Chloris* group	Cynodonteae
			Pommereullinae				*Muhlenbergia* group	
			Chloridinae					
			Bouteloinae				*Zoysia* group	
			Zoysiinae					
			Leptureae					Leptureae
Zoysieae		Zoysieae		Zoysieae	Zoysieae			
					Triodieae			
Unioleae		Unioleae						
Aristideae				Aristideae	Aristideae			
		(Arundinoideae) Aristideae						

but instead indicate five different high-level groups, namely the *Zoysia* group, the *Chloris* group, the *Eragrostis* I and *Eragrostis* II groups and the *Muhlenbergia* group. Their analyses also showed strong support for the smaller tribes Pappophoreae Kunth, Orcuttieae Reeder and Triodeae Benth.

They, however, stated that many of the species need more thorough investigation and, therefore, their system is not a formal taxonomic classification (Van den Borre and Watson 1997).

The Grass Phylogeny Working Group (2001) has recently proposed a new classification for the grasses. Their results are based on the combined data of six molecular sequence data sets, morphological data and chloroplast restriction site data. The most significant changes in this new classification are the division of the traditional Bambusoideae and Arundinoideae and the expansion of the Pooideae. They divide the grasses into eleven previously published subfamilies and one new subfamily, Danthonioideae. Changes in the circumscription of traditionally recognized subfamilies have also been included. The circumscription of the Chloridoideae remains basically the same with the recognition of the tribes Cynodonteae, Eragrostideae, Leptureae Dumort., Orcuttieae and Pappophoreae, with the exception that the danthonioid genus *Centropodia* Rchb. and the danthonioid species *Merxmuellera rangei* (Pilg.) Conert are now also included in the Chloridoideae (GPWG 2001). The GPWG did, however, note that the current tribal classification conflicts with molecular data and could be modified in the future (see for example Hilu *et al.* 1999).

In this study the latest classification of the subfamily (GPWG 2001) will be followed, in that *Centropodia* and *Merxmuellera rangei* are included in the Chloridoideae (*incertae cedis*), but the tribal and subtribal delimitations will be according to Clayton and Renvoize (1986), as GPWG (2001) did not revise any tribal classifications (Table 1.2).

Table 1.2. Southern African representatives of the subfamily Chloridoideae, according to the classification of GPWG (2001) and tribes and subtribes according to Clayton and Renvoize (1986). Genera included in this study are highlighted in bold.

Cynodonteae

- **Pommereullinae**
  - *Lintonia* Stapf
- **Chloridinae**
  - *Brachyachne* (Benth.) Stapf
  - ***Chloris* Sw.**
  - *Ctenium* Panz.
  - *Craspedorachis* Benth.
  - ***Cynodon* Rich.**
  - ***Enteropogon* Nees**
  - ***Eustachys* Desv.**
  - ***Harpochloa* Kunth**
  - ***Microchloa* R.Br.**
  - ***Polevansia* DeWinter**
  - ***Rendlia* Chiov.**
  - *Schoenefeldia* Kunth
  - *Spartina* Schreb.
  - *Tetrapogon* Desf.
  - *Willkommia* Hack.
- **Boutelouinae**
  - —
- **Zoysiinae**
  - ***Catalepis* Stapf & Stent**
  - *Monelytrum* Hack. ex Schinz
  - *Mosdenia* Stent
  - ***Perotis* Aiton**
  - ***Tragus* Haller**

Eragrostideae

- **Triodiinae**
  - —
- **Uniolinae**
  - ***Entoplocamia* Stapf**
  - ***Fingerhuthia* Nees**
  - *Tetrachne* Nees

Monanthochloinae

—

Eleusininae

Acrachne Wright & Arn. ex Chiov.

***Bewsia* Gooss.**

Brachychloa S.M.Phillips

***Cladoraphis* Franch.**

Coelachyrum Hochst. & Nees

***Dactyloctenium* Willd.**

Diandrochloa DeWinter

Dinebra Jacq.

***Eleusine* Gaertn.**

***Eragrostis* Wolf**

Leptocarydion Stapf

***Leptochloa* P.Beauv.**

Lophacme Stapf

***Odyssea* Stapf**

Oropetium Trin.

***Pogonarthria* Stapf**

***Stiburus* Stapf**

***Trichoneura* Andersson**

Tripogon Roem. & Schult.

Triraphis R.Br.

Sporobolinae

***Sporobolus* R.Br.**

Lepturea

Lepturus R.Br.

Orcuttieae

—

Pappophoreae

***Enneapogon* Desv. ex P.Beauv.**

Kaokochloa DeWinter

***Schmidtia* Steud. ex J.A.Schmidt**

Incertae cedis

***Centropodia* Rchb.**

***Merxmuellera rangei* (Pilg.) Conert**

1.2.2 Morphology and Anatomy

Chloridoideae are anatomically distinct in the grass family. This subfamily is characterized by unspecialized, usually many-flowered spikelets with 1-(3)-nerved lemmas [although Jacobs (1987) found that more than 50% of the 152 species examined had more than three lemma nerves and, therefore, this feature might be too inconsistent to use in the delimitation of the subfamily], Kranz syndrome and associated anatomy, distinctive leaf-blade anatomy and equidimensional silica bodies. Within the subfamily little anatomical variation exists (Ellis 1987; Renvoize and Clayton 1992).

According to Linder *et al.* (1990), glandular structures may be bi- or multicellular. These bicellular structures are referred to as bicellular trichomes, microhairs (by anatomists) or salt glands (by physiologists). The trichomes present in Poaceae, usually referred to as microhairs, are a feature of the upper and lower epidermis of leaf blades, paleas, lodicules and lemmas (Terrell and Wergin 1981). They are relatively thin walled and small in size (25-70 µm). This distinguishes them from grass macrohairs and 'prickles' that are unicellular, thick walled and larger (Amarashinge and Watson 1988). These microhairs are present throughout Poaceae, with the exception of the subfamily Pooideae. The occurrence of multicellular glands in Poaceae is rare (Johnston and Watson 1976; Linder *et al.* 1990).

Chloridoid microhairs are unique in their shape, with relatively short, broad and thick walled cap cells (Johnston and Watson 1976). They are the only type of microhairs for which the function has been determined, namely the secretion of salt from two-celled salt glands (Oross and Thomson 1984). The secretion of ions by such specialized salt glands, is a mechanism for regulating the mineral content of various halophytic plants (Lipschitz and Waisel 1974), and enables the rehabilitation of soils damaged by poor irrigation practice (Chapman and Peat 1992). Salt glands have a concentrated occurrence in the subfamily Chloridoideae and have been observed in various species (Lipschitz and Waisel 1974). It is proposed that salinity tolerance is highly correlated to leaf Na^+ and Cl^- exclusion, which is in turn correlated to leaf salt gland ion secretion rates. The tolerance of high salt levels is also associated with accumulation of the proposed compatible solute glycinebetaine, which reaches effective levels for cytoplasmic osmotic adjustment in salt tolerant grasses only (Marcum 1999).

The Kranz syndrome is an example of structure related to function with the features of the photosynthetic carbon fixation process being correlated with leaf anatomy (Ellis 1977). C_4 plants are grouped into two distinct groups, depending on the type of reaction for C_4 acid decarboxylation that occurs in the bundle sheath cells of the leaf blades. The groups are aspartate and malate formers (Dowton 1970; Brown and Gracen 1972; Hatch *et al.* 1975). Chloridoids are aspartate formers. This implies mesophyll cells that are arranged radially and a double bundle sheath with large, specialized chloroplasts localized in the outer bundle sheath (Ellis 1984a). Two subtypes (structural/biochemical variants) are recognized for the aspartate pathway, namely NAD-ME (nicotine amide adenine dinucleotide-malic enzyme) and PCK (phosphoenol pyruvate carboxikinase) (Ellis 1977) (Table 1.3). Ellis *et al.* (1980) found NAD-ME grasses to dominate in arid areas with low and unpredictable rainfall and PCK grasses were found in generally moist habitats, with less than 350mm rainfall per year., In areas where the rainfall exceeds this amount, the PCK grasses are found primarily in more specialized habitats. Therefore, NAD-ME species would probably be more successful in dry areas, whereas PCK has intermediate moisture requirements (Ellis *et al.* 1980).

Chloridoideae are accepted to be a C_4 subfamily. This enables these plants to photosynthesize more efficiently in high temperatures and high light intensities (Clayton 1983). The only exceptions are *Eragrostis walterii* Pilg. and *Merxmuellera rangei,* which have been found to be C_3 plants (Ellis 1982, 1984a).

A small minority of chloridoids is known as 'resurrection grasses' (Chapman and Peat 1992). This implies that these grasses have foliage that is able to revive after dehydration (Chapman 1992). Resurrection plants in southern Africa include the following: *Brachyachne patentiflora* (Stent & Rattray) C.E.Hubb., *Eragrostis hispida* K.Schum., *E. nindensis* Ficalho & Hiern, *E. paradoxa* Launert, *Microchloa caffra* Nees, *M. kunthii* Desv., *Oropetium capense* Stapf, *Sporobolus festivus* Hochst. ex A.Rich., *S. lampranthus* Pilg., *S. stapfianus* Gand. and *Tripogon minimus* (A.Rich.) Hochst. ex Steud. (Gaff and Ellis 1974). Other grass groups containing resurrection grasses are the Arundinoideae (*Micraira* F.Muell.) and Pooideae (*Poa*

Table 1.3. Characteristics of the C_4 aspartate subtypes (Ellis 1977).

NAD-ME	PCK
Centripetal chloroplasts	Centrifugal chloroplasts
Granal chloroplast membranes	Distinct grana on the chloroplast membranes
Mitochondria centripetal	Centrifugally arranged mitochondria
Malate decarboxylate as decarboxylating enzyme	Cytosolic phosphoenol pyruvate carboxylase as decarboxylating enzyme

bulbosa L.) (Lazarides 1992). Other plant groups in which this phenomenon occurs include some ferns and sedges (Chapman 1992).

1.2.3 Biogeography

The subfamilies and tribes of Poaceae are rather uniformly distributed across the continents in broad regions corresponding to climatic zones. The genera, however, being younger in age, are usually restricted to single continents (Gibbs Russell *et al.* 1990).

Chloridoideae and Panicoideae are the most diverse subfamilies in the open environments of the warm tropical and subtropical regions, which includes southern Africa (Renvoize and Clayton 1992; Davis and Soreng 1993).

Hartley and Slater (1960) and Hartley (1964) concluded that Chloridoideae occur mainly in arid regions that are characterized by high winter temperatures and summer or sporadic rainfall. This centers their distribution in the seasonally dry, or arid to semi-arid areas of the southern Hemisphere tropics, most notably southern Africa and Australia (Jacobs 1987). In these areas the photosynthetic system and associated morphological and anatomical adaptations it provides, presents these grasses with a competitive advantage (Jacobs 1987).

The close relationship between climatic factors and the distribution of the subfamily Chloridoideae, suggests that the subfamily is an old one, and that the present distribution of the subfamily is not greatly affected by historical factors (Hartley and Slater 1960). Particular tribes and subtribes and especially certain genera have restricted distributions, but the subfamily as a whole appears to be spread throughout the world in those parts to which they are physiologically and climatically adapted. Furthermore, many of the smaller genera, as well as individual species, have markedly distinct distributions. These factors support the antiquity of the subfamily (Hartley and Slater 1960).

The great number of chloridoids (number of taxa and number of endemics) in tropical Africa led Hartley and Slater (1960) to suggest an African origin for the chloridoids. From Africa the subfamily then spread to other regions of the world.

Factors supporting an African origin for Chloridoideae include the following:

- The subfamily is taxonomically related to Panicoideae, which are believed to have originated in the east Africa-Madagascar region (Hartley 1958a).
- As is the case with Panicoideae, there appears to be a major center of endemism of the subfamily in Madagascar, with certain genera and species being confined to this area.
- Many of the larger tribes and subtribes have centers of high specific differentiation on the African continent.
- The subtribe Eragrostinae Ohwi [according to Pilger's classification (1956)] exhibits many characters, which are regarded as primitive in Poaceae. This is believed to be the progenitor of the other tribes and subtribes in the subfamily. Factors corroborating this hypothesis are the strong representation of the subtribe on the African continent, monographs on some of the genera suggesting an African origin, the primitive characters of some species in the tribe, as well as apparent affinities to other grass tribes found in Africa (Hartley and Slater 1960).

The subfamily Chloridoideae comprises approximately 1360 species, in ±150 genera of which 100 are mono- or ditypic (Van den Borre and Watson 1997; Hilu and Alice 2001), which according to Clayton and Renvoize (1986) indicates that the subfamily has been dominated by strong adaptive radiation into specialized, often stressful habitats.

The largest genus in the subfamily is the genus *Eragrostis*. This is also one of the most widespread genera in the world (Carnahan and Hill 1961). The genus exhibits almost a full range of anatomical and morphological variation found in the subfamily, of which it contains approximately 25% of the species (Van den Borre and Watson 1994).

The grass family includes 194 genera and 912 species in southern Africa and the subfamily Chloridoideae is represented by 50 genera and 230 species in southern Africa (Fish 2000) (Table 1.4).

1.3 Cytogenetics

Any data that can differentiate species are of taxonomic significance (Stace 1991). For this reason, Raven (1975) regarded cytogenetics as an important element in the evaluation of relationships and in the determination of phylogenetic evolution in the angiosperms.

Cytogenetics includes studies dealing with observations of chromosomal pairing or meiotic behavior. Cytotaxonomy refers to the use of these characteristics and others, such as chromosome number and chromosome morphology, as data for classification (Jones and Luchsinger 1987).

Cytogenetically, the grasses are so diverse that it raises many problems for those attempting to divide them into discrete species. Some 80% of them have a polyploid chromosome number (Clayton 1978), and the occurrence of polyhaploidy, the reversion of polyploids back to the diploid state, has been demonstrated for various genera, the best know example being the *Dicanthium* Willem.-*Bothriochloa* Kuntze complex (Harlan and De Wet 1963; De Wet 1968; De Wet and Harlan 1970). Apomictic swarms are common and over 4000 hybrids have been recorded (Freeling 2001).

In 1931, Avdulov lead the way with the use of cytogenetic features in establishing phylogenetic and systematic relationships among species and genera of grasses. By using cytogenetic information, Avdulov (1931) proposed a phylogenetic subdivision of Poaceae and the publication, *Karyo-systematic investigations in the family Gramineae* (originally published in Russian), was the start of a new age in the classification of the grasses (Jauhar 1993). Avdulov indicated that the basic chromosome number, x, as well as chromosome morphology could serve as a basis

Table 1.4. Chloridoid genera present in southern Africa and their worldwide occurrence (Adapted from Fish 2000).[1]

GENUS	SPECIES IN SOUTHERN AFRICA	SPECIES WORLDWIDE
Acrachne	1	3
Bewsia	1	1•
Brachyachne	1	10
Brachychloa	2	2•
Catalepis	1	1◊
Centropodia	2	4
Chloris	8	55
Cladoraphis	2	2◊
Coelachyrum	1	6
Craspedorachis	2	2–5
Ctenium	1	20
Cynodon	8	10
Dactyloctenium	4	13
Diandrochloa	2	7
Dinebra	1	3
Eleusine	4	9
Enneapogon	7	30
Enteropogon	4	6–17
Entoplocamia	1	1♣
Eragrostis	90	350
Eustachys	1	10
Fingerhuthia	2	2

[1] ♣ Occur only in Africa

• Occur only in southern Africa

◊ Occur only in South Africa

□ This single species of the previously danthonioid genus *Merxmuellera* is now included in the Chloridoideae (GPWG 2001)

Harpochloa	1	2
Kaokochloa	1	1°
Leptocarydion	1	1•
Leptochloa	7	30
Lepturus	1	15
Lintonia	1	2♣
Lophacme	1	2•
Merxmuellera rangei□	1	1°
Microchloa	3	4
Monelytrum	1	1•
Mosdenia	1	1◊
Odyssea	1	2♣
Oropetium	1	3–6
Perotis	3	10
Pogonarthria	3	4♣
Polevansia	1	1◊
Rendlia	1	1♣
Schmidtia	2	2
Schoenefeldia	1	2
Spartina	1	16
Sporobolus	38	160
Stiburus	2	2◊
Tetrachne	1	1
Tetrapogon	1	5
Tragus	4	7
Trichoneura	2	7
Tripogon	1	30
Triraphis	5	7
Willkommia	3	4

for the broad divisions of Poaceae and for the grouping of genera into tribes and subtribes, and species into genera and sections. He also regarded the increase in absolute size of chromosomes as a major trend in grass evolution (Jauhar 1993).

This classification has been found to be consistent with anatomy and geographical distribution (Jauhar 1993).

The basic chromosome number of the Poaceae is the subject of large disputes. Mehra *et al.* (1968), as well as Sharma (1979), support x = 6 as the basic ancestral chromosome number. Flovik (1938) is of the opinion that x = 5 represent the basic chromosome number from which higher numbers were derived through gain aneuploidy and/or polyploidization. Stebbins (1985) suggested that x = 5, 6, and 7 could all have been present in the now extinct complex that was the ancestor of the present day Poaceae.

Basic chromosome numbers in the Chloridoideae are x = 9 and 10. Cytogenetically the group has been investigated to a great extent, and especially in southern Africa, with its large concentration of Chloridoideae, there have been various cytogenetic studies (Appendix A and B). The basic chromosome number of x = 9 occurs in the lowest frequency of the two main basic chromosome numbers and is proposed to have originated by aneuploid or dysploid reduction from x = 10. Polyploidy is frequent in the group with more than 70% of southern African Chloridoideae reported having somatic chromosome numbers of more than 2x.

1.4 Apomixis

Plants reproduce sexually, asexually by means of seed (agamospermy) or vegetatively (McWilliam 1964). Apomixis includes the various developmental pathways by which a plant reproduces asexually by means of seed formation (Nogler 1984; Asker and Jerling 1992). Apomictic reproduction can vary from obligate (strictly asexual) to facultative (partially sexual) with differing degrees of apomixis between and within species and genotypes (Hanna and Bashaw 1987).

Apomixis is known from more than 300 species in more than 35 different plant families (Hanna and Bashaw 1987). The phenomenon is predominant in the families Asteraceae, Rosaceae L. and Poaceae, which together comprise approximately 10% of the angiosperm species (Nogler 1984).

In Poaceae, the phenomenon has been reported in more than 125 species representative of most of the tribes (Bashaw and Hanna 1990). The replacement of a sexual reproduction system by an asexual reproduction system has been known in the grass family since 1932 when Müntzing first identified apomixis in *Poa* L. Apospory, the development of unreduced embryo sacs from somatic cells of the ovule (Asker 1979), is the most common mechanism of apomixis in grasses and accounts for more than 95% of apomictic grasses (Bashaw and Hanna 1990).

Apomixis has been observed in the following chloridoid genera: *Bouteloua* Lag. (Harlan 1949; Freter and Brown 1955; Mohammed and Gould 1966; Bierzychudek 1985); *Chloris* (Brown and Emery 1958; Hutton 1961); *Eragrostis* (Streetman 1963a, b; Voight 1971; Voight and Bashaw 1972, 1976; Brix 1974; Vorster and Liebenberg 1984; Voight *et al.* 1992); *Eustachys* (Strydom and Spies 1994a); *Fingerhuthia* (Brown and Emery 1958); *Harpochloa* (Strydom and Spies 1994a); *Hilaria* Kunth (Brown and Emery 1958); *Rendlia* (Strydom and Spies 1994a) and *Schmidtia* (Brown and Emery 1958).

1.5 Hybridization

Great importance is attached to hybridization in the evolution of Poaceae (Tzvelev 1972, 1975). The primitive species of many genera, as well as tribes, could have originated in association with the descent of grasses from various mountain systems to the plain, followed by subsequent cross-migrations. Taxa that have undergone hybridization have a much greater possibility for genetic recombination as opposed to their primary diploids and also exhibit a greater degree of despecialization, resulting in greater evolutionary possibilities (Tzvelev 1975). Natural hybridization is common in the grasses and in populations where hybrids occur the variability is increased. The high levels of genetic variability allow grasses to colonize new habitats (Gibbs Russell and Spies 1988; Spies and Gibbs Russell 1988).

The diversity level in hybrid taxa will be affected by factors such as the number of parental species involved in their origin, the degree of genetic variation between the parental taxa, type of mating system, species age and historical circumstances (Morrell and Rieseberg 1998).

The process of natural hybridization between closely related taxa results in the production of a genetic genotype with a new genetic composition, which might or might not be favorable (Rieseberg *et al.* 1996). This implies that hybridization between lineages, along with the process of mutation, provides the basis for adaptive evolution (Anderson 1949). The process of hybrid speciation has the potential of fixating adaptive genetic combinations in the population (Grant 1981).

Polyploidy is nearly always associated with hybridization (De Wet 1987).

1.6 Polyploidy

Polyploidy and the process of plant domestication are two general features of plant evolution. Chromosome doubling renders the resultant plants with greater stress tolerance, delayed reproduction, a longer life span, greater defense against herbivores and pathogens, lower reproductive effort, larger seeds, etc. Many of these properties are important in the domestication of plants (Hilu 1993). Polyploids are also known to exhibit a greater colonizing ability than their diploid progenitors (Ehrendorfer 1980) and, thus, have a wider geographical distribution. The high incidence of polyploidy in the grass family can be attributed to the success it presents under various ecological conditions and can be explained by genomic hybridity and chromosome multiplicity (Tal 1980; Levin 1983).

Polyploids can be classified into two basic groups in terms of time of origin (Grant 1963; Goldblatt 1980):

- Neopolyploid plants have chromosome numbers that are multiples of the basic chromosome numbers found in their diploid ancestors.
- Paleopolyploid species have re-diploidized and have high secondary basic chromosome numbers.

Polyploidy has a higher frequency in perennial plants than in annuals (Stebbins 1971) due to the fact that the perennial habitat provides a selective advantage to polyploidy. In a perennial habitat, auto- and allopolyploids have a better chance to recover from sterility after polyploidization, because there is no need for immediate fitness (Hilu 1993).

Polyploid plants have higher genetic variability and higher heterozygosity than their diploid parents. There is increasing evidence that polyploids may have higher levels of self-compatibility than their related diploid ancestors. Asexual reproduction, usually absent in diploid taxa, shows an increase in consequent polyploids (Thompson and Lumaret 1992). Furthermore, inbreeding depression, traditionally counteracting the evolution of selfing, may be reduced by polyploidy. The reason for the success of polyploids may be sought in greater enzyme diversity, wider physiological tolerances and increased flexibility in the reproductive system (Thompson and Lumaret 1992).

Polyploidy has a very high frequency in the Chloridoideae (more than 60%) and especially in the southern African Chloridoideae where more than 70% of the known chromosome reports are polyploid (Appendix A, B).

1.7 Molecular markers

It is widely accepted that molecular phylogenetic studies should include multiple markers to guarantee that the resultant gene tree is an accurate representation of the species phylogeny. Relying upon a single gene for phylogenetic reconstruction can be problematic due to phenomena such as introgression, concerted evolution and mistaken orthology (Doyle 1992).

The markers that are most widely used in plants, are the *ITS* (internal transcribed spacer) regions of nuclear ribosomal DNA, and various regions in the chloroplast genome (Kim *et al.* 1999).

The *ITS* nuclear ribosomal DNA region has proven useful for elucidation of relationships at various taxonomic levels (e.g. Baldwin *et al.* 1995; Kim *et al.* 1996; Cox *et al.* 1997; Kelly 1998; Freudenstein 1999; Alan and Porter 2000; Hao *et al.* 2000; Torrecilla and Catalan 2002). This region consists of components that evolve at different rates (Ainouche and Bayer 1997) and the intergenic spacer regions are particularly suitable (Baldwin *et al.* 1995) being flanked by conserved regions that make amplification with a set of universal primers possible (White *et al.* 1990). Furthermore, the region is repeated many times in the nuclear genome (Rogers and Bendich 1987).

Chloroplast DNA sequencing has been widely used in plant phylogeny and genes such as *atp*B, *mat*K, *ndh*F and *rbc*L are popular choices (for example Chase *et al.* 1993; Kim and Jansen 1995; Gaut *et al.* 1997; Hoot and Douglas 1998; Hilu and Alice 1999; Oxelman *et al.* 1999; Savolainen *et al.* 2000; Smith 2000; Cameron *et al.* 2001). Most chloroplast coding regions do, however, not evolve rapidly enough to resolve relationships at lower taxonomic levels (Doebley *et al.* 1990; Gaut *et al.* 1992). Non-coding chloroplast regions (introns and intergenic spacers) evolve more rapidly than their coding regions by accumulating insertion/deletions (indels) at a rate almost equal to that of nucleotide substitutions (Curtis and Clegg 1984; Wolfe *et al.* 1987; Zurawski and Clegg 1987; Clegg and Zurawski 1992). This is because these regions are less functionally constrained (Clegg *et al.* 1994) and, therefore, useful in studies below family level (Gielly and Taberlet 1994). Examples of such non-coding regions include *rpo*C1 (intron) (Liston 1992; Wallace and Cota 1996; Downie *et al.* 1998); *rpl*16 (intron) (Kelchner and Clark 1997; Renner 1999; Applequist and Wallace 2000); *atp*B-*rbc*L spacer (Manen and Natalie 1995; Hoot and Douglas 1998; Schwarzbach and Ricklefs 2000) and the *trn*L-F intron, spacer region (Bayer and Starr 1998; Bakker *et al.* 1999; Bellstedt *et al.* 2001; Liede and Täuber 2002).

Although the need for multiple data sets to reliably determine phylogenies is apparent, it is also becoming clear that different data sets may in fact possess different phylogenetic histories (Wendel and Doyle 1998). This incongruence may be caused by various phenomena such as hybridization, introgression, conversion, evolutionary rate heterogeneity, lineage sorting, reticulation, concerted evolution or mistaken orthology (Rieseberg and Soltis 1991; Doyle 1992; Maddison 1997; Wendel and Doyle 1998; Sang and Zhong 2000).

Various methods have been developed to test whether the observed incongruence between different data sets is statistically robust (Larson 1994; de Queiroz *et al.* 1995; Mason-Gamer and Kellogg 1996). Some of the significance tests of heterogeneity are the following:

- 'The homogeneity test (Farris *et al.* 1995a, b) tests the null hypothesis that characters are randomly distributed between data sets with regard to their phylogenetic informativeness. If two data sets are highly incongruent then the sum of their minimal trees should be significantly shorter than that of the sum of tree lengths from random partitions of the combined data and the null hypothesis will be rejected'. This is known as the ILD (incongruence length difference) test (Mason-Gamer and Kellogg 1996) and implemented as partition homogeneity testing in PAUP*.

- 'The Wilcoxon signed-rank test (Wilcoxon *et al.* 1970; Templeton 1983) can be used to assess whether data provide significantly less support for a specified alternative topology compared to the most parsimonious topology. This method tests whether either data set, when reanalyzed under a constraint that accommodates the topological conflict presented by the other data set, produces a set of changes in the lengths of individual characters whose directionality is greater than expected by chance alone'.

Whether or not data sets are congruent is usually taken as an indication of whether they can be combined or not. This is the methodology on which the conditional combination approach is based with both separate and combined analyses being conducted. Homogeneity tests are conducted to measure the significance of incongruence levels. If the null hypothesis of data set homogeneity cannot be rejected then the data sets can be combined. If the null hypothesis is rejected, the source of heterogeneity needs to be investigated (Bull *et al.* 1993; Bremer 1996; Huelsenbeck *et al.*1996; Mason-Gamer and Kellogg 1996; Johnson and Soltis 1998; Wiens 1998).

Two other approaches to analyzing multiple data sets are the total evidence (Kluge 1989; Kluge and Wolf 1993) and congruence (Miyamoto 1985; Miyamoto and Fitch 1995) approaches. With the total evidence approach phylogenetic analysis is done of all available evidence in combination. With the congruence approach, data sets are analyzed separately and after the separate analyses, consensus methods are used to identify points of agreement between the data sets.

1.7.1 Chloroplast genome

Chloroplast DNA is independent of polyploidy, an event which has its highest known incidence in the grass family. Autopolyploidy, where genomes are duplicated, does not affect the chloroplast genome (Ogihara and Tsunewaki 1982). With allopolyploids and segmental allopolyploids, however, where hybridization occurs, the mode of chloroplast inheritance would play a role. Chloroplasts and chloroplast DNA are inherited maternally (reviewed in Kirk and Tilney-Bassett 1978; Sears 1980; Whatley 1982; Mogensen 1996). In some angiosperm families paternal inheritance does occur and, in the case of biparental inheritance, the maternal parent usually donates most of the cytoplasm (Hilu 1987).

In most respects the molecular evolution of the chloroplast genes reflects that of the nuclear genes. Chloroplast protein-coding genes, however, evolve approximately five times slower than the nuclear genes (Wolfe *et al.* 1987, 1989). The non-coding regions of the chloroplast genome tend to evolve more rapidly than the coding region (Wolfe and Sharp 1988). Two major factors in distinguishing between chloroplast and nuclear genome evolution are the lack of transposon activity associated with the chloroplast genome and the apparent lack of recombinational potential. Because biparental inheritance is rare for the chloroplasts and intraspecific variance is low, recombinational processes do not play an important role in chloroplast sequence evolution (Clegg and Zurawski 1992).

The mutations in the chloroplast genome include point mutations (substitutions) and rearrangements. Major rearrangements include inversions and indels of genes and introns. Minor rearrangements consist of smaller indels (1-1000bp). These minor rearrangements are the most common mutation and occur mostly in the non-coding regions of the intergenic spacers and introns (Palmer 1985). According to Soltis *et al.* (1989, 1990a), these mutations may provide essential information in studies of closely related taxa.

The combination of adjacent regions that evolve at different rates may increase the phylogenetic range over which the sequences can be useful. The more slowly evolving regions provide support for older divergences, while the more rapidly evolving regions, usually non-coding chloroplast DNA sequences, which exhibit higher mutation rates (for example Clegg and Zurawski 1992), provide resolution at intrageneric as well as intraspecific levels (Taberlet *et al.* 1991; McDade and Moody 1999).

The non-coding chloroplast region investigated in this study comprises the *trn*L intron (the intron of the transfer RNA leucine-UAA gene), *trn*L 3' exon, and the *trn*L-F spacer (the intergenic spacer between *trn*L exon and the transfer RNA phenylalanine-GAA gene) (hereafter referred to as the *trn*L-F region) (Figure 1.1).

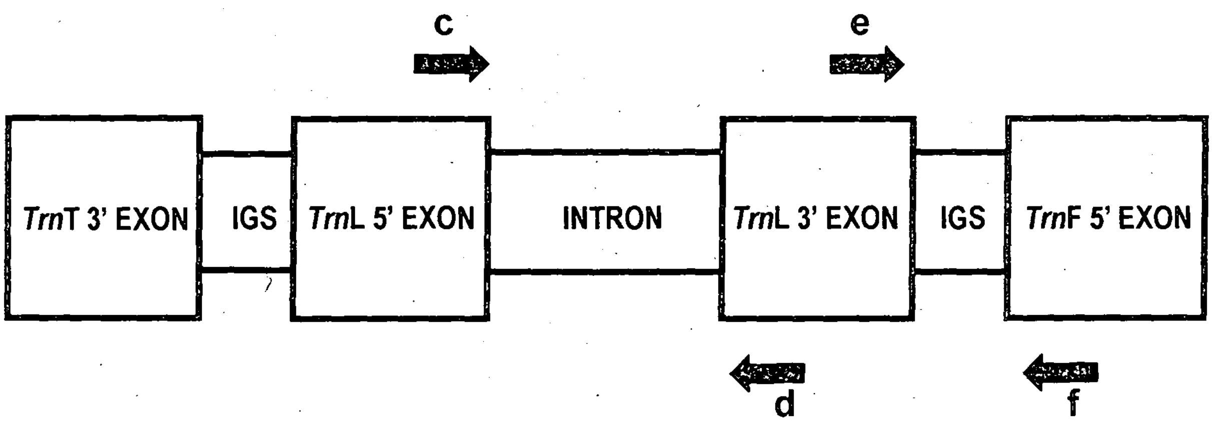

Figure 1.1. *Trn*L-F region in the chloroplast genome. IGS indicates the intergenic spacer region between the *trn* genes. The primers used are designated as c–f and the positions in which they approximately anneal are also indicated. Regions are not drawn to scale.

This region has been investigated at various levels:

- Generic – *Disa* (Bellstedt *et al.* 2001); *Miscanthus* (Hodkinson *et al.* 2002a); *Pelargonium* (Bakker *et al.* 1999).
- Tribal – Andropogoneae (Hodkinson *et al.* 2002b); Gnaphalieae (Bayer *et al.* 2000); Melanthieae (Zomlefer *et al.* 2001).
- Subfamily – Zygophylloideae (Sheahan and Chase 2000).
- Family – Acanthaceae (McDade and Moody 1999); Palmae (Baker *et al.* 1999); Restionaceae (Eldenas and Linder 2000).

1.7.2 Nuclear genome

ITS sequence analysis has proven to be an effective tool for testing phylogenetic relationships within and among closely related genera (e.g. Baldwin *et al.* 1995; Kim *et al.* 1996). Variation in the internal transcribed spacer region has also been used in higher-level relationships, for example within tribes in the Poaceae (Hsiao *et al.* 1995a, b), at familial level (e.g. Downie and Katz-Downie 1996) and even among families of flowering plants (Hershkovitz and Zimmer 1996).

The predominance of rRNA genes in nature and the considerable evidence that the repeat unit consists of regions that have different rates of sequence divergence explains the phylogenetic utility of *ITS* (Wojciechowski *et al.* 1993).

Ribosomal repeats exhibit a pattern of concerted evolution in which the repeats present in one array are more closely related to one another than to repeats in arrays on other chromosomes (Copenhaver *et al.* 1995) or repeats in other taxa (Arnheim 1983). Processes such as unequal crossing over (Smith 1976), gene conversion (Arnheim 1983) and biased gene conversion (Hillis *et al.* 1991) drive this concerted evolution.

Nucleotide differences arising from mutation are usually corrected by homogenization (Leskinen and Alström-Rapaport 1999). *ITS* region polymorphisms may, however, occur when concerted evolution among paralogous genes does not homogenize the sequences fast enough for them to behave as a single orthologous unit, thereby impairing the ability to infer a species phylogeny from the gene phylogeny (Sanderson and Doyle 1992). In angiosperms this can be caused by polyploidy, hybridization, agamospermy and slow rates of concerted evolution across nuclear ribosomal DNA loci on non-homologous chromosomes (Buckler *et al.* 1997).

The nuclear *ITS* region includes the internal transcribed spacer regions *ITS*1 and *ITS*2 and the 5.8S rDNA (Figure 1.2).

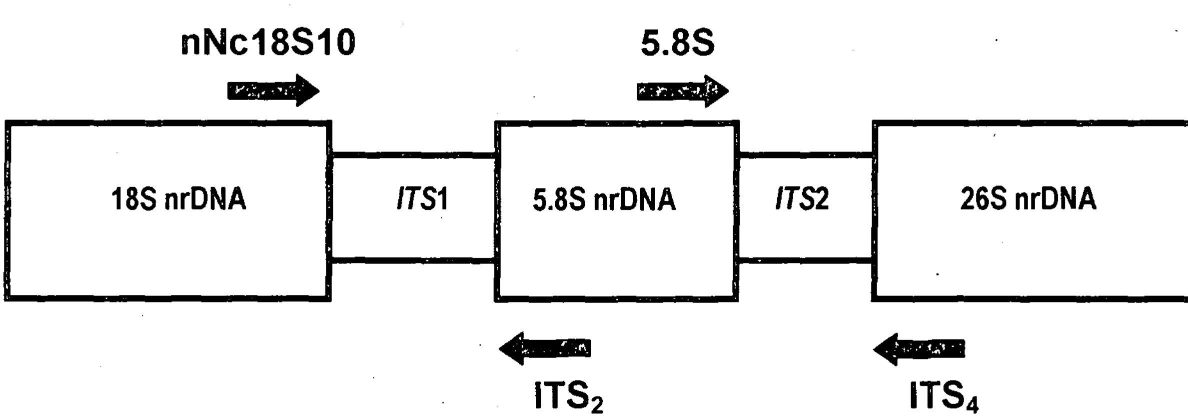

Figure 1.2. The internal transcribed spacer regions (*ITS*) of nuclear ribosomal DNA. The primers used are designated as nNc18S10, ITS_2, ITS_4 and 5.8S and the positions in which they approximately anneal are also indicated. Regions are not drawn to scale.

1.8 Phylogeny

Understanding evolutionary processes involves a detailed knowledge of evolutionary pattern. Phylogeny reconstruction is, therefore, essential to all evolutionary biology. Especially over the last 20 years, more and more methods have been developed for phylogenetic analysis, which is in large part attributed to the increasing availability of computing power (Kellogg and Watson 1993).

In recent years phylogenetic studies of the grass family, especially at the molecular level, have greatly increased in number [Hamby and Zimmer 1988 (18S ribosomal DNA); Doebley *et al.* 1990 (plastid gene *rbc*L); Doyle *et al.* 1992a (chloroplast DNA inversions); Hamby and Zimmer 1992 (nuclear ribosomal 18S and 26S RNA); Davis and Soreng 1993 (plastid DNA restriction site data); Cummings *et al.* 1994 (plastid gene *rpo*C2); Nadot *et al.* 1994 (plastid gene *rps*4); Barker *et al.* 1995 (plastid gene *rbc*L); Clark *et al.* 1995 (plastid gene *ndh*F); Duvall and Morton 1996 (plastid gene *rbc*L); Liang and Hilu 1996 (plastid gene *mat*K); Mathews and Sharrock 1996 (nuclear phytochrome gene family); Morton *et al.* 1996 (nuclear gene *Adh*); Gaut *et al.* 1997 (nuclear gene *Adh* and plastid gene *rbc*L); Kellogg 1998a (combination of published results on anatomy, morphology, plastid genes *rbc*L, *ndh*F, *rpo*C2 and *rps*4, chloroplast restriction site data, nuclear ribosomal RNA and the nuclear genes *phy*B and GBSSI); Mason-Gamer *et al.* 1998 (nuclear gene GBSS1); Soreng and Davis 1998 (combination of morphological, anatomical, chromosomal, biochemical and structural chloroplast features with chloroplast restriction site data); Barker *et al.* 1999 (grass-specific insert in plastid gene *rpo*C2); Gaut *et al.* 1999 (nuclear gene *Adh*); Hilu and Alice 1999 (plastid gene *mat*K); Hilu *et al.* 1999 (plastid gene *mat*K); Hsiao *et al.* 1999 (nuclear *ITS* regions); Clark *et al.* 2000 (combination of plastid genes *ndh*F and *rbc*L with nuclear gene *phy*B); Mathews *et al.* 2000 (nuclear gene *phy*B); Zhang 2000 (plastid gene *rpl*16 intron)].

These studies mostly support a monophyletic PACC (Panicoideae-Arundinoideae-Chloridoideae-Centothecoideae) assemblage *sensu* Davis and Soreng (1993). Hilu and Wright (1982) first resolved this monophyletic group in a phenetic analysis of 85 taxa with morphological and anatomical data. Further morphological and anatomical evidence for this grouping includes immunological and prolamin studies (Hilu and Esen 1988, 1990, 1993; Esen and Hilu 1989). Very few of these studies have, however, been able to resolve relationships within the PACC assemblage.

The study done by Hsiao *et al.* (1999) resolved relationships within the PACC clade and placed Panicoideae as the sister to Chloridoideae. This supports their sharing of an arundinoid-like common ancestor as proposed by Clayton (1981). Further evidence indicating a close relationship between these two subfamilies is characteristics such as lodicule structure, length of the embryo, nature of the first leaf of the seedling, C_4 photosynthetic pathways and characteristic anatomy, as well as chromosome number and size (Hilu and Johnson 1991).

Studies done by the Grass Phylogeny Working Group (2001), involved the combined data of eight data sets: morphological [a varied set of characters representing variation in macromorphology, biochemistry and anatomy, as well as structural variants for example inversions and deletions in the plastid and nuclear genes), restriction site variation throughout the plastid genome, sequences of *ndh*F, *rbc*L, *rpo*C2 (plastid genome) and *ITS*, *phy*B and *waxy* (nuclear genome)]. Representatives were sampled from all recognized subfamilies, constituting 57 exemplar grass genera (GPWG 2001). In this analysis the two clades PACC and BOP (Bambusoideae-Oryzoideae-Pooideae) were resolved as sister groups. Within PACC, Chloridoideae, Centothecoideae and Panicoideae were resolved as monophyletic, with Arundinoideae being paraphyletic. According to this, Chloridoideae are nested in the Arundinoideae (GPWG 2001). Subsequently with the new subfamilial classification of the GPWG (2001) the BOP clade has become the BEP (Bambusoideae-Ehrhartoideae-Pooideae) clade and the PACC clade has become the PACCAD (Panicoideae-Arundinoideae-Centothecoideae-Chloridoideae-Aristidoideae-Danthonioideae) clade.

1.9 Aim of the study

Hybridization and subsequent polyploidy have a high frequency in the grasses. These phenomena, which lead to reticulate evolution, may be partly responsible for large-scale homoplasy in Poaceae (Van den Borre and Watson 1997).

The main aim of this study was to investigate southern African Chloridoideae on cytogenetic and molecular levels.

Chromosome numbers and meiotic behavior of southern African Chloridoideae will be determined. The incidence of polyploidy will also be investigated. By making a worldwide and southern African comparison of known chromosome number reports, the incidence of ancestral polyploidization (paleopolyploidy) in the subfamily will be examined. By studying the types of polyploids present in the subfamily, the frequency of hybridization can be assessed.

The phylogeny of southern African Chloridoideae will be investigated based on two genomic regions, namely nuclear ribosomal *ITS* and chloroplast *trn*L-F. The monophyly of the subfamily, constituent tribes and genera in the subfamily will be investigated. Due to the different modes of inheritance of the two regions investigated, incongruent phylogenies may indicate the existence of putative hybrids.

Lastly it is the aim of this study to examine whether groups with a high known occurrence of polyploidy and hybridization can be successfully examined on a phylogenetic level and whether adequate resolution can be obtained.

CHAPTER 2
Materials and Methods

One hundred and thirty specimens, representing 27 genera and 58 species of southern African Chloridoideae, were investigated during this study. Studies done on these specimens include cytogenetic investigation by means of squashes, where anthers were dissected and meiotic cells were investigated, and DNA sequencing of the *ITS* regions in the nuclear genome and the *trn*L-F region in the chloroplast genome. These results were used in a phylogenetic study to determine relationships, to investigate phenomena such as polyploidy and hybridization, and the effects of these phenomena on phylogenetic reconstruction and resolution. The computer program PAUP* (version 4.0b10) was used for phylogenetic analyses.

2.1 Materials

Voucher herbarium specimens were collected in the veld and stored in the Geo Potts Herbarium Bloemfontein (BLFU) or in the National Herbarium, Pretoria (PRE). The plants collected are listed in Table 2.1.

DNA Molecular Marker VI (pBR328 DNA cleaved with a mixture of *Bgl*I and *Hinf*I) (Boehringer Mannheim cat. no. 1062590); *Thermus aquaticus* (*Taq*) Super Therm DNA polymerase with 10X Buffer (Southern Life Biotechnology LPI-801, LPI-455); sequencing primers (Integrated DNA Technology, custom synthesized) and the ABI (Applied Biosystems Inc.) PRISM BigDye Terminator v3.0 Ready Reaction Cycle Sequencing Kit and 5X [Tris-HCl (pH9.0) + $MgCl_2$] dilution solution (ABI, product no. 4390242, 4305605) were used during this study. All other chemicals used during the study were of either analytical or electrophoretic grade.

Data on some of the *ITS* and *trn*L-F sequences were obtained from Genbank. These taxa are listed in Table 2.2.

Table 2.1. List of localities and voucher herbarium numbers of specimens investigated in this study. (C) indicates chromosome studies only, (S) indicates molecular studies only (DNA sequencing) and (B) indicates both cytogenetic and molecular studies. Where AS follows a voucher number, the cytogenetic results have been published already in Strydom and Spies (1994b) but additional molecular work was done on these specimens during this study. Grid references are presented using the degree reference system (Edwards and Leistner 1971). Spies refers to material collected by J.J. Spies, Davidse to G. Davidse, HJTV to H.J.T. Venter, Swart to E. Swart and HdP to H. du Plessis.

Bewsia Gooss.

B. biflora **(Hack.) Gooss.**

MPUMALANGA.—2530 (Lydenburg): Steenkamp's Mountains (–AA), *Spies 1531* (C).

Catalepis Stapf & Stent

C. gracilis **Stapf & Stent**

FREE STATE.—2828 (Bethlehem): 10 km from Clarens to Fouriesburg (–CB), *Spies 6653* (S).

EASTERN CAPE.—3028 (Matatiele): 26 km from Rhodes to Maclear (–DA), *Spies 6962* (S).

Centropodia Rchb.

C. glauca **(Nees) Cope**

NORTHERN CAPE.—2816 (Oranjemund): 46 km from Bloeddrift to Alexander Bay (–DA), *Spies 5706* (C).

Chloris Sw.

C. virgata **Sw.**

FREE STATE.—2827 (Senekal): 20 km from Senekal to Rosendal (–BD), *Spies 6616* (B). 2926 (Bloemfontein): UFS library, Bloemfontein (–AA), *Spies 7498* (S).

Cladoraphis Franch.

C. *cyperoides* (Thunb.) S.M.Phillips

NORTHERN CAPE.—2816 (Oranjemund): 46 km from Bloeddrift to Alexander Bay (–CB), *Spies 5704* (B). 2917 (Springbok): 84 km from Springbok to Kleinsee (–CA), *Spies 4889* (C); 135 km from Springbok to Kleinsee (–CA), *Spies 4894* (B).

WESTERN CAPE.—3118 (Vanrhynsdorp): 21 km from Doorn Bay to Donkin Bay (–CD), *Spies 5356* (C).

C. *spinosa* (L.f.) S.M.Phillips

NORTHERN CAPE.—2917 (Springbok): 82 km from Springbok to Kleinsee (–CA), *Spies 4885* (B).

WESTERN CAPE.—3118 (Vanrhynsdorp): 7 km from Vanrhynsdorp to Nuwerus (–DA), *Spies 6335* (S).

Cynodon Rich.

C. *dactylon* (L.) Pers.

SWAZILAND.—2631 (Mbabane): 18 km north east of Mbabane (–BD), *Spies 2549* (C).

NORTHERN CAPE.—2816 (Oranjemund): Alexander Bay (–DA), *Spies 2966* (C).

FREE STATE.—2925 (Jagersfontein): 33 km from Bloemfontein to Petrusburg (–AB), *Spies 7480* (S).

EASTERN CAPE.—3026 (Aliwal North): Aliwal North (–DA), *Spies 5248* (B) (AS).

Dactyloctenium Willd.

D. *aegyptium* (L.) Willd.

KWAZULU-NATAL.—2832 (Mtubatuba): Richard's Bay (–CC), *HJTV 9326* (S); 22 km from Cape Vidal to St Lucia (–AD), *Spies 2403* (C).

Eleusine Gaertn.

E. *coracana* (L.) Gaertn. subsp. *africana* (Kenn.-O'Byrne) Hilu & DeWet

KWAZULU-NATAL.—2832 (Mtubatuba): Cape Vidal (–BA), *Spies 2365* (C), *Spies 2366* (C).

WESTERN CAPE.—3118 (Vanrhynsdorp): Koekenaap, irrigation scheme (–CB), *Spies 2783* (C).

Enneapogon P.Beauv.

E. cenchroides (Roem. & Schult.) C.E.Hubb

LIMPOPO.—2428 (Nylstroom): Soutpan at the crater (–CD), *Spies 3288* (C).

NORTHERN CAPE.—2924 (Hopetown): 31 km from Hopetown to Britstown (–CA), *Spies 2709* (C).

EASTERN CAPE.—3125 (Steynsburg): Cradock, on rocky outcrop outside town (–DD), *Spies 7506* (S). 3323 (Willowmore): 110 km from Willowmore to Patensie (–DB), *Spies 5213* (S).

E. pretoriensis Stent

LIMPOPO.—2627 (Potchefstroom): 7 km from Hartbeeshoek turn-off between Muldersdrift and Hekpoort (–BB), *Spies 3716* (C).

E. scoparius Stapf

NORTHERN CAPE.—2922 (Prieska): Nelspoortjie / Vogelstruisbult (–CB), *Swart 18* (S).

FREE STATE.—2925 (Jagersfontein): 54 km from Petrusburg to Kimberley (–AB), *Spies 7487* (S)

Enneapogon sp.

NORTH-WEST.—2725 (Bloemhof): 31 km from Vryburg to Schweizer-Reineke (–AB), *Spies 5532* (C).

Enteropogon Nees

E. macrostachyus (A.Rich.) Benth.

NAMIBIA.—1913 (Sesfontein): Sesfontein, Kaokoland (–BB), *HJTV 9339* (B).

Entoplocamia Stapf

E. aristulata (Hack. & Rendle) Stapf

NAMIBIA.—2415 (Sossusvlei): Sesriem (–DB), *HJTV 9353* (S).

Eragrostis Wolf

E. barbinodes Hack.

LIMPOPO.—2428 (Nylstroom): Soutpan (–CD), *Spies 3317* (C).

E. *biflora* **Hack. ex Schinz**

FREE STATE.—2926 (Bloemfontein): Bloemfontein (–DA), *Spies 6705* (S).

E. *capensis* **(Thunb.) Trin.**

MPUMALANGA.—2530 (Lydenburg): 41 km from Lydenburg to Roossenekal (–AB), *Spies 1595* (C). 2729 (Volksrust): Hartbeesfontein, Volksrust (–BB), *Spies 6532* (S).

FREE STATE.—2729 (Volksrust): 92 km from Harrismith to Normandien Pass (–DC), *Spies 5069* (C); Giddies Home, Memel (–DC), *Spies 6551* (S).

KWAZULU-NATAL.—2931 (Stanger): Balito Bay to Umhlali at turnoff before Stanger/Tongaat connection (–AC), *HdP 110* (C).

EASTERN CAPE.—3028 (Matatiele): 65 km from Rhodes via Naude's Neck (–CC), *Spies 4696* (C). 3325 (Port Elizabeth): 2 km from Rocklands to Elands River (–CD), *Spies 3483* (C). 3424 (Humansdorp): 4 km from Humansdorp to Cape St Frances (–BB), *Spies 3498* (C).

LOCALITY UNKNOWN. *Davidse 33552* (C).

E. *chloromelas* **Steud.**

FREE STATE.—2925 (Jagersfontein): 12 km from Bloemfontein to Petrusburg (–AB), *Spies 7474* (S).

EASTERN CAPE.—3027 (Lady Grey): 35 km from Aliwal North to Lady Grey (–CA), *Spies 6947* (B).

E. *ciliaris* **(L.) R.Br.**

KWAZULU-NATAL.—2931 (Stanger): On route from Balito Bay to Umhlali at turnoff before Stanger / Tongaat connection (–AC), *HdP 111* (C).

E. *curvula* **(Schrad.) Nees**

MPUMALANGA.—2729 (Volksrust): Hartbeesfontein, Volksrust (–BB), *Spies 6529* (S).

EASTERN CAPE.—3225 (Somerset East): 35 km from Somerset East to Pearston (–CB), *Spies 1137* (C). 3324 (Steytlerville): 25 km from Patensie to Willowmore (–DA), *Spies 5191* (S).

E. *echinochloidea* **Stapf**

FREE STATE.—2925 (Jagersfontein): 60 km from Bloemfontein to Petrusburg (–AB), *Spies 7485* (S).

NORTHERN CAPE.—2917 (Springbok): 36 km from Springbok to Hondeklip Bay (–DB), *Spies 5933* (S). 3018 (Kamiesberg): 3 km from Bitterfontein to Garies (–DB), *Spies 2799* (C), *Spies 2800* (C).

E. heteromera **Stapf**

SWAZILAND.—2631 (Mbabane): 80 km from Manzini to Lomahasha (–BA), *Spies 2634* (C).

E. inamoena **K.Schum.**

KWAZULU-NATAL.—2832 (Mtubatuba): 12 km from Cape Vidal to St Lucia (–AD), *Spies 2392* (C).

E. lehmanniana **Nees var. *lehmanniana***

NORTHERN CAPE.—2922 (Prieska): Nelspoortjie / Vogelstruisbult (–CB), *Swart 20* (S).

EASTERN CAPE.—3125 (Steynsburg): 4 km from turnoff to Graaff-Reinet from Cradock (–DD), *Spies 7514* (S).

E. obtusa **Munro ex Ficalho & Hiern.**

FREE STATE.—2827 (Senekal): 20 km from Senekal to Rosendal (–BD), *Spies 6623* (S). 2924 (Hopetown): 16 km from Griekwastad to Kimberley (–CD), *Spies 2886* (C).

NORTHERN CAPE.—3123 (Victoria West): 140 km from Beaufort West to Colesberg (–DA), *Spies 6732* (S).

E. planiculmis **Nees**

EASTERN CAPE.—3225 (Somerset East): Daggaboer's Neck Pass, Cookhouse to Cradock (–DB), *Spies 1116* (C).

E. pseudobtusa **DeWinter**

EASTERN CAPE.—3125 (Steynsburg): Cradock, on rocky outcrop outside town (–DD), *Spies 7508* (S).

E. racemosa **(Thunb.) Steud.**

MPUMALANGA.—2729 (Volksrust): Hartbeesfontein, Volksrust (–BB), *Spies 6533* (S).

FREE STATE.—2729 (Volksrust): 92 km from Harrismith to Normandien Pass (–DC), *Spies 5066* (C).

KWAZULU-NATAL.—2829 (Harrismith): Windy Corner, Van Reenen (–AD), *Spies 3279* (C).

EASTERN CAPE.—3027 (Lady Grey): 15 km from Barkly East to Lady Grey (–CD), *Spies 4743* (C).

E. sclerantha Nees subsp. _sclerantha_

FREE STATE.—2828 (Bethlehem): 19 km from Fouriesburg to Clarens (–CA), *Spies 4844* (C).

E. superba Peyr.

LIMPOPO.—2428 (Nylstroom): Soutpan (–CD), *Spies 3326* (C).

KWAZULU-NATAL.—2830 (Dundee): 5 km from Muden to Greytown (–DC), *HdP 136* (C).

FREE STATE.—2925 (Jagersfontein): 12 km from Bloemfontein to Petrusburg (–AB), *Spies 7470* (S).

E. tef (Zucc.) Trotter

KWAZULU-NATAL.—2832 (Mtubatuba): 22 km from Cape Vidal to St Lucia (–AD), *Spies 2405* (C).

E. tenuifolia (A.Rich.) Steud.

SWAZILAND.—2631 (Mbabane): Siteki (–BD), *Spies 2595* (C).

E. trichophora Coss. & Dur.

WESTERN CAPE.—3118 (Vanrhynsdorp): 3 km from Lutzville to Koekenaap (–CB), *Spies 2774* (C).

Eustachys Desv.

E. paspaloides Lanza & Mattei

EASTERN CAPE.—3228 (Somerset East): Cookhouse (–DB), *Spies 5597* (S).

Fingerhuthia Nees

F. africana Lehm.

NAMIBIA.—2618 (Keetmanshoop): Remshoogte, Annisfontein (–BD), *Spies 2947* (C).

NORTHERN CAPE.—2917 (Springbok): 21 km from Springbok to Kleinsee (–DB), *Spies 4879* (S).

WESTERN CAPE.—3118 (Vanrhynsdorp): 35 km from Vanrhynsdorp to Nieuwoudtville (–DA), *Spies 4349* (B).

EASTERN CAPE.—3125 (Steynsburg): Cradock, on rocky outcrop outside town (–DD), *Spies 7507* (S).

Harpochloa Kunth

H. falx (L.f.) Kuntze

MPUMALANGA.—2530 (Lydenburg): Nederhorst turnoff on Lydenburg-Roossenekal road (–AA), *Spies 5128* (C); 11 km from Dullstroom to Lydenburg via Frischgewaagd (–AC), *Spies 5118* (S); 16 km from Dullstroom to Lydenburg via Frischgewaagd (–AC), *Spies 5125* (C); 5 km from Belfast to Dullstroom (–CA), *Spies 5113* (C). 2729 (Volksrust): Hartbeesfontein, Volksrust (–BB), *Spies 6530* (S).

FREE STATE.—2729 (Volksrust): 92 km from Harrismith to Normandien Pass (–DC), *Spies 5065* (C); 97 km from Harrismith to Normandien Pass (–DC), *Spies 5078* (C). 2827 (Senekal): 33 km from Senekal to Rosendal (–BD), *Spies 6629* (C). 2828 (Bethlehem): 38 km from Clarens to Phudatitjhaba (–DA), *Spies 6670* (S).

EASTERN CAPE.—3027 (Lady Grey): 39 km from Barkly East to Rhodes (–DD), *Spies 6955* (C); 45 km from Barkly East to Rhodes (–DD), *Spies 3986* (C); 52 km from Rhodes via Lundean's Neck (–DD), *Spies 4729* (C). 3028 (Matatiele): 47 km from Rhodes via Naude's Neck (–CC), *Spies 4691* (C); 65 km from Rhodes to Maclear via Naude's Neck (–CC), *Spies 4695* (C). 3128 (Umtata): 38 km from Maclear to Elliott (–AC), *Spies 4712* (C).

Leptochloa P.Beauv.

L. fusca (L.) Kunth

NORTHERN CAPE.—2917 (Springbok): 7 km from Springbok to Kleinsee (–DB), *Spies 4875* (C). 3017 (Hondeklip Bay): 12 km east of Hondeklip Bay (–AD), *Spies 3037* (C); 5 km east of Kamieskroon (–BB), *Spies 2991A* (C). 3018 (Kamiesberg): 35 km from Leliefontein to Garies (–AB), *Spies 4316* (C).

FREE STATE.— 2826 (Brandfort): Soetdoring nature reserve (–CC), *Spies 7622* (S).

WESTERN CAPE.—3118 (Vanrhynsdorp): Gifberg, FM tower gate (–CB), *Spies 3794* (C). 3419 (Caledon): McGregor FM tower, Riviersonderend Mountains (–BA), *Spies 3932* (C).

EASTERN CAPE.—3324 (Steytlerville): 34 km from Patensie to Willowmore (–DD), *Spies 5200* (C).

LOCALITY UNKNOWN. *Davidse 33407* (C).

Microchloa R.Br.

***M. caffra* Nees**

MPUMALANGA.—2530 (Lydenburg): 49 km from Lydenburg to Machadadorp (–CB), *Spies 5146* (B) (AS).

Odyssea Stapf

***O. paucinervis* (Nees) Stapf**

NORTHERN CAPE.—3017 (Hondeklip Bay): Groen River mouth, on dunes and rocks (–DC), *Spies 3384* (C).

Perotis Aiton

***P. patens* Gand.**

KWAZULU-NATAL.—2832 (Mtubatuba): Richard's Bay (–CC), *HJTV 9323* (S).

Pogonarthria Stapf

***P. squarrosa* (Roem. & Schult.) Pilg.**

FREE STATE.—2925 (Jagersfontein): 46 km from Bloemfontein to Petrusburg (–AB), *Spies 7483* (S). 2926 (Bloemfontein): Bloemfontein (–AA), *Spies 7504* (S).

Polevansia DeWinter

***P. rigida* DeWinter**

EASTERN CAPE.—3027 (Lady Grey): Between Lady Grey and Barkly East (–CD), *Spies 7621* (S).

Rendlia Chiov.

***R. altera* (Rendle) Chiov.**

MPUMALANGA.—2530 (Lydenburg): 4 km from Pilgrim's Rest to Graskop (–BA), *Spies 5133* (S).

Schmidtia Steud.

***S. kalihariensis* Stent**

NORTHERN CAPE.—2824 (Kimberley): 24 km from Kimberley to Barkly West (–DA), *Spies 7490* (S).

FREE STATE.—2925 (Jagersfontein): 37 km from Petrusburg to Kimberley (–AB), *Spies 7486* (S).

S. *pappophoroides* Steud.

LIMPOPO.—2329 (Pietersburg): 66 km from Pietersburg to Louis Trichardt (–BB), *HdP 186* (C).

WESTERN CAPE.—3118 (Vanrhynsdorp): 7 km from Vanrhynsdorp to Nuwerus (–DA), *Spies 6334* (S).

***Schmidtia* sp.**

NORTHWEST.—2624 (Vryburg): 36 km from Vryburg to Amalia (–DC), *Spies 5536* (C).

Sporobolus R.Br.

S. *africanus* (Poir.) Robyns & Tournay

KWAZULU-NATAL.—2832 (Mtubatuba): Cape Vidal (–BA), *Spies 2369* (C).

FREE STATE.—2925 (Jagersfontein): 46 km from Bloemfontein to Petrusburg (–AB), *Spies 7476* (S).

WESTERN CAPE.—3420 (Bredasdorp): 1.4 km from De Hoop Nature Reserve (–AD), *Spies 4508* (C).

S. *albicans* Nees

WESTERN CAPE.—3220 (Sutherland): 15 km from Sutherland to Matjiesfontein, Verlatenkloof (–BC), *Spies 3141* (C).

S. *consimilis* Fresen.

NAMIBIA.—2316 (Nauchas): Gaub River bridge, on road between Namib park and Solitaire (–CC), *HJTV 9354* (S).

S. *fimbriatus* (Trin.) Nees

KWAZULU-NATAL.—2832 (Mtubatuba): Richard's Bay (–CC), *HJTV 9328* (S).

EASTERN CAPE.—3125 (Steynsburg): Cradock, next to rocky outcrop outside town (–DD), *Spies 7509* (S).

S. *ioclados* (Trin.) Nees

NORTHERN CAPE.—2923 (Douglas): 65 km from Hope Town to Strydenburg (–DC), *Spies 2717*(C).

S. *pyramidalis* P.Beauv.

EASTERN CAPE.—3028 (Matatiele): 31 km from Rhodes to Maclear in Naude's Neck (–DA), *Spies 6966* (S).

S. *virginicus* (L.) Kunth

KWAZULU-NATAL.—2931 (Stanger): Tongaat River, on beach near bridge (–CA), *HdP 122* (C).

Stiburus Stapf

S. *alopecuroides* (Hack.) Stapf

MPUMALANGA.—2530 (Lydenburg): Steenkamp's Mountains, 18 km from Dullstroom to Goede Hoop (–AC), *Spies 1470* (C).

S. *conrathii* Hack.

MPUMALANGA.—2530 (Lydenburg): 19 km from Lydenburg to Weltevreden (–AB), *HdP 19* (C).

Tragus Haller

T. *berteronianus* Schult.

FREE STATE.—2827 (Senekal): 20 km from Senekal to Rosendal (–BD), *Spies 6620* (S).

T. *koelerioides* Asch.

EASTERN CAPE.—3123 (Victoria West): 140 km from Beaufort West to Colesberg (–DA), *Spies 6729* (S).

T. *racemosus* (L.) All.

FREE STATE.—2727 (Kroonstad): Kroonstad (–CA), *Spies 7108* (S).

***Tragus* sp.**

FREE STATE.—2827 (Senekal): 6 km from Clocolan to Peka bridge (–DC), *Spies 4803* (C).

Trichoneura Anderss.

T. *grandiglumes* (Nees) Ekman

FREE STATE.—2827 (Senekal): 6 km from Nebo to Fouriesburg via Generaal's Neck (–DB), *Spies 4833* (C).

OUTGROUPS

Aristida L. (Aristidoideae)

***A. adscensionis* L.**

MPUMALANGA.—2729 (Volksrust): Hartbeesfontein, Volksrust (–BB), *Spies 6540* (S).

Chaetobromus Nees (Danthonioideae)

***Chaetobromus involucrates* (Schrad.) Nees subsp. *dregeanus* (Nees) Verboom**

NORTHERN CAPE.—3119 (Calvinia): 83 km from Clanwilliam to Nieuwoudtville (–AC), *Spies 6284* (S).

Karroochloa Conert & Türpe (Danthonioideae)

***Karroochloa purpurea* (L.f.) Conert & Türpe**

WESTERN CAPE.—3320 (Montagu): 48 km from Montagu to Touwsrivier (–CD), *Spies 6241* (S).

Phragmites Adans. (Arundinoideae)

***Phragmites australis* (Cav.) Steud.**

FREE STATE.—2729 (Volksrust): Giddies Home, Memel (–DC), *Spies 6557* (S).

Table 2.2. List of Genbank sequences used in this study.

Species	(Subfamily, Tribe)	Genbank accession number	Region investigated	Reference
Astrebla lappacea	Chloridoideae, Cynodonteae	AF019838	*ITS*1-*ITS*2	Hsiao *et al.* 1999
Centropodia glauca	Chloridoideae, *incertae cedis*	AF019861	*ITS*1-*ITS*2	Hsiao *et al.* 1998
Cynodon dactylon	Chloridoideae, Cynodonteae	AJ489601	*ITS*1-*ITS*2	Ferris *et al.* (unpubl.)
Cynodon dactylon	Chloridoideae, Cynodonteae	AJ489466	*Trn*L intron	Ferris *et al.* (unpubl.)
Eleusine coracana	Chloridoideae, Eragrostideae	AJ489602	*ITS*1-*ITS*2	Ferris *et al.* (unpubl.)
Eleusine coracana	Chloridoideae, Eragrostideae	AJ489464	*Trn*L intron	Ferris *et al.* (unpubl.)
Eleusine indica	Chloridoideae, Eragrostideae	AJ489603	*ITS*1-*ITS*2	Ferris *et al.* (unpubl.)
Eleusine indica	Chloridoideae, Eragrostideae	AJ489465	*Trn*L intron	Ferris *et al.* (unpubl.)
Imperata cylindrica	Panicoideae, Andropogoneae	AY116297	*ITS*1-*ITS*2	Hodkinson *et al.* 2002b
Imperata cylindrica	Panicoideae, Andropogoneae	AY116262	*Trn*L-F spacer	Hodkinson *et al.* 2002b
Merxmuellera rangei	Chloridoideae, *incertae cedis*	AF019862	*ITS*1-*ITS*2	Hsiao *et al.* 1998
Muhlenbergia richardsonis	Chloridoideae, Eragrostideae	AF019837	*ITS*1-*ITS*2	Hsiao *et al.* 1999
Panicum lanipes	Panicoideae, Paniceae	AY129710	*ITS*1-*ITS*2	Missaoui *et al.* (unpubl.)
Panicum lanipes	Panicoideae, Paniceae	AY142732	*Trn*L intron	Missaoui *et al.* (unpubl.)
Panicum stapfianum	Panicoideae, Paniceae	AY129724	*ITS*1-*ITS*2	Missaoui *et al.* (unpubl.)
Panicum stapfianum	Panicoideae, Paniceae	AY142745	*Trn*L intron	Missaoui *et al.* (unpubl.)
Sorghum halepense	Panicoideae, Andropogoneae	AY116293	*ITS*1-*ITS*2	Hodkinson *et al.* 2002b
Sorghum halepense	Panicoideae, Andropogoneae	AY116244	*Trn*L-F spacer	Hodkinson *et al.* 2002b
Triodia stenostachya	Chloridoideae, Eragrostideae	AF019836	*ITS*1-*ITS*2	Hsiao *et al.* 1999

2.2 Methods

2.2.1 Cytogenetics

2.2.1.1 Meiotic analysis

Young inflorescences were fixed in Carnoy's fixative (ethanol: chloroform: acetic acid::6:3:1) (Carnoy 1886). The fixative was replaced by 70% (v/v) ethanol 24-48 hours after fixation. Anthers of the inflorescences were squashed in 2% (m/v) aceto-carmine (Darlington and La Cour 1976) on a microscope slide. Contrast between cytoplasm and chromosomes was enhanced by adding a droplet of 45% (v/v) acetic acid, saturated with iron acetate, to the stain immediately before making the squash (Thomas 1940) and then gently heating the slide over a spirit flame. Squashes were made according to Darlington and La Cour's (1976) method. The slides were made permanent by freezing them with liquid carbon dioxide (Bowen 1956), followed by dehydration in ethanol and mounting in Euparal.

Whenever possible, at least twenty cells each of diakinesis, metaphase I, anaphase I and telophase I were examined in each specimen. The gametic chromosome numbers, the presence of B chromosomes as well as the percentage rod and ring bivalents and multivalents were recorded. In the case of metaphase I, anaphase I and telophase I, the number of chromosomal abnormalities (univalents, chromosome laggards and micronuclei) were recorded as well.

Genome relationships in tetraploid specimens were determined with the model of Kimber and Alonso (1981).

2.2.1.2 Microphotography

Microphotography was done using a Nikon Microphot-FXA photomicroscope with Pan-F 35 mm (ASA 50) black and white films. The films were developed for twelve minutes in Agfa Rodinol film developer and then rinsed in water for approximately 5 minutes. After fixation in Ilford rapid fixer for 10 minutes, the films were rinsed in running water for 20 minutes. The films were then left to dry overnight.

Ilfospeed developer was used to develop the photographs and development was then stopped in water to which some acetic acid was added. The photographs were fixed with Ilford Hypam fixative where after the photographs were rinsed in water for 5 minutes and left face up, to dry. Ilford Multigrade IV RC DE LUXE paper was used for the photographs.

A digital camera, Nikon Coolpix 990 was used to photograph meiotic stadia during the latter part of the study. Images were directly transferred to the computer.

Microphotographs, depicting meiotic stages, abnormalities or certain behavioral trends during meiosis, were mounted on herbarium sheets and are stored in the Geo Potts Herbarium, Bloemfontein. Selections of these photographs, which depict certain of these phenomena the best, are included in this thesis.

2.2.2 Molecular studies

The leaves of the different specimens were collected in the veld and stored in a saturated sodium chloride and hexadecyl trimethyl ammonium bromide (CTAB) solution (Rogstad 1992).

2.2.2.1 DNA extraction

The CTAB method (Doyle and Doyle 1987) was used to extract DNA from ± 0.5 g of leaf material. The leaves were rinsed with distilled water and blotted with paper before the extractions were carried out in eppendorf tubes. The material was ground to a fine powder with liquid nitrogen. The ground tissue was then immediately incubated at 65°C for one hour in 600 µl CTAB extraction buffer [2% (m/v) CTAB, 100mM Tris-HCl (pH 8.0), 25mM EDTA (pH 8.0), 1.4M NaCl, to which 0.2% (v/v) 2-mercapto-ethanol had been added just before use]. After one hour 600 µl chloroform:iso-amylalcohol (24:1) was added, mixed thoroughly and the resultant mixture centrifuged for five minutes at 5000 g. The supernatant was transferred to a clean tube and to this 600 µl cold (-20°C) absolute ethanol, containing 3M sodium acetate (25:1) was added to precipitate the DNA. After one hour of incubation at 4°C, the mixture was centrifuged at 7000 g. for eight minutes. The supernatant was discarded and the DNA pellet washed twice with 70% (v/v) ethanol containing 10mM ammonium acetate. After decanting the ethanol and evaporating any excess ethanol left, the DNA was dissolved in sterilized, distilled water (20-50 µl, depending on the size of the pellet).

A modification of the CTAB method, adapted for extraction from herbarium specimens (Loockerman and Jansen 1996), was also used: This method differs in the following aspects from the above mentioned:

- The ground tissue was incubated at 60°C for only half an hour.
- The CTAB extraction buffer contains 4% (m/v) CTAB and an additional 1% (m/v) PVP.
- The mixture was centrifuged at 7000 g. for two minutes after the chloroform:iso-amylalcohol (24:1) was added.
- The mixture was incubated overnight at 4°C to precipitate the DNA.
- After the mixture was incubated overnight, it was centrifuged at 7000 g. for five minutes.

2.2.2.2 Taguchi optimization

The sequencing reactions were optimized according to a modified Taguchi method (Cobb and Clarkson 1994). With this optimization, the optimal conditions for four reaction variables can be achieved, by using only nine reactions. The number of experimental reactions (E) required (nine), can be calculated by using the equation $E = 2k + 1$, where k is the number of factors to be tested (four) (Cobb and Clarkson 1994). These variables are the primer, magnesium chloride, DNA and dNTP concentrations. In this optimization, three concentrations of each reaction component are varied in an orthogonal array. With this Taguchi method, the product yield for each reaction is used to estimate the effects that the individual components have on the amplification products (Cobb and Clarkson 1994). This yield can be calculated by using quadratic loss functions, which are referred to as signal to noise (SNL) ratios by Taguchi (Taguchi and Wu 1980; Taguchi 1986):

$$SNL = -10\log [1/n \sum 1/y^2],$$

where SNL is the signal to noise ratio, y is the yield for each amplification reaction and n is the number of levels. For each of the reaction components the largest SNL value represents the optimal condition.

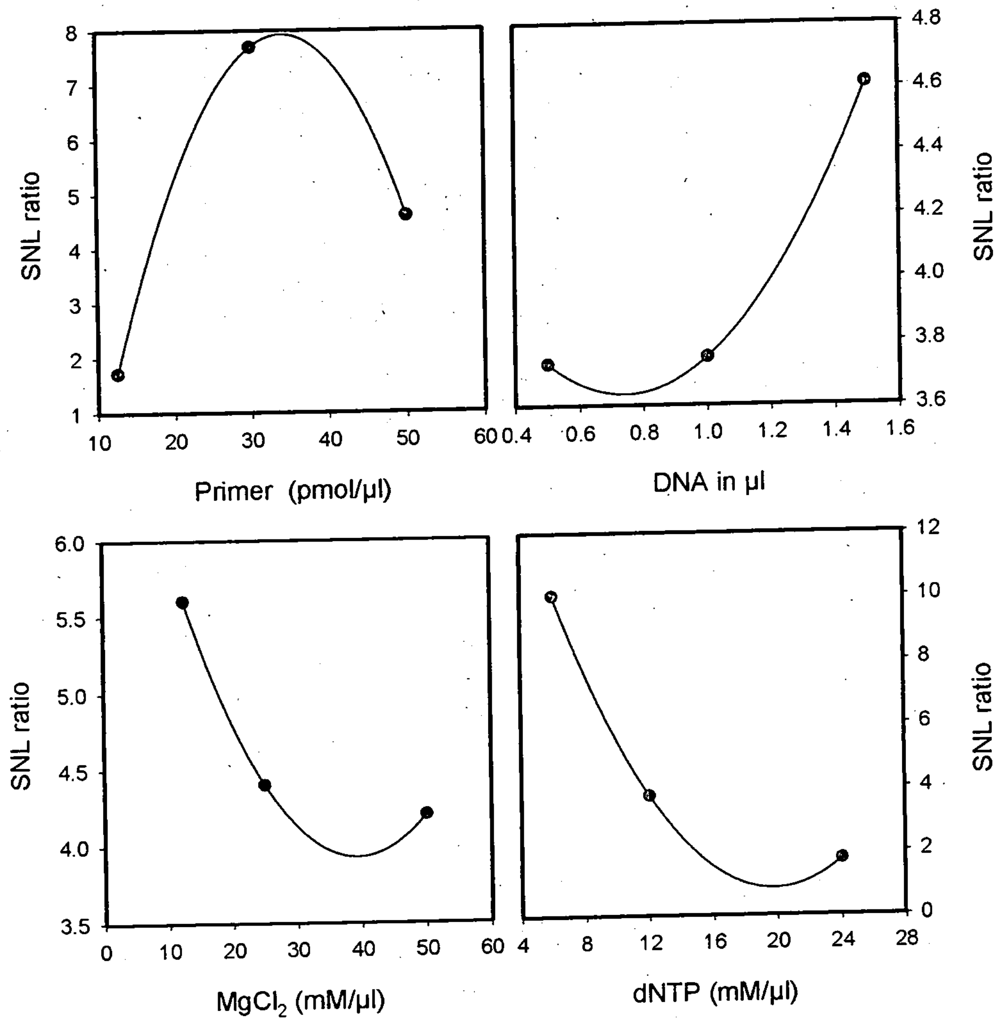

Figure 2.1. Taguchi optimization values for reaction conditions for *ITS* fragment amplification. Largest SNL values were taken as reaction optima.

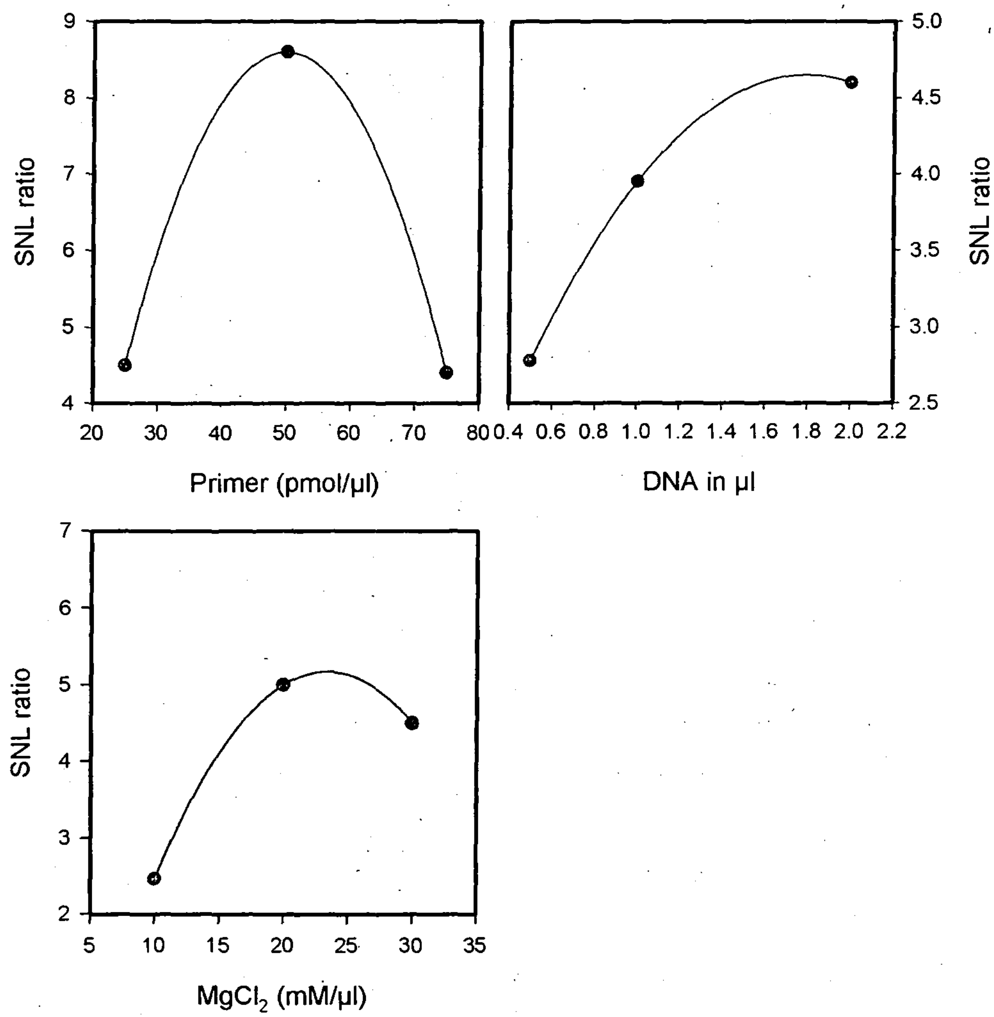

Figure 2.2. Taguchi optimization values for reaction conditions for *trn*L-F fragment amplification. Largest SNL values were taken as reaction optima. dNTP optima were not determined as this was included in the 5X buffer.

2.2.2.3 Sequencing

2.2.2.3.1 *ITS* fragment amplification

Genomic DNA was used to amplify the DNA region between the 18S and 5.8S nrDNA genes (the *ITS*1 region), as well as between the 5.8S and 26S nrDNA genes (the *ITS*2 region). In both cases a part of the 5.8S gene was also amplified as a result of the annealing sites of the primers. The primers used for PCR amplification of the regions were nNc18S10 (Wen and Zimmer 1996) and ITS_2 (White *et al.* 1990) [for *ITS*1] and 5.8_S (Sun *et al.* 1994) and ITS_4 (White *et al.* 1990) [for *ITS*2]. The regions were also sequenced using these primers.

nNc18S10	5' – AGGAGAAGTCGTAACAAG – 3'
ITS_2	5' – GCTGCGTTCTTCATCGATCG – 3'
5.8_S	5' – ACGACTCTCGGCAAC – 3'
ITS_4	5' – TCCTCCGCTTATTGATATGC – 3'

The PCR reactions were performed in a total volume of 25 µl. The reactions were optimized according to Taguchi (2.2.2.2) (Figure 2.1) and each reaction consisted of 1.5 µl DNA, 0.6 µl dNTP (10mM), 0.5 µl $MgCl_2$ (20mM), 2.8 µl of each primer (12.5pmol), 2.5 µl 10X Buffer, 2 µl DMSO, and 0.16 µl *Taq* polymerase (5u).

The reactions were briefly centrifuged and placed in the Perkin Elmer GeneAmp PCR system 9600. An initial denaturation step at 94°C for 3 minutes was followed by 40 amplification cycles, each consisting of 30 sec. at 94°C, 30 sec. at 50°C and 90 sec. at 72°C. Amplification was completed by a final step at 72°C for 7 minutes (modification of Baldwin 1992). Strong denaturing reaction conditions were needed because of the high GC content of the *ITS* region and the presence of secondary structure (Buckler and Holtsford 1996a). This was achieved by the addition of DMSO, which reduces strand reannealing (Winship 1989; Vadaraj and Skinner 1994). Buckler *et al.* (1997) also suggested that the addition of DMSO would prevent the preferential amplification of pseudogenes. These might be preferentially amplified due to low secondary structure stability.

The amplification products were run on 1% (m/v) agarose gels with 1X TAE running buffer (40mM Tris-acetate, 1mM EDTA, pH 8.0) at 60V, intercalated with ethidium bromide and visualized by illumination with ultraviolet (UV) light.

2.2.2.3.2 *Trn*L-F fragment amplification

The regions amplified in the chloroplast genome were the intron in the *trn*L gene (between the 5' and 3' exons of the *trn*L gene); the 3' exon of the *trn*L intron, as well as the intergenic spacer between the 3' exon of the *trn*L gene and the 5' exon of the *trn*F gene. The primers used for the PCR were c and f for amplification (Taberlet *et al.* 1991) and primers PS1, PS2, PS3 and PS4 were used for sequencing (Pfosser and Speta 1999).

c	5' – TCGTAACAAGGTTTCCGTAGGTG – 3'
f	5' – TCCTCCGCTTATTGATATGC – 3'
PS1	5' – CTACGGACTTAATTGGATTGAGC – 3'
PS2	5' – GGGGATAGAGGGACTTGAAC – 3'
PS3	5' – GGTTCAAGTCCCTCTATCCC – 3'
PS4	5' – AGGATTTTCAGTCCTCTGCTC – 3'

The PCR reactions were performed in a total volume of 10 µl. The reactions were optimized according to Taguchi (2.2.2.2) (Figure 2.2) and consisted of 2 µl DNA, 1 µl $MgCl_2$ (20mM), 1 µl primer combination (50 pmol), 2 µl 5X Buffer (containing 10mM dNTP's) and 0.16 µl *Taq* polymerase (5u).

The reactions were briefly centrifuged and placed in the Perkin Elmer GeneAmp PCR system 9600. A touchdown PCR procedure was followed: An initial denaturation at step 94°C for 3 minutes was followed by 2 cycles each of 40 sec. at 94°C, 40 sec. at 58°C and 90 sec. at 72°C. The annealing temperature was decreased with 2°C in every two consecutive cycles until an annealing temperature of 49°C was reached and maintained for 25 cycles. This was followed by a final extension step at 72°C for 7 minutes (modification of Don *et al.* 1991).

The amplification products were visualized as described in 2.2.2.3.1

2.2.2.3.3 Sequencing

Sequencing reactions were carried out by using the system based on Sanger *et al.*'s dideoxynucleotide method (1977).

For each template to be sequenced the following were combined:

Sequence reagent pre-mix	1 µl
Sequencing buffer	1.5 µl
Primer (1 pmol)	1.6 µl
DNA template (30ng)	3 µl
distilled water	2.9 µl
Total volume	10 µl

These reactions were placed in the Perkin Elmer thermal cycler with 25 amplification cycles, each consisting of 94°C for 10 sec., 50°C for 5 sec. and 60°C for four minutes, according to the manufacturer's protocol.

After amplification 16 µl deionised water was added to each reaction, as well as 64 µl 95% (v/v) ethanol. These reactions were vortexed briefly and left for a period of 20 minutes. After 20 minutes the reactions were centrifuged for 20 minutes at 10 000 g., where after the supernatant was aspirated and 250 µl 70% (v/v) ethanol was added to wash the pellet. The mixtures were centrifuged at 10 000 g. for 10 minutes and after the supernatant was drawn off the pellets were left to air dry. The pellets were stored in this dry state at 4°C until they were loaded on the gel. Prior to gel loading each pellet was resuspended in 4 µl formamide loading buffer and vortexed vigorously for 10-20 sec. to ensure complete resuspension. The samples were briefly centrifuged to collect each sample at the bottom of the tube. Approximately 1.5-2 µl of the samples was loaded on a 6% polyacrylamide gel run for 4-6 hours on an ABI Prism™ 377 fluorescent sequencing system.

2.2.2.3.4 Sequence alignment

The boundaries of the *ITS* and *trn*L-F regions were identified by comparison to known sequences. For sequence editing and assembly of complimentary strands, AutoAssembler version 1.4.0. (Applied Biosystems Inc.) was used. Sequences were aligned in ClustalG version 1.0 (Wilson *et al.* 1999). ClustalG default parameters were used and include a gap opening cost of 1 and gap extension cost of 0.1 with the slow-accurate pairwise alignment parameter and a gap opening cost of 1 and gap extension penalty of 0.05 for the multiple alignment parameters. Final alignment was visually inspected and manually optimized for phylogenetic analysis. Nucleotide ambiguities were coded as N (uncertain) and when two peaks were definitely present in two strands with the same resolution these were coded as polymorphic according to the IUPAC system.

2.2.3 Phylogenetic Analyses

Data were analyzed with the computer program PAUP* (version 4.0b10) (Swofford 2003). All characters were weighted equally and unordered (Fitch parsimony, Fitch 1971). Uninformative (autapomorphic and constant) characters were removed from all analyses. The heuristic search comprised of an initial search of 10 000 random additions, nearest neighbor interchange (NNI) branch swapping and mulpars not in effect, to search for islands of most parsimonious trees (Maddison 1991). The trees resulting from this search were then subjected to more thorough tree bisection and reconnection (TBR) branch swapping with mulpars on in the absence of a maxtrees limit (with *trn*L-F a maxtree limit of 20 000 was set). The amount of phylogenetic information in the parsimony analysis was estimated using the consistency index (Kluge and Farris 1969) and retention index (Farris 1989) as calculated in PAUP*. Gaps were treated as missing data, but their presence/absence was coded as a separate binary matrix appended to the initial data matrix (Wojciechowski *et al.* 1993; Oxelman and Liden 1995; Simmons and Ochoterena 2000). Gaps were coded by the program GapCoder (Young and Healy 2003), but where nucleotides were missing due to sequencing failure (N), these were coded as uncertain (?) in the gap matrix. For each heuristic analysis a strict consensus tree (Sokal and Rohlf 1981) was generated. Branch support was determined by means of bootstrap (Felsenstein 1985), jackknife (Lanyon 1985) and decay values (Donoghue *et al.* 1992; Bremer 1994).

Bootstrap searches were performed with 200 bootstrap replicates using simple taxon addition, TBR branch swapping, mulpars selected and saving no more than 500 trees per replicate. The same settings were selected for jackknife searches, but emulate Jac was additionally selected. With emulate Jac the conditions of the program Parsimony Jackknifer (Farris 1995) is emulated and user specified weighting schemes are not allowed. Therefore the deletion percentage was 36.79%. The following categories were used for bootstrap and jackknife support: weak, 50-74%; moderate, 75-84% and strong support 85-100% as proposed by Crespo *et al.* (2000). Bremer support was determined by 10 random addition sequences per converse constraint, TBR branch swapping, mulpars selected and maxtrees set at 500. Decay of clades was assessed using the reverse constraint approach implemented in Autodecay 4.02 (Eriksson 1998).

Congruence between the individual data sets was assessed by visual inspection of the Strict consensus trees in a conditional combination approach (Huelsenbeck *et al.* 1996; Kellogg *et al.* 1996; Mason-Gamer and Kellogg 1996; Seelanan *et al.* 1997; Johnson and Soltis 1998; Wiens 1998; Whitten *et al.* 2000; Mort *et al.* 2002). Separate analyses were conducted and the results compared for hard incongruence (well supported alternative placement of taxa). The 70% cutoff percentage proposed by Mason-Gamer and Kellogg (1996) was used. For the combined analysis all taxa with either *trn*L-F or *ITS* data missing were removed.

CHAPTER 3

Chromosome numbers

PUBLISHED AS:

R. ROODT AND J.J. SPIES. 2002. POACEAE: CHROMOSOME STUDIES ON AFRICAN PLANTS. 18. THE SUBFAMILY CHLORIDOIDEAE. *BOTHALIA* 32 (2): 240–249.

Chromosome numbers are reported for 79 specimens representing 42 species in 19 genera. Basic chromosome numbers of 6, 9 and 10 were observed. Meiosis was normal in most instances. B chromosomes, which have a high incidence in the grass family, were only observed in 2 specimens. Polyploidy is reported for 52 specimens and 37 new or additional counts are reported.

3.1 Introduction

The subfamily Chloridoideae comprises ± 150 genera and 1 360 species and occurs mainly in arid regions (Hilu and Alice 2001). The plants probably originated in Africa (Hartley 1964), hence the great representation of the subfamily in Africa and especially southern Africa, with ± 51 genera and 235 species (Gibbs Russell *et al.* 1990). It is currently divided into five tribes by the Grass Phylogeny Working Group (2001): Cynodonteae Dumort., Eragrostideae Stapf, Leptureae Dumort., Orcuttieae Reeder and Pappophoreae Kunth. The genus *Centropodia* Rchb. and the species *Merxmuellera rangei* (Pilg.) Conert, previously included in the Arundinoideae, are now included in the Chloridoideae. They have not previously been included in any of the recognized tribes (GPWG 2001).

The aim of this study is to investigate chromosome numbers, meiotic chromosome behavior and polyploid levels of some southern African representatives of this subfamily.

3.2 Results and Discussion

Seventy-nine plants, representing 42 species and 19 genera, were studied (Appendix A). They represent three of the recognized tribes, namely Cynodonteae, Eragrostideae and Pappophoreae, as well as the unplaced genus *Centropodia*.

Tribe Cynodonteae

In the genus *Chloris* Sw., a single *C. virgata* Sw. specimen was investigated and found to be diploid (n = x = 10) (Figure 3.1A). This confirms the basic chromosome number of 10 for this genus (Darlington and Wylie 1955; Pienaar 1955; Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1971, 1972, 1973, 1974, 1977; Goldblatt 1981, 1983, 1985, 1988; Goldblatt and Johnson 1990, 1991, 1998, 2000). Polyploid levels do occur in the genus and triploid and tetraploid numbers have been observed in South African specimens by previous authors (Moffet and Hurcombe 1949; De Wet 1954a; Spies and Du Plessis 1987). The genus is known to contain many aneuploid deviations from the basic chromosome number of ten (Fish 2000), but none have been observed in South African specimens before (Hunter 1934; Moffet and Hurcombe 1949; De Wet 1954a; Spies and Du Plessis 1987; Spies and Jonker 1987; Strydom and Spies 1994b).

Cynodon dactylon (L.) Pers is an introduced species in tropical and warm temperate areas throughout the world, but is indigenous to southern Africa (Gibbs Russell and Spies 1988). Two specimens were investigated, both with 2n = 4x = 36 (Figure 3.1B). Tetraploidy is by far the most numerous polyploid level present in the genus (Darlington and Wylie 1955; Pienaar 1955; Ornduff 1968, 1969; Federov 1969; Moore 1970, 1972, 1973, 1974, 1977; Goldblatt 1981, 1983, 1985; Goldblatt and Johnson 1990, 1994, 1996, 1998). De Silva and Snaydon (1995) concluded that the differences in the polyploid level in *C. dactylon* could be related both to different climatic regions and different ecological habitats. The populations growing in arid, dry and intermediate regions were tetraploid and those from wetter regions consisted entirely of diploid plants. De Silva and Snaydon (1995) also related these polyploid levels to soil acidity and alkalinity (tetraploid = pH > 6.5; diploid = pH < 5.0). These findings might explain the predominance of tetraploidy in South Africa with its dryer, more arid regions. A basic chromosome number of x = 9 is confirmed for this species and genus, although 10 has also been reported in a few instances (Ornduff 1968, 1969; Moore 1970, 1972, 1974, 1977; Goldblatt 1981, 1983, 1985; Goldblatt and Johnson 1990, 1994, 1996, 1998).

Chromosome numbers for the genus *Enteropogon* Nees have only been reported once and a basic chromosome number of 10 published for the genus (Darlington and Wylie 1955). One *E. macrostachyus* (A.Rich.) Benth. specimen investigated in this study was found to be tetraploid (n = 2x = 20). This is the first report on a South African specimen in the genus, the previous one being from India.

Twelve specimens representing the species *Harpochloa falx* (L.f.) Kuntze were studied. Nine of these were tetraploid and three were hexaploid. All specimens had

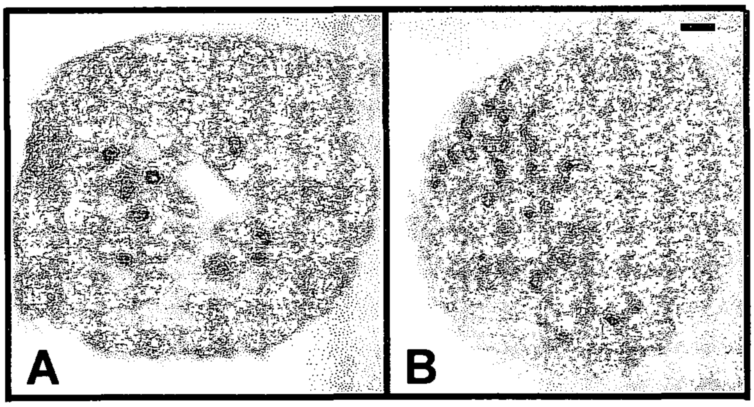

Figure 3.1. Photomicrographs of meiotic chromosomes in the genera *Chloris* and *Cynodon*. **A.** *Chloris virgata*, *Spies 6616*, 2n = 2x = 20, diakinesis with 20_{II}. **B.** *Cynodon dactylon*, *Spies 2549*, 2n = 4x = 36, metaphase I. Scale bar: 5 µm.

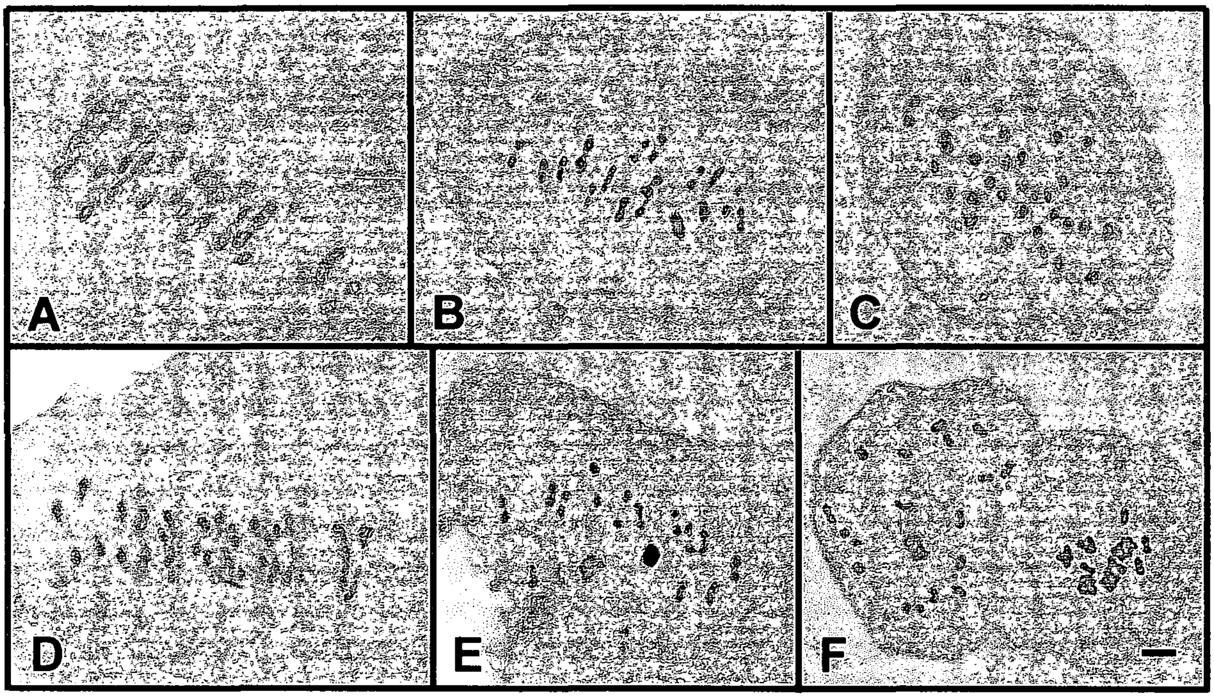

Figure 3.2. Photomicrographs of meiotic chromosomes in the genus *Harpochloa*. **A–F.** *H. falx*. **A.** *Spies 3986*, 2n = 4x = 36, metaphase I. **B, C.** *Spies 4695*, 2n = 4x = 36, metaphase I (**B**) and desynapsis of bivalents during metaphase I (**C**). **D.** *Spies 4729*, 2n = 4x = 36, metaphase I. **E.** *Spies 5113*, 2n = 4x = 36, metaphase I. **F.** *Spies 6955*, 2n = 4x = 36, diakinesis with 18_{II}. Scale bar: C, E = 8 µm; A, B, D, F = 10 µm.

multiples of nine (n = 2x = 18; n = 3x = 27) (Figure 3.2A–F). This represents a new basic chromosome number for this genus and could imply that *Harpochloa* Kunth also has two basic chromosome numbers (De Wet 1958; Spies and Du Plessis 1986a; Spies *et al.* 1991; Strydom and Spies 1994b). Furthermore, no known reports of any diploid specimens in the genus exist, which could indicate the existence of an older polyploid complex.

The genus *Tragus* Haller is widespread throughout the tropics, but mainly in Africa. It is especially common in disturbed areas (Clayton and Renvoize 1986; Fish 2000). One *Tragus* specimen was investigated. It was diploid with n = x = 10. Only diploid, as in this study, or tetraploid chromosome numbers are known for this genus, based on a basic chromosome number of 10 (Darlington and Wylie 1955; Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1972, 1973, 1974, 1977; Goldblatt 1981, 1983, 1988; Goldblatt and Johnson 1990, 1994, 1998).

Tribe Eragrostideae

The genus *Bewsia* Gooss. is monotypic and a single *Bewsia biflora* (Hack.) Gooss. specimen was investigated. This specimen was tetraploid (n = 2x = 20) (Figure 3.3A), which confirms a basic chromosome number of ten, based on previous reports by De Wet and Anderson (1956) of 2n = 3x = 30 and Davidse *et al.* (1986) of 2n = 45 from Zimbabwe. Davidse *et al.* (1986) reported on very irregular meiosis in the particular specimen. Results presented in this study are the third known report for this genus.

Cladoraphis Franch. comprises two species *C. cyperoides* (Thunb.) S.M.Phillips and *C. spinosa* (L.f.) S.M.Phillips. De Winter (1955) included this genus in *Eragrostis* Wolf, but later authors (Phillips 1982; Clayton and Renvoize 1986; Gibbs Russell *et al.* 1990; Watson and Dallwitz 1992 onwards) retained its separate generic status. It has a very specific habitat and occurs in sandy desert (*C. spinosa*) and coastal dunes (*C. cyperoides*) (Clayton and Renvoize 1986), mainly in the western regions of Namibia and Northern and Western Cape (Fish 2000). Five specimens were investigated representing both species. All four *C. cyperoides* specimens were diploid, with *C. spinosa* being tetraploid (n = 2x = 20) (Figure 3.3B–E). This is, to the best of our knowledge, the first reports for chromosome numbers in this genus.

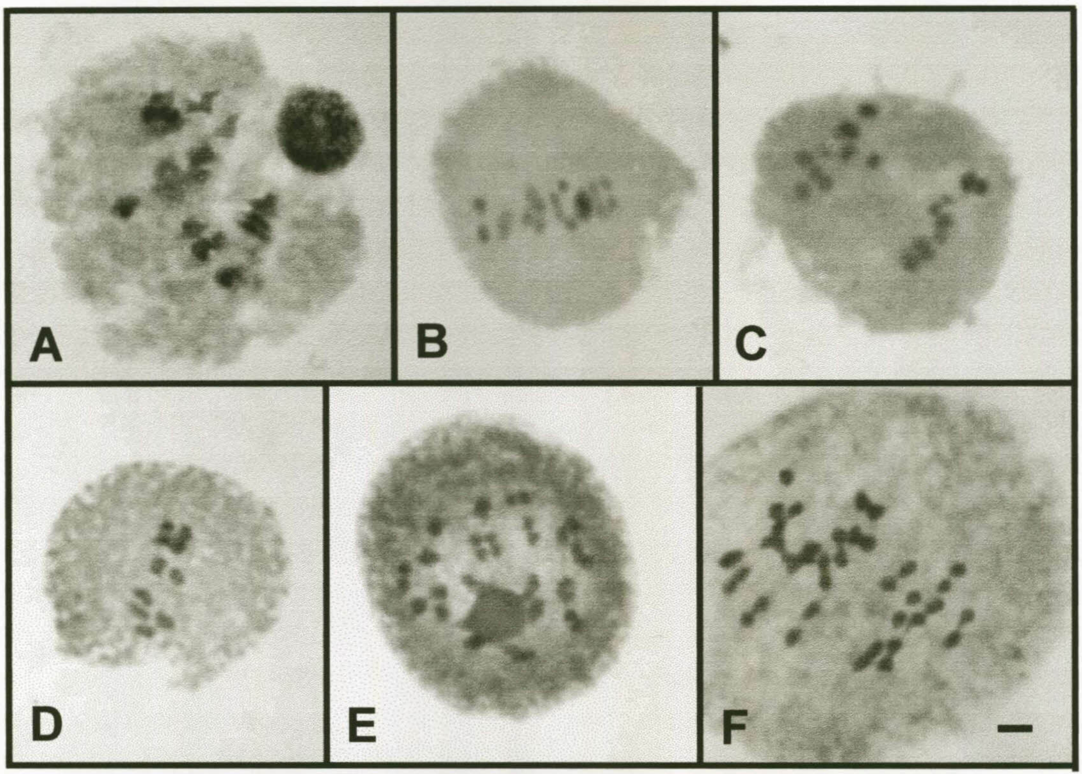

Figure 3.3. Photomicrographs of meiotic chromosomes in the genera *Bewsia*, *Cladoraphis* and *Dactyloctenium*. **A.** *Bewsia biflora*, *Spies 1531*, 2n = 4x = 40, diakinesis with 20_{II}. Three chromosomes are not in focus on this photograph. **B, C.** *Cladoraphis cyperoides*, *Spies 4894*, 2n = 2x = 20, metaphase I (**B**) and anaphase I, 10-10 segregation (**C**). **D.** *C. cyperoides*, *Spies 5356*, 2n = 2x = 20, diakinesis. **E.** *C. spinosa*, *Spies 4885*, 2n = 4x = 40, diakinesis with 20_{II}. **F.** *Dactyloctenium aegyptium*, *Spies 2403*, 2n = 4x = 40, metaphase I. Scale bar: 5 µm.

One specimen of the widespread tropical weed (Gould and Soderstrom 1974) *Dactyloctenium aegyptium* (L.) Willd. was investigated. It was found to be tetraploid (n = 2x = 20) (Figure 3.3F). Three basic chromosome numbers are recorded for this genus, x = 9, 10, 12 [Darlington and Wylie 1955 (x = 10, 12); Pienaar 1955 (x = 9, 12); Ornduff 1967 (x = 10), 1968 (x = 12); Moore 1971 (x = 9), 1972 (x = 9), 1977 (x = 12); Goldblatt 1981 (x = 9, 10, 12), 1983 (x = 9, 10, 12), 1985 (x = 12), 1988 (x = 9, 10); Goldblatt and Johnson 1990 (x = 9, 10, 12), 1991 (x = 10), 1994 (x = 12), 1998 (x = 10, 12)]. This is one of the genera in the Chloridoideae (as is *Sporobolus*), with the most variation in basic chromosome number.

The generic status of *Diplachne* P.Beauv. has long been in doubt (McVaugh 1983; Peterson *et al.* 1997), with some authors preferring to unite this genus with the closely related genus *Leptochloa* P.Beauv. (McNeill 1979; Phillips 1982). These two genera have traditionally been kept distinct by Old World taxonomists where these genera are quite distinct, whereas the position of the genera from the Americas are very confused with intergrading taking place (Phillips 1982). For this study, the accepted name *Leptochloa* will be used.

Eight *Leptochloa fusca* (L.) Kunth specimens were investigated and all were diploid (n = x = 10) (Figure 3.4A–E), which confirms the basic chromosome number of ten for this genus (Darlington and Wylie 1955; Ornduff 1968; Federov 1969; Moore 1977; Goldblatt and Johnson 1990, 1991, 1994, 1998). Previous studies have mostly reported tetraploids and this is the first study with such a large number of diploids. The specimens investigated in this study were largely from Northern and Western Cape, and due to the widespread distribution of this species, the total variation present might not be represented in this study.

Eleusine Gaertn. is predominantly an African genus, with six of the nine species confined to tropical and subtropical Africa (Phillips 1972). *Eleusine coracana* (L.) Gaertn. is widely grown in Africa, India and China, and used as a cereal. It is derived from *E. indica* (L.) Gaertn., a diploid cosmopolitan weed (subsp. *indica*, 2n = 18), which has a tetraploid race in Africa (subsp. *africana*). The morphological characters of the two races overlap greatly, and this leads to their inclusion in a single species (Clayton and Renvoize 1986). *Eleusine coracana* (L.) Gaertn. subsp. *africana* (Kenn.-O'Byrne) Hilu & DeWet (= *E. indica* subsp. *africana*) is native to Africa, where it is widespread along the eastern highlands and the highlands of the southern African plateau (Phillips 1972).

Three *E. coracana* subsp. *africana* specimens were investigated. The two specimens from Cape Vidal were diploid (Figure 3.5A, B) and the specimen from Koekenaap in Western Cape was tetraploid (n = 2x = 18) (Figure 3.5C).

This indicates that diploid and tetraploid forms of this species are present in South Africa and confirm a basic chromosome number of nine for this genus

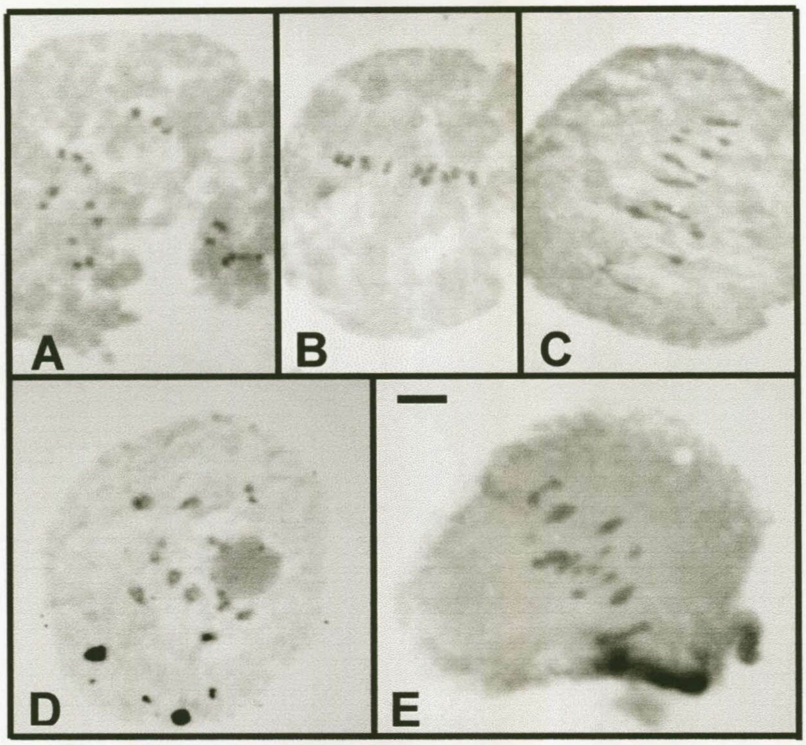

Figure 3.4. Photomicrographs of meiotic chromosomes in the genus *Leptochloa*. **A–E.** *L. fusca*. **A, B.** *Spies 3794*, 2n = 2x = 20, anaphase I with 10-10 segregation (**A**) and metaphase I (**B**). **C.** *Spies 3932*, 2n = 2x = 20, metaphase I. **D.** *Spies 4316*, 2n = 2x = 20, diakinesis with 10_{II}. **E.** *Spies 5200*, 2n = 2x = 20, metaphase I. Scale bar: 5 µm.

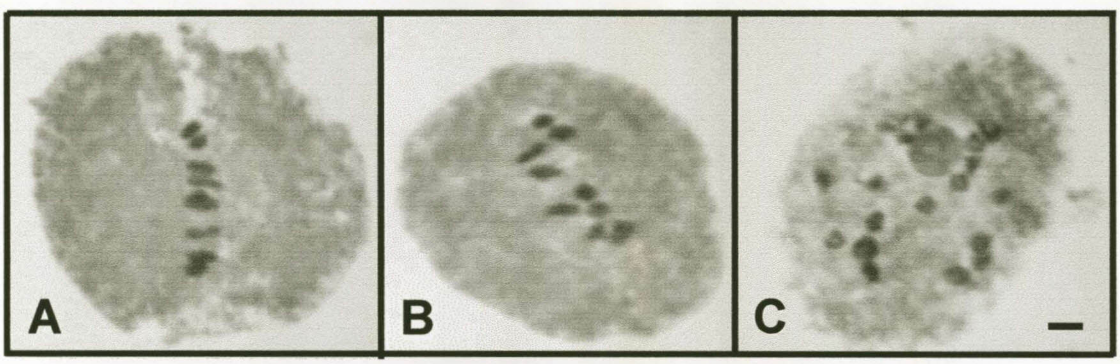

Figure 3.5. Photomicrographs of meiotic chromosomes in the genus *Eleusine*. **A–C.** *E. africana* subsp. *africana.* **A, B.** *Spies 2365*, 2n = 2x = 18, metaphase I. **C.** *Spies 2783*, 2n = 4x = 36, diakinesis with 18_{II}. Scale bar: 5 µm.

(Darlington and Wylie 1955; Pienaar 1955; Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1971, 1972, 1974, 1977; Goldblatt 1981, 1983, 1985, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1998, 2000).

Eragrostis Wolf is the largest genus in the subfamily Chloridoideae. It has a worldwide occurrence in the warmer regions where it is found in most habitats, showing a preference for open sites, poor dry soil and weedy places (Clayton and Renvoize 1986). The genus exhibits the full range of morphological and anatomical variation found in the subfamily (Van den Borre and Watson 1994).

Eragrostis is the largest grass genus in southern Africa with ± 90 species. In this study 26 specimens were investigated, representing 17 species. Twenty of the specimens were tetraploid (Figure 3.6A–C, E, F, H). Only four specimens investigated were diploid and two were hexaploid (Figure 3.6D, G). Polyploidy is frequent in this genus as can be seen from the results presented. Tetraploidy, as in this study, is the most frequent polyploid level observed, followed by diploidy (Darlington and Wylie 1955; Pienaar 1955; Ornduff 1967, 1968, 1969; Moore 1970, 1971, 1972, 1973, 1974, 1977; Goldblatt 1981, 1983, 1985, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1998, 2000).

Seven specimens were investigated for *E. capensis* (Thunb.) Trin. All but one was tetraploid (Figure 3.6A–C). *Spies 4696* was diploid and is the second report for this species (De Wet 1958) where tetraploidy (Avdulov 1931; Pienaar 1953; Davidse *et al.* 1986; Spies and Du Plessis 1986a; Spies *et al.* 1991) and hexaploidy (Moffet and Hurcombe 1949; Spies and Voges 1988) have previously been observed.

De Winter (1955) regards *E. curvula* (Schrad.) Nees as the most variable species in the genus in southern Africa, with a great many morphological forms. This was corroborated by large-scale cytogenetic studies by Vorster and Liebenberg (1977). Several species are known to intergrade with *E. curvula* through hybridization: *E. barbinodes* Hack., *E. caesia* Stapf, *E. chloromelas* Steud., *E. lehmanniana* Nees, *E. planiculmis* Nees and *E. rigidor* Pilg. (Smook 1990). Proof of hybridization in this species indicates a collapse of isolating mechanisms between different species in the *Eragrostis curvula* complex, resulting in a large-scale hybrid swarm, with continuous variation of characters between parental extremes. The variation in morphological characters is an indication of the extent of hybridization

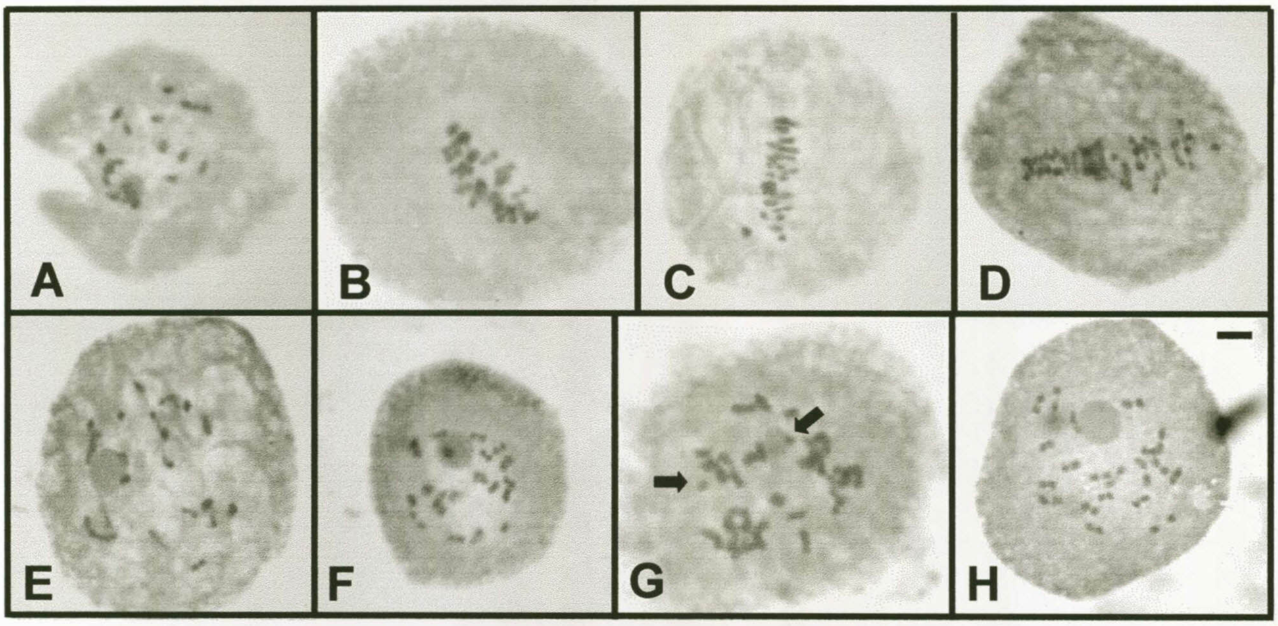

Figure 3.6. Photomicrographs of meiotic chromosomes in the genus *Eragrostis*. **A–C.** *E. capensis*. **A.** *Spies 3483*, 2n = 4x = 40, diakinesis with 20_{II}. **B.** *Spies 3498*, 2n = 4x = 40, metaphase I. **C.** *Spies 5069*, 2n = 4x = 40, metaphase I. **D.** *E. curvula*, *Spies 1137*, 2n = 6x = 60. **E.** *E. echinochloidea*, *Spies 2799*, 2n = 4x = 40, diakinesis with 20_{II}. **F.** *E. inamoena*, *Spies 2392*, 2n = 4x = 40, diakinesis with 20_{II}. **G.** *E. planiculmis*, *Du Plessis 116*, 2n = 6x = 60+0-4B, diakinesis with 30_{II}. Two B chromosomes are indicated. **H.** *E. superba*, *Du Plessis 136*, 2n = 4x = 40, diakinesis with 20_{II}. Scale bar: B, G = 10 µm; A, C–F, H = 12 µm.

(Spies 1984). Four specimens in this complex were cytogenetically investigated and tetraploid (*E. barbinodes* and *E. chloromelas*) and hexaploid (*E. curvula* and *E. planiculmis*) levels were observed (Figure 3.6D, G). In all but *E. barbinodes*, various univalents were observed which resulted in laggards and later formed micronuclei. According to Church (1929), the presence of unpaired or univalent chromosomes is one of the most prominent suggestions that a plant is of hybrid origin and therefore, in this complex with its large-scale hybridization, these phenomena will be very prevalent.

This is the third report for the species *E. heteromera* Stapf with 2n = 4x = 40 (De Wet 1958, 1960). As far as is known only two reports for *E. tef* (Zucc.) Trotter exist (Avdulov 1931; Moffet and Hurcombe 1949). This study corroborates tetraploidy present in this species. Previously only tetraploid levels have been observed in the species *E. tenuifolia* (A.Rich.) Steud. (Ornduff 1967; Moore 1973, 1977; Goldblatt 1983). Here we report on a diploid specimen from Siteki in Swaziland. Univalents were observed in some cells in this specimen. The tetraploid chromosome count for *E. trichophora* Coss. & Dur. reported here is second for the species (Davidse *et al.* 1986) and a hexaploid specimen was reported by Spies and Jonker (1987). One previous report of 2n = 4x = 40 for *E. racemosa* (Thunb.) Steud. (Ornduff 1967) is confirmed in this study where three tetraploid specimens were found.

Two *Fingerhuthia africana* Lehm. specimens were investigated and were tetraploid (n = 2x = 20) (Figure 3.7A, B). Previous reports by Spies and Du Plessis (1987) and De Wet (1958, 1960) also found tetraploidy in the genus, but diploidy has been reported (De Wet 1958, 1960) as well.

Odyssea Stapf is a xerophytic grass genus with two species, one indigenous to southern Africa (Clayton and Renvoize 1986). It has a very distinct, much-branched, spiny habit, which is an adaptation to its specialized sandy and saline habitats (Phillips 1982). This is a first report for the genus. The specimen, *O. paucinervis* (Nees) Stapf, was tetraploid (n = 2x = 18) and, therefore the basic chromosome number for this genus is 9.

The genus *Sporobolus* R.Br. is cytogenetically complex and different basic chromosome numbers, x = 6, 9 and 10 may be present (Davidse *et al.* 1986). Four *Sporobolus* species were investigated. Three diploid [*S. africanus* (Poir.) Robyns & Tournay, *Spies 4508*, *S. ioclados* (Trin.) Nees, *S. virginicus* (L.) Kunth], one tetraploid (*S. africanus*, *Spies 2369*) and one hexaploid (*S. albicans* Nees) specimen were found (Figure 3.7C–F). They all displayed multiples of nine and this confirms x = 9 as the basic chromosome number for the genus (Darlington and Wylie 1955; Pienaar 1955; Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1971, 1972, 1973, 1974, 1977; Goldblatt 1981, 1983, 1985, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1996, 1998). A chromosome number for *S. albicans* has not been published yet and this constitutes a first report for this species (Figure 3.7D). Large-scale studies in this genus are still necessary to investigate the different basic chromosome numbers present and their possible phylogenetic relationships.

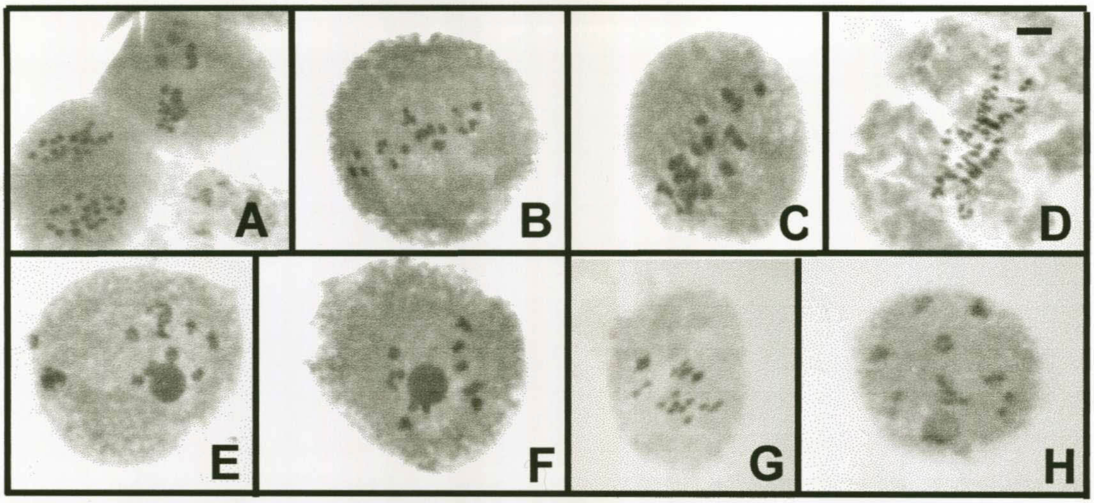

Figure 3.7. Photomicrographs of meiotic chromosomes in the genera *Fingerhuthia*, *Sporobolus* and *Stiburus*. **A, B.** *Fingerhuthia africana*, *Spies 2947*, 2n = 4x = 40, late anaphase I (**A**) and metaphase I (**B**). **C.** *S. africanus*, *Spies 2369*, 2n = 4x = 36, metaphase I. **D.** *Sporobolus albicans*, *Spies 3141*, 2n = 6x = 54, metaphase I. **E, F.** *S. virginicus*, *Du Plessis 122*, 2n = 2x = 18, diakinesis with 9_{II}. **G, H.** *Stiburus conrathii*, *Du Plessis 19*, 2n = 2x = 20, metaphase I (**G**), diakinesis with 10_{II} (**H**). Scale bar: 8 µm.

One specimen each of the two species *Stiburus alopecuroides* (Hack.) Stapf and *S. conrathii* Hack. was examined. Both were diploid (n = x = 10) (Figure 3.7G, H) and this confirms chromosome counts based on multiples of 10 for this genus (Spies and Du Plessis 1986a).

A single *Trichoneura grandiglumes* (Nees) Ekman specimen was found with a chromosome count of n = x = 10. Moffet and Hurcombe (1949) and De Wet and Anderson (1956) also reported on diploid specimens.

Tribe Pappophoreae

The genus *Enneapogon* Desv. ex P.Beauv. is a very uniform genus in which most species (28 in total) closely resemble one another. Four specimens representing two species and one unidentified specimen were examined in this study (Figure 3.8A–D). One specimen, *Enneapogon cenchroides* (Roem. & Schult.) C.E.Hubb. was tetraploid with n = 2x = 20, but another specimen was hexaploid

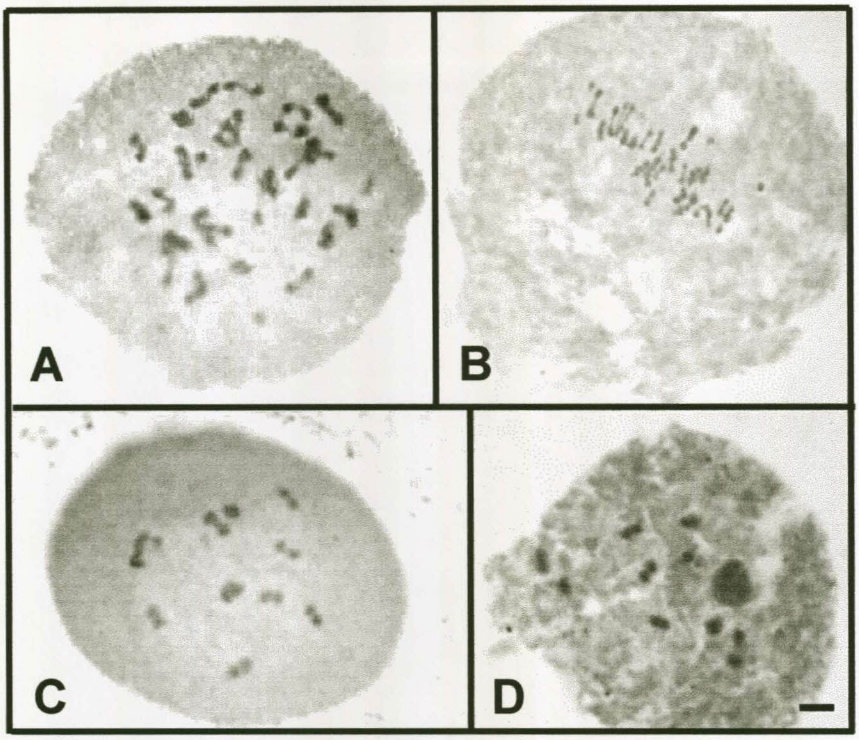

Figure 3.8. Photomicrographs of meiotic chromosomes in the genus *Enneapogon*. **A, B.** *E. cenchroides*, *Spies 2709*, 2n = 6x = 60, diakinesis with 30_{II} (**A**) and metaphase I (**B**). **C, D.** *E. pretoriensis*, *Spies 3716*, 2n = 2x = 20, diakinesis with 10_{II}. Scale bar: A, C, D = 5 µm; B = 8 µm.

(Figure 3.8A, B). *Spies 5532*, the unidentified specimen, was also found to be tetraploid. A single *E. pretoriensis* Stent specimen had n = x = 10 (Figure 3.8C, D). Two basic chromosome numbers are reported for this genus, x = 9, 10 [Darlington and Wylie (x = 9, 10); Ornduff 1968 (x = 10), 1969 (x = 10); Moore 1970 (x = 10), 1977 (x = 10); Goldblatt 1981 (x = 10), 1985 (x = 10); Goldblatt and Johnson 1991 (x = 10), 1998 (x = 10)]. The majority of the studies support a basic chromosome number of ten. Only three studies, De Wet (1954a), Thomas unpublished (listed in Darlington and Wylie 1955) and De Wet and Anderson (1956) ever reported x = 9. They found one diploid (De Wet and Anderson 1956) and five tetraploid [De Wet 1954a; Thomas unpublished (listed in Darlington and Wylie 1955); De Wet and Anderson 1956] specimens based on x = 9. Davidse *et al.* (1986) also reported on aneuploidy in the genus.

The genus *Schmidtia* Steud. ex J.A.Schmidt comprises only two species, both widespread in southern Africa. Two specimens were examined representing *S. pappophoroides* Steud. and an unidentified *Schmidtia* species. Both were tetraploid but *Spies 5536* had 0-4 B chromosomes present in some cells. This confirms the basic chromosome number of 9 for this genus (De Wet and Anderson 1956; De Wet 1958), although Reeder and Singh (1968) reported on a basic chromosome number of ten.

Unplaced

Centropodia Rchb. was formerly recognized as an arundinoid genus but has recently (GPWG 2001) been included in the subfamily Chloridoideae. A single specimen of this genus was investigated and found to be octaploid (n = 4x = 24) (Figure 3.9A, B). This confirms the basic chromosome number of the genus as six (Du Plessis and Spies 1988; Hoshino and Davidse 1988).

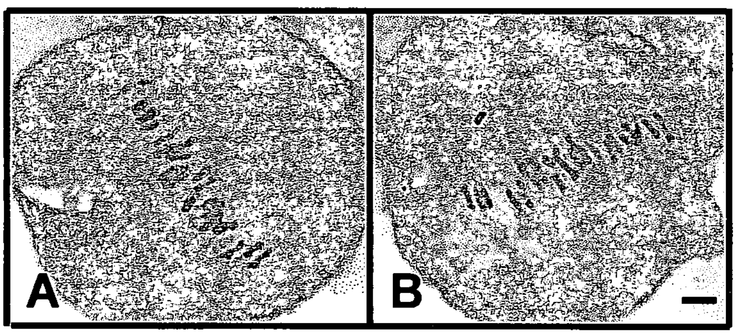

Figure 3.9. Photomicrographs of meiotic chromosomes in the genus *Centropodia*. **A, B.** *C. glauca*, *Spies 5706*, 2n = 8x = 48, metaphase I. Scale bar: 8 µm.

3.3 Conclusions

Chromosome numbers are reported for three of the five tribes of the subfamily Chloridoideae. Basic chromosome numbers of x = 9 and 10 occur in all the tribes. A basic chromosome number of six is also corroborated for the genus *Centropodia*. The high incidence of polyploidy (65% in this study) in Poaceae and especially the southern African grasses are once again confirmed by this study.

CHAPTER 4

Basic chromosome numbers

IN PRESS (TAXON):

R. ROODT AND J.J. SPIES. CHROMOSOME STUDIES IN THE GRASS SUBFAMILY CHLORIDOIDEAE. I. BASIC CHROMOSOME NUMBERS. IN PRESS (*TAXON*)

Two main basic chromosome numbers occur in the majority of southern African Chloridoideae, i.e. 9 and 10, the majority being x = 10. Two main evolutionary pathways, one following x = 10 and the other following an aneuploid/dysploid reduction to x = 9 are suggested for the subfamily. Evidence indicates that x = 9, 10 are paleopolyploid basic chromosome numbers, with x = 10 derived from x = 5. This corresponds to the closely related panicoid tribe Andropogoneae where five is accepted as the basic chromosome number.

4.1 Introduction

Avdulov (1931) was the first to recognize the taxonomic significance of the grass chromosomes. He studied 232 species and recognized three types of grass karyotypes, based on basic chromosome number (x) and chromosome size: the first type has x = 9, 10 with small chromosomes; the second has x = 12 with small chromosomes; and the third x = 7 with large chromosomes.

Stebbins (1956) considered four main lines of evolution in the grasses on the bases of morphological and cytogenetic characters. The panicoid and the eragrostoid-chloridoid lines (x = 9, 10) developed in the tropics and show a reduction in the number of florets and specialization in leaf anatomy. The third line is the Pooideae Benth. (= Festucoideae Link) (x = 7), which are the principle grasses of temperate climates with the largest chromosomes in the family. A fourth line was Bambuseae Dumort., which became dominant in the moist tropical forests (x = 12). Three additional smaller lines, which were also seen as successful, were the arundinoid (x = 6), oryzoid (x = 12) and stipoid lines (x = 6). Smaller groups containing one or a few genera, such as *Anomochloa* Brongn. (x = 9), *Nardus* L. (x = 13) and *Pariana* Aubl. (x = 11), were also recognized.

In 1961, Carnahan and Hill proposed that grasses fall into two groups:

- Tropical and subtropical species with small chromosomes and x = 10, or derivatives thereof, such as 9 and 12.
- Species with a more temperate distribution that have larger chromosomes and usually a basic chromosome number of 7.

According to McWilliam (1964), the different basic chromosome numbers in Poaceae (R.Br.) Barnhart reflect taxonomic groupings in the family. This is confirmed by some of the most recent classifications, for example Clayton and Renvoize (1986), who recognized six subfamilies: Bambusoideae Asch. & Graebn. (x = 12), Centothecoideae Soderstr. (x = 12), Pooideae Macfarlane & Watson (x = 7), Arundinoideae Tateoka (x = 6, 7, 13), Chloridoideae Rouy (x = 9, 10) and Panicoideae A.Braun (x = 9, 10). Though similar basic chromosome numbers occur in different subfamilies, these numbers are not necessarily monophyletic (Panicoideae and Chloridoideae have predominantly x = 9 and 10 and both Arundinoideae and Pooideae have x = 7), but similar chromosome numbers with similar morphologies may be monophyletic (chloridoid chromosomes are smaller than the panicoid chromosomes and the arundinoid chromosomes are medium sized in comparison to the very large chromosomes of the Pooideae). Currently 12 subfamilies are recognized [Grass Phylogeny Working Group (GPWG) 2001] based on morphology and molecular data, but basic chromosome numbers still indicate the major evolutionary diversification in the Poaceae.

The two subfamilies with both 9 and 10 as basic chromosome numbers in the majority of the genera present in the groups are the Chloridoideae and Panicoideae. Evidence indicating a close phylogenetic relationship between these two subfamilies, except for basic chromosome number, includes immunological affinities (Esen and Hilu 1989), similar prolamin profiles and prolamin sizes (Hilu and Esen 1988), length of the embryo, lodicule structure and nature of the first leaf of the seedling (Hilu and Johnson 1991). Hubbard (1948) and Stebbins (1956) proposed that the Chloridoideae and Panicoideae came from closely related ancestors and Tateoka (1957) and Clayton (1981), suggested that the ancestor to these two groups might be arundinoid. From the Arundinoideae with its basic chromosome number of 6, a possible aneuploid reduction could have lead to five in the Chloridoideae and Panicoideae. This was increased by polyploidization to the paleopolyploid basic chromosome number of ten and subsequent aneuploid reduction lead to nine. This has been corroborated by various molecular studies (Barker *et al.* 1995, 1999; Hilu *et al.* 1999; Hilu and Alice 2001).

Goldblatt (1980) was of the opinion that high basic chromosome numbers, for example x ≥ 9, are not of recent origin and most probably had polyploidy in their evolutionary history. Taxa with these secondary basic chromosome numbers, therefore the Chloridoideae and Panicoideae, would be paleopolyploids, or ancient taxa that are rediploidized polyploids with high basic chromosome numbers (Grant 1963; Goldblatt 1980). According to Feldman *et al.* (1997), this diploidization process occurs by means of chromosome diploidization in which homoeologous chromosome pairing is suppressed and also by means of genetic diploidization. The genetic diploidization process includes various changes such as for example, structural rearrangements at various levels (Song *et al.* 1995; Wendel *et al.* 1995a; Leitch and Bennett 1997), the regulation of gene expression (Galitski *et al.* 1999; Matzke *et al.* 1999) and the amplification, reassortment or elimination of various types of sequences (Feldman *et al.* 1997; Hanson *et al.* 1998).

Rhoades (1951) first proposed that maize (Panicoideae) (2n = 2x = 20), contains duplicated genes, and may be the result of ancient polyploidy from a 2n = 2x = 10 ancestor. This is strongly supported by isozyme evidence (Wendel *et al.* 1985, 1986, 1989) and DNA marker studies (Helentjaris *et al.* 1988). Structural changes in the maize genome include rearrangement and gene silencing (Gaut and Doebley 1997; White and Doebley 1998). The proposal of ancient polyploidy was later extended to other genera in the panicoid tribe Andropogoneae Dumort. (Garber 1950; Celarier 1956; Mehra and Sharma 1975; Clayton and Renvoize 1986). Molecular support for this includes RFLP studies on *Sorghum* Moench (Chittenden *et al.* 1994; Pereira *et al.* 1994) and molecular cytogenetic and linkage analysis studies in sugarcane (D'Hont *et al.* 1996; Ming *et al.* 1998). Comparative mapping in maize and sorghum renders evidence in support of an ancient polyploid origin (Whitkus *et al.* 1992). Further comparative genetic studies have shown that maize, sugar cane, sorghum, pearl millet, and foxtail millet share a common genome arrangement (Gale and Devos 1998; Devos and Gale 1997, 2000; Kellogg 1998b).

Could a similar phenomenon of ancient polyploidy and a basic chromosome number of five be present in the Chloridoideae, the subfamily with which the Panicoideae shares large affinities? Unlike the Panicoideae, which consists of a number of economically important genera and has been thoroughly investigated, studies in the Chloridoideae relating to ancient polyploidy is limited. These two subfamilies are seen as the most recent radiation in Poaceae (Hsiao *et al.* 1998; GPWG 2001), both of which have diversified into the tropical and subtropical regions, especially the southern Hemisphere (Renvoize and Clayton 1992) and compose the largest majority of the southern African grass flora (Gibbs Russell 1986).

It is the aim of this study to investigate chromosome numbers of various southern African genera and species of the subfamily Chloridoideae, to determine and corroborate basic chromosome numbers, and by giving a review of chromosome numbers found in southern Africa and worldwide, to indicate that ancestral polyploidization has also lead to paleopolyploid basic chromosome numbers in the subfamily as is seen in the closely related Panicoideae.

4.2 Results

The major studies dealing with the chromosome numbers of South African chloridoid grasses (Figure 4.1) are those of Avdulov (1931); Hunter (1934); Nielson (1939); Moffet (1944); Hurcombe (1946, 1947); Moffett and Hurcombe (1949); Pienaar (1953); De Wet (1954a, b, 1958, 1960); De Wet and Anderson (1956); Reeder and Singh (1968); Nordenstam (1969); Vorster and Liebenberg (1977); Jones *et al.* (1978), Nordenstam (1982); Spies (1982); Davidse *et al.* (1986); Spies and Du Plessis (1986a, b, 1987); Spies and Jonker (1987); Du Plessis and Spies (1988); Hoshino and Davidse (1988); Spies and Gibbs Russell (1988); Spies and Voges (1988); Spies *et al.* (1991); Strydom and Spies (1994b) and the present study (Appendix A, B). For a list of worldwide studies see Appendix C. In these tables and in the text no reference is made to aneuploid deviations in somatic chromosome numbers and these were not considered further. This is to make interpretations easier, but these deviations do occur in various genera such as *Bouteloua* Lag., *Chloris* Sw., *Cynodon* Rich., *Dactyloctenium* Willd., *Hilaria* Kunth, *Muhlenbergia* Schreb. and *Sporobolus* R.Br.

In the seventy-nine specimens investigated in this study (Appendix A), 67% of the species have the paleopolyploid basic chromosome number of 10 (Figure 4.2A–E, L), with only 32% of the species investigated with $x = 9$ (Figure 4.2F–K). Three other basic chromosome numbers which also occur in the Chloridoideae are $x = 6$, 7, 8. These chromosome numbers, however, occur only in a small percentage of genera and are, therefore not considered main basic chromosome numbers.

Figure 4.1. Herbarium specimen of *Chloris virgata* Sw., a typical member of Chloridoideae. Scale bar: 3cm.

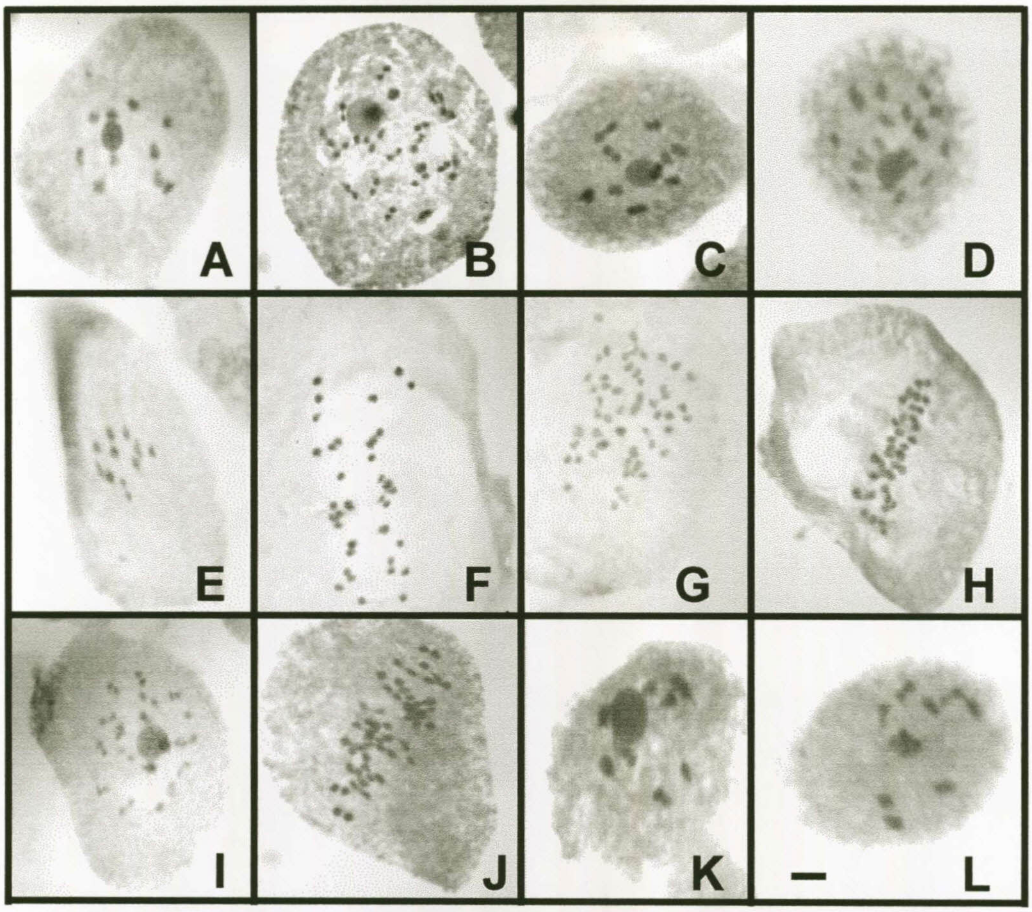

Figure 4.2. Photomicrographs of meiotic chromosomes in some genera of the subfamily Chloridoideae. **A.** *Cladoraphis cyperoides*, *Spies 4889*, 2n = 2x = 20, diakinesis with 10_{II}. **B.** *C. spinosa*, *Spies 4885*, 2n = 4x = 40, diakinesis with 20_{II}. **C.** *Enneapogon pretoriensis*, *Spies 3716*, 2n = 2x = 20, diakinesis with 10_{II}. **D.** *Enteropogon macrostachyus*, *Venter 9339*, 2n = 4x = 40, diakinesis with 20_{II}. **E.** *Eragrostis tenuifolia*, *Spies 2595,* 2n = 2x = 20, diakinesis with 10_{II}. **F, G.** *Harpochloa falx, Spies 4729, 2n* = *4x* = 36, anaphase I segregation (**F**), *Spies 5128*, 2n = 6x = 54, anaphase I segregation (**G**). **H.** *Odyssea paucinervis*, *Spies 3384*, 2n = 4x = 36, metaphase I. **I.** *Schmidtia pappophoroides*, *Du Plessis 186*, 2n = 4x = 36, diakinesis with 18_{II}. **J.** *Sporobolus albicans*, *Spies 3141*, 2n = 6x = 54, metaphase I. **K.** *Sporobolus virginicus*, *Du Plessis 122*, 2n = 2x = 18, diakinesis with 9_{II}. **L.** *Stiburus conrathii*, *Du Plessis 19*, 2n = 2x = 20, diakinesis with 10_{II}. Scale bar: A, B, D = 5 µm; C, L = 3 µm; E–H = 6.5 µm; I, J = 10 µm; K = 8 µm.

The basic chromosome number of six was only observed in one species, namely *Centropodia glauca* (Nees) Cope.

New chromosome numbers, reported for the first time or where new numbers deviate from previous reports, for southern African species found in this study is the following: *Cladoraphis cyperoides* (Thunb.) S.M.Phillips (2n = 2x = 20) (Figure 4.2A); *C. spinosa* (L.f.) S.M.Phillips (2n = 4x = 40) (Figure 4.2B); *Enneapogon pretoriensis* Stent (2n = 2x = 20) (Figure 4.2C); *Enteropogon macrostachyus* (A.Rich.) Benth. (2n = 4x = 40) (Figure 4.2D); *Eragrostis tenuifolia* (A.Rich.) Steud. (2n = 2x = 20) (Figure 4.2E); *Harpochloa falx* (L.f.) Kuntze (2n = 4x = 36; 2n = 6x = 54) (Figure 4.2F, G); *Odyssea paucinervis* (Nees) Stapf (2n = 4x = 36) (Figure 4.2H); *Schmidtia pappophoroides* Steud. (2n = 4x = 36) (Figure 4.2I); *Sporobolus albicans* Nees (2n = 6x = 54) (Figure 4.2J); *Sporobolus virginicus* (L.) Kunth (2n = 2x = 18) (Figure 4.2K) and *Stiburus conrathii* Hack. (2n = 2x = 20) (Figure 4.2L).

From these somatic chromosome numbers, a paleopolyploid basic chromosome number of ten for the species *Cladoraphis cyperoides*, *C. spinosa*, *Enteropogon macrostachyus*, *Eragrostis tenuifolia* and *Stiburus conrathii* is accepted. A paleopolyploid basic chromosome number of 9 is indicated for the species *Odyssea paucinervis* and *Sporobolus albicans*. New evidence for the occurrence of both basic chromosome numbers is found for the southern African representatives of the genera *Enneapogon* and *Harpochloa* and the species *Schmidtia pappophoroides* and *Sporobolus virginicus*.

4.3 Discussion

In the Chloridoideae and the Panicoideae the most common paleopolyploid basic chromosome numbers are x = 9 and x = 10. Stebbins (1985) was of the opinion that x = 5, 6 or 7 had equal probability of being the original basic chromosome number of the grasses. He proposed that from these widespread original basic chromosome numbers, the paleopolyploid numbers of x = 10 and x = 12 in different groups (such as the Chloridoideae and Panicoideae) arose (Stebbins 1985). This is in contrast to Raven (1975) who proposed that x = 10, 11 and 12 are the more primitive basic chromosome numbers in the grasses. Stebbins (1985) gave the following reasons in support of x = 10, 11 and 12 being derived by polyploidy:

- The basic chromosome numbers of x = 5, 6 appear in a few distantly related taxa that are among the more primitive genera in their respective subfamilies, such as *Danthonia* DC. (x = 6) and *Sorghum* (x = 5).
- Furthermore, x = 7, 6, and 5 cannot be derived by aneuploid reduction from x = 12, as proposed by Raven (1975), due to the extreme rarity of x = 8 in the grasses, and the rarity of x = 9, except in the highly specialized members of the Chloridoideae and Panicoideae.

In 1987, De Wet reported on diploids, 2n = 2x = 10, in the panicoid genera *Sorghum* and *Thelepogon* Roth ex Roem. & Schult. As early as 1950 and 1956, Garber (1950) and Celarier (1956), had already proposed that 5 was the basic chromosome number of the tribe Andropogoneae (Panicoideae). By 2000, Watson & Dallwitz (1992 onwards), reported a basic number of 5 for the panicoid genera *Andropogon* L., *Coix* L., *Cymbopogon* Spreng., *Elionurus* Kunth ex Willd., *Sorghum, Thelepogon*, and *Zea* L. (based on studies by for example Harlan *et al.* 1952; Sisodia 1970; Dujardin 1978a; Wu 1978; Sapre and Barve 1983; Molina and Naranjo 1986, 1987; Lavania 1987; Sapre and Deshpande 1987; Morakinyo and Olorode 1988; Spies *et al.* 1991; Rao and Nirmala 1994).

According to De Wet (1987), diploids (2n = 2x = 10) seem to be absent from the Chloridoideae. In 1963, however, Swami found *Oropetium thomaeum* Trin. in India and Pohl (1969) found a specimen of *Muhlenbergia andina* Hitchc. in North America, both with 2n = 2x = 10. In 1986, Davidse *et al.* found *Dactyloctenium giganteum* Fisch. & Schweick (2n = 2x = 10) in Zimbabwe. This is evidence of a basic chromosome number of five. This was first proposed in 1965 by Roy when she observed secondary association of bivalents into five groups during meiosis in the Indian species *Eragrostis diarrhena* Steud. (2n = 4x = 20).

Both the Chloridoideae and Panicoideae have been proposed to have an African origin (Hartley 1958b; Hartley and Slater 1960), more specifically in the East Africa-Madagascar region (Hartley 1958b). This is based on biogeographical evidence suggesting that the Panicoideae originated in the East-Africa-Madagascar region. The occurrence of the genus *Miscanthus* Anderss. in southern Africa, a relatively primitive genus in the Panicoideae, supports the possible origin of the Panicoideae in this region (Hartley 1958b). Paleontological evidence that support this are Miocene fossil grasses belonging to the subfamilies Chloridoideae and Panicoideae in East Africa (Retallack *et al.* 1990). Five distinctly different plant morphologies, arrangements of stomata, phytoliths and hair bases were found among these fossil grasses. Three of these were identified as three different species of the subfamily Panicoideae and the remaining two as two separate species of the subfamily Chloridoideae. This renders evidence as to the presence of grasses and grasslands in East Africa for at least 14 million years (Retallack *et al.* 1990). The geographic distribution of the chloridoid genera *Triraphis* R.Br. and *Centropodia*, the most basal members of the subfamily in an analysis of the subfamily based on the *mat*K gene (Hilu and Alice 2001), further supports the African origin hypothesis of Hartley (1964) for the Chloridoideae.

According to Hartley and Slater (1960) the differentiation of the Chloridoideae probably preceded that of the Panicoideae because the Panicoideae have not reached a balanced distribution in the different hemispheres (Hartley 1958a, b). Therefore, if the basic chromosome number of the Panicoideae is considered to be five, the same can be proposed for the Chloridoideae, even though less primary diploids have been found which is probably only due to sampling bias.

Therefore, five is the basic chromosome number for the subfamily Chloridoideae, and many current diploid species ($2n = 2x = 20$) are paleotetra-polyploids ($2n = 4x = 20$), etc. The scarcity of specimens with $n = x = 5$ in the subfamily Chloridoideae indicates that a large number of diploids have become extinct (Hunziker and Stebbins 1987). According to Stebbins (1985), polyploidy and trends towards aneuploidy/dysploidy and a high degree of specialization with regard to some morphological characteristics originated quickly and shortly after the grasses first differentiated. Consequently, these early stages of grass evolution produced many genera and species that are now completely extinct. De Wet (1987) suggested that $x = 9$ was probably derived via aneuploidy from $x = 10$, which in turn was derived from $x = 5$. Whether the reduction is due to aneuploidy or dysploidy (fusion or Robertsonian translocation) is not known.

The genus *Sporobolus* is the only chloridoid genus in southern Africa in which both main basic chromosome numbers, x = 9, 10 and the less common basic chromosome number x = 6, occur (Moffet and Hurcombe 1949; De Wet 1954a; De Wet and Anderson 1956; De Wet 1958, 1960; Davidse *et al.* 1986; Spies and Du Plessis 1986b; Spies and Jonker 1987; Spies and Voges 1988; Spies *et al.* 1991).

Hubbard (1934) stated that *Sporobolus* shows a close relationship to *Eragrostis* Wolf (which has a paleopolyploid basic chromosome number of x = 10) and is probably derived form it. Brown (1950) also proposed that the basic chromosome number of x = 9 in *Sporobolus* was probably derived from *Eragrostis* with x = 10 by a reduction in basic chromosome number. This was before Roy (1965) reported on the basic chromosome number of *Eragrostis* as 5. Reports for diploids based on x = 6 (none, however, based on x = 5 for this genus), have been reported for *Sporobolus maderaspatanus* Bor (2n = 2x = 12) from India (Christopher and Samraj 1985). *Sporobolus molleri* Hack. with 2n = 2x = 12 has been found in Zaire and Uganda (Tateoka 1965a; Auqier and Renard 1975; Dujardin 1978b, 1979) and diploids for another *Sporobolus* species, *S. tenuissimus* Kuntze (2n = 2x = 12) are reported from Madagascar, Trinidad and Zaire (Tateoka 1965b; Davidse and Pohl 1972; Dujardin 1978b). The presence of *Sporobolus* with x = 6 in the region of origin of the subfamily and in the region where diploids based on x = 5 have also been reported, supports the likelihood that initially a *Sporobolus* lineage was derived from *Eragrostis* by a aneuploid increase in basic chromosome number from 5 to 6. Other chromosome numbers in *Sporobolus* probably arose by polyploidy (n = x = 5 to n = x = 10) (Christopher and Abraham 1974) and subsequent aneuploidy/ dysploidy (n = x = 9). This is supported by the fact that no *Sporobolus* species based on x = 5 have been found. It seems likely that *Sporobolus* species with x = 6 represents the older species in *Sporobolus* (some probably extinct), whereas the species with x = 9 are derived from the paleopolyploids based on x = 10, and therefore younger members of the genus derived after initial polyploidization events.

The close relationship between *Eragrostis* and *Sporobolus* is also noticeable at morphological level, where the major difference is the number of florets per spikelet (Clayton and Renvoize 1986). It may be that *Sporobolus* represents a specialized lineage of the genus *Eragrostis* with the differentiation of 3 basic chromosome numbers as opposed to the single basic chromosome number of *Eragrostis.*

The other southern African taxa having x = 6 is the genus *Centropodia* [2n = 8x = 48 for *C. glauca* and 2n = 4x = 24 for *C. forskalii* (Vahl) Cope] and the species *Merxmuellera rangei* (Pilg.) Conert (2n = 6x = 36) (De Wet 1954b; Du Plessis and Spies 1988; Hoshino and Davidse 1988; present study).

Centropodia has a well-developed Kranz anatomy (Ellis 1984b), which separates it from the Arundinoideae (Danthonioideae Barker & H.P.Linder in the sense of GPWG 2001) and groups it with the Chloridoideae. Verboom *et al.* (1994) also reported that this genus lacks haustorial synergids, a characteristic of the Danthonioideae, and is therefore excluded from this subfamily. The multinerved glumes and lemmas and several-flowered spikelets of this genus correspond to those in the basal lineages of the Chloridoideae, namely the Pappophoreae (x = 9, 10) (Hilu *et al.* 1999; Hilu and Alice 2001).

Merxmuellera rangei is the only species of the genus to occur in Namibia, the other occurring mainly in mountainous areas of most of southern Africa, the most species being endemic (Fish 2000). According to Ellis (1982) the leaf anatomy of this species differs from all the other representatives of the genus and that this species occupies an isolated position in the genus and warrants generic status.

These formerly danthonioid species are now placed in the Chloridoideae, but have not been included into any tribe. They represent the most basal members of the Chloridoideae as now delimited (GPWG 2001).

The only genera in southern Africa that have exclusively x = 9 are *Craspedorachis* Benth., *Eleusine* Gaertn. and *Odyssea* Stapf. However, the genera *Craspedorachis* and *Odyssea* are only represented by one chromosome report each (Moffet and Hurcombe 1949; present study). *Craspedorachis* is extremely rare in southern Africa and has a more widespread distribution in tropical Africa and North and South America. *Odyssea* does not have such a restricted distribution in southern Africa and also occurs in tropical Africa. No conclusions regarding the importance of x = 9 can, therefore be made for these genera without a more thorough investigation.

Chromosome numbers based on x = 9 and 10 have been reported for *Eleusine*, though only reports based on x = 9 have been found in southern Africa. Reports of x = 10 have been published by Hiremath and Chennaveeraiah (1982)

(India) [2n = 4x = 40 for *E. compressa* (Forssk.) Asch. & Scweinf. ex. C.Chr. and 2n = 2x = 20 for *E. jaegeri* Pilg.]; Hiremath and Salimath (1991) (Tanzania) (2n = 2x = 20 for *E. jaegeri*) and Mysore and Baird (1997) (Kenya and Tanzania) (2n = 2x = 20 for *E. jaegeri*).

Due to the limited nature of reports for x = 9, it seems that all the Chloridoideae, which are present in southern Africa, have chromosome numbers based on either the paleopolyploid basic chromosome number of x = 10, or both x = 9, 10 and that no genus is characterized only by x = 9.

In contrast to Africa, New World genera in the subfamily are characterized by single basic chromosome numbers derived by aneuploidy from either x = 5 or the paleopolyploid number x = 10 (Appendix C). This includes the genus *Hilaria* Kunth (Southern USA to Guatemala) (Clayton and Renvoize 1986), with only chromosome reports based on x = 9 (Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1973; Goldblatt 1981, 1985, 1988; Goldblatt and Johnson 1991). Many New World genera such as *Blepharoneuron* Nash (Moore 1973; Goldblatt 1981; Goldblatt and Johnson 1991, 1994); *Chaboissaea* E.Fourn. (Ornduff 1969; Moore 1970; Goldblatt and Johnson 1996); *Erioneuron* Nash (Ornduff 1968; Moore 1970, 1973; Goldblatt 1981, 1988) and *Munroa* Torr. (Federov 1969; Moore 1973; Goldblatt 1981) and the Australian genus *Triodia* R.Br. (Federov 1969; Moore 1973) have basic chromosome numbers of 8 which might be a further aneuploid reduction from x = 9 and *Blepharidachne* Hack. (Federov 1969; Goldblatt 1981, 1988) has multiples based on 7. The fact that most of these genera, which do not occur in southern Africa or even Africa, consist of derived new basic chromosome numbers are indications of the young age of these genera and implies that they are of more recent radiation in the Chloridoideae.

4.4 Conclusions

Chromosome numbers reported in this study confirm the presence of the two main basic chromosome numbers in the southern African Chloridoideae and indicates the high incidence of x = 10, which is then a paleopolyploid chromosome number. Although the reports of diploids (2n = 2x = 10, 12) are few for the Chloridoideae, increased sampling and cytogenetic and molecular studies will render more evidence that the same phenomenon as is seen in the closely related Panicoideae, is present in the Chloridoideae. Although the mechanisms might differ, the large affinities between the Chloridoideae and Panicoideae and the occurrence of specimens based on x = 5 indicates that the same phenomenon of polyploidization and subsequent rediploidization has occurred in these subfamilies. The African origin of the Chloridoideae is supported by the presence of taxa with either the paleopolyploid x = 10 or both x = 10 and x = 9, and by the restriction of deviations from these numbers to other continents where diversification took place later on in the history of the group.

CHAPTER 5

Polyploidy

IN PRESS (TAXON):

R. ROODT AND J.J. SPIES. CHROMOSOME STUDIES IN THE GRASS SUBFAMILY CHLORIDOIDEAE. II. AN ANALYSIS OF POLYPLOIDY IN SOUTHERN AFRICA AND THE WORLD. IN PRESS (*TAXON*)

Polyploidy is frequent among the grasses. This study indicates that it has a high frequency in the subfamily Chloridoideae, where more than 90% of the studied specimens are polyploids. These levels range from diploid (2n = 20 for x = 10 and 2n = 18 for x = 9) to 16-ploid (2n = 160) for x = 10 in *Ctenium concinnum* Nees and 20-ploid (2n = 180) for x = 9 in *Hilaria mutica* Benth. This polyploid trend is seen in southern Africa, as well as worldwide. Analysis indicates that many polyploids are allopolyploids, suggesting extensive hybridization within this group. This is supported by the presence of apomixis in many members of the subfamily. Both polyploidy and apomixis are thought to be important evolutionary mechanisms in the Chloridoideae as well as the closely related Panicoideae, and have a high frequency in southern Africa. Due to the stable ecological, geographical and climatological history of Africa, the continent is ideally suited for the stabilization of hybrid complexes. This stabilization of newly formed hybrids occurs by means of apomixis and polyploidization.

5.1 Introduction

Polyploidy is the existence, in genetically related taxa, of chromosome numbers that are multiples of each other, with the polyploid specimens containing more than two genomes per nucleus (Stebbins 1950). This phenomenon occurs in 80% of all angiosperms and is one of the most important cytogenetic mechanisms in plant evolution (Masterson 1994), as it is a prime facilitator of rapid speciation (Hiremath and Salimath 1991). In Poaceae (R.Br.) Barnh., polyploidy has undeniably played an essential role in the evolution of this family, for as early as 1947, Stebbins reported that approximately 70% of the known wild species of grasses were of polyploid origin and by 1985, Stebbins stated that between 80% and 90% of the grass taxa have undergone polyploidy during their evolutionary history. In the South African grass flora this is also reflected, where polyploidy has been reported in more than 80% of the specimens investigated (Spies *et al.* 1996).

The occurrence of polyploidy in the grass subfamily Chloridoideae Kunth ex Beilschm. is especially high. According to Goldblatt (1980), chromosome numbers of $x \geq 9$ are probably secondary derived, and in this subfamily, where x = 9 and 10 dominate, x = 9 (derived by aneuploidy from 10) and 10 (probably derived by allopolyploidization from 5) are, therefore polyploid. For the rest of this paper these will be referred to as basic chromosome numbers, even though they essentially are not.

Apomixis includes various developmental pathways by which plants can reproduce asexually via seed (Nogler 1984; Asker and Jerling 1992). It is known from more than 400 flowering plant species and 35 plant families (Nogler 1984; Carman 1997). Despite this taxonomic diversity most apomicts are also polyploids (Asker 1980; Grant 1981; Mogie 1986; Asker and Jerling 1992; Carman 1997; Grossniklaus *et al.* 2001). This was observed as early as 1878 by Strasburger who indicated that apomictic plants often have high chromosome numbers. Rosenberg (1917) and Winge (1917) independently remarked on the connection between high chromosome numbers, hybrid origin and apomixis.

Apomixis has a marked localized distribution with 75% of apomicts belonging to only three families, namely Asteraceae Dumort, Poaceae and Rosaceae L. (Brown and Emery 1958; Richards 1990; Asker and Jerling 1992; Czapik 1996, 2000; Vielle Calzada *et al.* 1996). Apomixis is unusually common among grasses of South Africa (Brown and Emery 1957; Goldblatt 1978) compared to other herbaceous families. According to Brown and Emery (1958), apomixis is especially common in the subfamily Panicoideae Link (tribes Paniceae R.Br., Andropogoneae Dumort.) and Chloridoideae (tribes Chlorideae Kunth, Eragrosteae Benth., Pappophoreae Kunth), compared to other subfamilies in the grasses. These two subfamilies together comprise 52% of the known reports of apomixis in the grass family (Czapik 2000). Apomixis is also frequent in the Pooideae Benth. (35% of known reports) (Czapik 2000) but this subfamily has a very low frequency in southern Africa (15%) where the Chloridoideae (24%), Arundinoideae (24%) [which are now three separate subfamilies, namely Aristidoideae Caro, Arundinoideae and Danthonioideae Barker & H.P.Linder (GPWG 2001)] and Panicoideae (35%) comprise the largest percentage of grasses (Gibbs Russell 1986). Brown and Emery (1958) proposed that the same apomictic genes are widespread amongst these two subfamilies (tribes according to the classification they used), and that many of the sexual species contain one or a few genes necessary for an effective balanced apomictic system. These sexual species would be carriers of one or more apomictic genes and subsequent hybridizations between these carrier taxa would facilitate apomixis (Brown 1958). Carman (1997) felt that apomixis is a multigene phenomenon and that the parthenogenetic development of the embryo is the result of duplicated female development genes that are asynchronously expressed. The required increase in the number of genes can be achieved by polyploidy. Even if the polyploidization event is ancient (such as in the Chloridoideae and Panicoideae) and paleopolyploids exists that are diploidized, the chromatin of the multiple genomes are still present (Carman 1997). Various authors support this multigene apomictic regulation model (for example Blakey *et al.* 1997; Sokolov *et al.* 1998; Blakey *et al.* 2001). This is in line with initial studies of apomixis by Gustafsson (1947a, b), who was of the opinion that apomixis results from the genetic interactions following polyploidy in taxa that had a tendency towards apomixis (or then the "genes necessary for an effective balanced apomictic system" proposed by Brown and Emery 1958). This tendency will be the intergenomic heterozygosity for rates and timing of female development that exists within cosmopolitan families, such as the grass family (Carman 1997).

It is the aim of this study to investigate the incidence and type of polyploidy in the Chloridoideae in southern Africa and to indicate that hybridization, polyploidization and apomixis are correlated in the subfamily and are especially high in the region where the group is proposed to have originated.

5.2 Results

The past century has seen an increase in the number of studies dealing with chromosome numbers in the grasses. The following studies have increased our knowledge of the southern African chloridoid grasses: Avdulov (1931); Hunter (1934); Nielson (1939); Moffet (1944); Hurcombe (1946, 1947); Moffett and Hurcombe (1949); Pienaar (1953); De Wet (1954a, b, 1958, 1960); De Wet and Anderson (1956); Reeder and Singh (1968); Nordenstam (1969); Vorster and Liebenberg (1977); Jones *et al.* (1978); Nordenstam (1982); Spies (1982); Davidse *et al.* (1986); Spies and Du Plessis (1986a, b, 1987); Spies and Jonker (1987); Du Plessis and Spies (1988); Hoshino and Davidse (1988); Spies and Gibbs Russell (1988); Spies and Voges (1988); Spies *et al.* (1991); Strydom and Spies (1994a); present study (see appendix A, B).

These studies report on chromosome numbers for approximately two thirds (34) of the genera present in the subfamily (52) in southern Africa. The genera that have not been studied are mostly monotypic, some of which are exceedingly rare, for example *Brachyachne* (Benth.) Stapf, *Brachychloa* S.M.Phillips and *Schoenefeldia* Kunth (Gibbs Russell *et al.* 1990).

The results obtained in this study, together with the chromosome reports for the southern African Chloridoideae previously published, were used to compile a table of chromosome numbers in the southern African Chloridoideae (Appendix B). A table was also compiled of the known chromosome numbers of Chloridoideae from the rest of the world (Appendix C). These tables were used to calculate frequencies of polyploidy in the region (Figure 5.1), as well as in the rest of the world (Figure 5.2). To make interpretation easier, only $x = 9$ and 10 are indicated on these graphs.

In southern Africa, 78% of the species with $x = 9$ are polyploids and 71% of the species based on $x = 10$ are polyploids. Only a single species from Zimbabwe, *Dactyloctenium giganteum* Fisch. & Schweick., has ever been reported as truly diploid (based on $x = 5$) ($2n = 2x = 10$) with five bivalents observed during metaphase I (Davidse *et al.* 1986). In the rest of the world only two diploid species, with $x = 5$ ($2n = 2x = 10$), *Muhlenbergia andina* A.Hitch. (Pohl 1969) and *Oropetium thomaeum* Trin. (Swami 1963) have been reported. Other basic chromosome numbers such as 6 (Figure 5.3A), 7 and 8 (aneuploid derivatives of the original basic chromosome number of $x = 5$ or the secondarily derived basic number of $x = 9$) contribute only 11% of the total number of chromosome reports for the group worldwide, and could indicate that these chromosome numbers either developed recently in the history of the group and have not become established in large numbers or, are specialization in groups in which $x = 10$ or 9 was already present.

The vast majority of species possess multiples of 10 (Figure 5.1). When the two main basic chromosome numbers, $x = 10$ (Figure 5.3B–F) and 9 (Figure 5.3G–J) are compared, it can be seen that the basic number of 10 forms a much larger polyploid complex, with the most frequent polyploid level being tetraploid. The same general trend is seen worldwide (Figure 5.2). Both in southern Africa and worldwide

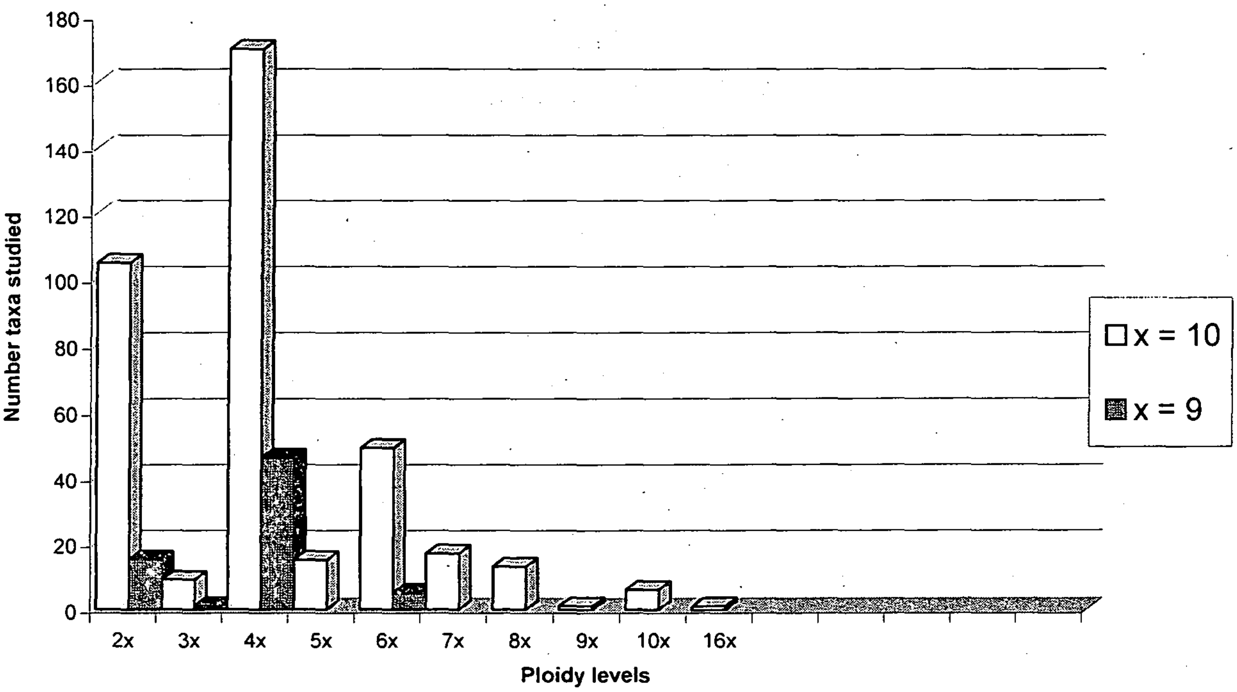

Figure 5.1. Ploidy levels present in southern Africa for basic chromosome numbers x = 9, 10.

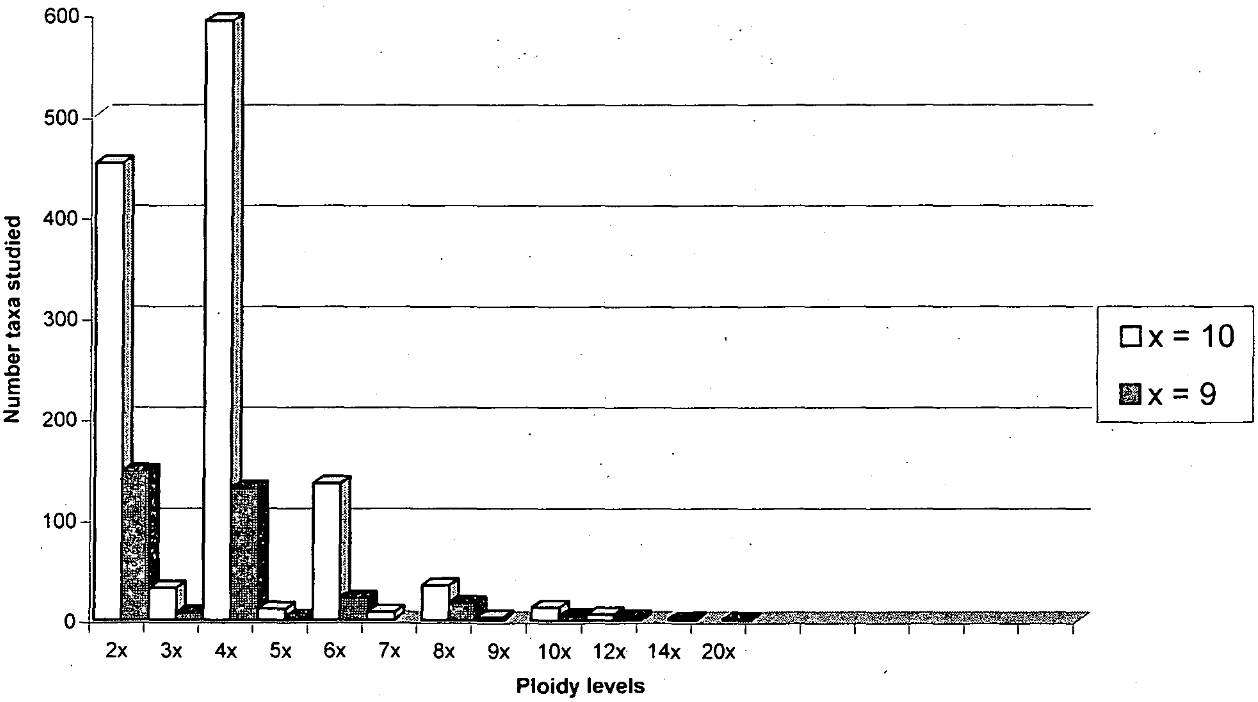

Figure 5.2. Ploidy levels present worldwide for basic chromosome numbers x = 9, 10.

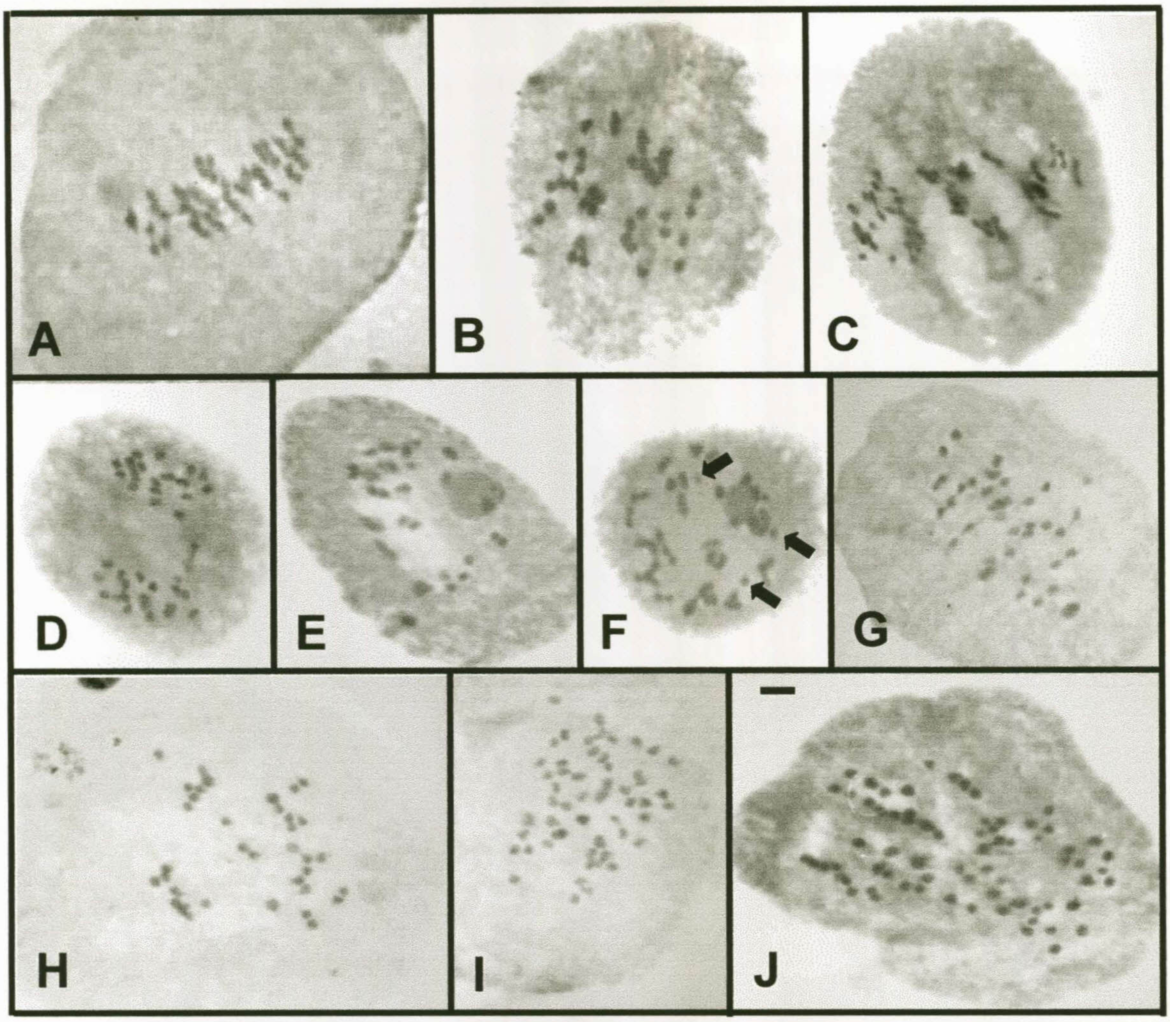

Figure 5.3. Photomicrographs of meiotic chromosomes in some genera of the subfamily Chloridoideae. **A.** *Centropodia glauca*, *Spies 5706*, 2n = 48, early anaphase I. **B.** *Dactyloctenium aegyptium*, *Spies 2403*, 2n = 40, diakinesis with 20_{II}. **C.** *Enneapogon cenchroides*, *Spies 2709*, 2n = 60, early metaphase I. **D.** *Eragrostis capensis*, *Spies 3498*, 2n = 40, anaphase I with one lagging chromosome pair. **E.** *E. inamoena*, *Spies 2392*, 2n = 40, diakinesis with 20_{II}. **F.** *E. planiculmis*, *Spies 1116*, 2n = 60, diakinesis with 30_{II}. B chromosomes are indicated. **G.** *Harpochloa falx*, *Spies 4695*, 2n = 36, early anaphase I. **H.** *H. falx*, *Spies 5078*, 2n = 36, late anaphase I. **I.** *H. falx*, *Spies 5128*, 2n = 54, late anaphase I. **J.** *H. falx*, *Spies 6955*, 2n = 36, anaphase I, two cells, each with an 18-18 segregation. Scale bar: A, D, E = 5 µm; F, J = 6 µm; B, C, G–I = 7 µm.

x = 10 has the same type of distribution with a large number of polyploids levels present and tetraploid levels occurring in the highest frequency.

5.3 Discussion

De Wet (1954a) and Stebbins (1956) were both of the opinion that the subfamily Arundinoideae represents the nearest living representative of the ancestral grass line that moved into the savannas from the forests. According to Clayton (1974), Arundinoideae apparently evolved into two directions namely the Chloridoideae and the Panicoideae. The origin of the Chloridoideae from arundinoid ancestors has been advocated by several researchers (for example Stebbins 1956; Tateoka 1957; Clayton 1981; Renvoize 1981; Phillips 1982; Campbell 1985; Watson *et al.* 1985; Clayton and Renvoize 1986; Conert 1987; Jacobs 1987; Kellogg and Campbell 1987; Davis and Soreng 1993; Hilu and Esen 1993; Liang and Hilu 1996; Soreng and Davis 1998; Hilu *et al.* 1999; Hsiao *et al.* 1999; Hilu and Alice 2001).

From the Arundinoideae with its basic chromosome number of 6, a possible aneuploid reduction could have lead to five in the Chloridoideae and Panicoideae, which was probably largely unstable and therefore polyploidization lead to the secondary basic chromosome number of ten and subsequent aneuploid reduction to nine which are now the most frequent basic chromosome numbers in these subfamilies (but see study by Spangler *et al.* 1999 based on *ndh*F sequences proposing that x = 5 represents a reduction in the Andropogoneae and not the ancestral basic chromosome number). This is corroborated by the studies of Barker *et al.* (1995, 1999) and Hilu *et al.* (1999) in which *Danthonia* DC. and *Centropodia* Rchb. (previously arundinoid genera but now Danthonioideae and Chloridoideae respectively) (x = 6) are most basal to the Chloridoideae.

Mehra *et al.* (1968) felt that x = 10 became stabilized early in the history of the Panicoideae, explaining the prevalence of multiples of 10, whereas x = 9 occurs in the more advanced tribes such as the Paniceae. This is probably also the case with the Chloridoideae where only as small number of primary diploids (2n = 2x = 10) have been reported (Swami 1963; Pohl 1969; Davidse *et al.* 1986) and x = 10 is more prevalent than x = 9. Hilu and Alice (2001) felt that x = 10 is a plesiomorphic character in the Chloridoideae and that x = 9 along with characters such as the evolution of the spicate inflorescence, a reduction in fertile florets and fewer-nerved lemmas became established soon after the appearance of early chloridoids because these characters are present in the more basal clades in their study based on the *mat*K gene. These basal clades are represented by the tribe Pappophoreae Kunth, subtribe Uniolinae Clayton and the genus *Eragrostis* Wolf. Clayton and Renvoize (1986) placed the Uniolinae as basal in their circumscription of the Chloridoideae and consider them the link between the Chloridoideae and Arundinoideae. In the Uniolinae, x = 10 is frequent, but in the genus *Uniola* L., x = 6 also occurs. Van den Borre and Watson (1997) place the Pappophoreae as near basal in their phylogeny based on morphology. Both x = 9 and 10 occur in this tribe and indicate that the polyploidization event from x = 5 to 10 and subsequent aneuploid reduction to x = 9 occurred early in the history of the group.

Polyploid complexes, as those found in this study within and among species, can be classified into five types according to the age of the complex

- An initial complex, which has the most recent origin and diploid specimens are most common.
- The young complex in which the diploids are far less common than polyploids and tend to be endemics.
- The mature complex where nearly all diploid specimens have become extinct and new cycles of polyploidy have arisen based on hybridization and/or chromosome doubling of specimens which behave like diploids, but have basic chromosome numbers of ancient polyploid origin. This diploid-like behavior is possibly due to chromosomal reorganization and gene silencing that can be so extensive that the genome is not structured as a polyploid any longer (Soltis and Soltis 1993, 1999).
- The declining complex where all the diploid ancestors have died out, but the basic chromosome number for the genus can still be determined by comparison with closely related taxa.
- The relictual complex comprising mainly of monotypic genera of very high chromosome number, with no close existing relatives. It is impossible to determine the basic chromosome number of the genus

because no remaining closely related taxa exist to make comparisons to (Stebbins 1956, 1971).

The Chloridoideae with x = 10 represents a mature polyploid complex in which most original diploids (based on x = 5) have become extinct, and as a result of hybridization and polyploidization, basic chromosome number of ancient polyploid origin (x = 10) are now found in most genera, whereas x = 9 represents a much younger complex with a relatively large frequency of diploids still apparent, compared to the other polyploid levels present.

To determine what type of polyploidy is present in the genera studied and whether hybridization occurs the meiotic configurations in tetraploid southern African specimens were analyzed with the model of Kimber and Alonso (1981). Kimber and Alonso (1981) formulated different tetraploid models, 4:0, 3:1, 2:1:1 and 2:2, based on the degree of homology between the genomes present in the tetraploid. Chromosome configurations are used to determine the relative affinity between the genomes and this is expressed by an x-value. Expected and observed chromosome configurations are compared and the sums of squares between these values for each specimen are calculated (Kimber and Alonso 1981). The model with the lowest sum of squares is considered to be the model best suited for that particular specimen. In the case of a 3:1 model, an x-value of 0.5 indicates that the last genome corresponds to the first three and that the specimen has a genomic constitution of for example AAAA (autopolyploidy). With this same model, an x-value of 1 indicates no homology between the last genome and the first three and the specimen will have a genomic constitution of for example AAAB (allopolyploidy). The 2:2 model with an x-value of 1 would indicate a genomic composition of AABB. Values ranging from 0.5 to 1 indicate varying degrees of homoeology and would indicate segmental allopolyploidy (Kimber and Alonso 1981).

The results of these analyses are presented in Table 5.1. The 2:2 model fit all the specimens best. These results indicate that the studied taxa are either segmental allopolyploids, which have diversified so much as to almost be a true allopolyploid (x value of 0.99), or allopolyploids (x value of 1). Even though the chromosomes studied are small, meiotic configurations could still be discerned and chiasma frequencies calculated. Sybenga (1994) stated that pairing in polyploids

Table 5.1. Genomic relationships in the tetraploid specimens analyzed according to the models of Kimber and Alonso (1981). Values indicated represent the sums of squares calculated for the four possible tetraploid models. The x-values are indicated in parentheses. The model best suited for each specimen is indicated in bold.

Specimen	2*n*	Voucher number	Chiasma frequency	Models			
				4:0	3:1	2:2	2:1:1
Cynodonteae							
Cynodon dactylon	36	*Spies 2549*	0.5	45.34	57.52 (0.95)	**30.39 (1)**	45.42 (0.5)
Cynodon dactylon	36	*Spies 2966*	0.89	18.34	18.88 (0)	**0.074 (0.99)**	0.48 (0.994)
Harpochloa falx	36	*Spies 5065*	0.50	45.34	45.71 (0.5)	**30.38 (0.99)**	45.42 (0.5)
Harpochloa falx	36	*Spies 5113*	0.53	39.04	53.60 (0)	**25.72 (0.99)**	39.13 (0.5)
Harpochloa falx	36	*Spies 6955*	0.50	44.54	44.91 (0.5)	**29.77 (1)**	44.62 (0.5)
Harpochloa falx	36	*Spies 4695*	0.50	45.34	45.71 (0.5)	**30.38 (0.99)**	45.42 (0.5)
Harpochloa falx	36	*Spies 4729*	0.50	45.34	50.44 (0.8)	**30.38 (0.99)**	45.42 (0.5)
Harpochloa falx	36	*Spies 4691*	0.53	38.65	52.61 (0.99)	**24.21 (0.99)**	38.74 (0.5)
Eragrostideae							
Bewsia biflora	40	*Spies 1531*	0.88	22.02	22.76 (0)	**0.2×10^{-5} (0.99)**	0.77 (0.995)
Cladoraphis spinosa	40	*Spies 4885*	0.51	54.40	73.46 (0)	**36.03 (0.99)**	54.50 (0.50)
Eleusine indica subsp. *africana*	36	*Spies 2783*	0.71	15.90	18.47 (0.85)	**3.65 (0.99)**	11.45 (0.95)
Eragrostis capensis	40	*Spies 3498*	0.59	32.80	46.99 (0)	**20.12 (0.99)**	32.91 (0.58)

Eragrostis capensis	40	*HdP 110*	0.58	36.38	37.22 (0.58)	**19.58 (0.99)**	36.35 (0.75)
Eragrostis capensis	40	*Spies 3483*	0.71	13.32	13.86 (0.5)	**5.17 (1)**	10.97 (0.9)
Eragrostis capensis	40	*Spies 5069*	0.51	54.40	54.86 (0.5)	**36.04 (1)**	54.50 (0.5)
Eragrostis capensis	40	*Spies 1595*	0.55	41.98	58.35 (0)	**24.62 (1)**	42.08 (0.61)
Eragrostis echinochloidea	40	*Spies 2799*	0.80	17.89	20.36 (0.999)	**1.010 (0.99)**	5.20 (0.999)
Eragrostis inamoena	40	*Spies 2392*	0.58	35.47	49.93 (0.999)	**19.04 (1)**	35.44 (0.75)
Eragrostis racemosa	40	*Spies 3279*	0.50	55.98	60.62 (0.76)	**37.52 (1)**	56.08 (0.5)
Eragrostis racemosa	40	*Spies 4743*	0.50	45.34	45.71 (0.5)	**30.38 (0.99)**	45.42 (0.5)
Eragrostis racemosa	40	*Spies 5066*	0.50	55.98	75.3 (0)	**37.52 (1)**	56.08 (0.5)
Eragrostis superba	40	*Spies 3326*	0.52	50.86	51.33 (0.5)	**33.21 (0.99)**	0.96 (0.5)
Eragrostis superba	40	*HdP 136*	0.54	44.18	61.16 (0)	**27.25 (0.89)**	44.29 (0.5)
Fingerhuthia africana	40	*Spies 2947*	0.52	50.27	50.75 (0.5)	**32.19 (0.99)**	50.37 (0.5)
Sporobolus africanus	36	*Spies 2369*	0.58	27.69	28.17 (0.5)	**14.57 (0.99)**	27.60 (0.76)
Pappophoreae							
Enneapogon cenchroides	40	*Spies 3288*	0.64	18.36	18.89 (0.5)	**8.41 (1)**	17.60 (0.85)
Enneapogon sp.	40	*Spies 5532*	0.62	23.14	23.65 (0.5)	**10.89 (1)**	22.60 (0.83)
Schmidtia pappophoroides	36	*HdP 186*	0.50	45.34	48.30 (0.73)	**30.38 (0.99)**	45.42 (0.5)
Schmidtia sp.	36	*Spies 5536*	0.57	29.93	42.04 (0)	**16.29 (0.99)**	29.93 (0.73)

could be affected by factors that may increase or decrease the amount of multivalent formation, and that these are independent of the chromosome affinities. These factors could include the position and number of pairing initiation points and their interference with chiasmata formation. Low multivalent frequencies (as observed in this study) are, therefore, not necessarily an indication of limited pairing because even in natural autopolyploids quadrivalent formation may be rare (Sybenga 1992, 1994, 1996). This has been observed in many species in which autopolyploids are known to exist such as *Triticum* L. (Yen and Kimber 1990) and rye (Wang and Berdahl 1990; Santos *et al.* 1995). The occurrence of a few multivalents in some specimens in this study furthermore indicates that *Ph* like genes are probably not present. In wheat it was found that the *Ph1* gene suppresses homoeologous chromosome pairing and bivalent formation will take place (Riley and Chapman 1958; Sears 1976). The mechanism of this phenomenon is controlled by a series of genes on the homoeologous group 5 chromosomes. These genes suppress or, in some cases, promote homoeologous chromosome pairing. A mutant (*Ph*) of the gene allows homoeologous pairing and is located on the long arm of chromosome 5 of the B genome (Wall *et al.* 1971a, b). The dominant allele suppresses homoeologous pairing and multivalent formation and leads to bivalent formation (Riley *et al.* 1961).

The cytogenetic results could indicate the existence of mostly segmental allopolyploid and allopolyploid tetraploid specimens (secondary derived). The cytogenetic results provide provisional evidence for the existence of large-scale hybridization in the southern African members of the subfamily, in a family in which hybridization is known to have a high occurrence. The abundance of naturally occurring interspecific hybrids in Chloridoideae (and Poaceae in general) seems to be related to the occurrence of different species growing together in dense stands, the production of vast amounts of wind-borne pollen and the existence of self-incompatibility systems which promote crosspollination (Hilu 1993).

According to Vorster (1974), the stable ecological, geographical and climatological history of the African continent makes it very suitable for the stabilization of hybrid complexes. Studies by Van Zinderen-Bakker (1964) on the fossil pollen in southern Africa, indicates fluctuations in the rainfall, dominated by various dry and wet rainfall cycles. This leads to increases or decreases in the geographical distribution of plant populations. During dry seasons populations may break up into various smaller sub-populations, which might become isolated from one another. If the dry season persists these populations may become karyotipically distinct from one another, by evolutionary development (Van Zinderen-Bakker 1964). Wet seasons could later lead to an increase in the distribution of these populations and hybridization between the separate populations. Depending on the divergence between the species, the hybrids may or may not be sterile with varying degrees of abnormality during meioses. This could lead to subsequent polyploidization (Van Zinderen-Bakker 1964). This scenario is in concordance with Stebbins' (1985) secondary contact hypothesis characterized by cycles of polyploidy.

The survival and successful establishment of many newly formed hybrids are associated with their perenniality and effective means of vegetative or asexual propagation. Perenniality implies that a plant does not need to be immediately fit, and provides a better chance for polyploids to recover from sterility problems which are associated with chromosome pairing and restore nucleocytoplasmic stability (Hilu 1993). The high frequency of polyploidy in the grasses has provided a means of fixing and spreading hybrid combinations (Stebbins 1956; McWilliam 1964; Knox 1967; De Wet and Stalker 1974; Asker 1980; Rieseberg 1997; Ellstrand and Schierenbeck 2000).

An effective means of asexual propagation to successfully establish hybrids is found in the form of apomixis. Apomixis, asexual reproduction via seed (Nogler 1984; Asker and Jerling 1992), is almost consistently associated with polyploidy in many plant families. There is no evidence that polyploidy promotes apomixis, but in association with hybridization it tends to strengthen the action of genes conditioning apomixis, which are not exhibited in a diploid background (Stebbins 1950; Bell 1982; Michod 1995). Kellogg (1990) found that in the grass family, apomictic groups are hybridizing groups. Apomixis allows the hybrids, which may only be partially fertile or sterile, to survive and increases the generation time for each genotype.

In the Chloridoideae apomixis has been found in *Bouteloua* Lag. (Harlan 1949; Freter and Brown 1955; Mohammed and Gould 1966; Bierzychudek 1985); *Chloris* Sw. (Brown and Emery 1958; Hutton 1961); *Eragrostis* Wolf (Streetman 1963a, b; Voight 1971; Voight and Bashaw 1972, 1976; Brix 1974; Vorster and

Liebenberg 1984; Voight *et al.* 1992); *Eustachys* Desv. (Strydom and Spies 1994a); *Fingerhuthia* Nees (Brown and Emery 1958); *Harpochloa* Kunth (Strydom and Spies 1994a); *Hilaria* Kunth (Brown and Emery 1958); *Rendlia* Chiov. (Strydom and Spies 1994a) and *Schmidtia* Steud. (Brown and Emery 1958). The higher incidence of apomixis in the Old World for the Chloridoideae (only *Bouteloua* and *Hilaria* are New World genera) (and the closely related Panicoideae) can be explained by the fact that these apomicts are more abundant towards the center of distributions of these groups (Brown 1958). As species spread out from a center of origin the more sexual species will be able to migrate the most rapidly. Apomicts will be more restricted and remain in the original habitats to which they are best adapted (Brown 1958).

5.4 Conclusions

Polyploidy occurs in the subfamily Chloridoideae. It is widely known that polyploidy has played an important role in the evolution of the grasses. The nature of the polyploidy present is probably related to hybridization and the large amount of apomicts present in southern Africa is also related to polyploidy. Various factors, such as the ecological, geographical and climatological history of Africa make it ideal for hybridization to occur. This can clearly be seen in the amount and type of polyploidy present in the subfamily Chloridoideae and in the closely related Panicoideae (also characterized by ancient polyploidy) in Africa. Furthermore, there is an unusually large concentration of apomictic genera for these two grass subfamilies in southern Africa, probably resulting from polyploidization. This renders evidence that the subfamily has been present long enough for these phenomena to become established and can be linked to the African origin of this subfamily.

CHAPTER 6
Nuclear DNA sequencing

SUBMITTED (AMERICAN JOURNAL OF BOTANY):

R. ROODT AND J.J. SPIES. PHYLOGENETIC RELATIONSHIPS IN THE SOUTHERN AFRICAN CHLORIDOIDEAE (POACEAE) BASED ON NUCLEAR *ITS* SEQUENCE DATA. SUBMITTED (*AMERICAN JOURNAL OF BOTANY*)

A phylogenetic study was conducted on the Chloridoideae, based on sequences of the internal transcribed spacer regions of the nuclear ribosomal DNA. Emphasis was placed on southern African representatives of the subfamily. Sequence data from 63 species in the subfamily Chloridoideae (Poaceae) and six outgroup taxa from the grass subfamilies Danthonioideae and Panicoideae were phylogenetically analyzed. Phylogenetic analyses of the sequences obtained during the study, together with published *ITS* sequences were used to determine relationships within southern African genera of the subfamily. The monophyly of the subfamily was confirmed, as was the polyphyletic nature of the Eragrostideae and Cynodonteae and the genus *Eragrostis*. Although hybridization and polyploidization are frequent in the subfamily, concerted evolution seems to have homogenized these *ITS* regions, as low levels of polymorphisms were observed. The *ITS* phylogeny renders evidence for the paleopolyploid nature of the basic chromosome numbers in the tribes and that from an initial chromosome number of 5, x = 10 and 9 became quickly established as these occur in the more basal groups.

6.1 Introduction

The Chloridoideae is one of 12 subfamilies recognized in Poaceae (R.Br.) Barnhart [Grass Phylogeny Working Group (GPWG) 2001]. This subfamily is seen as anatomically distinct in the grass family and is delimited by spherical, inflated bi-cellular microhairs, the Kranz syndrome and associated anatomy, distinctive leaf-blade anatomy and the chloridoid embryo (Reeder 1957; Tateoka *et al.* 1959; Hattersley and Watson 1976; Ellis 1987). At the tribal and generic levels, however, the subfamily has been characterized by taxonomic problems. This is because many of the morphological characters used are very variable and lack consistency (Hilu and Alice 2000).

Chloridoideae Kunth ex Beilschm. and Panicoideae Link, both members of the PACCAD clade (GPWG 2001), are seen as the most recent radiation in Poaceae (Hsiao *et al.* 1998; GPWG 2001). Both of these subfamilies have diversified into the tropical and subtropical regions, especially the southern Hemisphere (Renvoize and Clayton 1992) and compose the largest majority of the southern African grass flora (Gibbs Russell 1986).

In this study the phylogeny of mainly southern African species of the subfamily Chloridoideae was investigated. This was done due to the large concentration of Chloridoideae in southern Africa, with 50 genera and 230 species of the 194 genera and 912 species of grasses present in southern Africa, belonging to the Chloridoideae (Fish 2000).

The nuclear ribosomal internal transcribed spacer regions were investigated in this study. These internal transcribed spacer (*ITS*) regions of the 18-26S nuclear ribosomal DNA (nrDNA) have been used extensively to study lower level phylogenetic questions. The region includes three components: the 5.8S subunit, an evolutionarily conserved sequence, and two spacer regions flanking the gene, i.e. *ITS*1 and *ITS*2.

Within the family Poaceae, *ITS* sequences have been successfully used to resolve phylogenetic relationships at various levels. This includes studies of various genera such as *Bouteloua* Lag. (Columbus *et al.* 1998, 2000); *Brachypodium* P.Beauv. (Catalan and Olmstead 2000); *Bromus* L. (Ainouche and Bayer 1997; Ainouche *et al.* 1999); *Chloris* Sw. (Alice *et al.* 2000); *Festuca* L. (Torrecilla and Catalan 2002); *Festuca* and *Lolium* L. (Charmet *et al.* 1997; Gaut *et al.* 2000); *Miscanthus* Anderss. (Hodkinson *et al.* 2002a); *Phyllostachys* Sieb. & Zucc. (Hodkinson *et al.* 2000); *Sorghum* Moench. (Sun *et al.* 1994; Dillon *et al.* 2001); *Spartina* Schreb. (Baumel *et al.* 2002); *Sporobolus* (L.) R.Br. (Ortiz-Diaz and Culham 2000) and *Zea* L. (Buckler and Holtsford *et al.* 1996a, b). Studies have also been conducted on a related group of grasses known as the stipoid grasses (Jacobs *et al.* 2000) and on the chloridoid tribe Triodieae Benth. (Mant *et al.* 2000), the panicoid tribe Andropogoneae Dumort. (Hodkinson *et al.* 2002b) and the pooid tribes Aveneae Dumort. (Grebenstein *et al.* 1998) and Triticeae Dumort. (Hsiao *et al.* 1995a). The region has also been used to investigate subfamily relationships in the Arundinoideae Burmeist. (Hsiao *et al.* 1998), Danthonioideae Barker & H.P.Linder (published as tribe Danthonieae Zotov by Barker *et al.* 2000) and the Pooideae Benth. (Hsiao *et al.* 1994, 1995b). The phylogeny of the entire grass family (Hsiao *et al.* 1999) was also investigated using this region.

Ribosomal DNA regions are usually situated in the nucleolar organizing regions (NORs) and may be present on several different chromosomes (Thompson and Flavell 1988). Ribosomal DNA, however, evolves consistently within a single species and displays limited sequence divergence between copies in a single individual (Arnheim *et al.* 1980). Between species normal levels of sequence divergence are found. These two phenomena are collectively called concerted evolution (Dover 1982). Unequal crossing over (Smith 1976), gene conversion (Arnheim 1983) and biased gene conversion (Hillis *et al.* 1991) are the driving forces behind concerted evolution. Concerted evolution leads to the homogenization of the members of a multigene family. This process overcomes the problems with orthologous and paralogous genes (Zimmer *et al.* 1980; Doyle *et al.* 1992b; Moritz and Hillis 1996). The duplication of genes, followed by divergence, usually leads to greater similarity between some members of a multigene family across species, than within the multigene family of the same species (Doyle *et al.* 1992b). Therefore, the need arises to identify orthologous genes, which are similar due to speciation. Concerted evolution can produce situations in which the genes in a single species are more closely related to one another than any genes from another species. The 18S-25S ribosomal DNA is an example of such a large, but homogeneous, multigene family in most plants (Doyle *et al.* 1992b).

There is, however, a growing consciousness of *ITS* polymorphism in plants. Buckler *et al.* (1997) reviewed evidence for recombination among divergent paralogues as well as the presence of pseudogenes and functional *ITS* regions in several studies. *ITS* region polymorphisms in angiosperms have been attributed to processes such as hybridization, polyploidy, slow concerted evolutionary rates across nrDNA loci on non-homologous chromosomes and agamospermy (Suh *et al.* 1993; Sang *et al.* 1995; Buckler *et al.* 1997; Campbell *et al.* 1997). It might be that concerted evolution among paralogues is not homogenizing the sequences rapidly enough for them to behave as a single orthologue (Sanderson and Doyle 1992).

In taxa that are of a hybrid origin multiple copies (from different parents) may be preserved (Buckler and Holtsford 1996a; Cronn *et al.* 1999; Baumel *et al.* 2001), but this is not always the case. Other processes such as bidirectional concerted evolution (Wendel *et al.* 1995a) and intergenomic introgression (Wendel *et al.* 1995b) has also been found to occur and then hybrids do not show polymorphism or parental additivity.

In the Chloridoideae phenomena such as hybridization, polyploidy (more than 70%) and agamospermy have a high occurrence (Chapter 4, 5). According to Hsiao *et al.* (1999), complete concerted evolution of the *ITS* regions occurs in the grasses, although this was not tested by individual cloning. Divergent paralogues have, however, been found in *Festuca* and *Lolium* (Gaut *et al.* 2000).

In this study *ITS* sequence data was used to determine phylogenetic relationships within South African chloridoid genera. Usually sequencing studies, especially due to the high cost of sequencing, lead to the investigation of only one specimen per species and more often one specimen per genus. It was specifically the aim of this study to investigate more specimens of a southern African origin and more specimens per genus and in some instances per species. We focused on southern African genera and species in the subfamily due to the large concentration of genera and species in southern Africa.

6.2 Results

During this study the entire *ITS*1, 5.8S and *ITS*2 regions were amplified with the four primers used. The assembled sequences of the entire region of the 69 specimens consist of 668 characters (Appendix D), 810 with indel information included (Appendix E, F). *ITS*1 had a consensus length of 249 bp, 5.8S was 163bp in length and *ITS*2, 256 bp in length. For the entire region 430 characters (53%) are informative when gaps are considered as character states. These sites are distributed mostly in *ITS*1 (36.3%) and *ITS*2 (38.6%). The 5.8S region had 5.8% informative sites and indels contributed 19.3% of the total number of informative sites. The percentage guanine (G) and cytosine (C) in the 69 specimens ranged from 49.3% [*Sporobolus fimbriatus* (Trin.) Nees, *Venter* 9328) to 70% (*Centropodia glauca* (Nees) Cope, AF019861]. The average GC content for the entire region was 57.3%. The average GC contents for *ITS*1, 5.8S and *ITS*2 are 56.9%, 55.2% and 59.2% respectively.

No clear evidence of multiple rDNA repeat types was found. Each PCR product was resolved as a single band on 3% agarose gels and low levels of nucleotide polymorphisms, that could indicate multiple repeat types, were observed. Direct sequencing did not result in many ambiguities, suggesting that within an individual there is little variation. Although intragenomic polymorphisms were observed they were rare overall. For this reason cloning was not done.

Phylogenetic analysis using heuristic search options yielded 1936 equally parsimonious cladograms with a length of 2085, CI of 0.39 excluding uninformative characters and RI of 0.72 excluding uninformative characters. A strict consensus cladogram was used to summarize the data (Figure 6.1). Bootstrap (BS), jackknife (JK) and decay values (DV) are indicated on the cladogram. The monophyly of the Chloridoideae is strongly supported. Two large clades are found within the Chloridoideae although these are rather weakly supported with support values below or in the region of 50%. Most of the genera are monophyletic with only *Eragrostis* Wolf being polyphyletic.

6.3 Discussion

The length of the *ITS* region is in concordance with those found by Baldwin *et al.* (1995). These authors found *ITS*1 to vary from 187-298 bp in angiosperms and *ITS*2 from 187-252 bp. These two regions evolve more rapidly than the coding regions 18S, 5.8S and 26S and this can be seen from the homogeneity across the 5.8S region in the different species. The uniform size of the 5.8S subunit is one of two sizes reported for this region that is highly conserved in angiosperms (163-164 bp) (Baldwin 1993).

The high percentage of informative sites found in this study is in concordance with similar values found in the grasses: in the entire subfamily (53%, Hsiao *et al.* 1999); subfamily Arundinoideae (42%, Hsiao *et al.* 1998); and *Bouteloua* and related genera in the Chloridoideae (46%, Columbus *et al.* 1998). This trend has also been seen in other taxonomic groupings such as the families Acanthaceae Juss. (44%, McDade *et al.* 2000) and Vitaceae Juss. (64%, Rosetto *et al.* 2002); Apiaceae Lindl. subfamily Apioideae Seem. (55%, Downie and Katz-Downie 1996; 60%, Downie *et al.* 1998) and Orchidaceae Juss. subtribe Pleurothallidinae Lindl. ex G.Don (52%, Pridgeon *et al.* 2001).

The GC% in the *ITS* areas of angiosperm genomes is often in the region of 50% or more (Baldwin *et al.* 1995). The GC contents of the *ITS* region of most

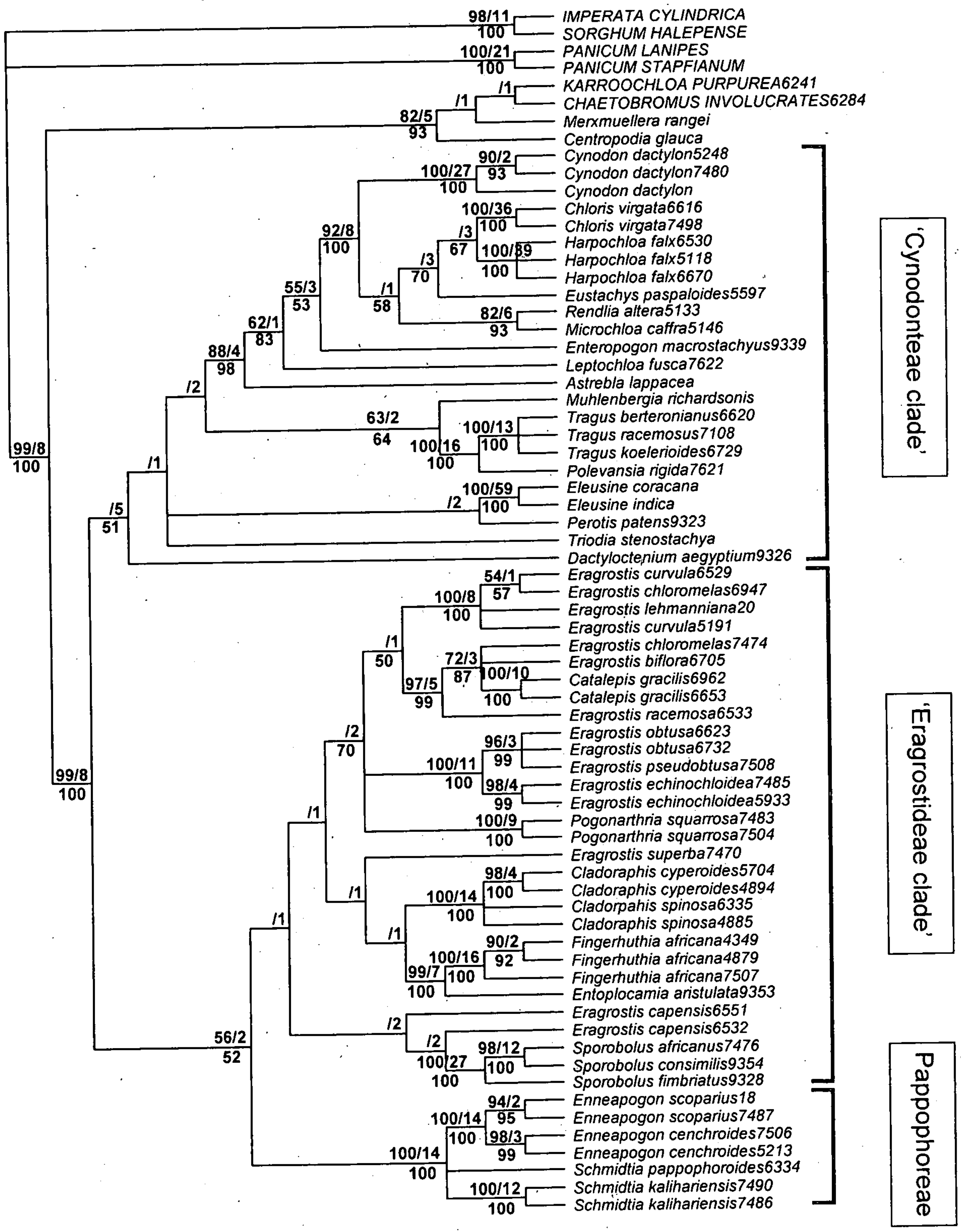

Figure 6.1. Strict consensus cladogram based on *ITS* sequencing data constructed from 1936 equally parsimonious cladograms with a length of 2085, CI of 0.39 and RI of 0.72 (both excluding uninformative characters). Bootstrap and decay values (BS/DV) are indicated on branches. Jackknife values are indicated below the branches.

grasses is higher than 50%, up to as high as 77% (Takaiwa *et al.* 1985). The average of 57.1% found in this study is similar to that of other grass subfamilies (Hsiao *et al.* 1994, 1995a, b, 1998, 1999). Salinas *et al.* (1988) showed by reassociation kinetics of single-stranded DNA that grasses growing in arid regions have on average a higher GC content than plants from temperate areas. This suggests an adaptive significance of the higher GC content. Furthermore, the high GC content observed in most of the specimens studied could account for the difficulties experienced in sequencing the 5.8S and *ITS*2 region. These high GC levels cause stronger template secondary structures, which may confound the sequencing reactions (Steane *et al.* 1999). For this reason the addition of DMSO is essential.

In the Chloridoideae, where polyploidization and hybridization are frequent, additivity of parental types (Soltis, P.S. *et al.* 1990) and polymorphisms is expected. Interlocus concerted evolution may, however, homogenize repeats from different arrays and then effectively remove one parent from the hybrid (Wendel *et al.* 1995a; Ainouche and Bayer 1997). Interlocus concerted evolution usually needs many sexual generations to reach completion (Wendel *et al.* 1995a; Brochman *et al.* 1996) and the lack of additivity might be accounted for by ancient polyploidy and also ancient hybridization, with complete concerted evolution in high polyploids (McDade 1995; Vargas *et al.* 1999). Where concerted evolution is present, direct evidence of hybrid speciation is not present any more but nrDNA may still be used when compared with other data (Hughes *et al.* 2002). The loss of an rDNA locus is another reason for a lack of non-additive profiles especially in hybrids of recent origin. This may be due to the terminal location of nucleolar organizer regions (NORs) where they are surrounded by heterochromatin and could be subject to gene loss (Soltis, P.S. *et al.* 1990). Concerted evolution among rDNA loci may be more common than previously believed, if taken into consideration that diploid species suspected of being paleopolyploids have *ITS* sequence homogeneity (Baldwin 1992; Baum *et al.* 1994; Wendel *et al.* 1995a). Furthermore, according to Soltis and Soltis (1993) and Campbell *et al.* (1997), hybridization may not have a large impact on polymorphisms and the amount of polymorphism depends on the sequence divergence of parents. In the Chloridoideae, any of the above could have played a role, but ancient polyploidy (Chapter 4, 5), which has been suggested for the group, could be one of the main contributing factors.

The Chloridoideae was found to be a well-supported monophyletic lineage (BS = 99%, JK = 100%, DV = 8) (Figure 6.1). This has long been accepted and illustrated in various previous molecular studies such as Nadot *et al.* (1994); Barker *et al.* (1995); Clark *et al.* (1995); Duvall and Morton (1996); Liang and Hilu (1996); Van den Borre and Watson (1997); Soreng and Davis (1998); Hilu *et al.* (1999); Hsiao *et al.* (1999); Hilu and Alice (2000, 2001); Matthews *et al.* (2000); Van den Borre and Watson (2000). Clayton and Renvoize (1986) believe the Chloridoideae to be monophyletic based on the adoption of the C_4 photosynthetic pathway. Hilu and Esen (1993) and Hilu (2000) also supported the monophyly of the subfamily based on prolamin and immunological studies.

Centropodia glauca and *Merxmuellera rangei* (Pilg.) Conert are not yet placed in any of the tribes of the Chloridoideae. These two taxa were previously placed in Danthonioideae but consistently group with the Chloridoideae as the most basal lineages (GPWG 2001). In this analysis they group with the Danthonioideae with strong support (BS = 82%, JK = 93%, DV = 5). This grouping with a group from which they were removed, might be due to the fact that their immediate sister group, Aristidoideae Caro (GPWG 2001), was not included in the study.

The current study distinguishes two main groupings in the Chloridoideae corresponding largely to the two main tribes, Eragrostideae Stapf and Cynodonteae Dumort. These are, however, only weakly supported (BS = < 50%, 56%; JK = 51%, 52%; DV = 5, 2) and are clearly not monophyletic. In the studies by Van den Borre and Watson (1997), Hilu *et al.* (1999) and Hilu and Alice (2000, 2001) based on molecular and morphological and anatomical data, the main tribes, Cynodonteae and Eragrostideae, were also not monophyletic. The difference between these tribes are based on inflorescences, with the Cynodonteae defined by a one-sided spike-like inflorescence that carries spikelets with one fertile floret subtending one or more sterile ones. The Eragrostideae are characterized by several flowered spikelets that are arranged in a panicle (Clayton and Renvoize 1986). Genera like *Acrachne* Chiov., *Dactyloctenium* Willd., *Eleusine* Gaertn. and *Leptochloa* P.Beauv. are difficult to place because they combine the spiciform inflorescence as well as the several flowered spikelets (Hilu and Wright 1982). This can be seen from the cladogram with *Dactyloctenium, Eleusine* and *Leptochloa* being classified as Eragrostideae, but grouping within the 'Cynodonteae clade'. Other studies that could not distinguish between the two main tribes include the immunological and prolamin studies of Hilu and Esen (1993), leaf blade anatomical studies of Ellis (1987) and studies by Phillips (1982) and Campbell (1985). According to Hilu and Alice (2000), too much emphasis is placed on separating Eragrostideae from Cynodonteae on number of florets, due to the variability in morphological characters and the lack in consistency at tribal and even generic levels. Campbell (1985) and Watson and Dallwitz (1992 onwards) proposed the merging of the chloridoid tribes.

The monophyly of Pappophoreae Kunth is strongly supported (BS = 100%, JK = 100%, DV = 12) and it forms the most basal lineage grouping with the Eragrostideae. The Pappophoreae is an isolated tribe (Clayton and Renvoize 1986) and is characterized by unusual elongated bulbous-tipped microhairs (Jacques Felix 1962; Reeder 1965; Renvoize 1985). Van den Borre and Watson (1997) also found Pappophoreae near basal in their study. In their analysis the Pappophoreae group with the outgroup genera indicating their isolated position (see also Watson *et al.* 1985).

The largest genus in the Chloridoideae, *Eragrostis*, was polyphyletic in this study. Based on the *mat*K chloroplast study of Hilu and Alice (2000, 2001) and the morphological and anatomical study of Van den Borre and Watson (1997, 2000), *Eragrostis* was also polyphyletic. Clayton and Renvoize (1986) and Kellogg and Campbell (1987) have suggested that *Eragrostis* is paraphyletic. *Sporobolus* forms a monophyletic clade in this study (BS = 100%, JK = 100%, DV = 27) and groups with *Eragrostis capensis* (Thunb.) Trin., although this grouping has very weak support (BS < 50%, JK < 50%, DV = 2). *Sporobolus* is closely related to *Eragrostis*. This was proposed by Phillips (1982) and studies by Hilu and Wright (1982), Duvall *et al.* (1994) and Hilu and Alice (2000, 2001) support this. Jacobs (1987) was of the opinion that *Sporobolus* and *Eragrostis* should not be separate genera and should be grouped together as *Eragrostis sensu lato* and reclassified.

The genus *Muhlenbergia* Schreb. falls in the 'Cynodonteae clade' even though this is a member of the Eragrostideae tribe. Clayton and Renvoize (1986) proposed that *Muhlenbergia* is an offshoot of the *Eragrostis-Sporobolus* complex.

Duvall *et al.* (1994), however, found the placement of *Muhlenbergia* problematic. They found *Muhlenbergia* to group with other exclusive New World genera such as *Bealia* Scribn., *Chaboissaea* Fourn. and *Pereilema* Presl (Duvall *et al.* 1994). Prolamin size and immunological studies also do not support the grouping of *Calamovilfa* (A.Gray) Scribn., *Sporobolus* and *Muhlenbergia* in one tribe (Hilu and Esen 1993). This is supported by the fact that their delimiting feature is one-flowered spikelets, but two-flowered spikelets are also found in species of all three genera (Clayton and Renvoize 1986).

Chromosome numbers are related to the major phylogenetic groupings in the grass phylogeny. Avdulov (1931) first proposed this and the increase in the number of chromosome studies in the family is evidence of the recognition of this fact.

Hilu and Alice (2001) in their study based on *mat*K chloroplast data proposed that a basic chromosome number of x = 10 and characters such as paniculate inflorescences and pedicelled many-flowered spikelets, as found in the Eragrostideae, were polymorphic characters in the Chloridoideae. The evolution of x = 9, along with spicate inflorescences and a reduction in the number of fertile florets, as found in the Cynodonteae, happened soon after emergence of earliest chloridoids as these apomorphic traits were found in the most basal clades. These basal clades comprise of mainly the Pappophoreae, *Sporobolus* and species of *Eragrostis*. This same trend is seen in this *ITS* study. The Eragrostideae are seen as the more primitive of the groupings and the Cynodonteae more derived, although in this study this distinction is not obvious. In the 'Eragrostideae clade', x = 10 is the predominant basic chromosome number with 9 and 10 occurring only in the Pappophoreae and in *Sporobolus*. The 'Cynodonteae clade' has x = 9 and 10, 10 being more frequent but with x = 9 more prevalent than in the 'Eragrostideae clade'. Mehra *et al.* (1968) also felt that x = 10 became stabilized early in the history of the group, explaining the prevalence of multiples of 10.

These basic chromosome numbers, which are found in the Chloridoideae, are paleopolyploid according to Goldblatt (1980), or ancient taxa that are rediploidized polyploids with high basic chromosome numbers (Grant 1963; Goldblatt 1980). The establishment of these most likely occurred by an aneuploid reduction from x = 6, which lead to five. This was increased by polyploidization to the paleopolyploid basic chromosome number of ten and subsequent aneuploid reduction lead to nine. This has been corroborated by various molecular studies (Barker *et al.* 1995, 1999; Hilu *et al.* 1999; Hilu and Alice 2001). The basic chromosome number of 6 is characteristic of the more basal grass subfamilies (Hunziker and Stebbins 1987) and also of the Arundinoideae, which is proposed to be the ancestor of the Chloridoideae. *Centropodia glauca*, *Merxmuellera rangei* and the two danthonioid species in this study are characterized by a basic chromosome number of 6.

6.4 Conclusions

ITS analyses have proved useful in the elucidation of the relationships between some representatives of the southern African Chloridoideae. The monophyly of the Chloridoideae and the problems with tribal delimitation have been observed in this study. Support for the ancient polyploidy origin of the two basic chromosome numbers of 9 and 10 and the aneuploid origin of x = 5 from x = 6 can be deduced from this study.

CHAPTER 7

Chloroplast DNA sequencing and combined analyses in the Chloridoideae

SUBMITTED (SYSTEMATIC BOTANY):

R. ROODT AND J.J. SPIES. *TRNL*-F AND COMBINED ANALYSIS IN REPRESENTATIVES OF THE CHLORIDOIDEAE (POACEAE) FROM SOUTHERN AFRICA. SUBMITTED (*SYSTEMATIC BOTANY*)

Phylogenetic relationships in 53 species of the subfamily Chloridoideae were investigated based on DNA sequences from the chloroplast *trn*L (UAA) 5' exon-*trn*F (GAA) exon region, using eight species from the grass clade PACCAD as outgroups. This data was used in combination with *ITS* data for this group and a combined matrix of 50 taxa was compiled, using 6 taxa from the Panicoideae and Danthonioideae as outgroups. The individual data sets were largely congruent and combined into a single data set, with the Chloridoideae found to be monophyletic and two groups, corresponding to the tribes Eragrostideae and Cynodonteae, polyphyletic in all three analyses. The basal position of the unioloid-pappophoroid group, seen as a link to the subfamily Danthonioideae, renders evidence of the origin of the Chloridoideae from arundinoid (in the broad sense) and more specifically danthonioid ancestors and renders molecular evidence for paleopolyploidy in the Chloridoideae. Putative hybrids could not be detected in the analyses, which indicates once again that hybrids do not behave predictably in phylogenetic analysis, as large-scale hybridization is a trademark of the grasses and subfamily Chloridoideae.

7.1 Introduction

The vast majority of extant grasses fall in two large groupings, namely the PACCAD clade and the BEP clade [Grass Phylogeny Working Group (GPWG 2001)]. More than half of the grass species are included in the PACCAD (Panicoideae-Arundinoideae-Chloridoideae-Centothecoideae-Aristidoideae-Danthonioideae) clade and from as early as the 1930s based on amongst others, chromosome studies (Avdulov 1931), taxa in this clade have been grouped together (GPWG 2001). One of the strongly supported lineages in this clade is the subfamily Chloridoideae. This is a tropical to subtropical subfamily with centers of distribution in southern Africa and Australia (Jacobs 1987). Together with the Panicoideae Link, which is also a member of the PACCAD clade, Chloridoideae Kunth ex Beilschm. comprise the largest majority of the southern African grass flora (Gibbs Russell 1986).

Two major tribes, the Eragrostideae Stapf and the Cynodonteae Dumort., are recognized in the subfamily although many authors feel this is not justified and proposed the merger of these two tribes (Campbell 1985; Watson and Dallwitz 1992 onwards). Various studies [for example Phillips 1982 (numerical morphological analysis); Ellis 1987 (bundle sheath anatomy); Van den Borre and Watson 1997 (morphology and leaf anatomy); Hilu *et al.* 1999 (*mat*K sequence data)] could also not distinguish between the two tribes. The smaller tribes recognized in the subfamily are the Leptureae Dumort., the Orcuttieae Reeder and the Pappophoreae Kunth (GPWG 2001).

Chloroplast DNA is being increasingly used in plant phylogenetic studies. This is due to the small size of the chloroplast genome, low rate of structural and sequence evolution, rarity of recombination and the uniparental inheritance of the genome (Palmer *et al.* 1988). The non-coding regions of the chloroplast genome evolve more rapidly than coding regions by accumulating indels at a rate almost equal to that of nucleotide substitutions (Curtis and Clegg 1984; Wolfe *et al.* 1987; Zurawski and Clegg 1987; Clegg and Zurawski 1992). This increases these regions' functionality at lower taxonomic levels, for example below family level.

The non-coding region investigated in this study comprises the *trnL* (UAA) intron, *trn*L (UAA) 3' exon, and the *trn*L (UAA) 3'-*trn*F (GAA) intergenic spacer (hereafter referred as the *trn*L-F region).

This region has been used at the intergeneric and interspecific level in various groups (for example Kita *et al.* 1995; Freeman and Ybarra 1996; Gielly and Taberlet 1996; Hauk *et al.* 1996; Gomez Martinez and Culham 1997; Compton *et al.* 1998).

In the grass family the region has been used at various taxonomic levels: the species *Poa jemtlandica* (Almq.) K.Richter (Brysting *et al.* 2000); *Spartina anglica* C.E.Hubb. (Baumel *et al.* 2001); the genera *Axonopus* P.Beauv. (Gomez-Martinez and Culham 1997); *Bouteloua* Lag. (Columbus *et al.* 2000); *Miscanthus* Anderss. (Hodkinson *et al.* 2002a) and *Spartina* Shreb. (Ferris *et al.* 1997); the panicoid tribes Andropogoneae Dumort. (Hodkinson *et al.* 2002b) and Paniceae R.Br. (Gomez-Martinez and Culham 2000; Doust and Kellogg 2002) and the pooid tribe Triticeae Dumort. (Mason-Gamer *et al.* 2002).

The occurrence of interspecific hybridization in plants has long been recognized (Stebbins 1950; Grant 1981). More than 50% of angiosperms have been estimated to have hybridization to some extent in their ancestry and Kellogg and Watson (1993) proposed it to be a major force in angiosperm evolution. This is based on the high frequency of polyploidy (80%, Masterson 1994) and the belief that most polyploidy is associated with reticulation (De Wet 1987). Especially in the grass family, hybridization is thought to have played a major role in the evolution of the group with more than 80% of grasses believed to be polyploid (Stebbins 1985) and the frequency of polyploidy in the Chloridoideae, specifically more than 70% (Chapter 5).

Stebbins (1950) suggested that most plant genera that create problems in classification are of hybrid origin. Potential hybridization is an ongoing problem for phylogenetic analyses and uncertainties about its frequency obscure the interpretation of cladograms (Kellogg and Watson 1993). Due to the fact that hybridization introduces a reticulate pattern into an evolutionary cladogram, it cannot easily be contained in an analytical method that assumes strict divergence (Funk 1981; Cronquist 1987; Kellogg 1989).

Three approaches have been proposed to reconstruct hybrid speciation (Sang and Zhong 2000):

- Identification of hybrids beforehand.
- Detecting hybrids according to their behavior on the cladogram.
- Comparison of discordant positions of hybrids between phylogenetic cladograms obtained from independent data sets.

The identification of hybrids beforehand is not always that easy as the morphology of hybrids may be intermediate (McDade 1990), or completely unlike either parent (Rieseberg *et al.* 1990), or nearly indistinguishable from one parent (Bennett 1984).

Identifying hybrids on bases of the behavior on cladograms may also be problematic. Hybrids can jump between parents (McDade 1992), or place basally to lineage with the most derived parent (McDade 1990), or group with other hybrid taxa (McDade 1992). McDade (1992) also states that hybrids do not disrupt phylogenies as much as has been proposed and that hybrids cannot readily be identifiable solely on their behavior in cladograms. Furthermore, hybrids between distantly related parents cause more topological problems than do those between more closely related parents.

The last option of comparing independent data sets (for example nuclear versus chloroplast phylogenies) has been used increasingly in hybrid identification as well as a means of increasing phylogenetic signal (Morrell and Rieseberg 1998; Widmer and Baltisberger 1999; Richardson *et al.* 2001; Zomlefer *et al.* 2001; Ferguson and Jansen 2002). Studies using nuclear and chloroplast regions enhance the potential of discovering for example hybridization because these genomes represent genetically unlinked regions (Andreasen *et al.* 1999). Furthermore, many studies in recent years have indicated that combined molecular data sets that utilize different levels of variation provide resolution at different levels of the cladogram and, therefore, phylogenetic resolution and bootstrap values are improved by combining separate data sets (Chase and Cox 1998; Soltis and Soltis 1998; Whitten *et al.* 2000).

When investigating hybridization, comparing incongruent gene trees renders opportunities to investigate ancient hybridization, where molecular additivity and morphological intermediacy have been obscured in the hybrid (Sang and Zhong 2000). In the grasses polyploidization is believed to be ancient. In the *ITS* study (Chapter 6), little polymorphism and molecular additivity was detected in the *ITS* regions and the basic chromosome numbers now present in the group (x = 9 and 10) are believed to be paleopolyploid in origin, rendering further support for ancient hybridization in the grass family and subfamily Chloridoideae.

Our aim with this study is to extend the work on phylogenetic relationships among the Chloridoideae based on *ITS* data (Chapter 6) by using data from both nuclear and chloroplast genomes. In this study additional sequencing of the *trn*L-F region was done and this data used in conjunction with *ITS* data to explore whether putative hybrids could be identified and to render a phylogeny for southern African Chloridoideae based on different genomic regions.

7.2 Results

The assembled sequences of the entire *trn*L-F region of the 61 specimens consist of 1191 characters (Appendix G), 1339 with indel information included (Appendix H, I). The *trn*L intron had a consensus length of 617 bp and the *trn*L-F intergenic spacer consensus was 524 bp in length. For the entire region 240 characters (17.9%) are informative when gaps are considered as character states. The informative sites are distributed mostly in the intron (34.2%), the intergenic spacer (32.1%) and the indels contributed 31.7% of the total number of informative sites. The percentage of adenine (A) and thymine (T) in the 61 specimens ranged from 66.2% [*Cynodon dactylon* (L.) Pers., AJ489466] to 69.5% (*Eustachys paspaloides* Lanza & Mattei, *Spies* 5597). The average AT content for the entire region was 67.6%.

Indels were frequent in the *trn*L-F region. Many of these were phylogenetically informative for various species or genera (Table 7.1).

Phylogenetic analysis using heuristic search options yielded 20 000 equally most parsimonious cladograms with a length of 483, CI of 0.60 excluding uninformative characters and RI of 0.80 excluding uninformative characters. A strict consensus cladogram was used to summarize the data (Figure 7.1). Bootstrap (BS), jackknife (JK) and decay values (DV) are indicated on the cladogram. The monophyly of the Chloridoideae is strongly supported. Two large clades, corresponding approximately to the groups Eragrostideae and Cynodonteae, are found within the Chloridoideae as was the case with the *ITS* data (Figures 6.1) although with the *trn*L-F data these two groupings are very strongly supported (BS = 91%, 95%; JK = 98%, 99%; DV = 4, 7). The cladogram is largely congruent with the *ITS* cladogram except for the lack of resolution within these two groupings. Another difference is the grouping of three *Sporobolus* R.Br. specimens, which are grouped with the 'Cynodonteae clade'. In the *ITS* analysis these three formed part of the 'Eragrostideae clade'. This, however, forms a soft incongruence with very little significant BS and JK support for this grouping in both analyses.

Because the two regions investigated produced nearly identical results, the regions were directly combined. The combined data matrix consisted of 1831 characters (Appendix J), 2098 including indels (Appendix K, L) of which 647 (30.8%) were parsimony informative. Analysis of this combined matrix resulted in 72 equally most parsimonious cladograms with a length of 2264, CI of 0.46 and RI of 0.72 (both excluding uninformative characters) (Figure 7.2). Although some polytomies are present (six), the combined cladogram provides resolution within the more basal and derived lineages of the Chloridoideae, whereas the *trn*L-F showed poor resolution within genera in the subfamily.

Table 7.1. List of phylogenetically informative indels.

Indel position	Taxa indel is phylogenetically informative for
106–109	*Eleusine coracana* *Eleusine indica*
155–160	*Eragrostis capensis Spies 6532* *E. capensis Spies 6551*
450–455	*Chloris virgata Spies 6616* *C. virgata Spies 7498*
774–778	*Eragrostis obtusa Spies 6623* *E. obtusa Spies 6732* *E. echinochloidea Spies 7485* *E. pseudobtusa Spies 7508*
1053–1060	*Schmidtia kalihariensis Spies 7486* *S. kalihariensis Spies 7490*
1102–1116	*Harpochloa falx Spies 5118* *H. falx Spies 6530* *H. falx Spies 6670*
1102–1108	*Cladoraphis cyperoides Spies 4894* *C. cyperoides Spies 5704* *C. spinosa Spies 6335*
1185–1188	*Harpochloa falx Spies 5118* *H. falx Spies 6530* *H. falx Spies 6670*

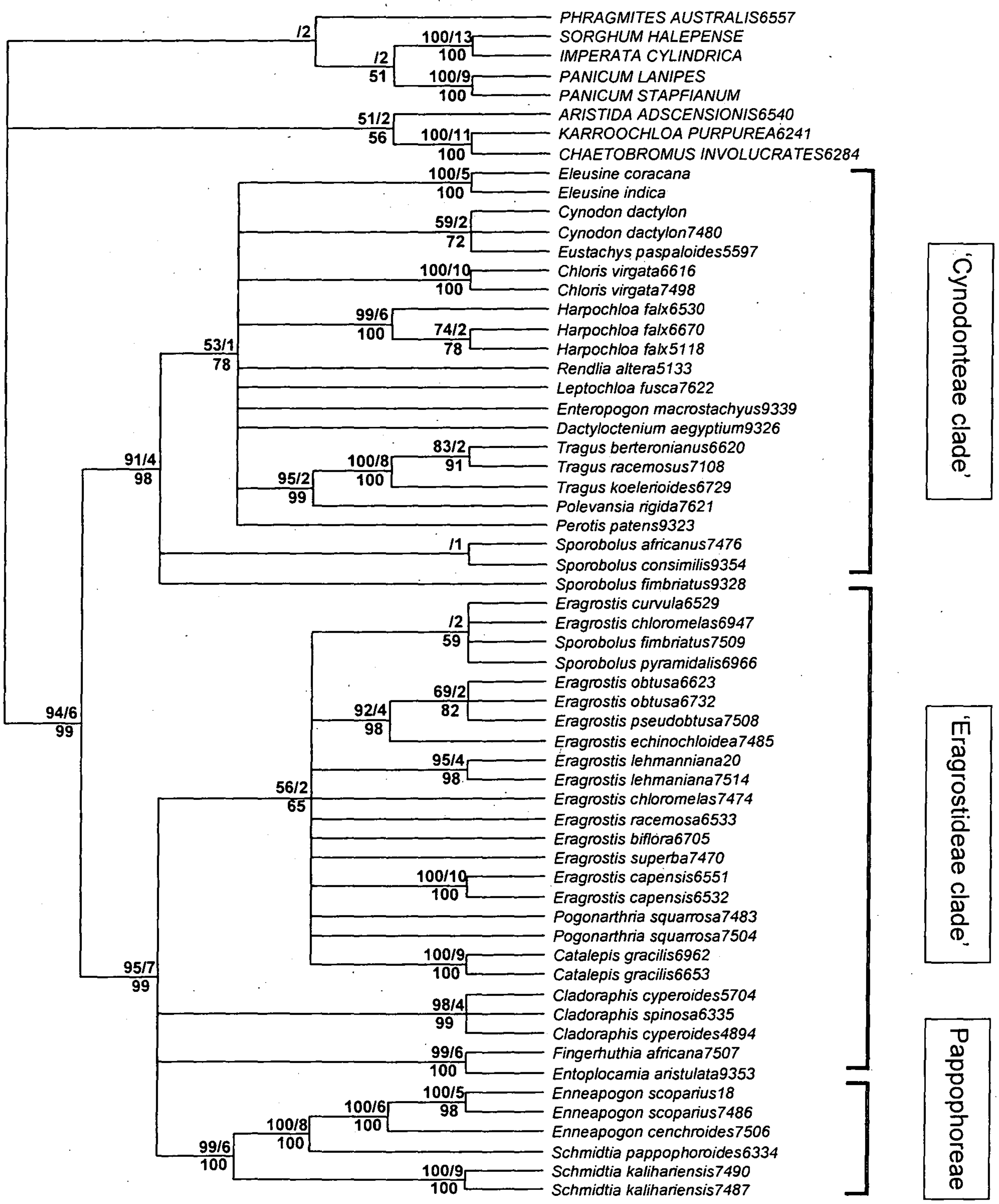

Figure 7.1. Strict consensus cladogram for *trn*L-F data sets produced from 20 000 equally most parsimonious cladograms with a length of 483, CI of 0.60 and RI of 0.80 (both excluding uninformative characters). Bootstrap and decay values (BS/DV) are indicated on branches. Jackknife values are indicated below branches.

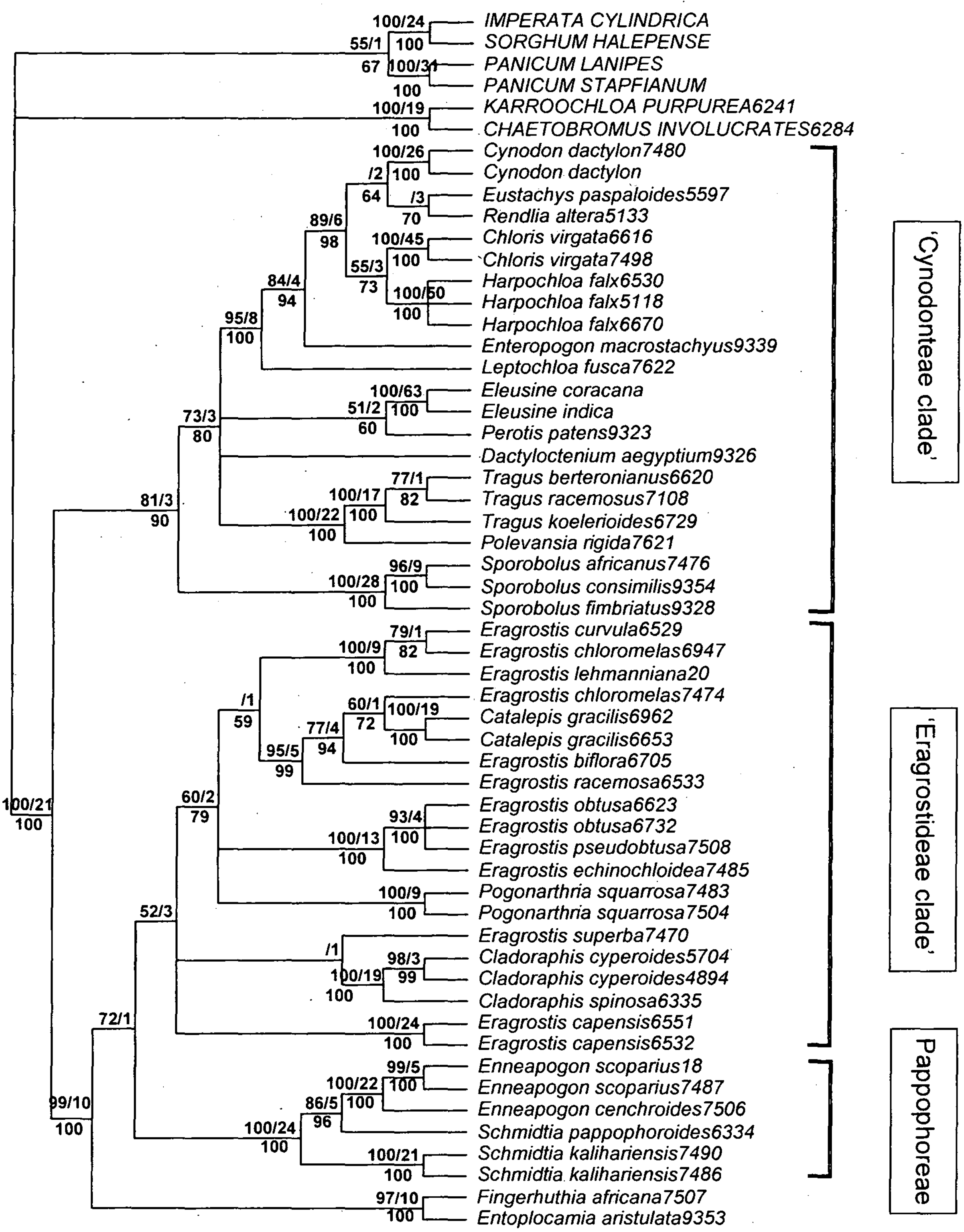

Figure 7.2. Strict consensus cladogram obtained from combined *ITS* and *trn*L-F data sets. Eighteen equally most parsimonious cladograms with a length of 2186, CI of 0.46 and RI of 0.73 (both excluding uninformative characters) were found. Bootstrap and decay values (BS/DV) are indicated on branches. Jackknife values are indicated below branches.

7.3 Discussion

In contrast to the nuclear genome, which has a high GC content (almost 60% in the *ITS* study, Chapter 6), chloroplast DNA is more adenosine (A) and thymine (T) rich (Palmer 1991). This can be seen in this study with the *trn*L-F region in the Chloridoideae having an average AT content of 67%. Similar values have been found in other non-coding regions in Poaceae (R.Br.) Barnhart (Morton and Clegg 1995; Morton *et al.* 1997). This has implications for the type of base substitution to frequent the region as AT rich favors transversions and GC rich favors transitions (Morton 1997). Due to difference in length between the *trn*L-F regions of the different studied specimens, numerous indels had to be introduced. According to Palmer (1985) these small indels (1-1000bp) known as minor rearrangements, are most common in non-coding regions of chloroplast DNA and can be informative within closely related taxa (Doebley *et al.* 1987; Soltis *et al.* 1989, 1990b). These indels probably result from molecular mechanisms such as slipped strand mispairing (Takaiwa and Suguira 1982); intramolecular recombination (Ogihara *et al.* 1988; Palmer 1991) and stem-loop formation (Sears *et al.* 1996).

As proposed by Hilu and Alice (2001), the classification of Clayton and Renvoize (1986) is used as a foundation for the discussion of the results. This is due to the fact that a large number of classification schemes have been proposed over the years and the number of tribes and subtribes might be confusing.

Recent studies have indicated that the use of non-coding chloroplast regions may only be useful at intergeneric but not infrageneric level due to a lack of informative sequence variation (Sang *et al.* 1997; Cros *et al.* 1998; Small *et al.* 1998; McDade and Moody 1999; Mummenhoff *et al.* 2001). This was seen in this study with the *trn*L-F region investigated providing resolution between, but not within, genera in the Chloridoideae.

As with the *ITS* data, the monophyly of the Chloridoideae is once again confirmed with the *trn*L-F (BS = 94%, JK = 99%, DV = 6) as well as combined (BS = 100%, JK = 100%, DV = 21) analyses. The sister group relationships between the Danthonioideae Barker & H.P.Linder and Arundinoideae Burmeist. as proposed by the GPWG (2001) can be seen from the *trn*L-F cladogram with *Aristida* L.

(Aristidoideae Caro), *Karroochloa* Conert & Türpe and *Chaetobromus* Nees (Danthonioideae) grouping together, although the support for this is rather weak (BS = 51%, JK = 56%, DV = 2).

Two main clades, roughly comparable with the main tribes Eragrostideae and Cynodonteae, are once again found as was also evident from the *ITS* analysis. The support for the separation is, however, far stronger based on chloroplast data (BS = 91%, 95%; JK = 98%, 99%; DV = 4, 7) and in the combined analysis (BS = 81%, 99%; JK = 90%, 100%; DV = 3, 10). The consistent nature of division into two groupings in the Chloridoideae indicates that there exists a subdivision in the subfamily, but the current nature of the division seems to be superficial as the two tribes are clearly not monophyletic. For example, the genus *Catalepis* Stapf & Stent consistently groups in the 'Eragrostideae clade' with nuclear, *trn*L-F and combined analyses. In their study based on morphological and leaf anatomical data, Van den Borre and Watson (1997) did not place *Catalepis* into any of the five informal groupings they proposed. This genus has been classified in the subtribe Zoysiinae Benth. (Clayton and Renvoize 1986) of the Cynodonteae, but did not group with this subtribe in their analysis and they state that this genus 'probably belongs elsewhere'. The Zoysiinae share characters such as a bottlebrush inflorescence that is unusual in the Chloridoideae and *Catalepis* forms the link to the subtribe Chloridinae J.Presl (Clayton and Renvoize 1986). Clearly this genus is problematic and should be studied more thoroughly.

The Pappophoreae is one of the strongest supported groupings in all analyses (*ITS*: BS = 100%, JK = 100%, DV = 12; *trn*L-F: BS = 100%, JK = 99%, DV = 6; combined: BS = 100%, JK = 100%, DV = 24). This tribe is only seen as distantly related to the Eragrostideae but consistently groups with the 'Eragrostideae clade', although always in a basal position. Only two genera in the tribe, namely *Enneapogon* Desv. ex P.Beauv. and *Schmidtia* Steud. ex J.A.Schmidt, were included in this study. According to Clayton and Renvoize (1986), many awns and unusual microhairs distinguish this small tribe. Studies by Van den Borre and Watson (1997) and Hilu and Alice (2000, 2001) also found this tribe in a more basal position confirming its position as early diverging chloridoid lineage.

The two members of the subtribe Uniolae (*Entoplocamia* Stapf and *Fingerhuthia* Nees) form the most basal lineage of the 'Eragrostideae' grouping although with weak to moderate support (BS = 72%, JK = 82%, DV = 1). This only became apparent in the combined analysis. In all analyses these two genera group together (*ITS*: BS = 100%, JK = 99%, DV = 7; *trn*L-F: BS = 100%, JK = 99%, DV = 6; combined: BS = 97%, JK = 100%, DV = 10), but the basal position is only evident in the combined analysis. The basal position of this group was also found in the study by Hilu and Alice (2000, 2001) based on *mat*K sequence data, and they called this an 'intriguing finding' due to the fact that no previous studies had indicated phylogenetic affinities between these two subtribes. This study corroborates their findings and provides further proof of the basal position of this group of grasses referred to as the 'pappophoroid-unioloid' group in the Chloridoideae and indicates the link between the Arundinoideae and the Chloridoideae as the Uniolae is seen as the link to the subfamily Arundinoideae through the genus *Tribolium* Desv. (now known as the subfamily Danthonioideae; GPWG 2001) (Clayton and Renvoize 1986). According to Clayton and Renvoize (1986) the similarities between the chloridoid subtribes Uniolae and Triodiinae and the arundinoid-danthonioid genera *Spartochloa* C.E.Hubb., *Styppeiochloa* DeWinter and *Tribolium* suggest that these are the primitive genera near the point of divergence of these subfamilies.

Except for *Eragrostis* Wolf and *Sporobolus* R.Br., most of the generic groupings are well supported. The two genera *Cladoraphis* Franch. and *Pogonarthria* Stapf form well supported lineages in the 'Eragrostideae clade' in all analyses conducted. Their generic status is clearly justified and their close relationship to *Eragrostis* is also evident. The pubescent rachilla tips in some *Eragrostis* species indicate affinities with *Pogonarthria* and this genus is seen as a link between the genera *Harpachne* Hochst. and *Eragrostis* (Clayton and Renvoize 1986). *Cladoraphis* was previously placed in *Eragrostis* by de Winter (1955), but later authors (Phillips 1982; Clayton and Renvoize 1986; Gibbs Russell *et al.* 1990; Watson and Dallwitz 1992 onwards) retained its separate generic status. It has a very distinctive morphology and very specific habitats, occurring in sandy desert [*C. spinosa* (L.f.) S.M.Phillips] and coastal dunes [*C. cyperoides* (Thunb.) S.M.Phillips] in southern Africa (Clayton and Renvoize 1986). Genera such as *Chloris* Sw., *Cynodon* Rich. and *Harpochloa* Kunth in the 'Cynodonteae clade' are also well supported in all analyses.

The polyphyletic nature of *Eragrostis* is once again confirmed by the *ITS*, *trn*L-F and combined analyses. This is the largest genus in the subfamily, and as Phillips (1982) stated, large genera are the exception to the rule, because the Chloridoideae seems to be undergoing adaptive radiation, resulting in many small but distinctive genera. This genus has always been problematic with 350 species included in the subfamily by Clayton and Renvoize (1986) and Watson and Dallwitz (1992 onwards) and the 'full range of morphological and anatomical variation found in Chloridoideae' exhibited in the genus (Van den Borre and Watson 1994). Species boundaries may further be confounded by interspecific and intergeneric hybridization in the genus (Vorster and Liebenberg 1977; Davidse *et al.* 1986; Burson and Voight 1996).

A grouping in the genus *Eragrostis*, which is apparent in the separate and combined data sets, is the connection between the species *E. echinochloidea* Stapf, *E. obtusa* Munro ex Ficalho & Hiern. and *E. pseudobtusa* DeWinter (*ITS*: BS = 100%, JK = 100%, DV = 11; *trn*L-F: BS = 92%, JK = 98%, DV = 4; combined: BS = 100%, JK = 100%, DV = 13). *Eragrostis pseudobtusa* is believed to be intermediate between *E. obtusa* and *E. echinochloidea* based on palea structure (Gibbs Russell *et al.* 1990).

The other polyphyletic genus in this study is *Sporobolus*. Like *Eragrostis*, this is also one of the larger genera in the subfamily (160 species) (the only other large genus is *Muhlenbergia* Schreb. with 160 species) (Clayton and Renvoize 1986; Watson and Dallwitz 1992 onwards). *Eragrostis* and *Sporobolus* are seen as closely related being separated based on 1-flowered spikelets and 1-nerved lemmas versus multi-flowered spikelets and 3-nerved lemmas in *Eragrostis* (Clayton and Renvoize 1986), but these authors felt that the distinction between the two genera 'is not as great as has been proposed'. Within the genus itself the boundaries are not sharply defined and species intergrade with one another (Clayton and Renvoize 1986; Watson and Dallwitz 1992 onwards; Duvall *et al.* 1994). Crawford (1983) offered three hypotheses explaining groups that are taxonomically difficult to delimit and in which the species boundaries are blurred morphologically:

- The taxa originated recently and divergence is not yet noticeable.
- There exists a high level of phenotypic plasticity that allows divergent genomes to converge phenotypically under similar conditions.
- Interspecific hybridization takes place between some populations of each species.

All three these phenomena are probably at play in the problematic taxa *Eragrostis* and *Sporobolus*.

The genera *Dactyloctenium* Willd., *Enteropogon* Nees and *Leptochloa* P.Beauv. occupy rather isolated position in all analyses. Hilu and Wright (1982) said these genera are difficult to place because they combine features delimiting both main tribes Eragrostideae and Cynodonteae, namely spiciform inflorescences and multi-flowered spikelets.

One of the main aims was to try and identify putative hybrids based on incongruence between the different data sets. In the grasses in general and the Chloridoideae specifically, hybridization and polyploidization are known to occur with high frequency (Chapters 4, 5). Therefore, not detecting any hard incongruence between the nuclear and chloroplast data sets was disappointing. Various explanations for this might be sought:

- The hybridizing groups may be closely related, for example *Eragrostis* and *Sporobolus*. According to McDade (1992) hybrids do probably not affect cladistic analyses as much, unless the hybrids are between distantly related taxa.
- Interlocus concerted evolution homogenized repeats from different arrays and effectively removed one parent from the hybrid (Wendel *et al.* 1995a; Ainouche and Bayer 1997) and this might have been the paternal parent, leaving no incongruence between the chloroplast (maternal) (Mogensen 1996) and nuclear (biparental) phylogenies. According to Hughes *et al.* (2002), where concerted evolution is present, direct evidence of hybrid speciation is not present any more.
- The hybridization might be too ancient to detect. Interlocus concerted evolution usually needs many sexual generations to reach completion (Wendel *et al.* 1995a; Brochman *et al.* 1996).

- No hybrids may have been included in the analyses. Especially in variable genera such as *Eragrostis* and *Sporobolus* not all of the variation might have been sampled.
- None of the putative parents of the hybrids present may be included in the study. McDade (1992) showed that many hybrids are placed between the two parents and as the basal member of the clade that includes the most derived parent. If no parent is included in the analysis this might be problematic for the hybrid and result in grouping with more distantly related taxa.

We believe basic chromosome numbers to be important indicators of evolution in the grasses and specifically the Chloridoideae. Many disagreements on which chromosome number developed from which, have leaded to many hypothesis regarding basic chromosome numbers and grass evolution (Mehra *et al.* 1968; Sharma 1979; Stebbins 1985). This study renders evidence of the relationship of the Chloridoideae to arundinoid (more specifically danthonioid) ancestors. Many previous authors have proposed this (e.g. Stebbins 1956; Clayton 1981; Phillips 1982; Campbell 1985; Clayton and Renvoize 1986; Conert 1987; Kellogg and Campbell 1987, Hilu and Esen 1993; Soreng and Davis 1998; Hsiao *et al.* 1999; Hilu and Alice 2001) but the basal position of *Entoplocamia*, *Fingerhuthia* and the Pappophoreae, seen as links to the Danthonioideae, once again provides cytogenetic proof. The basic chromosome number in the Danthonioideae (sister group in this study and found by GPWG 2001) is x = 6. Two other basic chromosome numbers also occur in this subfamily but only in certain genera [x = 7 in *Pentameris* P.Beauv., *Prionanthium* Desv. and *Pseudopentameris* Conert and x = 13 in *Pentaschistis* (Nees) Spach (for example De Wet 1960; Davidse *et al.* 1986; Spies and Du Plessis 1988; Morton 1993; Klopper *et al.* 1998; Spies and Roodt 2001)]. From x = 6 an aneuploid or dysploid reduction leads to five which has been found in some chloridoid genera (Swami 1963; Pohl 1969; Davidse *et al.* 1986). Relatively early in their history the paleopolyploid basic chromosome numbers of x = 10 and x = 9, which are the most prevalent in the Chloridoideae, became stabilized in the group. These two basic chromosome numbers are not restricted to any tribes, but x = 9 is less frequent in the Eragrostideae than in the Cynodonteae.

7.3 Conclusions

To conclude, the high level of congruence among the data sets, representing nuclear and chloroplast regions and the high bootstrap values in the combined analysis indicate that the resultant cladogram is a good estimate of phylogenetic relationships in the group. We feel, as McDade *et al.* (2000), that the combined analyses of the *ITS* and *trn*L-F data sets reinforced more strongly supported components of the separate analyses.

No putative hybrids were identified. This should not be taken as an indication of no hybridization in this group. As there may be many reasons for incongruence between data sets (Wendel and Doyle 1998; Sang and Zhong 2000), not finding this incongruence does not imply that these processes are not at work, only that they were not satisfactorily detected.

This study renders molecular support for paleopolyploidy in the Chloridoideae and supports the notion that polyploidy along with its close counterpart, hybridization, is an essential part of the evolution of this subfamily.

CHAPTER 8

General conclusions

Poaceae is one of the largest families of plants in the world (Watson 1990; Liang and Hilu 1996). Its success can be related to morphological, geographical, cytogenetical, ecological and physiological diversity, which renders this one of the most successful plant families (Kahler and Price 1987).

Cytogenetically the most prevalent phenomenon in the grass family is polyploidy. It is important in the grasses as this phenomenon is rare in some groups and common in others (De Wet 1971) and Stebbins (1987) named polyploidization and hybridization the major evolutionary forces in Poaceae. In this study, polyploidy was found to be frequent in the grass subfamily Chloridoideae in general and specifically in southern Africa, which was the focus point of the study. More than 70% of the studied specimens were polyploid.

Studies on the nature of the polyploidy revealed that most of the tetraploid specimens were alloploids or segmental alloploids, clear evidence of a hybrid origin. The close relationship between hybridization and polyploidy is nothing new as the major role of polyploidy in evolution has been the fixing and spreading of hybrid combinations. It is also one of the quickest methods of producing completely different, but still vigorous and well-adapted genotypes (McWilliam 1964).

The survival and successful establishment of many newly formed hybrids are associated with an effective means of vegetative or asexual propagation (Stebbins 1956). In Poaceae this is found in the form of apomixis. Gametophytic apomixis is inseperably connected to both polyploidy and hybridization in restoring fertility to organisms that become sexually sterile as a result of polyploidy and hybridization (De Wet and Stalker 1974). According to Asker and Jerling (1992), most plants, characterized by gametophytic apomixis, are polyploid. More often they are alloploids formed after hybridization between sexual plants (Bierzychudek 1985). Grant (1981) and Mogie (1986) report that more than 99% of apomicts are polyploids and according to Goldblatt (1980) and Stebbins (1985) in the grass family, polyploids are mostly apomicts. Especially in the Chloridoideae and Panicoideae, this phenomenon is frequent with these two subfamilies comprising 52% of the known reports of apomixis in the grass family (Czapik 2000). Furthermore, apomixis is especially frequent in the grasses of South Africa (Brown and Emery 1957; Goldblatt 1978). In this study apomixis was not investigated, but based on previous results, apomixis is seen to play an essential role in the high frequency of polyploidy and hybridization in the southern African Chloridoideae by providing an effective means of asexual reproduction.

According to Wendel (2000), diploidization after polyploidization is a common evolutionary event. This implies gene expression and chromosomal behavior of a diploid, although the plant has the amount of genetic material and the number of gene copies of a polyploid plant (e.g. Ohno 1970). This may happen by means of various mechanisms such as functional diversification of duplicated genes, gene silencing, long-term maintenance of similar but not identical function, or interactions between duplicated genes or their products (reviewed in Wendel 2000). This makes it difficult to distinguish more ancient polyploidization events. The processes that characterize diploidization, fragment the genomes and produce meso and paleopolyploids (Ehrendorfer 1980; Goldblatt 1980).

Paleopolyploids are defined as rediploidized polyploids with large basic chromosome numbers (Grant 1963; Goldblatt 1980). The basic chromosome numbers in the Chloridoideae are proposed to be paleopolyploid basic chromosome numbers. In this study the occurrence of two main basic chromosome numbers in the Chloridoideae, namely $x = 9$ and 10 have been confirmed. The notion that these are derived from a lower basic chromosome number is based on the presence of primary diploids ($x = 5$) reported for the subfamily. Furthermore, the basic chromosome number in the closely related Arundinoideae and Danthonioideae is $x = 6$, and $x = 5$ could have developed from this by aneuploid or dysploid reduction. The origin of the chloridoids from arundinoid ancestors has been corroborated by various studies (for example Stebbins 1956; Renvoize 1981; Phillips 1982; Campbell 1985; Watson *et al.* 1985; Conert 1987; Kellogg and Campbell 1987; Davis and Soreng 1993; Liang and Hilu 1996; Soreng and Davis 1998; Hilu *et al.* 1999; Hsiao *et al.* 1999; Hilu and Alice 2001). This is corroborated by the fact that Stebbins (1971, 1980) concluded lower basic chromosome numbers is the more primitive condition and that evolution leads to an increase in basic chromosome number. Lastly, paleopolyploidy has been proven for the closely related Panicoideae (tribe Andropogoneae) based on various cytogenetic (for example Garber 1950; Celarier 1956) and molecular studies (for example Chittenden *et al.* 1994; Pereira *et al.* 1994; D'Hont *et al.* 1996; Ming *et al.* 1998).

In groups with high frequencies of hybridization, phylogenetic reconstruction may become problematic. Hybridization (reticulate evolution) is inconsistent with the bifurcating way to depicting hierarchies (Funk 1981, 1985; Cronquist 1987; Kellogg 1989). Stebbins (1956) proposed that the evolution of the grasses can be considered to be reticulate. One of the most widely used methods in identifying hybridization is by comparing independent data sets (Morrell and Rieseberg 1998; Widmer and Baltisberger 1999; Richardson *et al.* 2001; Zomlefer *et al.* 2001; Ferguson and Jansen 2002). Palmer (1985) stressed the importance of comparing the uniparental chloroplast genome with the biparental phylogeny derived from the nuclear genome in groups where hybridization appears to be frequent.

In this study nuclear and chloroplast DNA have been used to investigate the phylogeny of southern African Chloridoideae and to investigate whether putative hybrids could be identified based on incongruent results. These two regions investigated were the nuclear *ITS* and chloroplast *trn*L-F regions. The main difference between these two regions is in their mode of inheritance, with chloroplast DNA being typically maternally inherited (Mogensen 1996) and nuclear DNA being biparentally inherited.

In the analyses of the *ITS* and *trn*L-F data, the results were largely congruent. The Chloridoideae were found to be monophyletic, thus corroborating previous studies (for example Barker *et al.* 1995; Duvall and Morton 1996; Van den Borre and Watson 1997; Soreng and Davis 1998; Hsiao *et al.* 1999; Matthews *et al.* 2000; Hilu and Alice 2001). Although two groupings were distinguished in the analysis corresponding to the main tribes, Cynodonteae and Eragrostideae, both were polyphyletic. These tribes are separated mainly on inflorescence structure (Clayton and Renvoize 1986) and it may be that this issue needs to be readdressed, as Stebbins (1950) and Schlichting (1986) were of the opinion that morphological characters, especially in the grasses, are greatly influenced by the environment and exhibit a high degree of phenotypic plasticity.

With the *ITS* sequencing data very little polymorphism was found. *ITS* region polymorphisms in angiosperms are proposed to result from processes such as hybridization, polyploidy and agamospermy (Suh *et al.* 1993; Sang *et al.* 1995; Buckler *et al.* 1997; Campbell *et al.* 1997) known, and shown in this study, to have a high frequency in the Chloridoideae. Various explanations for this may be sought but it is believed that ancient polyploidy, which has been proposed for the group in this study, has lead to the lack of additivity with complete concerted evolution in the Chloridoideae (McDade 1995; Vargas *et al.* 1999).

Due to the congruence of the separate data sets the data could be combined and a combined analysis conducted. The combined results were also largely congruent with the individual data sets. The *trn*L-F phylogeny was the least resolved of the three analyses. This is not surprising, as the region has been shown not to resolve relationships at infrageneric level (Sang *et al.* 1997; Cros *et al.* 1998; Small *et al.* 1998; McDade and Moody 1999; Mummenhoff *et al.* 2001). The lack of incongruence resulted in the failure of successfully identifying hybrids in this study. McDade (1992) stated that this might happen because hybrids do not disrupt phylogenies as much as has been proposed and hybrids cannot readily be identifiable solely on their behavior in cladograms. Furthermore, the relatedness of the parents of the hybrids may also play a role with hybrids between distantly related parents causing more topological problems than do those between more closely related parents. Therefore, even in a group characterized by polyploidy and hybridization, well-resolved phylogenetic topologies can be obtained and hybrids not necessarily identified based on their cladistic behavior.

The molecular results in this study confirm the paleopolyploidy present in the Chloridoideae, which was evident from the cytogenetic results as well. Of the two main tribes in the Chloridoideae, the Eragrostideae is accepted to be the most primitive. The basic chromosome number in this group is mostly x = 10, with x = 9 only occurring in the more specialized Pappophoreae and *Sporobolus*. In the less advanced Cynodonteae, x = 9 is more prevalent but less so than x = 10. It is believed that the polyploidization from an ancestral x = 5 occurred rather swiftly (Mehra *et al.* 1968), with subsequent aneuploid reduction to x = 9. This is probably one of the single most important events that set the Chloridoideae on an evolutionary path of their own.

Grass phylogeny forms the basis for various functional, genomic and evolutionary studies (Gaut 2002) and, therefore investigating and understanding the evolutionary relationships in this group are essential when studying for example cytogenetic relationships. But the opposite is also true. In this study the importance of incorporating cytogenetic data into phylogenetic studies was investigated. Without cytogenetic knowledge the magnitude of an occurrence such as polyploidy and especially paleopolyploidy might be greatly underestimated.

CHAPTER 9
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Appendices

APPENDIX A. Gametic chromosome numbers (n) of representatives of the subfamily Chloridoideae (Poaceae) in southern Africa with their voucher specimen numbers and provincial localities. Species are listed alphabetically. Separate entries for the same province for a species indicate different localities.

Taxon	n	Voucher	Locality
Cynodonteae			
Chloris virgata	10	*Spies 6616*	FREE STATE
Cynodon dactylon	18	*Spies 2549*	SWAZILAND
		Spies 2966	NORTHERN CAPE
Enteropogon macrostachyus	20	*Venter 9339*	NAMIBIA
Harpochloa falx	18	*Spies 5113*	MPUMALANGA
		Spies 5065	FREE STATE
		Spies 5078	FREE STATE
		Spies 6629	FREE STATE
		Spies 3986	EASTERN CAPE
		Spies 4729	EASTERN CAPE
		Spies 4691	EASTERN CAPE
		Spies 4695	EASTERN CAPE
		Spies 6955	EASTERN CAPE
	27	*Spies 5125*	MPUMALANGA
		Spies 5128	MPUMALANGA
		Spies 4712	EASTERN CAPE
Tragus sp.	10	*Spies 4803*	FREE STATE
Eragrostideae			
Bewsia biflora	20	*Spies 1531*	MPUMALANGA
Cladoraphis cyperoides	10	*Spies 5704*	NORTHERN CAPE
		Spies 4894	NORTHERN CAPE
		Spies 4889	NORTHERN CAPE
		Spies 5356	WESTERN CAPE
C. spinosa	20	*Spies 4885*	NORTHERN CAPE
Dactyloctenium aegyptium	20	*Spies 2403*	KWAZULU-NATAL
Eleusine coracana subsp. *africana*	9	*Spies 2365, 2366*	KWAZULU-NATAL
	18	*Spies 2783*	WESTERN CAPE
Eragrostis barbinodes	20	*Spies 3317*	LIMPOPO
E. capensis	10	*Spies 4696*	EASTERN CAPE
	20	*Spies 1595*	MPUMALANGA
		Spies 5069	FREE STATE
		Du Plessis 110	KWAZULU-NATAL

E. capensis	20	*Spies 3483*	EASTERN CAPE
		Spies 3498	EASTERN CAPE
		Davidse 33552	LOCALITY UNKNOWN
E. chloromelas	20	*Spies 6947*	EASTERN CAPE
E. ciliaris	10	*Du Plessis 111*	KWAZULU-NATAL
E. curvula	30	*Spies 1137*	EASTERN CAPE
E. echinochloidea	20	*Spies 2799, 2800*	NORTHERN CAPE
E. heteromera	20	*Spies 2634*	SWAZILAND
E. inamoena	20	*Spies 2392*	KWAZULU-NATAL
E. obtusa	10	*Spies 2886*	NORTHERN CAPE
E. planiculmis	30+0-4B	*Spies 1116*	EASTERN CAPE
E. racemosa	20	*Spies 5066*	FREE STATE
		Spies 3279	KWAZULU-NATAL
		Spies 4743	EASTERN CAPE
E. sclerantha subsp. *sclerantha*	20	*Spies 4844*	FREE STATE
E. superba	20	*Spies 3326*	LIMPOPO
		Du Plessis 136	KWAZULU-NATAL
E. tef	20	*Spies 2405*	KWAZULU-NATAL
E. tenuifolia	10	*Spies 2595*	SWAZILAND
E. trichophora	20	*Spies 2774*	WESTERN CAPE
Fingerhuthia africana	20	*Spies 2947*	NAMIBIA
		Spies 4349	WESTERN CAPE
Leptochloa fusca	10	*Spies 4875*	NORTHERN CAPE
		Spies 2991A	NORTHERN CAPE
		Spies 3037	NORTHERN CAPE
		Spies 4316	NORTHERN CAPE
		Spies 3794	WESTERN CAPE
		Spies 5200	WESTERN CAPE
		Spies 3932	WESTERN CAPE
		Davidse 33407	LOCALITY UNKNOWN
Odyssea paucinervis	18	*Spies 3384*	NORTHERN CAPE
Sporobolus africanus	9	*Spies 4508*	WESTERN CAPE
	18	*Spies 2369*	KWAZULU-NATAL
S. albicans	27	*Spies 3141*	WESTERN CAPE
S. ioclados	9	*Spies 2717*	NORTHERN CAPE
S. virginicus	9	*Du Plessis 122*	KWAZULU-NATAL
Stiburus alopecuroides	10	*Spies 1470*	MPUMALANGA
S. conrathii	10	*Du Plessis 19*	MPUMALANGA
Trichoneura grandiglumes	10	*Spies 4833*	FREE STATE

Pappophoreae			
Enneapogon cenchroides	20	*Spies 3288*	LIMPOPO
	30	*Spies 2709*	FREE STATE
E. pretoriensis	10	*Spies 3716*	NORTH-WEST
Enneapogon sp.	20	*Spies 5532*	NORTH-WEST
Schmidtia pappophoroides	18	*Du Plessis 186*	LIMPOPO
Schmidtia sp.	18+0-4B	*Spies 5536*	NORTH-WEST
Unplaced			
Centropodia glauca	24	*Spies 5706*	NORTHERN CAPE

APPENDIX B. Chromosome numbers for studies done on southern African Chloridoideae. Chromosome numbers found during present study are indicated by *.

Species	x	n	# of specimens examined	Reference
Cynodonteae				
Chloris gayana Kunth	10	10	8	Hunter 1934; Moffet and Hurcombe 1949; Davidse *et al.* 1986; Spies and Jonker 1987; Strydom and Spies 1994b
		20	8	Moffet 1944; Moffet and Hurcombe 1949
C. pycnothrix Trin.	10	15	1	De Wet 1954a
		20	1	Moffet and Hurcombe 1949
C. virgata Sw.	10	10	12	Moffet and Hurcombe 1949; Spies and Jonker 1987; Strydom and Spies 1994b; *
		20	1	Spies and Du Plessis 1987
Craspedorachis rhodesiana Rendle	9	27/2	1	Moffet and Hurcombe 1949
Ctenium concinnum Nees	10	c.50	1	Spies and Du Plessis 1986a
		80	1	De Wet 1960
Cynodon bradleyi Stent	9	9	1	Hurcombe 1946
C. dactylon (L.) Pers.	10	20	3	Hurcombe 1947; Moffet and Hurcombe 1949
	9	18	5	Strydom and Spies 1994b; *
C. magennisii Hurcombe	10	15	1	Hurcombe 1947
C. plectostachyum Pilg.	9	9	1	Moffet and Hurcombe 1949
		27	1	Moffet and Hurcombe 1949
C. transvaalensis Burtt Davy	10	10	1	Hurcombe 1947
Enteropogon macrostachyus (A.Rich.) Benth.	10	20	1	*
Eustachys paspaloides Lanza & Mattei	10	20	1	Strydom and Spies 1994b
	9	18	1	De Wet 1960

Harpochloa falx (L.f.) Kuntze	10	20	12	De Wet 1958; Spies and Du Plessis 1986a; Spies *et al.* 1991; Strydom and Spies 1994b
		25	2	Strydom and Spies 1994b
		30	3	Strydom and Spies 1994b
	9	27	3	*
		18	9	*
Lintonia nutans Stapf	10	15	1	De Wet 1960
Microchloa caffra Nees	10	10	1	De Wet and Anderson 1956
		40	1	Spies and Du Plessis 1986b
		c.50	5	Spies and Du Plessis 1986a; Strydom and Spies 1994b
M. kunthii Desv.	10	20	1	Moffet and Hurcombe 1949
Perotis patens Gand.	10	20	3	Moffet and Hurcombe 1949; De Wet 1960; Davidse *et al.* 1986
	9	18	1	De Wet and Anderson 1956
Rendlia altera (Rendle) Chiov.	10	20	9	Strydom and Spies 1994b
Tragus berteronianus Schult.	10	10	2	Strydom and Spies 1994b
T. racemosus (L.) All.	10	10	1	Strydom and Spies 1994b
		20	1	De Wet 1954a
Tragus sp.	10	10	1	*
Eragrostideae				
Bewsia biflora (Hack.) Gooss.	10	15	1	De Wet and Anderson 1956
		20	1	*
		45/2	1	Davidse *et al.* 1986
Cladoraphis cyperoides (Thunb.) S.M.Phillips	10	10	4	*
C. spinosa (L.f.) S.M.Phillips	10	20	1	*
Dactyloctenium aegyptium (L.) Willd.	10	20	1	*
	9	18	1	Moffet and Hurcombe 1949
D. giganteum Fisch. & Schweick.	10	5	1	Davidse *et al.* 1986
Diandrochloa namaquensis (Nees) DeWinter (as *Eragrostis namaquensis* Nees ex Schrad.)	10	10	1	Moffet and Hurcombe 1949

Dinebra retroflexa Panz. var. *condensata* S.M.Phillips	10	10	1	De Wet and Anderson 1956
Eleusine coracana (L.) Gaertn.	9	18	1	Davidse *et al.* 1986
Eleusine coracana (L.) Gaertn. subsp. *africana* (Kenn.-O'Byrne) Hilu & DeWet	9	9	4	Spies and Voges 1988; *
		18	2	Spies and Du Plessis 1986a; *
E. indica (L.) Gaertn.	9	18	2	Moffet and Hurcombe 1949; De Wet 1954a
Eragrostis acraea DeWinter	10	10	1	Davidse *et al.* 1986
E. aethiopica Chiov.	10	10	1	Jones *et al.* 1978
E. annulata Rendle ex Scott-Elliott	10	10	1	Nordenstam 1969
E. aspera (Jacq.) Nees	10	10	3	Avdulov 1931; Moffet and Hurcombe 1949
E. barbinodes Hack.	10	10	1	Spies and Du Plessis 1986a
		20	4	Pienaar 1953; De Wet 1958; *
		25	1	Spies and Jonker 1987
E. barrelieri Daveau	10	30	1	Moffet and Hurcombe 1949
E. biflora Hack. ex Schinz	10	10	2	Moffet and Hurcombe 1949
E. caesia Stapf	10	20	1	Davidse *et al.* 1986
E. capensis (Thunb.) Trin.	10	10	2	De Wet 1958; *
		20	12	Avdulov 1931; Pienaar 1953; Davidse *et al.* 1986; Spies and Du Plessis 1986a; Spies *et al.* 1991; *
		30	2	Moffet and Hurcombe 1949; Spies and Voges 1988
E. chapelieri (Kunth) Nees	10	10	1	Moffet and Hurcombe 1949
E. chloromelas Steud.	10	20	3	Pienaar 1953; Vorster and Liebenberg 1977; *
		41/2	1	Pienaar 1953
		30	2	Pienaar 1953
		61/2	1	Pienaar 1953
		31	2	Pienaar 1953
		63/2	1	Pienaar 1953

E. cilianensis (All.) Vignolo ex Janch.	10	10	2	Moffet and Hurcombe 1949; Spies *et al.* 1991
E. ciliaris (L.) R.Br.	10	10	2	De Wet 1960; *
		20	1	Moffet and Hurcombe 1949
E. crassinervis Hack.	10	20	1	Spies and Du Plessis 1986b
E. curvula (Schrad.) Nees	10	10	8	Pienaar 1953; Spies 1982
		20	31	Nielson 1939; Pienaar 1953; De Wet 1958; Vorster and Liebenberg 1977; Spies 1982; Spies and Du Plessis 1986a, 1986b; Spies and Jonker 1987
		25	10	De Wet 1954a; Vorster and Liebenberg 1977; Spies 1982; Davidse *et al.* 1986; Spies and Du Plessis 1986b
		30	28	Pienaar 1953; Vorster and Liebenberg 1977; Spies 1982; Spies and Jonker 1987; *
		35	11	Spies 1982
		40	8	Vorster and Liebenberg 1977; Spies 1982; Spies and Jonker 1987
E. curvula (Schrad.) Nees (as *E. robusta* Stent)	10	35	4	Pienaar 1953
E. curvula (Schrad.) Nees var. 1 (as *E. robusta* Stent)	10	35	1	Pienaar 1953
E. curvula (Schrad.) Nees var. 2 (as *E. robusta* Stent)	10	35	1	Pienaar 1953
E. curvula (Schrad.) Nees var. 3 (as *E. robusta* Stent)	10	40	1	Pienaar 1953
E. echinochloidea Stapf	10	15	1	De Wet 1960
		20	6	Moffet and Hurcombe 1949; Pienaar 1953; Spies and Du Plessis 1987; *
		30	2	Spies and Du Plessis 1987; Spies and Voges 1988
E. gummiflua Nees	10	20	2	Pienaar 1953; De Wet 1954a
		30	1	Spies and Du Plessis 1986a

E. habrantha Rendle	10	30	1	Moffet and Hurcombe 1949
		45	1	Moffet and Hurcombe 1949
E. heteromera Stapf	10	20	3	De Wet 1958, 1960; *
E. hierniana Rendle (as *E. uniglumes* Hack.)	10	20	2	Pienaar 1953; De Wet 1958
E. inamoena K.Schum.	10	20	1	*
E. inamoena K.Schum. (as *E. atrovirens* (Desf.) Trin.)	10	20	1	De Wet 1960
E. inamoena K.Schum. (as *E. galpinii* Stent)	10	20	1	Pienaar 1953
		41/2	1	Pienaar 1953
E. lappula Nees	10	20	2	De Wet 1954a, 1958
E. lappula var. *divaricata* Stapf	10	20	1	De Wet and Anderson 1956
E. lehmanniana Nees	10	20	6	Pienaar 1953; Spies and Du Plessis 1987; Spies and Jonker 1987; Spies and Voges 1988
		30	2	Spies and Du Plessis 1986b; Spies and Jonker 1987
E. micrantha Hack. ex Schinz	10	20	2	De Wet 1958; Spies and Du Plessis 1986a
E. nindensis Ficalho & Hiern	10	20	1	Davidse *et al.* 1986
E. nindensis Ficalho & Hiern (as *E. denudata* Hack. ex Schinz)	10	10	2	De Wet and Anderson 1956; De Wet 1960
		20	1	Moffet and Hurcombe 1949
E. obtusa Munro ex Ficalho & Hiern	10	10	2	De Wet 1960; *
		20	4	Moffet and Hurcombe 1949; Pienaar 1953; Spies and Du Plessis 1986b
		30	1	Spies and Du Plessis 1986b
E. pallens Hack. ex Schinz	10	10	1	Moffet and Hurcombe 1949
E. patens Oliv.	10	10	1	Moffet and Hurcombe 1949
E. plana Nees	10	10	6	Pienaar 1953; Spies and Jonker 1987
E. planiculmis Nees	10	21	1	Spies and Jonker 1987
		30	1	Spies and Du Plessis 1986b
		30+0-4B	1	*
E. pseudobtusa DeWinter	10	20	2	Pienaar 1953; Spies and Du Plessis 1987
		40	1	Spies and Du Plessis 1987

E. pseudosclerantha Chiov.	10	20	2	Spies and Du Plessis 1986a
		25	1	De Wet 1960
E. racemosa (Thunb.) Steud.	10	20	3	*
		30	1	De Wet 1958
E. racemosa (Thunb.) Steud. (as *E. chalcantha* Trin.)	10	30	1	Pienaar 1953
		31	1	Pienaar 1953
E. rigidior Pilg.	10	20	1	De Wet 1960
E. rotifer Rendle	10	20	1	Nordenstam 1969
E. rotifer Rendle (as *E. margaritacea* Stapf)	10	20	1	Moffet and Hurcombe 1949
E. sarmentosa Trin.	10	20	1	Spies *et al.* 1991
E. sclerantha Nees	10	20	1	Davidse *et al.* 1986
E. sclerantha Nees (small type)	10	20	1	Moffet and Hurcombe 1949
E. sclerantha Nees (large type)	10	20	1	Moffet and Hurcombe 1949
E. sclerantha Nees subsp. *sclerantha*	10	20	2	Spies and Du Plessis 1986a; *
E. stapfii DeWinter	10	10	1	De Wet 1960
E. stapfii DeWinter (as *E. sporoboloides* Stapf)	10	30	1	Pienaar 1953
E. superba Peyr.	10	20	8	Moffet and Hurcombe 1949; Pienaar 1953; De Wet 1954a; Spies and Du Plessis 1986a, 1986b, Spies and Jonker 1987; *
		25	1	Spies and Du Plessis 1986b
		40	1	Spies and Jonker 1987
E. tef (Zucc.) Trotter	10	20	2	Moffet and Hurcombe 1949; *
E. tenuifolia (A.Rich.) Steud.	10	10	1	*
E. trichophora Coss. & Dur.	10	20	2	Davidse *et al.* 1986; *
		30	1	Spies and Jonker 1987
E. trichophora Coss. & Dur. (as *E. atherstonei* Stapf)	10	10	3	Moffet and Hurcombe 1949; Pienaar 1953
E. truncata Hack.	10	10	1	Moffet and Hurcombe 1949
E. viscosa Trin.	10	20	2	Moffet and Hurcombe 1949; De Wet 1958

E. walterii Pilg.	10	20	2	Spies and Du Plessis 1986b
E. wilmaniae C.E.Hubb. & Schweick.	10	10	1	Moffet and Hurcombe 1949
E. wilmsii Stapf	10	20	1	De Wet 1954a
Eragrostis sp.	10	10	1	Pienaar 1953
Fingerhuthia africana Lehm.	10	20	5	De Wet 1958, 1960; Spies and Du Plessis 1987; *
F. sesleriiformis Nees	10	10	2	De Wet 1958, 1960
Leptochloa fusca (L.)	10	10	9	Spies *et al.* 1991; *
Kunth		19	1	Spies and Voges 1988
Odyssea paucinervis (Nees) Stapf	9	18	1	*
Oropetium capense Stapf	10	10	1	De Wet 1960
Pogonarthria squarrosa (Roem. & Schult.) Pilg.	10	20	4	Moffet and Hurcombe 1949; De Wet 1954a; De Wet and Anderson 1956; Davidse *et al.* 1986
		21	1	Moffet and Hurcombe 1949
		40	1	Spies and Jonker 1987
Sporobolus africanus	10	30	2	Spies and Jonker 1987
(Poir.) Robyns & Tournay	6	12	1	Spies *et al.* 1991
		24	1	Spies *et al.* 1991
	9	9	1	*
		18	3	Spies and Du Plessis 1986b; Spies and Voges 1988; *
		18+0-6B	1	Spies *et al.* 1991
S. africanus (Poir.) Robyns	9	9	1	De Wet 1954a
& Tournay (as *S. capensis* (Willd.) Kunth)		18	1	Moffet and Hurcombe 1949
S. albicans Nees	9	27	1	*
S. festivus A.Rich.	9	18	1	De Wet 1960
S. fimbriatus (Trin.) Nees	9	9	2	Moffet and Hurcombe 1949; De Wet 1958
		18	2	De Wet and Anderson 1956; De Wet 1958
S. ioclados (Trin.) Nees	9	9	1	*
S. ioclados (Trin.) Nees (as *S. smutsii* Stent)	9	18	2	De Wet and Anderson 1956; De Wet 1958
S. nitens Stent	9	9	1	De Wet and Anderson 1956

S. panicoides A.Rich.	10	10	2	Davidse *et al.* 1986
	6	12	1	Moffet and Hurcombe 1949
S. pectinatus Hack.	10	20	1	Spies and Jonker 1987
S. piliferus Kunth	9	18	1	Davidse *et al.* 1986
S. pyramidalis P.Beauv.	10	15	3	Moffet and Hurcombe 1949; De Wet 1960; Spies and Voges 1988
	6	12	2	Moffet and Hurcombe 1949; Spies and Voges 1988
	9	18	1	De Wet 1958
S. stapfianus Gand.	6	12	1	De Wet 1960
	9	18	1	De Wet and Anderson 1956
S. virginicus (L.) Kunth	10	15	1	De Wet 1960
	9	9	1	*
Stiburus alopecuroides (Hack.) Stapf	10	10	2	Spies and Du Plessis 1986a; *
S. conrathii Hack.	10	10	1	*
Tetrachne dregei Nees	10	10	3	Moffet and Hurcombe 1949; De Wet and Anderson 1956; De Wet 1960
Trichoneura grandiglumes (Nees) Ekman	10	10	3	Moffet and Hurcombe 1949; De Wet and Anderson 1956; *
Triraphis andropogonoides (Steud.) Phillips	10	10	1	De Wet 1954a
T. purpurea Hack. (as *T. fleckii* Hack.)	10	10	1	Hoshino and Davidse 1988
T. ramosissima Hack.	10	10	2	Hoshino and Davidse 1988
Pappophoreae				
Enneapogon brachystachyus Stapf	9	18	1	De Wet and Anderson 1956
E. cenchroides (Roem. & Schult.) C.E.Hubb.	10	20	3	Reeder and Singh 1968; Spies and Voges 1988; *
		24	1	Davidse *et al.* 1986
		30	1	*
	9	18	2	Thomas, unpubl (listed Darlington and Wylie 1955); De Wet and Anderson 1956
E. pretoriensis Stent	10	10	1	*
	9	9	2	De Wet and Anderson 1956; De Wet 1958

E. scaber Lehm.	10	20	1	Spies and Voges 1988
E. scoparius Stapf	10	20	1	Nordenstam 1982
	9	18	3	De Wet 1954a, 1958; De Wet and Anderson 1956
Enneapogon sp.	10	20	1	*
Kaokochloa nigrirostris DeWinter	10	11	1	Reeder and Singh 1968
Schmidtia pappophoroides Steud.	10	20	1	Reeder and Singh 1968
	9	18	1	*
S. pappophoroides Steud. (as *S. bulbosa* Stapf)	9	18	1	De Wet 1958
S. pappophoroides Steud. (as *S. glabra* Pilg.)	9	18	1	De Wet and Anderson 1956
Schmidtia sp.	9	18+0-4B	1	*
Unplaced				
Centropodia glauca (Nees) Cope	6	24	5	Du Plessis and Spies 1988; Hoshino and Davidse 1988; *
C. forskalii (Vahl) Cope (as *Danthonia forskalii* R.Br.)	6	12	1	De Wet 1954b
Merxmuellera rangei (Pilg.) Conert	6	18	1	Du Plessis and Spies 1988

APPENDIX C. Chromosome numbers for studies done in the Chloridoideae (excluding southern African specimens - see appendix B). The number of specimens examined, are indicated in brackets after each corresponding chromosome count. The summary listings of Ornduff (1967, 1968, 1969); Federov (1969); Moore (1970, 1971, 1972, 1973, 1974, 1977); Goldblatt (1980, 1981, 1983, 1985, 1988) and Goldblatt and Johnson (1990, 1991, 1994, 1996, 1998, 2000) were used to compile the table and original authors are not cited individually.

Species	x	n	Reference
Acrachne racemosa Ohwi	9	18	Goldblatt and Johnson 1994
Aegopogon cenchroides Humb. & Bonpl. ex Willd.	10	10, 20 (4), 30, 40	Ornduff 1968, 1969; Moore 1970, 1973, 1974
A. tenellus Trin.	10	10, 30	Ornduff 1967, 1981
Aeluropus lagopoides Trin. ex Thwaites	10	10 (2), 20, 25 (2)	Moore 1971, 1972; Goldblatt 1983; Goldblatt and Johnson 1998
A. littoralis Parl.	10	10 (5), 15	Federov 1969; Goldblatt and Johnson 1994, 1996
A. littoralis var. *intermedius* Coss. & Germ.	10	10?	Moore 1972
Allolepis texana (Vasey) Soderstr. & H.F.Decker	10	20 (2)	Ornduff 1968, 1969
Astrebla lappacea (Lindl.) Domin	10	20 (3)	Federov 1969
A. pectinata (Lindl.) Benth. (as *Astrebla pectinacea* F.Muell.)	10	20	Federov 1969
Blepharidachne benthamiana Hitchc.	7	7 (2)	Federov 1969; Goldblatt 1988
B. bigelovii Hack.	7	7 (3)	Federov 1969; Goldblatt 1981, 1988
B. kingii Hack.	7	7 (2)	Goldblatt 1981, 1988
Blepharoneuron tricholepis (Torr.) Nash	8	8 (4)	Moore 1973; Goldblatt 1981; Goldblatt and Johnson 1991, 1994
Bouteloua alamosana Vasey ex Rose	10	30	Moore 1974
B. americana (L.) Scribn.	10	20	Moore 1973
B. aristidoides Griseb.	10	20 (2)	Federov 1969; Moore 1973
B. barbata Lag.	10	10 (5), 20 (2)	Ornduff 1967, 1968; Federov 1969; Moore 1973; Goldblatt 1981, 1988
B. barbata var. *major* (Vasey) R.Govaerts (*as Bouteloua rothrockii* Vasey)	10, 7	10, 11 (2), 20, 41/2?, 21, 45/2, 47/2, 49/2, 25	Federov 1969; Goldblatt 1981

B. breviseta Vasey	10, 7	10 (2), 21/2, 14, 20 (5)	Ornduff 1967, 1968; Federov 1969; Goldblatt 1981, 1983; Goldblatt and Johnson 1990
B. chaseii Swallen	10	20 (4), 30 (2)	Ornduff 1967, 1968, 1969; Moore 1970, 1973; Goldblatt and Johnson 1990
B. chondrosioides Benth. ex S.Watson	10, 7	7, 11, 10 (5), 20 (7)	Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1973; Goldblatt 1981
B. curtipendula Torr.	10, 7	10 (3), 14, 35/2, 20 (7), 41/2, 21 (2), 43/2, 45/2, 26, 28, 29, 59/2, 30, 61/2, 31, 63/2, 35, 37, 40, 41, 43, 48, 49, 62, 69/2-103/2, 85/2-101/2	Federov 1969; Goldblatt 1981, 1983
B. curtipendula var. *caespitosa* Gould & Kapadia	10	c.46	Moore 1973
B. curtipendula var. *tenuis* Gould & Kapadia	10	20, 41/2	Moore 1972
B. dactyloides (Nutt.) J.T.Columbus (as *Buchloë dactyloides* (Nutt.) Engelm.)	10, 7	10 (2), 20 (6), 28, 30 (7)	Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1973; Goldblatt 1983, 1988
B. dimorpha J.T.Columbus (as *Opizia stolonifera* J.Presl.)	10	20 (3), 43/2	Ornduff 1967, 1968, 1969; Federov 1969
B. disticha Benth.	10	10, 20	Moore 1973; Goldblatt 1988
B. diversispicula J.T.Columbus (as *Cathestecum brevifolium* Swallen)	10	30	Goldblatt 1988
B. elata C.Reeder	10	10, 20	Ornduff 1968, 1969
B. eludens Griffiths	10	20	Goldblatt and Johnson 1994
B. eriopoda Torr.	10, 7	10 (3), 21/2, 14 (2)	Federov 1969; Ornduff 1969; Moore 1970; Goldblatt 1981
B. eriostachya (Swallen) Reeder	10	30	Ornduff 1969

B. gracilis (Kunth) Lag. ex Griffiths	10, 7	10 (4), 21/2, 14, 35/2, 20 (3), 21 (3), 30 (3), 61/2, 77/2, 42	Ornduff 1967, 1968; Federov 1969; Moore 1970; Goldblatt 1981
B. gracilis (Kunth) Lag. ex Griffiths (as *Bouteloua oligostachya* Torr. ex A.Gray)	10	20	Federov 1969
B. hirsuta Lag.	10, 7	6, 10 (3), 21/2, 11, 12(2), 14 (3), 18, 37/2, 20 (5), 21 (3), 23 (3), 25, c.26, c.60	Ornduff 1967; Federov 1969; Moore 1970, 1972, 1974; Goldblatt 1988
B. karwinskii (E.Fourn.) Griffiths	10	10 (4)	Ornduff 1968, 1969; Moore 1970; Goldblatt and Johnson 1990
B. longeseta Gould	10	40	Moore 1971
B. media (E.Fourn.) Gould & Kapadia	10	10 (5), 27/2	Ornduff 1968; Federov 1969; Moore 1972, 1973
B. parryi (E.Fourn.) Griffiths var. *parryi* (as *Bouteloua parryi* (E.Fourn.) Griffiths)	10	10	Goldblatt 1988
B. pectinata Feath.	10	10 (5)	Federov 1969; Moore 1970, 1972, 1974
B. purpurea Gould & Kapadia	10	20 (3)	Ornduff 1968; Federov 1969
B. radicosa Griffiths	10	10, 30	Ornduff 1967; Federov 1969
B. ramosa Scribn.	10	20 (2)	Goldblatt 1983, 1988
B. reflexa Swallen	10	10	Ornduff 1968
B. repens Scribn. & Merr.	10	10, 23/2, 20 (2), c.45/2, 23, 30 (3)	Moore 1971, 1972, 1974; Goldblatt 1988
B. repens Scribn. & Merr. (as *Bouteloua filiformis* Griffiths)	10, 7	7, 10 (2), 21/2, 11 (2), 20, c.45/2, 23, 30	Ornduff 1967; Federov 1969
B. repens Scribn. & Merr. (as *Bouteloua heterostega* Griffiths)	10	10, c.20	Federov 1969; Ornduff 1969

B. rigidiseta (Steud.) Hitchc.	10, 7	14, 35/2, 20 (2)	Federov 1969; Moore 1970
B. scorpioides Lag.	10	10 (2), 20 (2)	Ornduff 1968, 1969; Moore 1970; Goldblatt 1988
B. simplex Lag.	10	10, 20 (3)	Ornduff 1967; Federov 1969
B. triaena Scribn.	10	10 (4)	Federov 1969; Moore 1972
B. trifida Thurb.	10, 7	10 (5), 14	Ornduff 1967, 1968; Moore 1970, 1973
B. uniflora Vasey	10	10 (4)	Federov 1969
B. warnockii Gould & Kapadia	10, 7	21/2, 11 (2), 23/2, 12, 25/2, 14, 29/2-39/2, 20	Federov 1969
B. williamsii Swallen	10	10 (2), 20	Moore 1971; Moore 1973; Goldblatt 1981
Buchlomimus nervatus (Swallen) Reeder, C.Reeder & Rzed.	10	20 (2)	Ornduff 1967, 1969
Calamovilfa gigantea Scribn. & Merr.	10	20	Ornduff 1969
C. longifolia Hack.	10	20 (2)	Goldblatt 1981; Goldblatt 1983
C. longifolia var. *magna* Scribn. & Merr.	10	20	Ornduff 1969
Cathestecum annuum Swallen	10	10 (2)	Ornduff 1967, 1968
C. erectum Vasey & Hack.	10	10 (3), 15, 20, 30 (2)	Ornduff 1967, 1969; Moore 1970, 1973; Goldblatt 1981
C. multifidum Griffiths	10	10 (2)	Ornduff 1967, 1969
Chaboissaea atacamensis (Parodi) P.M.Peterson & Annable	8	8	Goldblatt and Johnson 1996
C. ligulata E.Fourn.	8	8 (2)	Ornduff 1969; Moore 1970
Chloris acuminata Trin.	10	20	Federov 1969
C. andropogonoides E.Fourn.	10	20 (3)	Federov 1969
C. barbata Sw.	10	10 (4), 20 (10), 25 (2)	Ornduff 1968, 1969; Federov 1969; Moore 1971, 1972, 1974, 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1991, 1998
C. barbata Sw. (as *Chloris inflata* Link)	10	20 (3), 28	Moore 1972, 1974, 1977; Goldblatt 1983
C. berroi Arechav.	10	20	Federov 1969
C. bourneii Rang. & Tadul.	10	20, 25, 30	Federov 1969; Goldblatt and Johnson 1991
C. caudata Trin. ex Bunge	10	20	Federov 1969

C. chloridea (C.Presl.) Hitchc.	10	20 (2)	Moore 1972; Goldblatt 1988
C. chloroides (J.Presl.) Hitchc.	10	40	Ornduff 1967
C. ciliata Sw.	10	20 (7)	Ornduff 1968, 1969; Federov 1969; Moore 1970
C. cucullata Bisch.	10	20 (5)	Ornduff 1968; Federov 1969; Moore 1970
C. dandyana C.D.Adams (as *Cynodon polydactyla* Sw.)	10	36	Federov 1969
C. distichophylla Lag.	10	10 (2), 20 (2)	Ornduff 1967; Federov 1969
C. dolichostachya Lag.	10	10, 20 (7), 30 (2)	Moore 1972, 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1990
C. ekmanii Hitchc.	10	20	Moore 1974
C. formosana (Honda) Keng	10	20	Moore 1973
C. gayana Kunth	10	10 (10), 15, 20 (8)	Ornduff 1967, 1968; Federov 1969; Moore 1970, 1977; Goldblatt 1983; Goldblatt and Johnson 1990
C. halophila Parodi	10	40	Federov 1969
C. incompleta Roth ex Roem. & Schult.	10	20	Moore 1977
C. mollis (Nees) Swallen	10	20	Moore 1977
C. montana Roxb.	10	20 (3)	Goldblatt 1988; Goldblatt and Johnson 1990, 1991
C. petraea Sw.	10	20 (4)	Federov 1969; Moore 1970, 1973
C. pilosa Schumach.	10	10 (2), 15	Federov 1969; Moore 1977; Goldblatt 1981
C. prieurii Kunth	10	20	Moore 1974
C. pycnothrix Trin.	10	18, 20 (3)	Ornduff 1967; Federov 1969; Goldblatt 1981, 1983
C. radiata (L.) Sw.	10	20 (4)	Ornduff 1968; Federov 1969; Moore 1973
C. radiata (L.) Sw. (as *Chloris gracilis* P.Durand)	10	15	Federov 1969
C. roxburghiana Schult.	10	10 (2)	Federov 1969; Goldblatt 1983
C. rufescens Lag.	10	50 (4)	Ornduff 1967, 1968; Federov 1969; Moore 1972
C. subdolichostachya N.J.C.Muell.	10	20, c.33	Federov 1969
C. subdolichostachya N.J.C.Muell. (as *Chloris latisquamea* Nash)	10	20, c.28, c.31, c.63/2, c.32, c.36, c.42	Federov 1969; Moore 1970

C. submutica Kunth	10	c.65/2, 40 (7)	Ornduff 1967, 1968; Federov 1969; Moore 1973
C. truncata R.Br.	10	20 (2)	Federov 1969
C. verticillata Nutt.	10	20 (3), c.28, 63/2	Federov 1969; Moore 1970; Goldblatt 1981
C. villosa Pers.	10	10	Goldblatt 1981
C. virgata Sw.	10	7, 10 (18), 13, 15, 18	Ornduff 1968; Federov 1969; Moore 1971, 1972, 1973, 1974; Goldblatt 1983; Goldblatt and Johnson 1990, 1998, 2000
Cottea pappophoroides Kunth	10	10 (4)	Federov 1969; Moore 1970
Crypsis aculeata Aiton	8, 9	8 (2), 9 (4), 27	Moore 1977; Federov 1969; Goldblatt 1981; Goldblatt and Johnson 1996
C. alopecuroides Schrad.	8, 9	8, 9 (2)	Federov 1969; Goldblatt 1983; Goldblatt and Johnson 1994
C. schoenoides (L.) Lam.	8, 9	16, 18 (2)	Moore 1971; Goldblatt 1981, 1983
C. vaginiflora Opiz	8	24	Goldblatt 1983
Ctenium canescens Benth.	9	9	Moore 1977
C. elegans Kunth	9	18	Moore 1977
C. newtonii Hack.	9	12, 18	Moore 1977; Goldblatt 1981
Cynodon aethiopicus Clayton & J.R.Harlan	10, 9	9-18	Moore 1973
C. alterniflorus	10	21	Federov 1969
C. barberi Rang. & Tadul.	9	9 (3)	Moore 1977; Goldblatt 1981
C. dactylon (L.) Pers.	10, 9	9 (9), 9+0-3B (3), 27/2 (6), 13+I, 15 (2), 18 (30), 18+0-2B (3), 20 (6), 27 (3)	Ornduff 1968, 1969; Federov 1969; Moore 1970, 1972, 1977; Goldblatt 1981, 1983, 1985; Goldblatt and Johnson 1990, 1994, 1996, 1998
C. dactylon var. *afghanicus* J.R.Harlan & DeWet	9	9 (2), 18 (2)	Moore 1972, 1974
C. dactylon var. *aridus* J.R.Harlan & DeWet	9	9 (3)	Moore 1972, 1974; Goldblatt 1985
C. dactylon var. *coursii* (A.Camus) J.R.Harlan & DeWet	9	18	Moore 1972
C. dactylon var. *dactylon*	9	9 (2)	Moore 1972; Goldblatt and Johnson 1994
C. dactylon var. *elegans* Rendle	9	18	Moore 1972

C. dactylon var. *polevansii* (Stent) J.R.Harlan & DeWet	9	18	Moore 1972
C. dactylon var. *villosus* Regel	9	9	Goldblatt and Johnson 1994
C. diploideus	9	9	Federov 1969
C. incompletes Nees var. *hirsutus* (Stent) DeWet (as *Cynodon hirsutus* Stent)	9	9	Federov 1969
C. michauxioides	9	14	Federov 1969
C. nlemfuensis Vanderyst var. *nlemfuensis* Clayton & J.R.Harlan	10, 9	9-18	Moore 1973
C. nlemfuensis var. *robustus* Clayton & J.R.Harlan	9	18	Goldblatt and Johnson 1990
C. plectostachyum Pilg.	9	9	Federov 1969
C. radiatus Roth (as *Cynodon arcautus* J. & C.Presl.)	10, 9	9, 10, 16, 18 (5)	Federov 1969; Moore 1977; Goldblatt and Johnson 1990
C. transvaalensis Burtt Davy	9	9	Moore 1973
Dactyloctenium aegyptium (L.) Willd.	10, 6	9 (3), 9+, 10 (6), 11, 11+, 23/2, 27/2, 17, 18 (3), 19 (3), 20 (11), 21 (2), 22 (3), 23 (9), 24 (7), 26	Ornduff 1967, 1968; Federov 1969; Moore 1971, 1972, 1973, 1974, 1977; Goldblatt 1981, 1983, 1985, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1998
D. aegyptium (L.) Willd. (as *Eleusine aegyptica* (L.) Roxb.)	9	17, 18 (2), 45/2 (2)	Federov 1969
D. aristatum Link	10	10 (3), 20 (3)	Goldblatt 1981, 1983
D. scindicum Boiss.	10, 6	9, 10 (3), 24	Federov 1969; Goldblatt 1981, 1983; Goldblatt and Johnson 1990
Desmostachya bipinnata Stapf	10	10 (5), 20	Moore 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1990
Dinebra arabica Jacq.	10	10	Federov 1969
D. retroflexa Panz.	10	10 (4), 20, 30	Federov 1969; Goldblatt 1981; Goldblatt and Johnson 1990, 1998
Diplachne bulgarica Bornm.	10	20 (2)	Moore 1977
D. fusca (L.) Roem. & Schult.	10	10, 20 (2)	Federov 1969; Goldblatt and Johnson 1990, 1998

D. serotina Link	10	20 (4)	Ornduff 1968; Federov 1969; Moore 1977
D. serotina var. *sinensis* Hance	10	20	Ornduff 1968
Distichilis palmeri (Vasey) Fassett ex I.M.Johnst.	10	20	Ornduff 1968
D. spicata (L.) Greene var. *borealis* (J.Presl.) Beetle	10	20	Moore 1977
D. spicata var. *spicata* (as *Distichilis spicata* (L.) Greene)	10	19, 20 (7), 21, 36	Federov 1969; Ornduff 1969; Moore 1973; Goldblatt 1981
D. stricta Rydb.	10	20 (4), c.36	Federov 1969; Ornduff 1969; Goldblatt 1983
D. texana (Vasey) Scribn.	10	20	Federov 1969
Eleusine brevifolia R.Br.	9	18	Federov 1969
E. compressa (Forssk.) Asch. & Scweinf. ex. C.Chr.	10, 9	9, 20, 45/2	Federov 1969; Goldblatt 1985; Goldblatt and Johnson 1990
E. coracana (L.) Gaertn.	9	18 (24), 18+1-2B	Ornduff 1968; Federov 1969; Moore 1971, 1974, 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1990, 1994, 2000
E. coracana subsp. *africana* (Kenn.-O'Byrne) Hilu & DeWet (as *Eleusine africana* Kenn.-O'Byrne)	9	18 (11)	Ornduff 1967, 1968; Federov 1969; Moore 1977; Goldblatt 1985; Goldblatt and Johnson 1990, 1994, 2000
E. coracana subsp. *africana* (Kenn.-O'Byrne) Hilu & DeWet (as *Eleusine indica* subsp. *africana* (Kenn.-O'Byrne) S.M.Phillips)	9	9, 18 (2)	Goldblatt 1981, 1985; Goldblatt and Johnson 1990
E. flagellifera Nees	9	45/2	Federov 1969
E. floccifolia Spreng.	9	9 (5), 18	Moore 1977; Goldblatt 1985; Goldblatt and Johnson 1994, 1998, 2000
E. indica (L.) Gaertn.	9	8, 9 (51), 18 (4), 27 (2)	Ornduff 1967, 1968, 1969; Federov 1969; Moore 1971, 1972, 1974, 1977; Goldblatt 1981, 1983, 1985; Goldblatt and Johnson 1990, 1991, 1994, 1998, 2000
E. indica subsp. *indica*	9	9	Goldblatt 1985
E. intermedia (Chiov.) S.M.Phillips	9	9 (2)	Goldblatt and Johnson 1994, 1998
E. jaegeri Pilg.	10	10 (3)	Goldblatt 1985; Goldblatt and Johnson 1994, 2000
E. kigeziensis S.M.Phillips	9	19	Goldblatt and Johnson 1994

E. lagopoides Merr.	9	18 (2)	Federov 1969
E. multiflora Hochst.	9	8 (4), 9	Goldblatt 1985, 1988; Goldblatt and Johnson 1994, 1998, 2000
E. oligostachya Link	9	9 (2)	Federov 1969
E. reniformis Divak.	9	18, 21	Goldblatt 1985; Goldblatt and Johnson 1990
E. tocussa Fresen.	9	39/2	Federov 1969
E. tristachya (Lam.) Lam.	9	8, 9 (12)	Ornduff 1968; Federov 1969; Moore 1970, 1977; Goldblatt 1981, 1985, Goldblatt and Johnson 1994, 1998, 2000
E. vertricillata Roxb.	9	9 (3), 18	Federov 1969; Goldblatt and Johnson 1994, 1998
Enneapogon borealis (Griseb.) Honda	10	10	Goldblatt and Johnson 1998
E. desvauxii P.Beauv.	10	10 (3)	Ornduff 1968, 1969; Federov 1969
E. elegans Stapf	10	10 (3)	Federov 1969; Moore 1977; Goldblatt 1981
E. persicus Boiss.	10	10	Goldblatt 1981
E. wrightii (S.Watson) C.E.Hubb.	10	10	Federov 1969
Enteropogon gracilior Rendle	10	20	Federov 1969
E. monostachyus K.Schum.	10	10 (2)	Federov 1969; Goldblatt 1981
Eragrostiella bifaria (Vahl) Bor	10,9	9, 20	Moore 1977; Goldblatt 1981
E. brachyphylla (Stapf) Bor	9	18	Federov 1969
E. leioptera (Stapf) Bor	10	7, 10 (3)	Goldblatt 1981, 1985
Eragrostis acutiflora Nees	10	20 (2)	Moore 1972, 1977
E. airoides Nees	10	18	Moore 1977
E. albida Hitchc.	10	20	Federov 1969
E. amabilis Wight & Arn. (as *Eragrostis tenella* (L.) Roem. & Schult.)	10	9, 10 (9), 20, 30	Ornduff 1967; Federov 1969; Moore 1971, 1972, 1977; Goldblatt 1981, 1983; Goldblatt and Johnson 1990
E. amurensis Prob.	10	20	Goldblatt 1988
E. aquatica Honda	10	30	Ornduff 1969
E. atrovirens (Desf.) Trin.	10	10 (3), 20 (2), 30 (8)	Federov 1969; Moore 1977; Goldblatt 1981; Goldblatt and Johnson 1990, 1991
E. barrelieri Daveau	10	30 (4)	Ornduff 1968, 1969; Federov 1969; Goldblatt and Johnson 1994
E. barteri C.E.Hubb.	10	10	Goldblatt 1981
E. beyrichii J.G.Sm.	10	20	Federov 1969
E. bifaria (Vahl) Steud.	10	20	Federov 1969
E. boriana Launert	10	30	Moore 1973

E. brownii (Kunth) Nees	10	20	Federov 1969
E. bulbillifera Steud.	10	20	Federov 1969
E. burmanica Bor	10	20	Federov 1969
E. cambessediana Steud.	10	10	Federov 1969
E. capensis (Thunb.) Trin.	10	20	Federov 1969
E. capillaris Nees	10	50	Federov 1969
E. chapellieri (Kunth) Nees	10	10 (4)	Ornduff 1967; Goldblatt 1981, 1983
E. cilianensis (All.) Vignolo ex Janch.	10	10 (15), 20 (4)	Ornduff 1968; Federov 1969; Moore 1972, 1973; Goldblatt 1983, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1996, 1998, 2000
E. cilianensis (All.) Vignolo ex Janch. (as *Eragrostis megastachya* Link)	10	10 (3), 20	Federov 1969
E. curtipendicellata Buckley	10	20 (2)	Federov 1969; Moore 1970
E. curvula (Schrad.) Nees	10	20 (3), 27 (2)	Goldblatt and Johnson 1990, 1991, 1994
E. decannensis Bor	10	10	Goldblatt 1988
E. diarrhena Steud.	10	10 (3), 20 (2), 30 (2)	Ornduff 1967; Goldblatt and Johnson 1990, 1991
E. diplachnoides Steud.	10	10 (2)	Moore 1977
E. elongata (Willd.) Jacq.	10	20	Federov 1969
E. ferruginea P.Beauv.	10	40 (3)	Federov 1969; Ornduff 1969
E. frankii Steud.	10	20, 40	Goldblatt 1981
E. gangetica Steud.	10	10, 40	Ornduff 1967; Goldblatt 1983
E. gangetica Steud. (as *Eragrostis stenophylla* Hochst. ex Miq.)	10	30	Goldblatt and Johnson 1990
E. glutinosa Trin.	10	30	Moore 1970
E. grandis Hillebr.	10	22	Federov 1969
E. guianensis Hitchc.	10	10	Moore 1977
E. hirsuta Nash	10	50	Federov 1969
E. holacantha Torr.	10	15	Goldblatt 1988
E. hondurensis R.W.Pohl	10	c.20, 15	Goldblatt 1983
E. hypnoides (Lam.) B.S.P.	10	10 (2), 20	Moore 1974; Goldblatt 1983
E. intermedia Hitchc.	10	30, 36, c.37, 38, 40 (2), 50, 60 (2), c.104	Moore 1970, 1973

E. japonica (Thunb.) Trin.	10	10 (6), 20 (3), 30	Federov 1969; Moore 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1990, 1991, 1998
E. japonica (Thunb.) Trin. (as *Eragrostis glomerata* (Walter) L.H.Dewey)	10	10 (2)	Ornduff 1969; Moore 1973
E. lehmanniana Nees	10	20, 30	Federov 1969
E. lugens Nees	10	20, 40, c.54	Federov 1969
E. macilenta Steud.	10	20	Ornduff 1967
E. maderaspatana Bor	10	30	Goldblatt 1985
E. maypurensis Steud.	10	10 (3), 20	Ornduff 1969; Moore 1972, 1973, 1977
E. megalosperma F.Muell. ex Benth.	10	10 (2)	Ornduff 1968; Federov 1969
E. mexicana (Hornem.) Link	10	30 (5)	Ornduff 1968; Federov 1969; Moore 1973; Goldblatt 1981
E. mildbraedii Pilg.	10	10	Ornduff 1967
E. minor Host	10	10 (2), 15, 20 (8), 30 (3)	Federov 1969; Goldblatt 1981, 1983, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1996, 1998, 2000
E. minor Host (as *Eragrostis poaeoides* P.Beauv.)	10	15, 20 (5), 22, 30	Federov 1969; Moore 1972, 1977; Goldblatt 1981, 1983; Goldblatt and Johnson 1990
E. minor Host (as *Eragrostis suaveolens* A.K.Becker ex Claus)	10	15	Goldblatt 1983
E. mexicana subsp. *virescens* (J.Presl) S.D.Koch & Sánchez Vega (as *Eragrostis virescens* J. & C.Presl.)	10	30	Goldblatt and Johnson 1994
E. montufari Steud.	10	35	Federov 1969
E. multicaulis Steud.	10	20 (3)	Federov 1969; Ornduff 1969
E. namaquensis Nees	10	10 (2)	Ornduff 1967; Goldblatt 1983
E. neomexicana Vasey	10	28 (3), 30 (4)	Ornduff 1968; Federov 1969; Moore 1970, 1973; Goldblatt 1983; Goldblatt and Johnson 1991
E. nigra Nees ex Steud.	10	30 (2)	Goldblatt 1981, 1985

E. nutans Nees ex Steud.	10	20 (2), 21+f, 27+1, 30 (3)	Federov 1969; Moore 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1990, 1991
E. nutans Nees ex Steud. (as *Eragrostis chariis* (Schult.) Hitchc.)	10	20	Federov 1969
E. obtusiflora (E.Fourn.) Scribn.	10	20	Goldblatt 1981
E. olivacea K.Schumm. ex Engl. (as *Eragrostis lasiantha* Stapf)	10	10	Ornduff 1967
E. pallescens Hitchc.	10	40	Federov 1969
E. palmeri S.Watson	10	20	Moore 1973
E. paniciformis (A.Braun) Steud.	10	30	Ornduff 1967
E. papposa Steud.	10	10	Moore 1972
E. patens Oliv.	10	10 (2)	Goldblatt 1983
E. pectinacea Nees	10	20, 30 (5), 40	Ornduff 1968; Federov 1969; Goldblatt 1981, 1983
E. pectinacea Nees (as *Eragrostis diffusa* Buckley)	10	30 (3)	Ornduff 1967; Moore 1970, 1973
E. pilosa (L.) P.Beauv.	10	10 (3), 15, 35/2, 18 (3), 20 (8), 25 (4), 30 (1), 36	Ornduff 1967; Federov 1969; Moore 1971, 1972, 1977; Goldblatt 1981, 1983, 1988; Goldblatt and Johnson 1990, 1991, 1994, 1998
E. pilosa var. *pilosa*	10	20	Goldblatt 1981
E. pilosa subsp. *pilosa*	10	20	Goldblatt 1981
E. plumbea Scribn. ex Beal	10	20, 30	Ornduff 1967
E. polytricha Nees	10	c.30	Ornduff 1969
E. polytricha Nees (as *Eragrostis trichocolea* Arechav.)	10	30, 40	Moore 1972, 1974
E. prolifera Steud.	10	10, 20	Moore 1974; Goldblatt 1981
E. prolifera Steud. (as *Eragrostis domingensis* Steud.)	10	20	Moore 1972
E. racemosa (Thunb.) Steud.	10	20	Ornduff 1967
E. secundiflora J. & C.Presl.	10	20	Federov 1969
E. secundiflora subsp. *oxylepis* (Torr.) S.D.Koch (as *Eragrostis oxylepis* (Torr.) Torr.)	10	20	Moore 1970
E. sessilispica Buckley	10	20 (3)	Ornduff 1967; Federov 1969; Moore 1970
E. simpliciflora Steud.	10	20	Moore 1973
E. spectabilis Steud.	10	10, 20, 21	Federov 1969; Goldblatt 1985

E. spicata Vasey	10	20	Federov 1969
E. squamata Steud.	10	20	Goldblatt 1981
E. superba Peyr.	10	10, 20 (4)	Goldblatt 1981, 1983
E. swallenii Hitchc.	10	42	Moore 1970
E. tef (Zucc.) Trotter	10	20 (3)	Federov 1969
E. tenella (L.) P.Beauv. var. *insularis* C.E.Hubb.	10	10, 20, 30	Moore 1977; Goldblatt and Johnson 1991
E. tenella var. *tenella*	10	10 (2), 20, 30	Moore 1977; Goldblatt and Johnson 1991
E. tenuifolia (A.Rich.) Steud.	10	20 (6)	Ornduff 1967; Moore 1973, 1977; Goldblatt 1983; Goldblatt and Johnson 1996
E. tephrosantos Schult.	10	30	Goldblatt 1981
E. tremula Hochst.	10	10 (4), 14 (2), 14+, 20 (2)	Ornduff 1967; Federov 1969; Moore 1977; Goldblatt 1983, 1988; Goldblatt and Johnson 1990, 1991
E. trichodes Wood	10	20	Goldblatt 1981
E. unioloides Nees ex Steud.	10	9 (2), 10 (6), c.15, 30 (2)	Federov 1969; Moore 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1990, 1991
E. usambarensis Napper	10	40	Ornduff 1967
E. variabilis Gaudich.	10	20	Goldblatt 1981
E. viscosa Trin.	10	8, 20, 30 (4)	Federov 1969; Moore 1972, 1977; Goldblatt 1988; Goldblatt and Johnson 1994
E. zeylanica Nees & Meyen	10	18, 20, 30, c.40	Federov 1969
Erioneuron avenaceum (Kunth) Tateoka	8	8 (2), 16	Moore 1970; Goldblatt 1988
E. grandiflorum (Vasey) Tateoka	8	8 (2), 16 (2)	Moore 1970, 1973; Goldblatt 1981
E. nealleyi (Vasey) Tateoka	8	8	Ornduff 1968
E. pilosum (Buckley) Nash	8	8 (4), 16	Ornduff 1968; Moore 1970, 1973; Goldblatt 1981
E. pulchellum (Kunth) Tateoka	8	8 (3), 16	Moore 1970, 1973; Goldblatt 1981
Eustachys petraea (Sw.) Desv.	10	20 (3)	Ornduff 1968; Goldblatt 1981
E. uliginosa (Hack.) Herter (as *Chloris uliginosa* Hack.)	10	20	Federov 1969
Gouinia gautemalensis (Hack.) Swallen	10	38	Moore 1974
G. latifolia Vasey	10	20 (2)	Federov 1969; Goldblatt 1981

G. longiramea Swallen (as *Gouinia virgata* (J.Presl.) Scribn.)	10	20 (4)	Federov 1969; Moore 1970, 1973; Goldblatt and Johnson 1998
Griffithsochloa multifida (Griffiths) G.J.Pierce	10	10	Goldblatt 1981
Gymnopogon ambiguus (Michx.) B.S.P.	10	20	Moore 1970
G. fastigiatus Nees	10	20 (2)	Moore 1973; Goldblatt 1981
G. foliosus Nees	10	10	Goldblatt 1981
G. spicatus (Spreng.) Kuntze	10	10	Goldblatt 1981
Harpachne schimperi Hochst.	10	20	Ornduff 1967
Hilaria annua Reeder & C.Reeder	9	18	Goldblatt and Johnson 1991
H. belangeri (Steud.) Nash	9	18 (3), 36 (3), 37 (3), 38, 41, 45	Ornduff 1967; Federov 1969; Moore 1970
H. cencroides Kunth	9	22, 36 (4), 37	Ornduff 1967, 1968, 1969; Federov 1969; Moore 1973
H. ciliata Nash	9	36 (4), 37	Ornduff 1967, 1968; Moore 1970; Goldblatt 1988
H. jamesii Benth.	9	9, 18, 19, 36	Ornduff 1967; Goldblatt 1981, 1985
H. mutica Benth.	9	18 (3), 19, c.27 (2), 36 (2), c.90	Federov 1969; Moore 1970, 1973; Goldblatt 1981
H. rigida Scribn.	9	18, 54	Goldblatt 1981, 1988
H. swallenii Cory	9	27, 36, 45, c.60	Federov 1969; Goldblatt 1988
Jouvea pilosa Scribn.	10	10 (4)	Ornduff 1969; Moore 1973, 1974
J. straminea E.Fourn.	10	10 (2)	Ornduff 1969; Moore 1973
Kengia hackelii (Honda) Packer	10	20	Ornduff 1969
K. serotina (L.) Packer	10	20	Federov 1969
Leptochloa caerulescens Steud.	10	10 (3)	Moore 1977; Goldblatt 1981
L. capillacea P.Beauv.	10	10	Federov 1969
L. chinensis Nees	10	10, 18, 20 (7), 27	Federov 1969; Moore 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1990, 1996
L. cognatum (Schult.) Chase	10	18, 36	Moore 1970
L. dubia Nees	10	20 (3), 30 (2), 40 (2)	Ornduff 1967, 1968; Federov 1969; Moore 1970; Goldblatt 1988

L. dubia Nees (as *Diplachne dubia* Scribn.)	10	20	Federov 1969
L. fusca (L.) Kunth subsp. *fascicularis* (Lam.) N.Snow (as *Leptochloa fascicularis* A.Gray)	10	10, 20	Ornduff 1968; Moore 1973
L. fusca subsp. *uninervia* (J.Presl) N.Snow (as *Leptochloa uninervia* (J.Presl.) Hitchc. & Chase)	10	10 (2)	Federov 1969; Moore 1970
L. nealleyi Vasey	10	20	Federov 1969
L. neesii (Thwaites) Benth.	10	20	Moore 1977
L. obtusiflora Trin. ex Steud.	10	10	Federov 1969
L. panicea (Retz.) Ohwi	10	10 (3), 10+1B, 20	Federov 1969; Goldblatt 1983, 1988; Goldblatt and Johnson 1990
L. panicea subsp. *brachiata* (Steud.) N.Snow (as *Leptochloa filiformis* (Lam.) P.Beauv.)	10	10 (4)	Federov 1969; Moore 1970; Goldblatt 1981; Goldblatt and Johnson 1990
L. panicoides (J.Presl.) Hitchc.	10	10	Goldblatt 1985
L. phleoides (Vill.) Rchb.	10	6, 10	Moore 1972; Goldblatt and Johnson 1990
L. polystachya Benth.	10	10	Federov 1969
L. scabra Nees	10	30 (2)	Moore 1974, 1977
L. uniflora Hochst. ex A.Rich.	10	10, 18, 20	Moore 1977; Goldblatt 1981
L. virgata (L.) P.Beauv.	10	20 (4)	Federov 1969; Ornduff 1969; Moore 1973
L. viscida (Scribn.) Beal	10	20	Moore 1973
Leptochloöpsis virgata (Poir.) Yates	10	20	Moore 1974
Lepturus cylindricus (Willd.) Trin.	7	13, 26	Federov 1969
L. filiformis Trin.	7, 9	7 (2), 18	Federov 1969
L. incurvatus (L.f.) Trin.	7, 9	7, 18 (3)	Federov 1969; Goldblatt 1981
L. pannonicus Kunth	7	7 (2)	Federov 1969
L. radicans A.Camus	9	9 (2)	Federov 1969; Moore 1977
L. repens (G.Forst.) R.Br.	9	27 (2)	Federov 1969; Moore 1973
Lycurus phleoides Kunth	10	14, 20 (6)	Ornduff 1967, 1969; Federov 1969; Moore 1973; Goldblatt 1981
Microchloa kunthii Desv.	10, 6	12 (3), 20 (2), 22	Ornduff 1967, 1969; Moore 1974; Goldblatt 1981, 1985
M. indica (L.f.) P.Beauv.	6	6 (2), 12, c.18, 24	Federov 1969; Moore 1977; Goldblatt and Johnson 1998
Monanthochloë littoralis Engelm.	10	20 (2)	Ornduff 1969; Goldblatt 1988

Mosdenia phleoides Stent	10	20	Federov 1969
Muhlenbergia aguascalientensis Y.Arrieta & Lacerda-Lemus	10	10	Goldblatt and Johnson 2000
M. andina Hitchc.	10	5, 10 (2)	Ornduff 1967; Federov 1969; Moore 1971
M. annua (Vasey) Swallen	10	10 (2)	Goldblatt and Johnson 1991, 1994
M. arizonica Scribn.	10	10	Moore 1970
M. articulata Scribn.	10	20	Moore 1970
M. asperifolia (Trin.) Parodi	10	10 (3), 11, 14	Ornduff 1967; Federov 1969; Moore 1970; Goldblatt 1983
M. biloba Hitchc.	10	8	Goldblatt and Johnson 1991
M. brachyphylla Bush	10	20 (2)	Ornduff 1967; Federov 1969
M. brevis C.O.Goodd.	10	10 (4)	Moore 1970; Goldblatt and Johnson 1991, 1994
M. bushii R.W.Pohl	10	20	Moore 1971
M. californica Vasey	10	40	Ornduff 1967
M. cilliata (Kunth) Trin.	10, 9	9 (2), 10 (3)	Moore 1970; Goldblatt and Johnson 1991, 1994
M. confusa (E.Fourn.) Swallen	10	30	Moore 1970
M. crispiseta Hitchc.	10	10 (3)	Moore 1970; Goldblatt and Johnson 1991, 1994
M. curviaristata (Ohwi) Ohwi	10	20	Goldblatt 1981
M. curviaristata var. *curviaristata*	10	20	Goldblatt and Johnson 1991
M. curviaristata var. *nipponica* Ohwi	10	20	Goldblatt and Johnson 1991
M. cuspidata Rydb.	10	10	Goldblatt 1983
M. depauperata Scribn.	10	10 (4)	Ornduff 1969; Moore 1970; Goldblatt and Johnson 1991, 1994
M. distans Swallen ex Hitchc.	10	20	Ornduff 1969
M. diversiglumis Trin.	10	10 (3)	Ornduff 1969; Goldblatt and Johnson 1991, 1994
M. eludens C.Reeder	10	20 (2)	Goldblatt and Johnson 1991, 1994
M. emersleyi Vasey	10	20 (3), 30, 32	Federov 1969; Ornduff 1969; Moore 1970
M filiformis Rydb.	9	9 (3)	Federov 1969; Goldblatt and Johnson 1991, 1994
M. filiformis var. *fortis* E.H.Kelso	9	9	Moore 1970
M. flaviseta Scribn.	10	10	Moore 1970
M. fragilis Swallen	10	10 (2)	Goldblatt and Johnson 1991, 1994
M. frondosa (Poir. ex Lam.) Fernald	10	20	Moore 1971

M. frondosa f. *commutata* (Scribn.) Fernald	10	20	Ornduff 1967
M. frondosa f. *frondosa*	10	20	Ornduff 1967
M. gigantea Hitchc.	10, 6	10, 12	Federov 1969; Ornduff 1969
M. glabrifloris Scribn.	10	20	Moore 1971
M. glauca Mez	10	30 (2)	Ornduff 1969; Moore 1970
M. glomerata (Willd.) Trin.	10	10 (3), 20 (2)	Ornduff 1967; Federov 1969; Moore 1971; Goldblatt 1983
M. grandis Vasey	10	10	Moore 1970
M. gypsophila C.Reeder & Reeder	10	10	Ornduff 1968
M. hakonensis (Hack.) Makino	10	20 (2)	Federov 1969; Goldblatt and Johnson 1991
M himalayensis Hack.	10	20 (2)	Moore 1974; Goldblatt 1981
M. huegelii Trin.	10	20 (3), 21	Federov 1969; Goldblatt 1981; Goldblatt and Johnson 1990
M. implicata (Kunth) Trin.	10	10 (5)	Ornduff 1968; Moore 1970, 1973, 1977; Goldblatt and Johnson 1991, 1994
M. involuta Swallen	6	12	Moore 1970
M. japonica Steud.	10	20 (2), 21 (2)	Federov 1969; Ornduff 1969; Goldblatt and Johnson 1991
M. lehmanniana Henr.	10	10+2B	Goldblatt 1981
M. leptoura Hitchc.	10	20	Moore 1970
M. lindheimeri Hitchc.	10, 6	10 (3), 13	Ornduff 1968; Federov 1969; Moore 1970
M. longistolon Ohwi	10	20, 21	Federov 1969; Goldblatt and Johnson 1991
M. macrostis Hitchc.	10	20, 30	Ornduff 1969; Moore 1970
M. macroura (Kunth) Hitchc.	10, 6	10, 12, c.14, 20 (2)	Ornduff 1968, 1969; Federov 1969; Moore 1970
M. mexicana (L.) Trin.	10	20 (4)	Federov 1969; Moore 1971; Goldblatt 1983
M. mexicana (L.) Trin. *f. ambigua* (Torr.) Fernald	10	20	Ornduff 1967
M. mexicana f. *mexicana*	10	20	Ornduff 1967
M. microsperma (DC.) Kunth	10	10 (2)	Goldblatt and Johnson 1991, 1994
M. minutissima (Steud.) Swallen	10	15, 20, 30 (4)	Ornduff 1968; Moore 1970; Goldblatt 1983; Goldblatt and Johnson 1991, 1994
M. montana Hitchc.	10	20 (2)	Moore 1970; Goldblatt and Johnson 2000
M. parviglumes Vasey	10	20	Moore 1970
M. pectinata C.O.Goodd.	10	10 (2)	Goldblatt and Johnson 1991, 1994
M. peruviana (P.Beauv.) Steud.	10	15	Goldblatt and Johnson 1994
M. plumbea Hitchc.	10	20	Ornduff 1969

M. polycaulis Scribn.	10	10, 20 (2)	Federov 1969; Ornduff 1969; Moore 1970
M. porteri Scribn.	10, 6	10, 23/2, 12	Ornduff 1968; Federov 1969; Moore 1970
M. pubescens Hitchc.	10	20 (3), 23, c.30	Ornduff 1967, 1969; Moore 1970
M. pubigluma Swallen	10	10, 15	Ornduff 1969; Moore 1970
M. pulcherrima Scribn.	10	15	Moore 1970
M. pungens Thurb.	10	21, 30	Federov 1969
M. purpusii Mez	10	10	Moore 1970
M. pusilla Steud.	10	15	Goldblatt and Johnson 1991
M. quadridentata (Kunth) Trin.	10	10	Goldblatt and Johnson 2000
M. racemosa B.S.P.	10	20 (3)	Ornduff 1967; Moore 1971; Goldblatt 1983
M. ramosa (Hack.) Makino	10	20	Goldblatt and Johnson 1991
M. ramulosa (Kunth) Swallen	10	10 (4)	Ornduff 1968; Moore 1973; Goldblatt and Johnson 1991, 1994
M. reederorum Soderstr.	10	26, 34 (2)	Ornduff 1969; Moore 1970
M. repens Hitchc.	10, 9	30, c.35, c.36 (2)	Federov 1969; Ornduff 1969; Moore 1970
M. reverchonii Vasey & Scribn.	10	10, 20	Federov 1969; Moore 1970
M. richardsonis Rydb.	10	20 (2)	Federov 1969; Goldblatt 1983
M. rigens Hitchc.	10	20 (2)	Federov 1969; Ornduff 1969
M. rigida (Kunth) Kunth	10	20 (3), c.22	Ornduff 1967; Federov 1969; Moore 1970
M. rigida complex	10	20	Ornduff 1969
M. robusta (E.Fourn.) Hitchc.	10	20	Moore 1970
M. schmitzii Hack.	10	20 (2)	Goldblatt and Johnson 1991, 1994
M. schreberi J.F.Gmel.	10	10, 20 (2)	Ornduff 1967; Federov 1969; Moore 1971
M. setarioides E.Fourn.	10	20 (2)	Moore 1973; Goldblatt 1981
M. setifolia Vasey	10	20	Moore 1970
M. sheperdii (Vasey) Swallen	10	8	Goldblatt and Johnson 1991
M. sinuosa Swallen	10, 6	10 (2), 12 (2)	Goldblatt and Johnson 1991, 1994
M. sobolifera (Muhl. ex Willd.) Trin.	10	10, 20	Ornduff 1967; Moore 1971
M. spiciformis Trin.	10	20	Moore 1970
M. squarrosa Rydb.	10	20	Federov 1969
M. straminea Hitchc.	10, 6	10, 21/2, 11, 12	Goldblatt and Johnson 2000
M. straminea Hitchc. (as *Muhlenbergia virescens* (Kunth) Trin.)	10, 6	10 (4), 10+1s, 12, 20 (3), 21/2	Ornduff 1969; Moore 1970; Goldblatt and Johnson 2000
M. stricta (J.Presl.) Kunth	10	c.14; 16	Moore 1970

M. strictior Beal	10	10 (3)	Moore 1970; Goldblatt and Johnson 1991, 1994
M. silvatica (Torr.) Torr. ex Gray	10	20 (3)	Ornduff 1967; Moore 1971; Goldblatt 1981
M. tenella (Kunth) Trin.	10	10 (4)	Moore 1972, 1973; Goldblatt and Johnson 1991, 1994
M. tenuifolia (Kunth) Kunth	10	20 (5)	Ornduff 1968, 1969; Moore 1970; Goldblatt and Johnson 1991, 1994
M. tenuifolia (Kunth) Kunth (as *Muhlenbergia monticola* Buckley)	10	10 (2), 20 (2)	Ornduff 1968, 1969; Federov 1969; Moore 1970
M. tenuiflora B.S.P.	10	10, 20 (2)	Ornduff 1967; Federov 1969; Moore 1971
M. tenuissima (J.Presl.) Kunth	10	10 (2)	Goldblatt and Johnson 1991, 1994
M. texana Buckley	10	20 (3)	Moore 1970; Goldblatt and Johnson 1991, 1994
M. umbrosa Scribn.	10	20	Federov 1969
M. uniflora Fernald	10	c.21	Federov 1969
M. utilis Hitchc.	10	10	Ornduff 1968
M. vaginata Swallen	9	9 (3)	Moore 1970; Goldblatt and Johnson 1991, 1994
M. villiflora Hitchc.	10	10, 11	Ornduff 1969
M. villosa Swallen	10	10	Ornduff 1969
M. wolfii Rydb.	10	10	Moore 1970
Munroa mendocina Phil.	8	8	Federov 1969
M. squarrosa Torr.	8	8 (2)	Moore 1973; Goldblatt 1981
Neeragrostis reptans (Michx.) Nicora	10	30	Moore 1970
Neostapfia colusana Davy	10	20 (2)	Ornduff 1967; Goldblatt 1985
Neyraudia arundinacea (L.) Henrard	10	20	Goldblatt and Johnson 1990
N. madagascariensis Hook.f.	10	20	Ornduff 1967
N. neyraudiana (Kunth) Keng ex Hitchc.	10	20 (4)	Federov 1969; Goldblatt 1981, 1985
Oxychloris scariosa (F.Muell.) Lazarides (as *Chloris scariosa* F.Muell.)	10	20 (3)	Ornduff 1968; Federov 1969

Orcuttia californica Vasey	10, 6	12, 16	Federov 1969; Goldblatt 1985
Orcuttia californica Vasey	10, 6	12, 16	Federov 1969; Goldblatt 1985
O. fragilis Swallen	10	20	Goldblatt 1985
O. greenei Vasey	6	12 (2)	Federov 1969; Goldblatt 1985
O. inaequalis Hoover	6	12	Goldblatt 1985
O. mucronata Crampton	10	20	Goldblatt 1985
O. pilosa Hoover	10	15, 16	Federov 1969; Goldblatt 1985
O. tenuis Hitchc.	10	13, 23	Federov 1969; Goldblatt 1985
O. viscida (Hoover) Reeder	10	14	Goldblatt 1985
Oropetium capense Stapf	10	20	Moore 1974
O. minimum (Hochst.) Pilg.	9	18	Goldblatt and Johnson 1998
O. thomaeum Trin.	10, 9	5, 9 (2), 10 (2)	Federov 1969; Moore 1972, 1977; Goldblatt and Johnson 1998
Pappophorum bicolor E.Fourn. ex Hemsl.	10	20, 30, 50 (3)	Ornduff 1968; Federov 1969; Moore 1970
P. mucronulutum Nees	10	30 (5)	Ornduff 1968; Federov 1969; Moore 1970
P. pappiferum (Lam.) Kuntze	10	30, 50	Moore 1977; Goldblatt 1981
Pentarrhaphis polymorpha Griffiths	10	10	Federov 1969
P. scabra Kunth	10	10 (2)	Moore 1974
Pereilema brasilianum Trin.	10	20	Goldblatt 1981
P. ciliatum E.Fourn. ex Hemsl.	10	10, 20	Moore 1972, 1970
P. crinitum J. & C.Presl.	10	10 (3)	Moore 1972, 1977; Goldblatt 1988
Perotis hilderbrandtii Mez	10	20	Ornduff 1968
P. hordeiformis Nees ex Hook. & Arn.	10, 9	9, 18, 20	Federov 1969; Goldblatt and Johnson 1990
P. indica (L.) Kuntze	10	10 (2), 20	Moore 1972, 1977; Goldblatt 1981
P. patens Gand.	10	20 (3)	Federov 1969; Goldblatt 1981, 1983
P. vaginata Hack.	10	20 (2)	Goldblatt 1981, 1985
Pringleochloa stolonifera Scribn.	10	20 (2)	Ornduff 1968, 1969
Redfeldia flexuosa (Thurb.) Vasey	10	25/2, 12II+1I	Goldblatt 1981
Reederochloa eludens Soderstr. & H.F.Decker	10	19 (2)	Ornduff 1969; Goldblatt 1988
Schedonnardus paniculatus Trel.	10	10 (4), 15	Federov 1969; Ornduff 1969; Moore 1970; Goldblatt 1981, 1983
Scleropogon brevifolius Phil.	10	14, 20 (4)	Ornduff 1969; Moore 1970, 1973; Goldblatt 1981

Spartina alterniflora Loisel.	10, 7	20, 21, 28, 30, 31 (7), 35 (3)	Federov 1969; Moore 1970, 1972; Goldblatt 1981
S. anglica C.E.Hubb.	10	30, 31, c.60, 64	Moore 1972; Goldblatt 1985
S. arundinacea Carmich.	10	20	Moore 1970
S. bakeri Merr.	10, 7	20 (2), 21	Federov 1969; Moore 1970
S. caespitosa A.A.Eaton	10, 7	20, 21	Federov 1969; Moore 1972
S. cynosuroides Roth	10, 7	14, 20, 21 (3), 40	Federov 1969; Moore 1970
S. foliosa Trin.	10	30	Goldblatt 1988
S. glabra Muhl.	10, 7	28, 31 (2)	Federov 1969; Moore 1970
S. gracilis Trin.	10, 7	20 (3), 21 (2)	Federov 1969; Moore 1970; Goldblatt 1981, 1983
S. leiantha Benth.	7	28	Federov 1969
S. maritima Fernald	10, 7	28, 30 (4)	Federov 1969; Moore 1970, 1972
S. michauxiana Hitchc.	7	14	Federov 1969
S.x neyrautii Foucaud	10	31	Goldblatt 1981
S. patens Muhl.	10, 7	14, 20 (5), 21, 28	Federov 1969; Ornduff 1969; Moore 1970, 1972
S. pectinata Bosc ex Link	10, 7	20 (6), 20+2B, 21 (2), 24, 35, 40	Federov 1969; Moore 1970, 1972; Goldblatt 1981, 1983
S. schreberii J.F.Gmel.	10	20 (2)	Federov 1969
S. spartinae (Trin.) Merr.	10, 7	14, 20(4), 21	Federov 1969; Moore 1970, 1973
S. stricta Roth	7	28	Federov 1969
S. townsendii H. & J.Groves	10, 7	30, 31 (4), 38, 45, 60, 61, 62 (2), 63 (3)	Federov 1969; Moore 1970, 1977; Goldblatt 1981, 1985
S. townsendii-sterilis f. *donegalensis*	10	60	Moore 1974
Sporobolus africanus (Poir.) Robyns & Tournay	6/9	18 (2)	Ornduff 1968; Federov 1969; Goldblatt and Johnson 1996
S. airoides Torr.	9	c.45, 54, 63	Federov 1969
S. airoides (Torr.) Torr. var. *airoides*	10	c.40	Ornduff 1968
S. agrostoides Chiov.	6	24	Goldblatt 1981
S. arabicus Boiss.	6/9	18	Goldblatt and Johnson 1998

S. asper (Michx.) Kunth var. *asper* (Michx.) Kunth	9	27	Goldblatt 1981
S. asper var. *macer* (Trin.) Shinners	10, 6	18, 19, 20, 21, 22, 23, 24	Goldblatt 1981
S. atrovirens Kunth	6	12	Goldblatt 1988
S. buckleyi Vasey	10	20 (2)	Federov 1969; Moore 1972
S. ciliatus J.Presl.	9	27	Moore 1973
S. clandestinus (Biehler) Hitchc.	6, 9	23, 24, 26, 27, 28	Goldblatt 1981
S. compositus (Poir.) Merr. (as *Sporobolus asper* Kunth)	9	27 (4), c.44, 54	Federov 1969; Moore 1970; Goldblatt 1983
S. congoensis Franch.	10	10	Goldblatt 1983
S. contractus Hitchc.	6/9	18 (3)	Federov 1969; Goldblatt 1981; Goldblatt and Johnson 1991
S. coromandelianus (Retz.) Kunth	6	12, 18 (6)	Moore 1974, 1977; Goldblatt 1988; Goldblatt and Johnson 1990, 1991, 1998
S. cubensis Hitchc.	10, 6/9	36, 40, c.45	Ornduff 1969
S. crytandrus A.Gray	9	9, 18 (5), 19 (6), 36	Ornduff 1968; Federov 1969; Moore 1970; Goldblatt 1981, 1983; Goldblatt and Johnson 1991
S. diander P.Beauv.	6	12 (13), 18 (7), 24	Federov 1969; Moore 1973, 1974, 1977; Goldblatt 1981, 1985; Goldblatt and Johnson 1990, 1991, 1998
S. elongatus R.Br.	6/9	18 (3)	Federov 1969
S. festivus A.Rich.	10, 6	10, 12	Ornduff 1967; Goldblatt 1983
S. fimbriatus (Trin.) Nees	6, 9	18, 24, 27	Goldblatt 1981, 1983
S. flexuosus Rydb.	6/9	18, 19	Federov 1969; Goldblatt 1981
S. giganteus Rydb.	6/9	18	Federov 1969
S. helvola T.Durand & Schinz	10, 6/9	8, 10, 14, 16, 18 (3)	Goldblatt and Johnson 1990, 1991
S. heterolepis A.Gray	6/9	36 (2)	Federov 1969; Goldblatt 1983
S. indicus (L.) R.Br.	10, 6, 9	9, 12 (6), 18 (9), 20 (2), 41/2, 21, 43/2, 22, 45/2, c.24	Ornduff 1967, 1968, 1969; Federov 1969; Moore 1974, 1977; Goldblatt 1988; Goldblatt and Johnson 1990, 1991, 1994

S. indicus (L.) R.Br. (as *Sporobolus beteroanus* (Trin.) Hitchc. & Chase)	10, 6/9	18, c.22	Federov 1969; Ornduff 1967
S. indicus. var. *indicus* Jovet & Guédès (as *Sporobolus poiretti* Hitchc.)	6/9	18 (7)	Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1972
S. indicus var. *major* (Büse) Baaijens (as *Sporobolus fertilis* (Steud.) Clayton)	6	12, 18 (3), 24 (5)	Ornduff 1969; Moore 1974, 1977; Goldblatt 1981, 1983, 1985
S. indicus var. *pyramidalis* (P.Beauv.) Veldkamp (as *Sporobolus jacquemontii* Kunth)	6	12 (3)	Moore 1972, 1973; Goldblatt 1981
S. infirmus Mez	10	10	Goldblatt 1981
S. interruptus Vasey	10	15	Goldblatt 1981
S. japonicus Maxim. ex Rendle	10	20 (2)	Federov 1969
S. macrospermus Scribn. ex Beal	10	20	Moore 1970
S. maderaspatanus Bor	6	6	Goldblatt 1988
S. marginatus Hochst. ex A.Rich.	10, 9	9 (6), 9+, 10 (2), 18 (4)	Moore 1971, 1972; Goldblatt 1988; Goldblatt and Johnson 1990, 1991
S. molleri Hack.	6	6 (4)	Ornduff 1967; Goldblatt 1981, 1983
S. montanus Engl.	10, 9	9, 10	Goldblatt 1981; Goldblatt and Johnson 1996
S. nealleyi Vasey	10	20 (3)	Ornduff 1969; Moore 1973; Goldblatt 1981
S. neglectus Nash	6/9	18 (2)	Federov 1969; Goldblatt 1983
S. nervosus Hochst.	6/9	18	Goldblatt and Johnson 1998
S. olivaceus Napper	6	12	Moore 1972
S. pectinellus Mez	6	12	Moore 1977
S. piliferus Kunth	10, 6/9	10, 18, 20 (2)	Goldblatt 1981, 1985, 1988
S. purpurascens Ham.	10	30 (2)	Moore 1973, 1974
S. pyramidalis P.Beauv.	6	12 (5), 18	Ornduff 1967; Moore 1977; Goldblatt 1981
S. pyramidatus (Lam.) Hitchc.	6, 9	12 (4), 18 (3), 27	Ornduff 1968, 1969; Federov 1969; Moore 1970, 1972, 1973
S. rigens E.Desv.	6/9	c.72	Goldblatt 1981
S. robustus Kunth	10	20 (2)	Ornduff 1967; Goldblatt 1981
S. sanguineus Rendle	10	10	Goldblatt 1983
S. spiciformis Swallen	10	20 (2)	Moore 1970, 1973
S. subtilis Kunth	10	10	Goldblatt 1981

S. tenuissimus Kuntze	10, 6	6 (3), 20	Ornduff 1967; Federov 1969; Moore 1974; Goldblatt 1981
S. tremulus Kunth	10, 6	10 (2), 24	Federov 1969; Moore 1977
S. trichodes Hitchc.	6	12	Ornduff 1967
S. vaginiflorus (Torr. ex A.Gray) A.W.Wood	9	27 (2)	Federov 1969; Moore 1970
S. virginicus (L.) Kunth	10, 9	9, 10 (5), 15 (2), 31/2, 20, 25, 30	Moore 1970, 1972, 1974; Goldblatt 1981; Goldblatt and Johnson 1991
S. virginicus var. *arenarius* (Gouan) Maire	10, 6/9	23/2-15	Moore 1977
S. virginicus var. *minor* F.M.Bailey	10	10 (2), 15 (2), 20 (2)	Goldblatt 1983
S. virginicus var. *virginicus* (L.) Kunth	10	20 (2)	Goldblatt 1983
S. wallichii Munro ex Trin.	10, 6	c.20, 12	Federov 1969; Moore 1977
S. wrightii Munro ex Scribn.	6/9	18	Federov 1969
Tetrapogon spathaceus Hack. ex Dur. & Schinz	9	9 (2)	Ornduff 1968; Federov 1969
T. tenellus Chiov.	10, 9	9 (2), 10	Ornduff 1968; Federov 1969; Goldblatt and Johnson 1998
T. villosus Desf.	10	10 (2)	Moore 1972; Goldblatt and Johnson 1998
Tragus berteronianus Schult.	10	10 (10)	Ornduff 1967, 1968, 1969; Federov 1969; Moore 1970, 1973, 1974; Goldblatt 1983; Goldblatt and Johnson 1998
T. biflorus Schult.	10	10 (4)	Moore 1972, 1977; Goldblatt 1981, 1983
T. muricatus Moench	10	18, 20	Moore 1977; Goldblatt 1981
T. racemosus (L.) All.	10	20 (10)	Moore 1977; Federov 1969; Goldblatt 1981, 1983, 1988; Goldblatt and Johnson 1994
T. roxburghii Panigrahi	10	10 (2)	Goldblatt and Johnson 1990, Johnson 1998
Trichloris crinita (Lag.) Parodi	10	20	Federov 1969
T. mendocina (Phil.) Kurtz	10	20 (2)	Federov 1969
T. pluriflora E.Fourn.	10	30, 40	Federov 1969; Moore 1970
Tridens albescens Wooton & Standl.	10	30 (3)	Moore 1970, 1973; Goldblatt 1981
Tridens albescens Wooton & Standl. (as *Triodia albescens* (Vasey))	8	16, 36	Federov 1969

T. ambigua Schult.	10	20	Moore 1970
T. avenaceus Hitchc.	8	16	Federov 1969
T. buckleyanus Nash	10	20	Goldblatt 1988
T. elongatus (Buckley) Nash	10	20 (2)	Federov 1969
T. eragrostoides Nash	10	20 (2)	Federov 1969; Moore 1970
T. flavus Hitchc.	10	20 (2)	Federov 1969
T. grandiflorus (Vasey) Wooton & Standl.	8	16	Federov 1969
T. muticus Nash	10	20 (5)	Federov 1969; Moore 1973; Goldblatt 1981
T. muticus var. *elongates* (Buckley) Shinners	10	20, 20+2B	Moore 1970
T. nealleyi (Vasey) Wooton & Standl.	8	8	Federov 1969
T. pilosus (Buckley) Hitchc.	8	8	Federov 1969
T. pulchellus (Kunth) Hitchc.	8	8	Federov 1969
T. strictus Nash	10	20	Moore 1970
T. texanus Nash	10	20 (5)	Ornduff 1968; Federov 1969; Moore 1970
Triodia basedowii E.Pritz.	10	c.30	Moore 1973
T. buckleyana Vasey	8	16	Federov 1969
T. cuprea Jacq.	10	21	Federov 1969
T. elongata (Buckley) Smyth	8	16	Federov 1969
T. flava Hitch.	10	14	Federov 1969
T. iritans R.Br.	10	c.15	Moore 1973
T. mutica Benth. ex S.Watson	8	16	Federov 1969
T. pilosa (Buckley) Merr.	8	8 (2)	Federov 1969
T. stricta Vasey	8	16	Federov 1969
T. texana S.Watson	8	8	Federov 1969
T. thomsonii Petrie	8	24	Federov 1969
Triplasis purpurea Chapm.	10	20	Moore 1970
Tripogon bromoides Roth ex Roem. & Schult.	10	10 (4)	Moore 1977; Goldblatt 1981, 1985
T. chinensis Hack.	10	10	Goldblatt and Johnson 1994
T. filiformis Nees ex Steud.	10	10 (5)	Moore 1974, 1977; Goldblatt 1981, 1985
T. jacquemontii Stapf	10	10, 20	Goldblatt 1981, 1988
T. japonicus (Honda) Ohwi	10	10	Federov 1969
T. minimus Hochst. ex Steud.	10	10 (4)	Ornduff 1968; Federov 1969; Moore 1974, 1977
T. spicatus Ekman	10	10 (2)	Federov 1969; Moore 1974

T. trifidus Munro ex Hook.f.	10	10 (3), 20, 29, 30 (3)	Moore 1974, 1977; Goldblatt 1981, 1985
T. wardii Bor	10	10	Moore 1977
Uniola latifolia Michx.	6	12, 24 (6)	Ornduff 1968; Federov 1969
U. laxa (L.) B.S.P.	6	12 (3)	Ornduff 1968; Federov 1969
U. nitida Baldwin ex Elliott	6	12 (2)	Ornduff 1968
U. ornithorhyncha Steud.	6	12 (2)	Ornduff 1968
U. ornithorhyncha x laxa	6	12	Ornduff 1968
U. paniculata Roth	10	20 (2)	Ornduff 1968
U. pittieri Hack.	10	20 (2)	Moore 1973, 1974
U. sessiliflora Poir.	6	12 (3)	Ornduff 1968; Federov 1969
U. virgata Griseb.	10	20 (2)	Ornduff 1968
Vaseyochloa multinervosa (Vasey) Hitchc.	10	28?, 34	Federov 1969
Willkommia texana Hitchc.	10	30	Federov 1969
Zoysia japonica Steud.	10	20 (2)	Federov 1969
Z. macrostachya Franch. & Sav.	10	20 (2)	Federov 1969
Z. matrella (L.) Merr.	10	10, 20 (4)	Federov 1969; Moore 1977; Goldblatt 1981
Z. tenuifolia Trin.	10	20 (2)	Federov 1969
Zoysia sp.	10	20	Federov 1969

APPENDIX D. Aligned sequence data of chloridoid and outgroup taxa for *ITS*. Numbers indicate the consecutive positions of 1 to 668 (5' to 3') from the beginning of the *ITS*1 region to the end of the *ITS*2 region. Dashes denote gaps. Arrows indicate the beginning of the *ITS*1, 5.8S and *ITS*2 regions. N indicates large regions of missing data where sequencing reactions failed. Due to the large size of the matrix and to keep sequences together, this appendix starts on the next page.

```
                                  1                                                  50
IMPERATACYLINDRICA                NNNNNNNNNN NNNNNNNNNN NNNCCGCGAA CGA-GTCTCT CGTGCCGCCG
SORGHUMHALEPENSE                  TCGTGACC-T TAAACAAAAC AGACCGTGAA CAT-GTCTCT CATGTCGTCG
PANICUMLANIPES                    TCGTGACCCT TAAACAAAAC AGACCGTGAA CGT-GTCATC CATGTCGTCT
PANICUMSTAPFIANUM                 TCGTGACCCT TAAACAAAAC AGACCGTGAA CAT-GTCATC CATGTCGTCG
KARROOCHLOAPURPUREA6241           NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
CHAETOBROMUSINVOLUCRATES6284      NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Merxmuellerarangei                TCGTGACCCT GACC-AAAAC AGACCGCGAA CGT-GTCATC CGTGCCGCCG
Centropodiaglauca                 TCGTGACCCT GACC-AAAAC AGACCGCGAA CGC-GTCACC CATGCCGCCG
Cynodondactylon5248               TCGTGACCCT GACC-AAAAC AAACCGTGAA CCT-GTCACC TATGCTGCCG
Cynodondactylon7480               TCGTGACCCT GACC-AAAAC AAACCGTGAA CCT-GTCACC TATGCTGCCG
Cynodondactylon                   TCGTGACCCT GATG-AAAAC AACCCGTGAA TTT-GTCACC TATGCTGCCG
Eleusinecoracana                  TCGTGACCCT AAACCAAAAC AAACCGTGAA CAT-GTCATC CATGCTGCCG
Eleusineindica                    TCGTGACCCT AAACCAAAAC AAACCGTGAA CAT-GTCATC CATGCTGCCG
Chlorisvirgata6616                TCGTGACCCT GACC-AAAAC AGACCGTGAA CAT-GTCATC TATGCTGCCG
Chlorisvirgata7498                TCGTGACCCT GACC-AAAAC AGACCGTGAA CAT-GTCATC TATGCTGCCG
Eustachyspaspaloides5597          TCGTTACCCT GACCCAAAAT AGACCGTGAA CATTGTCATC TAAGCTGCCG
Harpochloafalx6530                TCGTGACCCT GACC-AAAAG AGACTGTGAA CAT-GTCATC CATGCTGCTG
Harpochloafalx5118                NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Harpochloafalx6670                TAGTGATCCT GACC-AAAAG AGACTGTGAA CAT-GTCATC CATGCTGGTG
Rendliaaltera5133                 TCGTGACACT GACC-AAAAT AGACTGTGAA CAT-GTCATC CATGCTGCCG
Leptochloafusca7622               TCGTGACCCT GACC-AAAAC AGACCACGAA CAT-GTCATC CATGCTGCCG
Enteropogonmacrostachyus9339      TCGTGACCCT GACC-AAAAC AGACCGTGAA CAT-GTCATC CA-GCGGCCG
Astreblalappacea                  TCGTGACCCT GACC-AAAAC AGACTGTGAA CAT-GTCATC CATGCCACCG
Muhlenbergiarichardsonis          TCGTGACCCT GACC-AAAAC AGACTGTGAA CAT-GTCATC CATGCCACCG
Triodiastenostachya               TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATGCCACCG
Microchloacaffra5146              TCGTGACCCT GACC-AAAAC AGACCGTGAA CCT-GTCATC TATTCTGCCG
Dactylocteniumaegyptium9326       TCGTGACCCT GACC-AAAAY AGACCGTGAA CGC-GTCATC CATGGTGCCG
Tragusberteronianus6620           TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATGCTCCCG
Tragusracemosus7108               TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATGCTCCCG
Traguskoelerioides6729            TCKTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATGCTCCCG
Polevansiarigida7621              TCGTGACCCT GACC-AAAAC ACACCGTGAA CAT-GTCATC CATGCTCCCG
Perotispatens9323                 TCGTGACCCT GACC-AAAAG AGATCGTGAA CTT-GTCATC TATCTTACTA
Eragrostiscurvula6529             NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostisobtusa6623              NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostisobtusa6732              TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATCCTGCCG
Eragrostisechinochloidea7485      NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostispseudobtusa7508         TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATCCTTCCG
Eragrostisechinochloidea5933      TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CAACCTGCCG
Eragrostislehmanniana20           TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATCTTGCCG
Eragrostiscurvula5191             NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostischloromelas6947         TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATCCTGCCG
Eragrostischloromelas7474         TCGTGACCCT TACC-AAAAC AGACCGCGAR CAT-GTCATC CATGCTGCCG
Eragrostisracemosa6533            NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostisbiflora6705             TCGTGACCCT TAAC-AAAAC AGACCGCGAA CAT-GTCATC CATGCTGCCG
Eragrostissuperba7470             TCGTGACCCT AACC-AAAAC AGACCGCGAA CGT-GTCATC CATGCTCCCG
Eragrostiscapensis6551            TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTCATC CATGCCGCCG
Eragrostiscapensis6532            NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Pogonarthriasquarrosa7483         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Pogonarthriasquarrosa7504         TCGTGACCCT GAAC-AAAAC AGACCGTGAA CGT-GTCATC CATCTTGCCG
Catalepisgracilis6962             TCGTGACCCT TAAC-AAAAC AGACCGCGAA CAT-GTCATC CATGCTGCCG
Catalepisgracilis6653             NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Cladoraphiscyperoides5704         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Cladoraphisspinosa6335            NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Cladoraphisspinosa4885            TCGTGACCCT GACC-AAAAC AAACCGTGAA CGT-GTCATC C-TGCCGTCG
Cladoraphiscyperoides4894         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Fingerhuthiaafricana4349          TCGTGACCCT TACG-AAAAC AGACCGTGAA CAT-GTCACC CATGCCGTCG
Fingerhuthiaafricana7507          TCGTGACCCT TACG-AAAAC AGACCGTGAA CAT-GTCACC CATGCCGTCG
Fingerhuthiaafricana4879          TCGTGACCCT TAAG-AAAAC AGACCGTGAA CAT-GTCACC CATGCCGTCG
Entoplocamiaaristulata9353        TCGTGACCCT TACC-AAAAC AGACCGTGAA CAT-GTCATC CATGCCGTCG
Enneapogonscoparius18             NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Enneapogoncenchroides7506         TCGTGATCCT GACC-AAAAC AGACCGCGAA CGT-GTTATC TAAGCCGCCG
Enneapogoncenchroides5213         TCGCGACCCT GACC-AAAAC AGACCGCGAA CGT-GTTATC TAAGCCGCCG
Enneapogonscoparius7487           TCGTGACCCT GACC-AAAAC AGACCGTGAA CGT-GTTATC CAAGCCGCCG
Schmidtiapappophoroides6334       TCGTGACCCT TAAG-AAAAC AGACCCCGAA CGA-GTCATC CATCCCGCCG
Schmidtiakalihariensis7490        TCGTGACCCT GACC-AAAAC AGACCGCGAA CGC-GTCATC CATGCCGCCG
Schmidtiakalihariensis7486        NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Sporobolusafricanus7476           TCGTGACCCT AAAC-AAAAC AGACTGTGAA TAT-GTCTTC CATGCTGTCA
Sporobolusconsimilis9354          TCGTGACCCT AACC-AAAAG AGACTGTGAA TAT-GTCATC CATTCTGTCG
Sporobolusfimbriatus9328          TCGTGACCCT AACC-AAAAT AGACTGTGAA CAT-GTCATC AATTCCACCG
```

	51				100
IMPERATACYLINDRICA	GGC-------	----------	TCCGGCCCGG	CCAAGGCCCC	CGA-GCTCCG
SORGHUMHALEPENSE	AGC-------	----------	TTTGGCTCGG	CCAAGGTCCC	CTT-GCTCCA
PANICUMLANIPES	GGC-------	----------	TACGGCCCGA	CCAAGGCCCC	CAA-CCTTCG
PANICUMSTAPFIANUM	GGC-------	----------	TACGTTCCGA	CCAAGGCCCC	CCT-TCACAT
KARROOCHLOAPURPUREA6241	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	CGA-CCTCCG
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Merxmuellerarangei	GACGCCGGGG	CTC--GCCCC	CGTCGCCCGG	CACAGGCCCC	CGA-CCTCCG
Centropodiaglauca	GCCGGCGGGG	CTC--GCCCC	CGCCGACCGG	CACAGGCCCC	CGA-CCTCCG
Cynodondactylon5248	GTTGATGGG-	CTT--GCACC	TATCTCTCGG	TCTAGGCCAC	CGA-CCTTCT
Cynodondactylon7480	GTTGATGGG-	CTT--GCACC	TATCTCTCGG	TCTAGGCCAC	CGA-CCTTCT
Cynodondactylon	GTTGATGGAG	CTT--GCACC	TATCTCTCGG	TCTAGGCCAC	CGA-CCTTCT
Eleusinecoracana	GGCGATGGGT	CTT--GCACC	CATCTCTTGG	AACAGGGCGG	CCA-CCTTCT
Eleusineindica	GGCGATGGGT	CTT--GCACC	CATCTCTTGG	AACAGGGCGG	CCA-CCTTCT
Chlorisvirgata6616	TTWGATGGGT	CTT--GCACC	TATCTCTCGG	TTTAGGCCGC	CAA-CCTTCT
Chlorisvirgata7498	TTTGATGGGT	CTT--GCACC	TATCTCTCGG	TTTAGGCCGC	CAA-CCTTCT
Eustachyspaspaloides5597	GTTGATAGGT	CTT--GCACC	TATCTCTCGG	TCTAGGCCAC	CAA-CCTTCT
Harpochloafalx6530	GTTGATGGG-	CTT--GCACC	TATCTCCCGG	TCTTGGCCAC	TGA-CCTTCT
Harpochloafalx5118	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6670	GTTGATGGG-	CTT--GCCCC	TATCTCCCGG	TTTTGGCCAC	TGA-CCTTCT
Rendliaaltera5133	GTTGATGGGG	CTT--GCACC	TATCTCTTGG	TCTAGGCCAC	CAA-CCCTCT
Leptochloafusca7622	GGTGATGGGG	CTT--GCACC	CGTCTCCCGG	TCTTGGCCAC	CGA-CCTTCT
Enteropogonmacrostachyus9339	GG-GATGGGG	CTT--GCACC	TATCTTGTCA	CGGTATCCCC	CGA-TCCTCT
Astreblalappacea	GGTGATGGGA	CTT--GCACC	TATCCCTCGG	TCTAGGCCAA	CGA-CCTTCT
Muhlenbergiarichardsonis	ATTGACGGGG	CTT--GCACC	CGTCTCTCGG	TCTGGGGCAC	ATTACCTTCA
Triodiastenostachya	GGTGACGGGG	CTC--GCAAC	CGTCACCCGG	TACAGGCCGC	CGA-CCTTCT
Microchloacaffra5146	GTTGATGGGG	CTT--GTACC	TATCTCTCGG	TCTAGGCCAC	CAA-CCTTTT
Dactylocteniumaegyptium9326	GTTGACGGGG	CTC--GCACC	CGTCTCTCGG	TAGGGCAGG-	CGA-CCTTCC
Tragusberteronianus6620	AGTGATGGGT	CTT--GCACC	CGTCTCTTGG	CCCTGGGCTC	CGA-ACTTCG
Tragusracemosus7108	AGTGATGGGT	CTT--GCACC	CGTCTCTTGG	CCCTGGGCTC	CGA-ACTTCG
Traguskoelerioides6729	AGTGACGGGT	CTT--GCACC	CGTCTCTTGG	CCCTGGGCTC	CGA-ACTTCG
Polevansiarigida7621	AGNGATGGGS	CTT--GCACC	CATCTCTCGG	TCCATGGCTC	C-A-ACTTCT
Perotispatens9323	GGTGATGGGG	-TA--GCACC	TGTCTCCTAG	TATTGGTGAC	TTA-CCTTCC
Eragrostiscurvula6529	NNNNNNNNNN	NNNNNNNNTC	AA-CTCCCGG	CTTAG-CCCC	AGA--CTTCC
Eragrostisobtusa6623	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNGC
Eragrostisobtusa6732	GGTGACGGGG	CTTTTGCCTC	GC-CTCCCGG	CTTAGGCCCC	AGA--CTTCC
Eragrostisechinochloidea7485	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostispseudobtusa7508	GGTGACGGGG	CTTTTGCCTC	GC-CTCCCGG	CTTAGGCCCC	AGA--CTTCC
Eragrostisechinochloidea5933	GGTGACGGGG	CTT--GCCCC	GC-CTCCCGG	CTTAGGCCCC	AGA--CTTCC
Eragrostislehmanniana20	GGWGACGGGG	CTT--GCCTC	GG-CTCCCGG	CTTAGGCCCC	AGA--CTTCC
Eragrostiscurvula5191	NNNNNNNNNN	NNNNNGCCTC	GG-CTCTCGG	CTTATGCCCC	AGA--CTTCC
Eragrostischloromelas6947	GGTGACGGGG	CTT--GCCTC	GR-CTCCCGG	CTTAGGCCCC	AGA--CTTCC
Eragrostischloromelas7474	GGTGACGGGG	CTT--GCCTC	GC-CTCCCGG	CTTAGGTCCC	AGA--CTTCC
Eragrostisracemosa6533	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNAGGCCCC	A-A--CTTTC
Eragrostisbiflora6705	GGTGACGGGG	CTT--GCCTC	GC-CTCCCGG	CTTAGGTCCC	AGA--CTTCT
Eragrostissuperba7470	GGCGACGGGG	CTC--ACCTC	GC-CTCCCGG	TTTAGGCCCC	AGA--CTTTC
Eragrostiscapensis6551	GCTGACGGGG	CTC--GCCTC	GC-CTCCCGG	CTTAGGCCCC	TGT--CTTCC
Eragrostiscapensis6532	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNCC
Pogonarthriasquarrosa7483	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Pogonarthriasquarrosa7504	AGTTACGGGG	CCT--GCCTC	GT-CACTCGG	CTTAGGCCCC	AGA--CTTCC
Catalepisgracilis6962	GGTGATGGGG	CTA--GCCTC	GC-CTCCCGG	CTTAGGTCCC	AGA--CTTCC
Catalepisgracilis6653	NNNNNNNNNN	NNNNNNNNNN	NNNNTCCCGG	CTTAGGTCCC	AAA--CTTCC
Cladoraphiscyperoides5704	NNNNNNNNNN	NNNNNNNNTC	GC-CTCTCGA	CTTAGGCCCC	AGA--CTTTC
Cladoraphisspinosa6335	NNNNNNNNNN	NNNNNNNCTC	GC-CTCTCGA	CTTAGGCCCC	AGA--CTTTC
Cladoraphisspinosa4885	AGGGATGGGG	CTC--GCCTC	GC-CTCTCGA	CTTAGGCCCC	AGA--CTTTC
Cladoraphiscyperoides4894	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Fingerhuthiaafricana4349	GGCGACGGGG	CTT--GCTCC	GC-CTCCCGA	CATAGGCCCC	AGA--CTTCT
Fingerhuthiaafricana7507	GGCGACGGGG	CTT--GCTCC	GC-CTCCCGA	CATAGGCCCC	AGA--CTTCT
Fingerhuthiaafricana4879	GGMGACGGGG	CTT--GCTCC	GC-CTCCCGA	CATAGGCCCC	AGA--CTTCT
Entoplocamiaaristulata9353	GGCGATAGGG	CTT--GCCTT	GT-CTCCCGA	CTTAGGCCCC	CGA--TCTCC
Enneapogonscoparius18	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNCGA	TGT--CAGCC
Enneapogoncenchroides7506	GAAGACGGGG	CTC--RCCTC	GC-CTCCCGG	CATCGGCCGA	TGT--CATCC
Enneapogoncenchroides5213	GAAGACGGGG	CTC--GCCTC	GC-CTCCCGG	CATCGGCCGA	TGT--CATCC
Enneapogonscoparius7487	GAAGACGGGG	CTC--GCCCC	GC-CTCCCGG	CCTCGGCCGA	TGT--CGTCC
Schmidtiapappophoroides6334	GGAGACGGGG	CTT--GCCTC	GC-CTCACGG	CATCGGCTGA	TGA--CCTCC
Schmidtiakalihariensis7490	GGAGACGGGG	CTC--GCCTC	GC-CTCACGG	CATCGGCCGA	TGA--CCTCC
Schmidtiakalihariensis7486	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNCGA	TGA--CCTCC
Sporobolusafricanus7476	GGTGATGGTC	ATT--GCACT	GT-CTCTTGG	CTTGGACCCT	TGT--CGTTC
Sporobolusconsimilis9354	GGCGACGGTT	CTT--GCACC	GT-CTCTCGG	CATAGACCCT	TAT--CTTTC
Sporobolusfimbriatus9328	GGTGATGGCC	ATA--RTGTC	GT-CTCCTGG	CATGGGCCTC	TAT--CCTTC

	101				150
IMPERATACYLINDRICA	TCCC---GGG	GCGGAG---G	GGCCG-CAAC	A-GAACCCAC	GGCGCCTAG-
SORGHUMHALEPENSE	ACCT---GGG	GCAGAG---G	GGCCA-CAAA	A-GAACCCAC	GGCGCCTTA-
PANICUMLANIPES	TTTCGTTGGA	TG-GAG----	-GCCG-CCAA	A-GAACCCAC	GGCGCCAAA-
PANICUMSTAPFIANUM	TTTTGTTGGA	GG-GAG----	-GCCG-CCAA	A-GAACCCAG	GGCGCCGAA-
KARROOCHLOAPURPUREA6241	TCA----GGA	GGAGAG---T	GGCCG-CAAA	A-GAACCAAC	GGCGCCGAAC
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Merxmuellerarangei	TCCC---GGG	GGGGAG---G	GGCCG-CAAC	A-GAACCCAC	GGCGCCGACC
Centropodiaglauca	TCC----GGC	GGGAGG---G	GGCCG-CAAC	A-GAACCCAC	GGCGCCGAAC
Cynodondactylon5248	TC-----AGA	AGGGCG---G	GGTGC-CAAA	A-GAACCCAC	GGCGCCGTAT
Cynodondactylon7480	TC-----AGA	AGGGCG---G	GGTGC-CAAA	A-GAACCCAC	GGCGCCGTAT
Cynodondactylon	TC-----AGA	AGGGCG---G	GGTGC-CAAA	A-GAACCCAC	GGCGCCGTAT
Eleusinecoracana	TTG----TAG	AAGGTG---G	TGGTC-CAAA	A-GAACCTAC	GGCGCCGCAT
Eleusineindica	TTG----TAG	AAGGTG---G	TGGTC-CAAA	A-GAACCTAC	GGCGCCGCAT
Chlorisvirgata6616	TCC----AGA	GGGATG---C	GTGGC-CAAA	A-GAACCCAC	GGCGTCGTAT
Chlorisvirgata7498	TCC----AGA	GGGATG---C	GTGGC-CAAA	A-GAACCCAC	GGCGTCGTAT
Eustachyspaspaloides5597	TAC----GGA	GGGATG---G	TGTG--CAAA	AAGAACCCAC	GGCGCTGTAT
Harpochloafalx6530	TTT----GGA	GTGATT---G	TGTGC-CAAA	G-GAACCCAC	GGCGCTGTAT
Harpochloafalx5118	NNNNNNNNNN	NTGATT---G	TGTGC-CAAA	G-GAACCCAC	GGCGCTGTAT
Harpochloafalx6670	TTT----GGA	GTGATT---G	TGTGC-CAAA	G-GAACCCAC	GGCGCTGTAT
Rendliaaltera5133	TTT----GGA	GGGACG---G	GGTGC-CAAA	A-GAACTCAT	GGCGCTGTAT
Leptochloafusca7622	TCG----MGA	GGKACG---G	GGACC-CAAA	A-GAACCCAC	GGCGCCGTTT
Enteropogonmacrostachyus9339	TCC----TGG	GGGACG---G	GGGCC-CAAA	A-GAACCCAC	GGCGCCGTAT
Astreblalappacea	TTC----GGA	GGTACG---G	GGGCC-CAAA	A-GAACCCAC	GGCGCCGTAT
Muhlenbergiarichardsonis	TTTT---GAA	GGAAAA---G	TGACC-CAAA	AAGAACCCAC	GGCGCCGTAT
Triodiastenostachya	TCC----GGA	GGGGA----G	TGGCCACAAA	A-GAACCCAC	GGCGCCGTAT
Microchloacaffra5146	TC-----GGA	AGGTAT----	GGTGC-CAAA	A-GAACCCAC	GGCGCTGTAT
Dactylocteniumaegyptium9326	TTC----GGA	GGGGAGGAGG	GGCCC-CAAA	A-GAACCCAC	GGCACCGTAT
Tragusberteronianus6620	AT-----AGA	GGGGA----G	GGGCC-CAAA	A-GAACCCAC	GGCGCCGTAT
Tragusracemosus7108	ATC----AGA	GGGGA----G	GGGCC-CAAA	A-GAACCCAC	GGCGCCGTAT
Traguskoelerioides6729	ATC----AGA	GGGGA----G	GGGCC-CAAA	A-GAACCCAC	GGCGCCGTAT
Polevansiarigida7621	CATT---ASA	GGCAA----G	GGGCC-CAAA	A-GAACCCAC	GGCGCCGTAT
Perotispatens9323	TT----AGGG	ATGGTG--AG	TGGCCACAAA	A-GAACCC-C	GGCGCCGTGT
Eragrostiscurvula6529	GTA---TGGA	GGGCTG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCATCT
Eragrostisobtusa6623	TA----TGGA	GGGCTG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCG-AT
Eragrostisobtusa6732	GTA---TGGA	GGGCTG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCG-AT
Eragrostisechinochloidea7485	NTA---TGGA	GGGATG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCG-AT
Eragrostispseudobtusa7508	GTA---TGGA	GGGCTG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCG-AT
Eragrostisechinochloidea5933	GTA---TGGA	GGGATG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCG-AT
Eragrostislehmanniana20	ATA---TGGA	GGGCTG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCA-TC
Eragrostiscurvula5191	GTA---TGGA	GGGTTG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCA-TC
Eragrostischloromelas6947	GTA---TGGA	GGGCTG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCA-TC
Eragrostischloromelas7474	GTA---TGGA	GGGCTG---G	GGCCG-CAAA	A-GAACCCAC	GGCGCCA-TG
Eragrostisracemosa6533	GTA---CSGA	GGGATG---G	GGCCG-CAAA	A-GAACCCAC	GGCGCCA-TC
Eragrostisbiflora6705	GTA---TGGA	GGTTTG---G	GGCCG-CAAA	A-GAACCCAC	GGCGCCA-TC
Eragrostissuperba7470	GTA---TGGA	GGGATG---G	GGCCA-CAAC	A-GAACCCAC	GGCGCCG-AT
Eragrostiscapensis6551	TT----TGGA	GGGCTA---G	GGCCG-CAAA	A-GAACCCAC	GGCGCCG-AT
Eragrostiscapensis6532	TT----TGGA	GGGGTA---G	GGCCG-CAAA	A-GAACCCAC	GGCGCCG-AT
Pogonarthriasquarrosa7483	NNNNNNNNNN	NNNNNNNNNN	NNCCA-CAAA	A-GAACCCAC	AGCGCCG-AT
Pogonarthriasquarrosa7504	GTA---TGGA	GGGCTG---G	AGCCG-CAAA	A-GAACCCAC	GGCGCCG-AT
Catalepisgracilis6962	TTA---TGGA	GGGATG---G	GGCCG-CAAA	A-GAACCCAC	GGCGCCA-TC
Catalepisgracilis6653	TTA---TGGA	GGGATG---G	GGCCG-CAAA	A-GAACCCAC	GGCGCCA-TC
Cladoraphiscyperoides5704	GTA---TGGA	TGGCTG---G	GGCCG-CAAC	A-AAACCCAC	GGCGCCG-AT
Cladoraphisspinosa6335	GTA---TGGA	TGGCTG---G	GGCCG-CAAC	A-AAACCCAC	GGCGCCG-AT
Cladoraphisspinosa4885	GTA---TGGA	TGGCTG---G	GGCCG-CAAC	A-GAACCCAC	GGCGCCG-AT
Cladoraphiscyperoides4894	NNA---TGGA	TGGCTG---G	GGCCG-CAAC	A-AAACCCAC	GGCGCCG-AT
Fingerhuthiaafricana4349	TTA---TGGA	GGGATG---G	GGCCG-CAAC	A-GAACCCAC	GGCGCCGTGT
Fingerhuthiaafricana7507	TTA---TGGA	GGGATG---G	GGCCG-CAAC	A-GAACCCAC	GGCGCCGTAT
Fingerhuthiaafricana4879	TTA---TGGA	GGGATG---G	GGCCG-CAAC	A-GAACCCAC	GGCGCCGTGT
Entoplocamiaaristulata9353	GCT---TGGT	GGTTTG---G	GGCCG-CAAC	A-GAACCCAC	GGCGCCGTAT
Enneapogonscoparius18	TCA---CGGA	GGGCTT---C	GGACA-CAAA	A-GAACCCAC	GGCGCCGGTT
Enneapogoncenchroides7506	TCA---CGGA	GGGCTT---C	GGCCA-CAAA	A-GAACCCAC	GG-----GCT
Enneapogoncenchroides5213	TCA---CGGA	GGGCTT---C	GGCCA-CAAA	A-GAACCCAC	GGCGCCGGCT
Enneapogonscoparius7487	TCA---CGGA	GGGCTT---C	GGCCA-CAAA	A-GAACCCAC	GGCGCCGGTT
Schmidtiapappophoroides6334	TAA---CGGA	GGGTCT---C	GGCCA-CAAA	AAGAACACAC	GGCGCCGGTT
Schmidtiakalihariensis7490	TCA---CGGA	GGGCTT---C	GGCCA-CAAA	A-GAACCCAC	GGCGCCGGTT
Schmidtiakalihariensis7486	TCA---CGGA	GGGCTT---C	GGCCA-CAAA	A-GAACCCAC	GGCGCCGGTT
Sporobolusafricanus7476	TCA---TGAA	GGGGAA---G	GGTCT-CAAA	CAGAACCCAC	GGCGCTGGAT
Sporobolusconsimilis9354	TTG---TGGA	GGGGA----G	GGTCCCCAAC	A-GAACCCAC	GGCGCCGGAT
Sporobolusfimbriatus9328	TTA---T-GA	CGGGTG---T	GGTCCACAAA	A-GAACCCAC	GACGTCGGAT

	151				200
IMPERATACYLINDRICA	GG-CGTCAAG	G-AACACTT-	---CTATTGC	C--TTGC-TC	GGCGGAGCGG
SORGHUMHALEPENSE	GG-CGTCAAG	G-AACACTC-	---ATGTTGC	C--TTGC-AC	AGCGGAGTGG
PANICUMLANIPES	GG-CGTCAAG	G-AACACTG-	---ATATTGC	C--TTGC-TT	GGGGTCTTGT
PANICUMSTAPFIANUM	GG-CGTCAAG	G-AACACTG-	---ATATTGC	C--TTGC-TT	GGGGTCTTGT
KARROOCHLOAPURPUREA6241	GG-CGTCAAG	G-AACACTT-	---ATATTGC	C--TTGC-GC	GCGGCGGTGG
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Merxmuellerarangei	GG-CGTCAAG	G-AACACCG-	---ATATTGC	C--TTGC-GA	GGCGCCGCGG
Centropodiaglauca	GG-CGTCAAG	G-AACACTA-	---GTATTGC	C--TCGC-GC	GCGGCCGCGG
Cynodondactylon5248	GG-CGTCAAG	G-AGAACTA-	---ATGTTGC	C--TTGC-TT	GGGGCCTCGG
Cynodondactylon7480	GG-CGTCAAG	G-AGAACTA-	---ATGTTGC	C--TTGC-TT	GGGGCCTCGG
Cynodondactylon	GG-CGTCAAG	G-AGAACTA-	---ATGTTGC	C--TTGC-TT	GGGGCCTCGG
Eleusinecoracana	GG-CGTCAAG	G-AAAACTA-	---ATATTGC	T--TTGC-CG	GTGGTC-CAT
Eleusineindica	GG-CGTCAAG	G-AAAACTA-	---ATATTGC	T--TTGC-CG	GTGGTC-CAT
Chlorisvirgata6616	GG-CGTCAAG	G-AAAACAT-	---ATGTTGC	C--TTGC-CT	GGGGCTGTGA
Chlorisvirgata7498	GG-CGTCAAG	G-AAAACAT-	---ATGTTGC	C--TTGC-CT	GGGGCTGTGA
Eustachyspaspaloides5597	GG-CGTCAAG	G-ATGACTT-	---ATATTGC	C--TTGC-TT	GGGGCCACGA
Harpochloafalx6530	GG-CGTCAAG	G-AAAAGTA-	---ATATTGA	C--TTGC-CT	GGGGCCACAA
Harpochloafalx5118	GG-CGTCAAG	G-AAAAGTA-	---ATATTGA	C--TTGC-CT	GGGGCCACAA
Harpochloafalx6670	GG-CGTCAAG	G-AAAAGTA-	---ATATTGA	C--TTGC-CT	GGGGCCACAA
Rendliaaltera5133	AG-CGTCAAG	G-AAAACTA-	---ATATTGC	C--TTGC-AT	GGGGCCATGG
Leptochloafusca7622	GG-CGTCAAG	G-AAAACTA-	---ATATTGC	C--TTGC-CT	GGGGCGACGT
Enteropogonmacrostachyus9339	GG-CGTCAAG	G-AAAACTA-	---ATATTGC	C--TTGC-TT	GGGGCCATGA
Astreblalappacea	GG-CGTCAAG	G-AACACTA-	---AAATTGC	C--TTGC-TC	GGGATCACGA
Muhlenbergiarichardsonis	GG-CGTCAAG	G-AACACTT-	---GTATTG-	C--TTGC-TC	GGGGCAAAGA
Triodiastenostachya	GG-CGTCAAG	G-AACACTC-	---ATATTAC	C--TTGC-TC	GGGGTCACGA
Microchloacaffra5146	GG-CGTCAAG	G-AAAACAA-	---ATATTGC	C--TTGC-TT	GGGGCAGTGG
Dactylocteniumaegyptium9326	GG-TGTCAAG	GAGACCAAT-	---ATTTGCC	AATTTGC-TC	GGGTCGA-GA
Tragusberteronianus6620	GG-CGTCAAG	G-AACACTT-	---GTTTTGC	A--GTAC-TC	GGGGAAACGA
Tragusracemosus7108	GG-CGTCAAG	G-AACACTT-	---GTTTTGC	A--GTAC-TC	GGGGAAACGA
Traguskoelerioides6729	GG-CGTCAAG	G-AACACTT-	---GTTTTGC	A--GTAC-TC	AGAGAAACGA
Polevansiarigida7621	GG-CGTCAAG	G-AACACTT-	---GTTTTGC	A--TTGC-TT	GGGGAAGCTA
Perotispatens9323	GG-CGTCAAG	G-AACACAA-	---ATGTTGC	C--TTGC-TT	GGTGTAATGT
Eragrostiscurvula6529	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCTCA	AGGATTGTGA
Eragrostisobtusa6623	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AGGTC-GCGA
Eragrostisobtusa6732	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AGGTC-GCGA
Eragrostisechinochloidea7485	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AGGTC-GCGA
Eragrostispseudobtusa7508	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AGGTC-GCGA
Eragrostisechinochloidea5933	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AGGTC-GCGA
Eragrostislehmanniana20	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCTCA	AGGTTTGTGA
Eragrostiscurvula5191	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCTCA	AGGTCTGTGA
Eragrostischloromelas6947	TG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCTCA	AGGATTGTGA
Eragrostischloromelas7474	GG-CGTCAAG	G-AATACTA-	---ATATTGC	C--TTGCCCA	AG-TTCACGA
Eragrostisracemosa6533	GG-CGTCAAG	G-AACACTA-	---ATGTTGC	C--TTGCCCA	AG-TTCATGA
Eragrostisbiflora6705	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AG-TTCACGA
Eragrostissuperba7470	GG-CGTCAAG	G-AACACTA-	---CTATTGC	C--TTGCCCA	AGG-TCGCGA
Eragrostiscapensis6551	GG-CGTCAAG	G-AACACTA-	---TTGTTGC	A--TTGCCCA	AGG-TCGCGT
Eragrostiscapensis6532	GG-CGTCAAG	G-AACACTA-	---TTGTTGC	A--TTGCCCA	AGG-TCGCGT
Pogonarthriasquarrosa7483	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AGG-TCACGA
Pogonarthriasquarrosa7504	GG-CGTCAAG	G-AACCATA-	---ATATTGC	C--TTGCCCA	AGG-TCACGA
Catalepisgracilis6962	GG-CGTCAAG	G-AATACCA-	---ATATTGC	C--TTGCCCA	AG-TTTATGA
Catalepisgracilis6653	GG-CGTCAAG	G-AATACCA-	---ATATTGC	C--TTGCCCA	AG-TTTATGA
Cladoraphiscyperoides5704	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCTA	AGG-CCGTGT
Cladoraphisspinosa6335	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AGG-CCGTGT
Cladoraphisspinosa4885	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCCA	AGG-CCGTGT
Cladoraphiscyperoides4894	GG-CGTCAAG	G-AACACTA-	---ATATTGC	C--TTGCCTA	AGG-CCGTGT
Fingerhuthiaafricana4349	GG-CGTCAAG	G-AACACTT-	---CTATTGC	A--ATGCCCA	AG-ATTGTGA
Fingerhuthiaafricana7507	GG-CGTCAAG	G-AACACTT-	---CTATTGC	A--ATGCCCA	AG-ATTGTGA
Fingerhuthiaafricana4879	GG-CGTCAAG	G-AACACTT-	---CTATTGC	A--ATGCCCA	AG-ATTGTGA
Entoplocamiaaristulata9353	GG-CGTCAAG	G-AACACTA-	---TTATTGC	T--TTGCCCA	AG-ACCGTGA
Enneapogonscoparius18	GG-CGTCAAG	G-AACACTT-	---ATATTGC	C--TTGCCCA	AGG-TTGCGG
Enneapogoncenchroides7506	GG-CGTCAAG	G-AACACTT-	---ATATTGC	C--TTGCCCA	AGG-CTGCGG
Enneapogoncenchroides5213	GG-CGTCAAG	G-AACACTT-	---ATATTGC	C--TTGCCCA	AGG-CTGCGG
Enneapogonscoparius7487	GG-CGTCAAG	G-AACACTT-	---ATATTGC	C--TTGCCCA	AGG-TTGCGG
Schmidtiapappophoroides6334	GG-CGTCAAG	G-AACACTA-	---ATGTTGC	C--TTGCCCA	AAG-TCGCGG
Schmidtiakalihariensis7490	GG-CGTCAAG	G-AACACTG-	---ATATTGC	C--TTGCCCA	AGG-CTGCGG
Schmidtiakalihariensis7486	GG-CGTCAAG	G-AACACTG-	---ATATTGC	C--TTGCCCA	AGG-CTGCGG
Sporobolusafricanus7476	GGGCGTCAAG	G-AACACTG-	---ATGTTGC	---TTGCTTG	GGG-TTTTGG
Sporobolusconsimilis9354	GG-CGTCAAG	G-AATACTA-	---ATGTTGC	---TTGCTCG	GGG-TTACGG
Sporobolusfimbriatus9328	GA-CGTCAAG	G-AACACTTT	TATTTATTGC	---TTGCACA	ATG-GTGTGA

	201				250
IMPERATACYLINDRICA	TCGGCCTGCC	TTC--CGCTC	CCC-GCGCAG	CGAT-GATA-	-TCTTAATCC
SORGHUMHALEPENSE	TCGGCATGCC	TTC--CGCTC	CCT-GAGCAG	CGAT-GATA-	-TCTTAATCC
PANICUMLANIPES	TCGGCCTGCC	GCG--CAAGC	CCC-GTGCAA	TGTT-GCTA-	-TCTTAATCA
PANICUMSTAPFIANUM	TCGGCTTGCC	GCG--CATGT	CCC-ATGCAA	TGTT-GCTA-	-TCCAAATCC
KARROOCHLOAPURPUREA6241	CCGGCCTGCC	GGA--CGCTC	CGT-GCGCAG	CGAT-TGTA-	-TACTAATCC
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Merxmuellerarangei	CCGGCTCGCC	GGA--CGCGG	CCC-GCGCAG	CGAT-GCTA-	-TCTTAATCC
Centropodiaglauca	CCGGCCTGCC	GGG--CGCGC	CGC-GCGCGG	CGAT-GACA-	-CCTTAATCC
Cynodondactylon5248	CCGGCTTGCC	GGA--TGCAC	CCC-TTGCAG	CGAT-GCTA-	-TGGAAAATC
Cynodondactylon7480	CCGGCTTGCC	GGA--TGCAC	CCC-TTGCAG	CGAT-GCTA-	-TGGAAAATC
Cynodondactylon	CCGGCTTGCC	GGA--TGCAC	CCC-TTGCAG	CGAT-GCTA-	-TGGAAAATC
Eleusinecoracana	TTGGCATGCC	CTA--TGTAC	CCC-GTGCAG	TGAT-GCAT-	-TGTTAAGTC
Eleusineindica	TTGGCATGCC	GTA--TGTAC	CCC-GTGCAG	TGAT-GCAT-	-TGTTAAGTC
Chlorisvirgata6616	TCGGCTTGCC	GGA--CACAC	CTC-TCGCAG	CGAT-GCTA-	-TGAAATTTC
Chlorisvirgata7498	TCGGCTTGCC	GGA--CACAC	CTC-TCGCAG	CGAT-GCTA-	-TGAAATTTC
Eustachyspaspaloides5597	TCGGCTTGCC	GGA--CGTAC	TCC-TAGCAG	CGAT-GCKT-	-TGGAAATTC
Harpochloafalx6530	CTGGCTTGCT	GGA--CGCAC	CCG-GTGCAG	TGAT-GCTA-	-TAAAAATTT
Harpochloafalx5118	CTGGCTTGCT	GGA--CGCAC	CCG-GTGCAG	TGAT-GCTA-	-TAAAAATTT
Harpochloafalx6670	CTGGCTTGCT	GGA--CGCAC	CCG-GTGCAG	TGAT-GCTA-	-TAAAAATTT
Rendliaaltera5133	CCGGCTTGCT	GGA--CATAC	CCC-TTGCAG	CGAT-GCTA-	-TATAAATTC
Leptochloafusca7622	CCGGCCTGCT	GGA--TGCAC	CCC-CTGCAG	CGAT-GCTA-	-TGTAGATAC
Enteropogonmacrostachyus9339	CCGGCTTGCC	GGACGTGCAC	CCG--TGCAG	AGATTGATA-	-TGGAAATTC
Astreblalappacea	CCGGCTTGCC	GGA--CGCAC	CCG--TGCAG	CGAT-GCTA-	-TGTTAATTC
Muhlenbergiarichardsonis	TCGGCTTGCC	GAAC-GGAAC	CCC-GGACAA	CGAT-GATA-	-TGCTAATCA
Triodiastenostachya	TCGGCCTGCT	GGT--CATGC	CCC-GTGCGG	TGAT-GCTT-	-TGTTAATCC
Microchloacaffra5146	CCGGCTTGCT	GGA--CATAC	CCT-TTGCAG	CGAT-TCTA-	-TGGAAATTC
Dactylocteniumaegyptium9326	CCGGCTAGCC	GGA---GAAC	CCC-GCGCAG	CGAT-GCTAN	NNNNNNNNNN
Tragusberteronianus6620	TCGGCTTGCC	GAA--CGAAC	CTC-GGGTTG	CACT-GATA-	---TTAATCA
Tragusracemosus7108	TCGGCTTGCC	GAA--CGAAC	CTC-GGGTTG	CACT-GATA-	---TTAATCA
Traguskoelerioides6729	TCGGCTTGCC	GAA--CGTWC	CTC-GGGTTG	CRCT-GATA-	---TTAATCA
Polevansiarigida7621	TCGGCTTGCC	GGA--CGCAC	CCC-AGGCTG	CATT-GATA-	---TTAATCA
Perotispatens9323	CTGGCTTGCT	GGA--TGTGA	ATC-AAGCAT	TGAT-GCTAT	ATATTAATCC
Eragrostiscurvula6529	CCGGCTTGCC	GGA--AACGT	CTT-GAGCAG	CGATACCTA-	-TCGTAATCC
Eragrostisobtusa6623	CCGGCTTGCC	GGA--CGTGT	CTT-GAGCAG	CGATACCTA-	-TCATAATCC
Eragrostisobtusa6732	CCGGCTTGCC	GGA--CGTGT	CTT-GAGCAG	CGATACCTA-	-TCATAATCC
Eragrostisechinochloidea7485	CCGGCTTGCC	GGA--CGTGT	CTT-GAGCAG	CGATACCTA-	-TCATAATCC
Eragrostispseudobtusa7508	CCGGCTTGCC	GGA--CGTGT	CTT-GAGCAG	CGATACCTA-	-TCATAATCC
Eragrostisechinochloidea5933	CCGGCTTGCC	GGA--CGTGT	CTT-GAGCAG	CGATACCTA-	-TCATAATCC
Eragrostislehmanniana20	CCGGCTTGCC	GGT--AACGT	CTTTGAGCAG	CGATACCTA-	-TTGTAATCC
Eragrostiscurvula5191	TCGGCTTGCC	GGA--AACGT	CTT-GAGCAG	CGATACCTA-	-TCGTAATCC
Eragrostischloromelas6947	CCGGCTTGCC	GGA--AACAT	CTT-GAGCAG	CGATACCTA-	-TCGTAATCC
Eragrostischloromelas7474	TCGGCTTGCC	GGA--CGCGT	CTT-GAGCGG	CGATACCTA-	-TCTTAATCC
Eragrostisracemosa6533	CCGGCTTGCC	GGA--CGTGT	CTT-GAGCGG	CGATACCTA-	-TTGTAATCC
Eragrostisbiflora6705	CCGGCTTGCC	GGA--CGCGA	CTT-GAGCGG	CGATACCTA-	-TCTTAATCC
Eragrostissuperba7470	TCGGCCTGCC	GAG--CGCGT	CTT-GAGCAG	CGATACCTA-	-TTGTAATCC
Eragrostiscapensis6551	TTGGCTTGCC	GGA--CACGT	CTT-GAGCAG	CGATACCTA-	-CCATAATCC
Eragrostiscapensis6532	TTGGCTTGCC	GGA--CACGT	CTT-GAGCAG	CGATACCTA-	-CCATAATCC
Pogonarthriasquarrosa7483	ACGGCTTGTC	GGA--CGTGT	CTT-GAGCAG	CGATACATA-	-TCATAATCC
Pogonarthriasquarrosa7504	TCGGCTTGCC	GGA--CGTGT	CTT-GAGCAG	CGATACATA-	-TCATAATCC
Catalepisgracilis6962	TCGGCTTGCC	GGA--CAAGT	CTT-GAGCAG	CGATACCTA-	-TCTTAATCC
Catalepisgracilis6653	TCGGCTTGCC	GGA--CAAGT	CTT-GAGCAG	CGATACCTA-	-TCTTAATCC
Cladoraphiscyperoides5704	TTGGCCTGCC	AAA--CGCGT	CTT-GGGCAG	CGATACCAA-	-TTATAATCC
Cladoraphisspinosa6335	TTGGCCTGCC	GGA--CGCGT	CTT-GGGCAG	CGATACCCA-	-TTATAATCC
Cladoraphisspinosa4885	TTGGCCTGCC	GGA--CGCGT	CTT-GGGCAG	CGATACCCA-	-TTATAATCC
Cladoraphiscyperoides4894	TTGGCCTGCC	AAA--CGCGT	CTT-GGGCAG	CGATACCAA-	-TTATAATCC
Fingerhuthiaafricana4349	TCGGCCTGCC	GAA--CGCGT	CTT-GGGCAG	CGAT-GATA-	-TCTTAATCC
Fingerhuthiaafricana7507	TCGGCCTGCC	GAA--CGCGT	CTT-GGGCAG	CGAT-GATA-	-TCTTAATCC
Fingerhuthiaafricana4879	TCGGCCTGCC	GAA--CGCGT	CTT-GGGCAG	CGAT-GATA-	-TCTTAATCC
Entoplocamiaaristulata9353	TCGGCTTGCC	GGA--CGCGT	CTT-GAGCAG	CGAT-GCTA-	-TCTTAATCC
Enneapogonscoparius18	TCGGCATGCC	GGA--CGCGC	CTT-GAGCAG	CGAT-GCTA-	-TGTTAATCC
Enneapogoncenchroides7506	TCGGCATGCC	GGA--CGCGT	CTT-GAGCAG	CGAT-GCTA-	ATGTTAATCC
Enneapogoncenchroides5213	TCGGCATGCC	GGA--CGCGT	CTT-GAGCAG	CGAT-GCTA-	-TGTTAATCG
Enneapogonscoparius7487	TCGGCATGCC	GGA--CGCGC	CTT-GAGCAG	CGAT-GCTA-	-TGTTAATCC
Schmidtiapappophoroides6334	TCGGCATGCC	GGA--CGCGT	TTG-GAGCAG	GGAT-GCTA-	-TCTTAASCR
Schmidtiakalihariensis7490	CCGGCATGCC	GTT--CGCGT	CTT-GAGCAG	CGAT-GCTA-	-TCTCAATCC
Schmidtiakalihariensis7486	CCGGCATGCC	GTT--CGCGT	CTT-GAGCAG	CGAT-GCTA-	-TCTCAATCC
Sporobolusafricanus7476	CCAGCCTGCT	GGC--AGATC	CCT-GAGCTG	CGAT-GGTA-	-CCTTAATCC
Sporobolusconsimilis9354	CCGGCCTGCT	GGA--CGAGC	CCT-GTGCTG	CGAT-GCTAT	ACCTGAATCC
Sporobolusfimbriatus9328	ACTTCTTGTT	TGA--TACAC	CTT-GTGCTG	TGAT-GCTA-	-CCTTAATCC

	251				300
IMPERATACYLINDRICA	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
SORGHUMHALEPENSE	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
PANICUMLANIPES	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
PANICUMSTAPFIANUM	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
KARROOCHLOAPURPUREA6241	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGC
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNGGAAAGGA	TATTTAGTTT	TTCGCATTGA	TGAAGATCGT
Merxmuellerarangei	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Centropodiaglauca	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Cynodondactylon5248	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Cynodondactylon7480	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Cynodondactylon	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Eleusinecoracana	ACATGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Eleusineindica	ACATGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Chlorisvirgata6616	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Chlorisvirgata7498	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Eustachyspaspaloides5597	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Harpochloafalx6530	ACATGACTCT	TGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Harpochloafalx5118	ACATGACTCT	TGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Harpochloafalx6670	ACATGACTCT	TGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Rendliaaltera5133	TCATGACTCT	CGGCAACGGA	TATCTTGGCT	CTTGCATCGA	TGAAGAACGT
Leptochloafusca7622	ACATGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Enteropogonmacrostachyus9339	ACATGACTCT	TGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Astreblalappacea	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTTGCATCGA	TGAAGAACGT
Muhlenbergiarichardsonis	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Triodiastenostachya	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Microchloacaffra5146	ACATGACTCT	CGGCAACGGA	TATCTTGGCT	CTTGCATCGA	TGAAGAACGT
Dactylocteniumaegyptium9326	NNNNNNNNNN	NNGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Tragusberteronianus6620	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Tragusracemosus7108	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Traguskoelerioides6729	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Polevansiarigida7621	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Perotispatens9323	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAATAACGT
Eragrostiscurvula6529	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostisobtusa6623	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostisobtusa6732	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostisechinochloidea7485	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostispseudobtusa7508	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAASGT
Eragrostisechinochloidea5933	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostislehmanniana20	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostiscurvula5191	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostischloromelas6947	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostischloromelas7474	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostisracemosa6533	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAANNNNNN
Eragrostisbiflora6705	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostissuperba7470	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostiscapensis6551	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Eragrostiscapensis6532	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Pogonarthriasquarrosa7483	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Pogonarthriasquarrosa7504	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Catalepisgracilis6962	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAAAGT
Catalepisgracilis6653	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Cladoraphiscyperoides5704	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAANNNNNN
Cladoraphisspinosa6335	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Cladoraphisspinosa4885	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Cladoraphiscyperoides4894	ACATGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Fingerhuthiaafricana4349	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAAGGT
Fingerhuthiaafricana7507	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Fingerhuthiaafricana4879	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAAGGT
Entoplocamiaaristulata9353	ACACGACTCT	CGGCAACGGA	TATCTCGGCT	CTCGCATCGA	TGAAGAACGT
Enneapogonscoparius18	AAACGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Enneapogoncenchroides7506	AAACGACTCT	CGGCAAGGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Enneapogoncenchroides5213	AAACGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Enneapogonscoparius7487	AAACGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Schmidtiapappophoroides6334	ACACGACTTT	TGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Schmidtiakalihariensis7490	ACACGACTCT	CGGCAACGGA	TATCTTGGCT	CTTGCATCGA	TGAAGACNNN
Schmidtiakalihariensis7486	ACACGACTCT	CGGCAACGGA	TATCTTGGCT	CTTGCATCGA	TGAAGAACGT
Sporobolusafricanus7476	ATAAGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT
Sporobolusconsimilis9354	ATAAGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAANNNNNN
Sporobolusfimbriatus9328	ACAAGACTCT	CGGCAACGGA	TATCTTGGCT	CTCGCATCGA	TGAAGAACGT

	301				350
IMPERATACYLINDRICA	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
SORGHUMHALEPENSE	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
PANICUMLANIPES	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
PANICUMSTAPFIANUM	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
KARROOCHLOAPURPUREA6241	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
CHAETOBROMUSINVOLUCRATES6284	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	GAACCATGAG
Merxmuellerarangei	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Centropodiaglauca	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Cynodondactylon5248	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Cynodondactylon7480	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Cynodondactylon	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Eleusinecoracana	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Eleusineindica	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Chlorisvirgata6616	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCAAG
Chlorisvirgata7498	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCAAG
Eustachyspaspaloides5597	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Harpochloafalx6530	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCAAG
Harpochloafalx5118	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCAAG
Harpochloafalx6670	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCAAG
Rendliaaltera5133	AGCAAAATGC	GATACTTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Leptochloafusca7622	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Enteropogonmacrostachyus9339	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Astreblalappacea	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Muhlenbergiarichardsonis	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Triodiastenostachya	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCAAG
Microchloacaffra5146	AGCAAAATGC	GATACTTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Dactylocteniumaegyptium9326	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Tragusberteronianus6620	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Tragusracemosus7108	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Traguskoelerioides6729	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Polevansiarigida7621	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Perotispatens9323	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Eragrostiscurvula6529	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostisobtusa6623	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostisobtusa6732	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostisechinochloidea7485	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostispseudobtusa7508	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostisechinochloidea5933	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostislehmanniana20	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostiscurvula5191	AGCAAAATGC	GATACGTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostischloromelas6947	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostischloromelas7474	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostisracemosa6533	NNCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostisbiflora6705	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostissuperba7470	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostiscapensis6551	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Eragrostiscapensis6532	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Pogonarthriasquarrosa7483	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Pogonarthriasquarrosa7504	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Catalepisgracilis6962	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Catalepisgracilis6653	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Cladoraphiscyperoides5704	NNCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Cladoraphisspinosa6335	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Cladoraphisspinosa4885	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Cladoraphiscyperoides4894	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Fingerhuthiaafricana4349	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Fingerhuthiaafricana7507	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Fingerhuthiaafricana4879	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Entoplocamiaaristulata9353	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Enneapogonscoparius18	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Enneapogoncenchroides7506	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Enneapogoncenchroides5213	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Enneapogonscoparius7487	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Schmidtiapappophoroides6334	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGCG	AACCATCGAG
Schmidtiakalihariensis7490	NNNNNNNNNN	NNNNNCTGGT	GTGAATTGCA	GAATCCGGTG	AACCATCGAG
Schmidtiakalihariensis7486	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCATG	AACCATCGAG
Sporobolusafricanus7476	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG
Sporobolusconsimilis9354	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNATCCCGTG	AACCATCGAG
Sporobolusfimbriatus9328	AGCAAAATGC	GATACCTGGT	GTGAATTGCA	GAATCCCGTG	AACCATCGAG

	351				400
IMPERATACYLINDRICA	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGTCGAGG	GCACGTCTGC
SORGHUMHALEPENSE	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CCGGCCGAGG	GCACGTCTGC
PANICUMLANIPES	TTTTTGAACG	CAAGTTGCGC	CCGAGACCTT	CTGGTTGAGG	GCACGCCTGC
PANICUMSTAPFIANUM	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	TTGGTTGAGG	GCACGTCTGC
KARROOCHLOAPURPUREA6241	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGTCGAGG	GCACTCCTGC
CHAETOBROMUSINVOLUCRATES6284	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGCCTGC
Merxmuellerarangei	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGCCTGC
Centropodiaglauca	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGCCTGC
Cynodondactylon5248	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	GTGGCCGAGG	GCACGTCTGC
Cynodondactylon7480	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	GTGGCCGAGG	GCACGTCTGC
Cynodondactylon	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	GTGGCCGAGG	GCACGTCTGC
Eleusinecoracana	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	TTGGTCGAGG	GCACGTCTGC
Eleusineindica	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	TTGGTCGAGG	GCACGTCTGC
Chlorisvirgata6616	TTTTTGAACG	CAAGTTGCGC	CTAAGGCCTT	TTGGCCAAGG	GCACGTCTGC
Chlorisvirgata7498	TTTTTGAACG	CAAGTTGCGC	CTAAGGCCTT	TTGGCCAAGG	GCACGTCTGC
Eustachyspaspaloides5597	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	TTGGTCGAGG	GCACGTCTGC
Harpochloafalx6530	TTTTTGAATG	CAAGTTGCGC	CCGAGGCCTT	TTGGCTAAGG	GTACGTTTGC
Harpochloafalx5118	TTTTTGAATG	CAAGTTGCGC	CCGAGGCCTT	TTGGCTAAGG	GTACGTTTGC
Harpochloafalx6670	TTTTTGAATG	CAAGTTGCGC	CCGAGGCCTT	TTGGCTAAGG	GTACGTTTGC
Rendliaaltera5133	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	TGGGTTGAGG	GCACGTCTGC
Leptochloafusca7622	TTTTTGAACG	CAAGTTGCGC	CTGAGGCCTT	CTGGCTGAGG	GCACGTCTGC
Enteropogonmacrostachyus9339	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	TCGGCCGAGG	GCACGTCTGC
Astreblalappacea	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCTGAGG	GCACGTCTGC
Muhlenbergiarichardsonis	TTTTTGAACG	CAAGTTGCGC	CCGAGACCTT	CTGGTTGAGG	GCACGTCTGC
Triodiastenostachya	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGTCGAGG	GCACGTCTGC
Microchloacaffra5146	TTTTTGAACG	CAAGTTGCGC	CTGAGGCCTT	TGGGCTGACG	GCACGTCTGC
Dactylocteniumaegyptium9326	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTC	CTGACCGAGG	GCACGTCTGC
Tragusberteronianus6620	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Tragusracemosus7108	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Traguskoelerioides6729	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Polevansiarigida7621	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Perotispatens9323	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	TTGGTTGAGG	GCACGTCTGC
Eragrostiscurvula6529	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Eragrostisobtusa6623	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGTCGAGG	GCACGTCTGC
Eragrostisobtusa6732	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGTCGAGG	GCACGTCTGC
Eragrostisechinochloidea7485	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Eragrostispseudobtusa7508	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGTCGAGG	GCACGTCTGC
Eragrostisechinochloidea5933	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Eragrostislehmanniana20	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Eragrostiscurvula5191	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Eragrostischloromelas6947	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Eragrostischloromelas7474	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Eragrostisracemosa6533	TTTTTGAACG	CAAGTTGCGC	CCGAG-CCTT	CTGGCCGAGG	-CACGTCTGC
Eragrostisbiflora6705	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGTCGAGG	GCACGTCTGC
Eragrostissuperba7470	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Eragrostiscapensis6551	TTTTTGAACG	CAAGTTGCGC	CCGAGACCTT	CTGGTTGAGG	GCACGTCTGC
Eragrostiscapensis6532	TTTTTGAACG	CAAGTTGCGC	CCGAGACCTT	CTGGTTGAGG	GCACGTCTGC
Pogonarthriasquarrosa7483	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Pogonarthriasquarrosa7504	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Catalepisgracilis6962	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Catalepisgracilis6653	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Cladoraphiscyperoides5704	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Cladoraphisspinosa6335	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCAAGG	GCACGTCTGC
Cladoraphisspinosa4885	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Cladoraphiscyperoides4894	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Fingerhuthiaafricana4349	TTTTTGACCG	CAAGTTGCGC	CCGAGACCTT	CTGGTCGAGG	GCACGTCTGC
Fingerhuthiaafricana7507	TTTTTGAACG	CAAGTTGCGC	CCGAGACCTT	CTGGTCGAGG	GCACGTCTGC
Fingerhuthiaafricana4879	TTTTTGAACG	CAAGTTGCGC	CCGAGACCTT	CTGGTCGAGG	GCACGTCTGC
Entoplocamiaaristulata9353	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGCCTGC
Enneapogonscoparius18	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Enneapogoncenchroides7506	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Enneapogoncenchroides5213	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Enneapogonscoparius7487	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Schmidtiapappophoroides6334	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Schmidtiakalihariensis7490	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Schmidtiakalihariensis7486	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTT	CTGGCCGAGG	GCACGTCTGC
Sporobolusafricanus7476	TTTTTGAACG	CAAGTTGCGC	CTGAGGCCTC	CTGGTTGAGG	GCACGTCTGC
Sporobolusconsimilis9354	TTTTTGAACG	CAAGTTGCGC	CCGAGGCCTC	CTGGTTGAGG	GCACGTCTGC
Sporobolusfimbriatus9328	TTTTTGAACG	CAAGTTGCGC	CTGAGGCCAC	TTGGTCGAGG	GCACGTCTGC

	401				450
IMPERATACYLINDRICA	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCAA	CCCACCCTC-	GGG-------
SORGHUMHALEPENSE	CTGGGCGTCA	CGCCAACAGA	CA-CTCCCAA	CCCACCCTC-	GGG-------
PANICUMLANIPES	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCAA	CCCATCCTT-	GGG-------
PANICUMSTAPFIANUM	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCTAC	CCCATACTAT	GGG-------
KARROOCHLOAPURPUREA6241	CTGGGCGTCA	CGCCAAAAGA	CG-CTCCCRC	CCTACCTTT-	GGG-------
CHAETOBROMUSINVOLUCRATES6284	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCGAA	CCCCCCAA--	CGCAAGTTGT
Merxmuellerarangei	CTGGGCGTCA	CGCCAAAAGA	CG-CTCCCGC	CCACCCCG--	GGC-------
Centropodiaglauca	CTGGGCGTCA	CGCCAAAAGA	CG-CTCCCAC	CCCACCCC--	GGT-------
Cynodondactylon5248	CTGGGCGTCA	CGCCAAAAGA	CA-CT-CCAC	CGCAATCCC-	GGT-------
Cynodondactylon7480	CTGGGCGTCA	CGCCAAAAGA	CA-CT-CCAC	CGCAATCCC-	GGT-------
Cynodondactylon	CTGGGCGTCA	CGCCAAAAGA	CA-CTTCCAC	CGCAATCCC-	GGT-------
Eleusinecoracana	CTGGGCGTCA	CGTCAAAAGA	CA-CTCCCTA	CCATTCCTT-	GGT-------
Eleusineindica	CTGGGCGTCA	CGTCAAAAGA	CA-CTCCCTA	CCATTCCTT-	GGT-------
Chlorisvirgata6616	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCACA	CCAACTCT--	GGT-------
Chlorisvirgata7498	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCACA	CCAACTCT--	GGT-------
Eustachyspaspaloides5597	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCATA	CCCAACCC--	GGT-------
Harpochloafalx6530	TTGGGCGTCA	CACCAAAAGA	CA-CTCCACA	CCTGTCCT--	GGT-------
Harpochloafalx5118	TTGGGCGTCA	CACCAAAAGA	CA-CTCCACA	CCTGTCCT--	GGT-------
Harpochloafalx6670	TTGGGCGTCA	CACCAAAAGA	CA-CTCCACA	CCTGTCCT--	GGT-------
Rendliaaltera5133	CTGGGCGTCA	TGTGAAAAGA	CA-CTCCACA	CCAAATCC--	AGT-------
Leptochloafusca7622	CTGGGCGTCA	CGCCAAAAGA	CA-CTCTGCA	CCTACCCT--	GGT-------
Enteropogonmacrostachyus9339	CTGGGCGTCA	CACCAAAAGA	CA-CTCCAAA	CCAATCCC--	GGT-------
Astreblalappacea	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCACA	TCAATCCT--	GGT-------
Muhlenbergiarichardsonis	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCAACCT--	AGT-------
Triodiastenostachya	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCCTC-	GGT-------
Microchloacaffra5146	CTGGGCGTCA	CGTCAAAAGA	CA-CTCCACA	CCAAACTT--	GGT-------
Dactylocteniumaegyptium9326	CTGGGCGTCA	CGCCAGTATA	CAACTCCCCA	CCCATCCC--	GGT-------
Tragusberteronianus6620	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAATCTT--	GGT-------
Tragusracemosus7108	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAATCTT--	GGT-------
Traguskoelerioides6729	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAATCTT--	GGT-------
Polevansiarigida7621	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAAACTT--	GGT-------
Perotispatens9323	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCTA	CCCAATTT--	GGT-------
Eragrostiscurvula6529	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Eragrostisobtusa6623	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAATCAT--	GGT-------
Eragrostisobtusa6732	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAATCAT--	GGT-------
Eragrostisechinochloidea7485	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAATCAT--	GGT-------
Eragrostispseudobtusa7508	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAATCAT--	GGT-------
Eragrostisechinochloidea5933	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCAATCAT--	GGT-------
Eragrostislehmanniana20	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Eragrostiscurvula5191	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCAACAT--	GGT-------
Eragrostischloromelas6947	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Eragrostischloromelas7474	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Eragrostisracemosa6533	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Eragrostisbiflora6705	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Eragrostissuperba7470	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCTA	CCCATCGT--	GGT-------
Eragrostiscapensis6551	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCACA	CCCATCGT--	GGT-------
Eragrostiscapensis6532	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCACA	CCCATCGT--	GGT-------
Pogonarthriasquarrosa7483	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Pogonarthriasquarrosa7504	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Catalepisgracilis6962	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Catalepisgracilis6653	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCAT--	GGT-------
Cladoraphiscyperoides5704	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCAACTC--	GGT-------
Cladoraphisspinosa6335	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCAACTC--	GGT-------
Cladoraphisspinosa4885	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCAACTC--	GGT-------
Cladoraphiscyperoides4894	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCAACTC--	GGT-------
Fingerhuthiaafricana4349	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCGC--	GGT-------
Fingerhuthiaafricana7507	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCGC--	GGT-------
Fingerhuthiaafricana4879	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCGC--	GGT-------
Entoplocamiaaristulata9353	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCAAA	CCCATCCC--	GGT-------
Enneapogonscoparius18	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATACA--	GGT-------
Enneapogoncenchroides7506	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATACC--	GGT-------
Enneapogoncenchroides5213	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATACC--	GGT-------
Enneapogonscoparius7487	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATACA--	GGT-------
Schmidtiapappophoroides6334	CTGGGCGTCA	CGGCAAAAGA	CA-CTCCCGA	CCCAACCC--	GGT-------
Schmidtiakalihariensis7490	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCTC--	GGT-------
Schmidtiakalihariensis7486	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCA	CCCATCTC--	GGT-------
Sporobolusafricanus7476	CTGGGCGTCA	CGCCAAGTGA	CA-CTTCACT	ACCATTCT--	GGT-------
Sporobolusconsimilis9354	CTGGGCGTCA	CGCCAAAAGA	CA-CTCCCCT	GCCATCCT--	GGT-------
Sporobolusfimbriatus9328	CTGGGCGTCA	CGCGAAAAGA	CA-CTCCCCC	ACCCTTCA-T	GGA-------

	451				500
IMPERATACYLINDRICA	------GAGG	GACGTGGTGT	TTGGACCCCC	GCG----CCG	-CAGGGCGCG
SORGHUMHALEPENSE	------GAGG	GATGTGGTTT	TTGGCTCCCC	GTG----CCG	-CATGGCGCG
PANICUMLANIPES	------TACG	GACGTGGTGT	TTGGCTCCCC	ATG----CCT	-CATGGTGTG
PANICUMSTAPFIANUM	-----GTACG	GATGTGGTGT	TTGGCTCCCC	TTG----CCT	-TGCGGCATG
KARROOCHLOAPURPUREA6241	------TGAG	GATGCGGTGT	ATGGCTCCTC	GTG----CCG	--TGAGGCGC
CHAETOBROMUSINVOLUCRATES6284	AACGGGAACG	GACGCGGCAT	ATGGCCCCCC	GTG----TCC	GCAAGGCGCG
Merxmuellerarangei	-------GAG	GACGCGGCGT	TTGGCTCCCC	GCG----CCC	GCGGGGCGCG
Centropodiaglauca	-------GCG	GACGCGGTGT	CTGGCCCCCC	GTG----CC-	GCAGGGCGCG
Cynodondactylon5248	-------CTG	GACGTGGTGT	TTGGCCCCTC	ATT----CCA	TAGTGT-ATG
Cynodondactylon7480	-------CTG	GACGTGGTGT	TTGGCCCCTC	ATT----CCA	TAGTGT-ATG
Cynodondactylon	-------CTG	GACGTGGTGT	TTGGCCCCTC	ATT----CCA	TAGTGT-ATG
Eleusinecoracana	-------GTG	GACGTGGA-T	TTGGCTCCTC	ATG----CCT	TAGGGCGTGG
Eleusineindica	-------GTG	GACGTGGA-T	TTGGCTCCTC	ATG----CCT	TCGGGCGTGG
Chlorisvirgata6616	-------ATG	GACGTGGTGT	TTGGCCCCCC	ATA----CCA	CATGGTTATG
Chlorisvirgata7498	-------ATG	GAYGTGGTGT	TTGGCCCCCC	ATA----CCA	CATGGTTATG
Eustachyspaspaloides5597	-------ATG	GATGTGGTGT	TTGGCCCCTC	ATC----CCA	TAGGGT-ATG
Harpochloafalx6530	-------TTG	GATGTGGTGC	ATGGCCCCTC	ATA----CCA	TCGGGTT-TG
Harpochloafalx5118	-------TTG	GATGTGGTGC	ATGGCCCCTC	ATA----CCA	TCGGGTT-TG
Harpochloafalx6670	-------TTG	GATGTGGTGC	ATGGCCCCTC	ATA----CCA	TCGGGTT-TG
Rendliaaltera5133	-------CTG	GACGTGGTAT	TTGGCCCCTC	ATC----CTA	TAAGGT-ATG
Leptochloafusca7622	-------GTG	GACGTGGTGT	TTGGCCCCTC	ATG----CCG	CAGGGT-GTG
Enteropogonmacrostachyus9339	-------CTG	GACGTGGTGT	TTGGCCCCTC	ATG----CCC	CAGGGT-GTG
Astreblalappacea	-------GTG	GACGAGGTGT	TTGGCCTCTC	ATG----CCG	CAGGGT-GTG
Muhlenbergiarichardsonis	-------GGG	GACGTGGTAT	TTGGCTCCTC	GTG----TCG	TTATGC-ACG
Triodiastenostachya	-------GAG	GACGTGGAGT	CTGGCTCCTC	GTG----CCG	---AGC-ACG
Microchloacaffra5146	----GGTCAG	GATGTGGTGT	TTGGCCCCTC	ATC----CTA	AATGGGTATG
Dactylocteniumaegyptium9326	-------GCG	GACGTGGTGT	CCGGCCCCTC	GTG----CCT	CCGGGC-GCG
Tragusberteronianus6620	-------GTG	GATGTGGTAT	TTGGCCCCTC	GTT----CCT	TATGGC-ACG
Tragusracemosus7108	-------GTG	GATGTGGTAT	TTGGCCCCTC	RTT----CCT	TATGGC-ACG
Traguskoelerioides6729	-------GTG	GATGTGGTAT	TTGGCCCCTC	GTT----CCT	TATGGC-ACG
Polevansiarigida7621	-------GAG	GACGTGGTAT	TTGGCCCCTC	GTT----CCG	TATGGC-RCG
Perotispatens9323	------GGTG	GATGTGGTGT	TTGGCTCCTC	GTG----CCG	TC-GGT-GCG
Eragrostiscurvula6529	-------GTG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	CATGGT-GCG
Eragrostisobtusa6623	-------GCG	GATGTGGCAT	TTGGCTCTCC	GTG----CCA	TACGGC-GCG
Eragrostisobtusa6732	-------GCG	GATGTGGCAT	TTGGCTCTCC	GTG----CCA	TACGGC-GCG
Eragrostisechinochloidea7485	-------GCG	GATGTGGCAT	TTGGCTCCCC	GTG----CCA	CACGGC-GCG
Eragrostispseudobtusa7508	-------GCG	GATGTGGCAT	TTGGCTCTCC	GTG----CCA	TACGGC-GCG
Eragrostisechinochloidea5933	-------GCG	GATGTGGCAT	TTGGCTCCCC	GTG----CCA	CACGGC-GCG
Eragrostislehmanniana20	-------GTG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	CATGGT-GCG
Eragrostiscurvula5191	-------GTG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	CATGGT-GCG
Eragrostischloromelas6947	-------GTG	GACGTGGCAT	TTGGCTYCCC	GTG----CCA	CATGGT-GCG
Eragrostischloromelas7474	-------GTG	GACGTGGCAT	TTGGCTCCCC	GTG----CCT	CACGGT-GCG
Eragrostisracemosa6533	-------GTG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	CACGGG-GCG
Eragrostisbiflora6705	-------GTG	GATGTGGCAT	TTGGCTCCCC	GTG----CCT	CACGGT-GCG
Eragrostissuperba7470	-------GTG	GATGTGGCAT	TTGGCTCCCC	GTG----CCA	CATGGT-GCG
Eragrostiscapensis6551	-------GCG	GATGTGGCAT	TTGGCTCCCC	GTG----CYG	CATGGT-GCG
Eragrostiscapensis6532	-------GCG	GATGTGGCAT	TTGGCTCCCC	GTG----CTG	CATGGT-GCG
Pogonarthriasquarrosa7483	-------GCG	GACGTGGCAT	TTGGCTCCCC	GTG----CCT	CACGGT-GCG
Pogonarthriasquarrosa7504	-------GCG	GACGTGGCAT	TTGGCTCCCC	GTG----CCT	CACGGT-GCG
Catalepisgracilis6962	-------GTG	GACGTGGCAT	TTGGCTCCCC	GTG----CCT	CACGGT-GCG
Catalepisgracilis6653	-------GTG	GACGTGGCAT	TTGGCTCCCC	GTG----CCT	CACGGT-GCG
Cladoraphiscyperoides5704	-------GTG	GATGTGGCAT	TTGGCTCCCC	GTG----CCG	CACGGT-GCG
Cladoraphisspinosa6335	-------GCG	GATGTGGCAT	TTGGCTCCCC	GTG----CCG	CACGGT-GCG
Cladoraphisspinosa4885	-------GCG	GATGTGGCAT	TTGGCTCYCC	GTG----CCG	CACGGT-GCG
Cladoraphiscyperoides4894	-------GTG	GATGTGGCAT	TTGGCTCCCC	GTG----CCG	CACGGT-GCG
Fingerhuthiaafricana4349	-------GCG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	AACGGC-GCG
Fingerhuthiaafricana7507	-------GCG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	AACGGC-GCG
Fingerhuthiaafricana4879	-------GCG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	AACGGC-GCG
Entoplocamiaaristulata9353	-------GCG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	AACGGC-ACG
Enneapogonscoparius18	-------GTG	GACGTGGTGT	TTGGCTCCCC	GTG----CCA	CAAGGC-GCG
Enneapogoncenchroides7506	-------GTG	GACGTGGTGT	TTGGCTCCCC	GTG----CCA	CGAGGC-GCG
Enneapogoncenchroides5213	-------GTG	GACGTGGTGT	TTGGCTCCCC	GTG----CCA	CGAGGC-GCG
Enneapogonscoparius7487	-------GTG	GACGTGGTGT	TTGGCTCCCC	GTG----CCA	CAAGGC-GCG
Schmidtiapappophoroides6334	-------GAG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	CATGGC-ATG
Schmidtiakalihariensis7490	-------GCG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	CATGGT-GCG
Schmidtiakalihariensis7486	-------GCG	GACGTGGCAT	TTGGCTCCCC	GTG----CCA	CATGGT-GCG
Sporobolusafricanus7476	------ATTG	GATGTGGATT	CTGACCTTCC	ATGCC--TGA	AAGGGC-GTG
Sporobolusconsimilis9354	------GCTG	GATGTGGCGT	CTGGTCTTCC	ATGCCACTAG	AAAGGA-GTG
Sporobolusfimbriatus9328	------GCGG	GATGTGGTGT	TTGGCCTTCC	GTGTCATGTG	AATGGT-TCG

	501				550
IMPERATACYLINDRICA	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCGAA	CCGCGCCGGG	CAC-AGCACG
SORGHUMHALEPENSE	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCGAT	TCGTGTCGGG	CAC-AGCACG
PANICUMLANIPES	GTGGGCTGAA	-GTT-GGGGC	TGCCGGCATA	CCGTGCCGGG	CACCTGCATG
PANICUMSTAPFIANUM	GTGGGCTAAA	-GTT-GTGGC	TGCCGGCATA	CCGTGTCGGG	CACCTGCATG
KARROOCHLOAPURPUREA6241	GTGGGCCGAA	-GTT-GCGGC	TGCCGGCGTA	CCGTGCCGGG	CAC-AGCACA
CHAETOBROMUSINVOLUCRATES6284	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCGCA	CCCGGCTGGG	CAC-AGCACA
Merxmuellerarangei	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCGTA	CCGTGCCGGG	CAC-AGCACA
Centropodiaglauca	GCGGGCCGAA	-GTT-GGGGC	TGCCGGCGTA	CCGTGCCGGG	CAC-AGCACA
Cynodondactylon5248	GTGGGCCAAA	-GAG-GCGGC	TGCCGGCG--	--GTGCGGGT	CAC-AGCAGA
Cynodondactylon7480	GTGGGCCAAA	-GAG-GCGGC	TGCCGGCG--	--GTGCCGGT	CAC-AGCAGA
Cynodondactylon	GTGGGCCAAA	-GAG-GAGGC	TGCCGGCG--	--GTGCCGGT	CAC-AGCAGA
Eleusinecoracana	TGGACCAAAG	-ATG-GAG-C	TGCCGGTT--	--GTGCCGAT	CGC-AGCACA
Eleusineindica	TGGACCAAAG	-ATG-GAG-C	TGCCGGTT--	--GTGCCGAT	CGC-AGCACA
Chlorisvirgata6616	ATGGGCTTAA	-GAT-GTGGC	TATCGGCA--	-GGTGCCGAT	CAG-AGCACA
Chlorisvirgata7498	ATGGGCTTAA	-GAT-GTGGC	TATCGGCA--	-GGTGCCGAT	CAK-AGCACA
Eustachyspaspaloides5597	ATGGGCCAAA	-GAT-GCGGT	TGCCGGT---	-GGTGCTGAT	CAC-AGCACA
Harpochloafalx6530	ATGGGCCAAA	-GTT-GCGGA	TGGCGGC---	-GGTGCTGAA	CAC-AGCACA
Harpochloafalx5118	ATGGGCCAAA	-GTT-GCGGA	TGGCGGC---	-GGTGCTGAA	CAC-AGCACA
Harpochloafalx6670	ATGGGCCAAA	-GTT-GCGGA	TGGCGGC---	-GGTGCTGAA	CAC-AGCACA
Rendliaaltera5133	ATGGGCCAAA	-AAT-GTGGC	TGCCGGT---	-GGTGCCGAT	CAC-AGCACT
Leptochloafusca7622	GTGGGCCAAA	-TTT-GGGGC	TGCCGGC---	-GGTGCCGAT	CAC-AGCACA
Enteropogonmacrostachyus9339	GTAGGCCAAA	AGAT-GGGGC	TGCCGGC---	-GGTGCCGAT	CAC-AGCACA
Astreblalappacea	GTGGGCCAAA	-GAC-GGGGC	TGCCGGT---	-GGTGCTGAT	CAC-AGCACA
Muhlenbergiarichardsonis	GTGGGCAAAA	-GTT-GGGGC	TGCCGGC---	-GGTGCCGAT	CAC-AGCACA
Triodiastenostachya	GTGAGCCAAA	-GTT-TGGCC	TGCCGAC---	-GGTGCCGAC	CAC-AGCACA
Microchloacaffra5146	GTGGGCCAAA	-GAT-GCGGC	TGGCGGC---	-AGTGCCGAT	CAC-AGCACC
Dactylocteniumaegyptium9326	GTGGGCCAAA	-GTT-GGGGC	TGCCGGC---	-CGTGCCGAT	CAC-AGCACG
Tragusberteronianus6620	GTGGGCCGAA	-GTT-AGGGC	TGCCGGC---	-GGTGCCGAT	CAC-AGCACA
Tragusracemosus7108	GTGGGCCGAA	-GTT-ACGGC	TGCCGGC---	-GGTGCCGAT	CAC-AGCACA
Traguskoelerioides6729	GTGGACCGAA	-GTT-AGGGC	TGCCGGC---	-GGTGCCGAT	CAC-AGCACA
Polevansiarigida7621	GTGGGCCGAA	-GTT-AGGGC	TGCCGGC---	-GGTGCCGAT	CAC-AGCACA
Perotispatens9323	GTGGGCCAAA	-GTA-GGGGA	TACCGGC---	-AGTGCATCT	CAC-AGCACA
Eragrostiscurvula6529	GTGGGCCGAA	-GTT-GGGGC	TGCCGGTTTA	CGATACCGGT	CAC-AGCACA
Eragrostisobtusa6623	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	AGGTACCGGT	CAC-AGCACA
Eragrostisobtusa6732	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	AGGTACCGGT	CAC-AGCACA
Eragrostisechinochloidea7485	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	AGSTACCGGT	CAC-AGCACA
Eragrostispseudobtusa7508	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	AGGTACCGGT	CAC-AGCACA
Eragrostisechinochloidea5933	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	AGCTACCGGT	CAC-AGCACA
Eragrostislehmanniana2C	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGATACCGGT	CAC-AGCACA
Eragrostiscurvula5191	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGATACCGGT	CAC-AGCACA
Eragrostischloromelas6947	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGATACCGGT	CAC-AGCACA
Eragrostischloromelas7474	GTGGGCCGAA	-GAT-GGGGC	TGCCGGCTTA	TGGTGCCGGT	CAC-AGCACA
Eragrostisracemosa6533	GTGGG-CCAA	-ATT-GGGCT	GCCCGGCTTA	CGGGGCCGGT	CAC-ATCACA
Eragrostisbiflora6705	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGGTGTCGGT	CAC-AGCACA
Eragrostissuperba7470	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	TGGTACCGGT	CAC-AGCACA
Eragrostiscapensis6551	GTGGGCCTAA	-GTT-GGGGC	TGCCGGCTTA	TGGTACCGGT	CAC-AGCACA
Eragrostiscapensis6532	GTGGGCCTAA	-GTT-GGGGC	TGCCGGCTTA	TGGTACCG-T	CAC-AGCACT
Pogonarthriasquarrosa7483	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGGTACCGGT	CAC-AGCACA
Pogonarthriasquarrosa7504	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGGTACCGGT	CAC-AGCACA
Catalepisgracilis6962	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	AGGTGCCGGT	CAC-AGCACA
Catalepisgracilis6653	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	AGGTGCCGGT	CAC-AGCACA
Cladoraphiscyperoides5704	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGGTACCGGT	CAC-AGCACA
Cladoraphisspinosa6335	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGGTACCGGT	CAC-AGCACA
Cladoraphisspinosa4885	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGGTACCGGT	CAC-AGCACA
Cladoraphiscyperoides4894	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	CGGTACCGGT	CAC-AGCACA
Fingerhuthiaafricana4349	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	TGGTACCGGT	CAC-AGCACA
Fingerhuthiaafricana7507	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	TGGTACCGGT	CAC-AGCACA
Fingerhuthiaafricana4879	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	TGGTACCGGT	CAC-AGCACA
Entoplocamiaaristulata9353	GTGGGCCGAA	-GTT-GGGGC	TGCCGGCTTA	TGGTACCGGT	CAC-AGCACA
Enneapogonscoparius18	GTGGGCCGAA	-GTT-GGGGC	TGCCGGTGAA	AGGTACCGGT	CAC-AGCGCA
Enneapogoncenchroides7506	GTGGGCCGAA	-GTT-GGGGC	TGCCGGTGAA	AGGTACCGGT	CAC-AGCGCA
Enneapogoncenchroides5213	GTGGGCCGAA	-GTT-GGGGC	TGCCGGTGAA	AGGTACCGGT	CAC-AGCGCA
Enneapogonscoparius7487	GTGGGCCGAA	-GTT-GGGGC	TGCCGGTGAA	AGGTACCGGT	CAC-AGCGCA
Schmidtiapappophoroides6334	GTGGGCCTAA	-GTT-GGGGT	TGCCGATGAA	AGGTACCGGT	CAG-AGCACA
Schmidtiakalihariensis7490	GTGGGCCGAA	-GTT-GGGGC	TGCCGGTGAA	AGGTACCGGT	CAC-AGCACA
Schmidtiakalihariensis7486	GTGGGCCGAA	-GTT-GGGGC	TGCCGGTGAA	AGGTACCGGT	CAC-AGCACA
Sporobolusafricanus7476	GTAGGCTAAA	GTAAGAGGC	TGCT-GC-GA	TGGTGCTAGT	CAC-AGCACT
Sporobolusconsimilis9354	GTAGGCTAAA	GTAAGAGGC	TGCTGGC-TA	TGGTGCCGGT	CAC-AGCACT
Sporobolusfimbriatus9328	GTGGACTAAA	-GTAT-AGGC	TGCTAGC-TA	TGGGGCTGGT	CAT-AGCACT

	551				600
IMPERATACYLINDRICA	TGGTGGGCGA	CA-TCAGTTG	TTCTCGGTGC	A-GCGCCCCN	NNNNNNNNNN
SORGHUMHALEPENSE	TGGTGGGCGA	CACTTAGTTG	TTCTCGGTGC	A-GCGCCCCN	NNNNNNNNNN
PANICUMLANIPES	TGGTGGGCGA	CA-TAAGTTG	TTCTCGGTGC	A--GTGTCC-	--TGTCACG-
PANICUMSTAPFIANUM	TGGTGGGCGA	CA-TTAGTTG	TTCTCGGTGC	A--GTGTCC-	--TGACACG-
KARROOCHLOAPURPUREA6241	TGGTGGTCGA	CCAAAAGTTG	TCA-CGGTGT	T--GTGCCTC	G-GTGCGTA-
CHAETOBROMUSINVOLUCRATES6284	AGGTGGGCGT	AACA--TCCC	TTCAACGTGT	M--GTGCCTC	G-GCCGGTAG
Merxmuellerarangei	TGGTGGGCGA	CACAA-GTTG	TTCTCGGTGC	T--GCGCCTC	G-GCCCGCAG
Centropodiaglauca	TGGTGGGCGA	CACGA-GTTG	TTCTCGGTGC	T--GTGCCTC	G-GACCGCAG
Cynodondactylon5248	TGGTGGATGG	CACAA-GTTA	TTCTCGGTGT	T--GTGATCC	T-GACAAGTC
Cynodondactylon7480	TGGTGGATGG	CACAA-GTTA	TTCTCGGTGT	T--GTGATCC	T-GACAACTC
Cynodondactylon	TGGTGGATGG	CACAA-GTTA	TTCTCGGTGT	T--GTGATCC	T-GACAACTC
Eleusinecoracana	AGGTGGATGA	CGAAT-GTTG	TTCTCACTGC	T--TTGATCG	A-AACAGCTC
Eleusineindica	AGGTGGATGA	CGAAT-GTTG	TTCTCACTGC	T--TTGATCG	A-AACAGCTC
Chlorisvirgata6616	AGGTGGATGA	CACAT-GTTA	TTCTCGGTGT	T--ATGATCT	G-GAGAACTC
Chlorisvirgata7498	AGGTGGATGA	CACAT-GTTA	TTCTCGGTGT	T--ATGATCT	G-SAGAACTC
Eustachyspaspaloides5597	TGGTGGATAA	CACAA-GTTA	TTCTCGGTGT	TTTATTGAAT	--CATGACAC
Harpochloafalx6530	TGGTGGATGA	CACAT-GTTA	TTCTCGGTGT	TTT----CGT	T--CGGACAC
Harpochloafalx5118	TGGTGGATGA	CACAT-GTTA	TTCTCGGTGT	TTT----CGT	T--CGGACAC
Harpochloafalx6670	TGGTGGATGA	CACAT-GTTA	TTCTCGGTGT	TTT----CGT	T--CGGACAC
Rendliaaltera5133	TGGTGGATGA	CACAA-GTTA	TTCTCTGTGC	T--ATTATCT	G-GACAACTC
Leptochloafusca7622	AGGTGGATGA	CGCAA-GTTG	TTCTCGGTGT	T--ATGATCC	G-GACCACTC
Enteropogonmacrostachyus9339	AGGTGGATGA	CGCAA-GTTG	TTCTCGGTGT	T--AGGATCC	G-GTGCACTA
Astreblalappacea	AGGTGGATGA	CGCAA-GTTG	TTCTCGGTGT	T--ACGATCT	G-GACCACTC
Muhlenbergiarichardsonis	AGGTGGATGA	CGCAA-GTTG	TTCTCGGTGC	T--ATGATAC	G-AGCCGTGT
Triodiastenostachya	AGGTGGATGA	CTCGT-GTCG	TTCTCGATGC	T--ATGATCC	G-CACCGGTA
Microchloacaffra5146	TGGTGGATGA	CGCAA-GTTA	TTCTCAGTGT	T--ATGATCT	G-GACAACTC
Dactylocteniumaegyptium9326	AGGTGGATGA	CGCAT-GTTG	TTCTCAGTGC	T--AAAATCG	G-TACAGCTT
Tragusberteronianus6620	TGGTGGATAA	CGCGA-GTTG	TTCTCGGTGC	T--ATGATTC	G-GACTCCTT
Tragusracemosus7108	TGGNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Traguskoelerioides6729	TGGTGGATAA	CGCGA-GTTG	TTCTCGGTGC	T--ATGATTC	G-GACTCCTT
Polevansiarigida7621	TGGTG-ATGA	CTTTT-GTTG	TTCTCGGTGC	T--ATGGTTC	G-GATGCCTT
Perotispatens9323	AGGTGGATGG	CACAG-GTTA	TTCTCGGTGC	T--GTGATGC	TGTATTTGAT
Eragrostiscurvula6529	AGGTGGGTGA	CACAT-AGTG	TTCTCGCTGC	T--GTGGCCT	G-GATCATTG
Eragrostisobtusa6623	AGGTGGGTGA	CACAT-AGTG	TTCTCGCTGT	T--GTGGCCT	G-GACTATTG
Eragrostisobtusa6732	AGGTGGGTGA	CACAT-AGTG	TTCTCGCTGT	T--GTGGCCA	G-GACTATTG
Eragrostisechinochloidea7485	AGGTGGGTGA	CACGT-AGTG	TTCTCGCTGT	T--GTGGCCT	G-AGCTATTG
Eragrostispseudobtusa7508	AGGTGGGTGA	CACAT-AGTG	TTCTCGCTGT	T--GTGGCCT	G-GACTATTG
Eragrostisechinochloidea5933	AGGTGGGTGA	CACGT-AGTG	TTCTCGCTGT	T--GTGGCCT	G-AGCTATTG
Eragrostislehmanniana20	AGGTGGGTGA	CACTT-AGTG	TTCTCGCTGT	T--GTGGCCT	G-GATCATTG
Eragrostiscurvula5191	AGGTGGGTGA	CACAT-AGTG	TTCTCGCTGC	T--GTGGCCT	G-GATCATTG
Eragrostischloromelas6947	AGGTGGGTGA	CACAT-AGTG	TTCTCGCTGC	T--GTGGCCT	G-GATCATTG
Eragrostischloromelas7474	AGGTGGGTGA	CACTC-GGTG	TTCTCGCTGC	T--GTGACTC	T-AACCGT-G
Eragrostisracemosa6533	AGGGGGGTGA	CACAC-GGTG	TTCTCGCTGC	T--GTGACTT	G-AATCGTTG
Eragrostisbiflora6705	AGGTGGGTGA	CACTT-GGTG	TTCTCGCTGC	T--GTGACTT	G-AACCGT-G
Eragrostissuperba7470	AGGTGGGTGA	CACAT-AGTG	CTCTCGCTGC	T--GTGGCCT	G-GATCAATG
Eragrostiscapensis6551	AGGTGGGTGA	CACAC-GGTG	TTCTCGCTGT	T--GTGACCT	C-TACCGCTG
Eragrostiscapensis6532	TGGTGGACAA	CATGC-GTTG	TTCTCGGAGT	T--GTGACTT	G-TACTGCTT
Pogonarthriasquarrosa7483	AGGTGGGTGA	CACAT-GGTG	TTCTCGCTGC	T--GTGACAT	G-GACCGCTG
Pogonarthriasquarrosa7504	AGGTGGGTGA	CACAT-GGTG	TTCTCGCTGC	T--GTGACAT	G-GACCGCTG
Catalepisgracilis6962	AGGTGGGTGA	CACTC-GGTG	TTYTCGCTGC	T--GTGACTT	G-AACTGT-G
Catalepisgracilis6653	AGGTGGGTGA	CACTC-GGTG	TTCTCGCTGC	T--GTGACTT	G-AACTGT-G
Cladoraphiscyperoides5704	AGGTGGGTGA	CACAT-GTTG	TTCTCGCTGC	T--GTGACAT	G-GCCGCT-G
Cladoraphisspinosa6335	AGGTGGGTGA	CACAT-GTTG	TTCTCGCTGC	T--GTGACAT	G-GCCGCT-G
Cladoraphisspinosa4885	AGGTGGGTGA	CACAT-GTTG	TTCTCGCTGC	T--GTGACAT	G-GCCGCT-G
Cladoraphiscyperoides4894	AGGTGGGTGA	CACAT-GTTG	TTCTCGCTGC	T--GTGACAT	G-GCCGCT-G
Fingerhuthiaafricana4349	AGGTGGGTGA	CACTT-GATG	TTCTCGCTGC	T--GCGACAC	G-GACCGTT-
Fingerhuthiaafricana7507	AGGTGGGTGA	CACTT-GWTG	TTCTCGCTGC	T--GCGACAC	G-GACCGTT-
Fingerhuthiaafricana4879	AGGTGGGTGA	CACTT-GATG	TTCTCGCTGC	T--GCGACAC	G-GACCGTT-
Entoplocamiaaristulata9353	AGGTGGGTGA	CACTT-AGTG	TTCTCGCTGC	T--GCGACCT	G-GACCGTT-
Enneapogonscoparius18	AGGTGGGTGA	CACAA-GGTG	TTCTCGCCGC	A--GTGGCTC	G-GATCACAT
Enneapogoncenchroides7506	AGGTGGGTGA	CACAC-GGTG	TTCTCGCCGC	A--GTGGCTC	G-GATCACAT
Enneapogoncenchroides5213	AGGTGGGTGA	CACAC-GGTG	TTCTCGCCGC	A--GTGGCTC	G-GATCACAT
Enneapogonscoparius7487	AGGTGGGTGA	CACAA-GGTG	TTCTCGCCGC	A--GTGGCTC	G-GATCACAT
Schmidtiapappophoroides6334	AGGTGGGTGA	CACGC-GGTG	TTCTCGCTGC	T--CTGACTT	G-GATCACTG
Schmidtiakalihariensis7490	AGGTGGGTGA	CACAA-GGTG	TTCTCGCTGC	C--GTGACTC	G-GATCCATG
Schmidtiakalihariensis7486	AGGTGGGTGA	CACAA-GGTG	TTCTCGCTGC	C--GTGACTC	G-GATCCATG
Sporobolusafricanus7476	TGGTGGACAA	CATGC-GTTG	TTCTCGGAGT	NNNNNNNNNN	NNNNNNNNNN
Sporobolusconsimilis9354	TGGTGGACAA	CGTCG-GTTG	TTCTCGGAGT	T--GTGACTT	G-TACTGGTT
Sporobolusfimbriatus9328	TGGTGGATGA	CAAAT-GTTG	TTCTCGGAGT	T--GTGACAT	G-TATTGCTT

	601				650
IMPERATACYLINDRICA	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
SORGHUMHALEPENSE	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMLANIPES	--CAGCTAGC	TCCTTGGCCT	AA--AGGACC	CATTTACGAC	CGTAGC-CCT
PANICUMSTAPFIANUM	--CAGCTAGC	TCCATAGCCT	CA--AGGACC	CATTTACGAC	CGTAGCGCCT
KARROOCHLOAPURPUREA6241	C-CAG---CG	ATAC-GGCC-	TTT-ACGACC	CTT--GAGAC	CGCAGCGCTC
CHAETOBROMUSINVOLUCRATES6284	C-CGG---CA	TCAT-GGCCC	TT--CCGACC	CTT--ACACC	GCTAGCGCTC
Merxmuellerarangei	C-CGG---CG	ACAC-GGCCC	TT--GGGACC	CT----CCAT	CGGAGCGCGA
Centropodiaglauca	C-CGG---CG	CGAG-GGCCC	TC---GGACC	CAT--GCGAC	CGTACGCCGC
Cynodondactylon5248	C-CGGTCATG	TTAT-GCCCC	TTTT-GGACC	CAT---GGTT	TGGAGCGTAC
Cynodondactylon7480	C-CGGTCATG	TTAT-GCCCC	TTTT-GGACC	CAT---GGTT	TGGAGCGTAT
Cynodondactylon	C-CGGTCATG	TTAT-GCCCC	TTTT-GGACC	CAT---GGTT	TGGAGCGTAT
Eleusinecoracana	C--GGTGATG	CAAT-GGC--	TCTATGGACC	CAT---GGAT	TAAAGTGCAT
Eleusineindica	C--GGTGATG	CAAT-GGC--	TCTATGGACC	CAT---GGAT	TGAAGTGCAT
Chlorisvirgata6616	C-TTGCTATG	TTAT-GGCCC	TTAATTGACC	CAT---GGTT	TTGAGTGCAT
Chlorisvirgata7498	C-TTGCTATG	TTAT-GGCCC	TTAATTGACC	CAT---GGTT	TTGAGTGCAT
Eustachyspaspaloides5597	T-CGGTCATG	TCAA-GCCCC	TTT--AGACC	CAT---GAAT	TTGAGCGCAT
Harpochloafalx6530	A---GTCATG	TTAT-GCCCT	TT---GGACC	CAT---GGTT	TTGAGTGCAT
Harpochloafalx5118	A---GTCATG	TTAT-GCCCT	TT---GGACC	CAT---GGTT	TTGAGTGCAT
Harpochloafalx6670	A---GTCATG	TTAT-GCCCT	TT---GGACC	CAT---GGTT	TTGAGTGCAT
Rendliaaltera5133	C-CGGTCACC	TGAT-GCCCC	CTTT-GGACC	CAA---GGTT	TGGTGCACAT
Leptochloafusca7622	C-TGGTGATG	TTAT-GGCCC	TTT--GGACC	CAT---CGAG	TGGAGCACGT
Enteropogonmacrostachyus9339	A-CGGTGATG	TTTGCGGCCC	TTT--GGACC	CWT---GGTT	AGGAGCGCAC
Astreblalappacea	C-CGGTAATG	TTAT-GGCCC	TTT--GGACC	CAT---GGTT	TCGAGTGCAT
Muhlenbergiarichardsonis	A-CGGCGATA	CAAT-GGCCC	TTT--GGACC	CAT---TAAT	CGAAGCGCAC
Triodiastenostachya	C-CGGCGTTG	ATAC-GGCCC	TTT--GGACC	CAT---GGAC	CGAAGCACAA
Microchloacaffra5146	C-CGGTCATG	TGAT-GGCCC	TTT--GGACC	CAT---GGTT	TGGAGCGCTT
Dactylocteniumaegyptium9326	--CGTGTGAC	CCTC-GGG--	-----ACCCC	CATTT-GACC	GAAGGTGCAT
Tragusberteronianus6620	T-TGGCTGTG	TTCT-GGCCC	TCT--GGACC	CATT--AGAC	TGAAGCACAC
Tragusracemosus7108	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Traguskoelerioides6729	T-CGGCTGTG	TTAT-GGCCC	TCT--GGACC	CATT--AGAC	TGAAGCACAC
Polevansiarigida7621	T-CGGCTAAG	TTAG-GGCCC	TCT--GGACC	CATT---GAC	TGAAGCACAC
Perotispatens9323	TCTGGTGTTA	CAAC--ATCC	CAT--GGACT	CAT---ACAT	CGAGATGCAA
Eragrostiscurvula6529	CTATGGCATG	AAAT-GGCCC	TCAT--GACC	CAT---CAAC	CGATGCGCAT
Eragrostisobtusa6623	C-----CGTG	CAAT-GGCTC	TCAT--GACC	CAT---CAAC	CGAAGCGCAT
Eragrostisobtusa6732	C-----CGTG	CAAT-GGCTC	TCAT--GACC	CAT---CAAC	CGAAGCGCAT
Eragrostisechinochloidea7485	C-----CGTG	CAAT-GGCTC	TCAT--GACC	CAT---CAAC	CGAAGCGCAT
Eragrostispseudobtusa7508	C-----CGTG	CAAT-GGCTC	TCAT--GACC	CAT---CAAC	CGAAGCGCAT
Eragrostisechinochloidea5933	C-----CGTG	CAAT-GGCTC	TCAT--GACC	CAT---CAAC	CGAAGCGCAT
Eragrostislehmanniana20	CTATGGCATG	AAAT-GGCCC	TCAC--GACC	CAT---CAAC	CGATGCGCAT
Eragrostiscurvula5191	CTATGGCATG	AAAT-GGCCC	TCAC--GACC	CAT---CAAC	CGATGCGCAT
Eragrostischloromelas6947	CTATGGCATG	AAAT-GGCCC	TCAT--GACC	CAT---CAAC	CGATGCGCAT
Eragrostischloromelas7474	CA--GGCATA	CAAT-GGCCC	TCAC--GACC	CAT---CAAC	CGAAGCGCAT
Eragrostisracemosa6533	CA--TGCATG	CAAT-GGNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisbiflora6705	CA--GGTATG	CAAT-GGCCC	TCAC--GACC	CAT---CAAT	CGAAGCGTAC
Eragrostissuperba7470	C--TGGTACA	CAAT-GGCCC	TCAT--GACC	CAT---CAAC	CGAAGCGCAC
Eragrostiscapensis6551	CC----TATG	CAAT-AGTCC	TCGC--GACC	CAT---CAAC	CGAAGCGCAT
Eragrostiscapensis6532	CC--GGCG-A	CATT-GGCAC	TTT---GGAC	CCAT--GAAT	TG-AGCAAAT
Pogonarthriasquarrosa7483	CC-----ATG	CAAG-GGCCC	TTGT--GACC	CAT---CAAC	C-AAGCGCAT
Pogonarthriasquarrosa7504	CC-----ATG	CAAG-GGCCC	TTGT--GACC	CAT---CAAC	C-AAGCGCAT
Catalepisgracilis6962	CA--GGCATG	CAAT-GGCCC	TCAT--GACC	CAT---GAAC	CAAAGAGCAT
Catalepisgracilis6653	CA--GGCATG	CAAT-GGCCC	TCAT--GACC	CAT---GAAC	CAAAGAGCAT
Cladoraphiscyperoides5704	CC----TATG	CAAT-GGCCC	TCAT--GACC	CAT---CAAC	CGATGCGCAC
Cladoraphisspinosa6335	CC----TATG	CAAT-GGCCC	TCAT--GACC	CAT---CAAC	CGATGCGCAC
Cladoraphisspinosa4885	CC----TATG	CAAT-GGCCC	TCAT--GACC	CAT---CAAC	CGATGCGCAC
Cladoraphiscyperoides4894	CC----TATG	CAAT-GGCCC	TCAT--GACC	CAT---CAAC	CGATGCGCAC
Fingerhuthiaafricana4349	CC----AAGG	CAAT-TACCC	TCAT--GACC	CAT---CGAC	CGAAGCGCAC
Fingerhuthiaafricana7507	CC----AAGG	CAAT-TACCC	TCAT--GACC	CAT---CGAC	CGAAGCGCAC
Fingerhuthiaafricana4879	CC----AAGG	CAAT-TACCC	TCAT--GACC	CAT---CGAC	CGAAGCGCAC
Entoplocamiaaristulata9353	GC----AAGG	CAAC-GACCC	TCAT--GACC	CAT---CGAC	CGAAGCGCAC
Enneapogonscoparius18	CCA-GGCAAG	CA-T-GGCCC	TCAA--GACC	CAT---CGAC	CGTAGCGCAC
Enneapogoncenchroides7506	CCA-GGCAAG	CA-T-GGCCC	TCAA--GACC	CAT---CGAC	CGTAGCGCAC
Enneapogoncenchroides5213	CCA-GGCAAG	CA-T-GGCCC	TCAA--GACC	CAT---CGAC	CGTAGCGCAC
Enneapogonscoparius7487	CCA-GGCAAG	CA-T-GGCCC	TCAA--GACC	CAT---CGAC	CGTAGCGCAC
Schmidtiapappophoroides6334	CCT-GGCAAG	CAAT-GGACC	TCAC--GACC	CAT---CAAC	CGGAGCGCAC
Schmidtiakalihariensis7490	ACT-GGCAAG	CAAT-GGCCC	TCAT--GACC	CTT---CGAC	CGTAGCGCAC
Schmidtiakalihariensis7486	ACT-GGCAAG	CAAT-GGCCC	TCAT--GACC	CTT---CGAC	CGTAGCGCAC
Sporobolusafricanus7476	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Sporobolusconsimilis9354	T-CCGCG--A	CACT-GGCCC	T-TA-GGACC	CAT---GAAT	CT-AGCATCG
Sporobolusfimbriatus9328	CTAGCGAT-A	GTAT-GGCTG	T-TA-TGACC	CAT---GCAT	CGGAGCTTTG

	651	668
IMPERATACYLINDRICA	NNNNNNNNNN	NNNNNNNN
SORGHUMHALEPENSE	NNNNNNNNNN	NNNNNNNN
PANICUMLANIPES	TGGTG-----	-CTCGGAC
PANICUMSTAPFIANUM	TGGTG-----	-CTCGGAC
KARROOCHLOAPURPUREA6241	-GACG-----	-CTCGGAC
CHAETOBROMUSINVOLUCRATES6284	-GTCACTCGG	ATCGCGAC
Merxmuellerarangei	-GACG-----	-CTCGGAC
Centropodiaglauca	-GCCG-----	-CTCGGAC
Cynodondactylon5248	-GTAG-----	-CTCGGAC
Cynodondactylon7480	-GTAG-----	-CTCGGAC
Cynodondactylon	-GTAG-----	-CTCGGAC
Eleusinecoracana	-GTTT-----	-ATCAAAC
Eleusineindica	-GTTT-----	-ATCAAAC
Chlorisvirgata6616	-GCCG-----	-CTCGGTC
Chlorisvirgata7498	-GCCG-----	-CTCGGTC
Eustachyspaspaloides5597	-GTTG-----	-CTTTGAC
Harpochloafalx6530	-GCTT-----	-CTTGGAC
Harpochloafalx5118	-GCTT-----	-CTTGGAC
Harpochloafalx6670	-GCTT-----	-CTTGGAC
Rendliaaltera5133	-GTTG-----	-CTCGGAC
Leptochloafusca7622	-GTTG-----	-CTCGGAC
Enteropogonmacrostachyus9339	-GTTG-----	-CTCGTAC
Astreblalappacea	-GTCG-----	-CTCGGAC
Muhlenbergiarichardsonis	-GTCG-----	-CTCGAAC
Triodiastenostachya	-GTTG-----	-CTCGGAC
Microchloacaffra5146	-GTCG-----	-CTTGCAC
Dactylocteniumaegyptium9326	-GTTA-----	-CTCGGAC
Tragusberteronianus6620	-GTTG-----	-CTCGGAC
Tragusracemosus7108	NNNNNNNNNN	NNNNNNNN
Traguskoelerioides6729	-GTTG-----	-CTCGGAC
Polevansiarigida7621	-GTTG-----	-CTCGGAC
Perotispatens9323	-GTCA-----	-CTTGAAC
Eragrostiscurvula6529	-GTCG-----	-CTCGGAC
Eragrostisobtusa6623	-G--------	-CTCGGAC
Eragrostisobtusa6732	-G--------	-CTCGGAC
Eragrostisechinochloidea7485	-G--------	-CTCGGAC
Eragrostispseudobtusa7508	-G--------	-CTCGGAC
Eragrostisechinochloidea5933	-G--------	-CTCGGAC
Eragrostislehmanniana20	-GTCG-----	-CTCGGAC
Eragrostiscurvula5191	-GTCG-----	-CTCGGAC
Eragrostischloromelas6947	-GTCG-----	-CTCGGAC
Eragrostischloromelas7474	-GTCG-----	-CTCGGAC
Eragrostisracemosa6533	NNNNNNNNNN	NNNNNNNN
Eragrostisbiflora6705	-GTCG-----	-CTCGGAC
Eragrostissuperba7470	-GTCG-----	-CTCGGAC
Eragrostiscapensis6551	-GTCG-----	-CTCGGAC
Eragrostiscapensis6532	-GTTG-----	-CTCGAAC
Pogonarthriasquarrosa7483	-G--------	-CTCGGAC
Pogonarthriasquarrosa7504	-G--------	-CTCGGAC
Catalepisgracilis6962	-GTTG-----	-CTTGGAC
Catalepisgracilis6653	-GTTG-----	-CTTGGAC
Cladoraphiscyperoides5704	-GTCG-----	-CTCGGAC
Cladoraphisspinosa6335	-GTCG-----	-CTCGGAC
Cladoraphisspinosa4885	-GTCG-----	-CTCGGAC
Cladoraphiscyperoides4894	-GTCG-----	-CTCGGAC
Fingerhuthiaafricana4349	-GTCG-----	-CTCGGAC
Fingerhuthiaafricana7507	-GTCG-----	-CTCGGAC
Fingerhuthiaafricana4879	-GTCG-----	-CTCGGAC
Entoplocamiaaristulata9353	-GTCG-----	-CTCGGAC
Enneapogonscoparius18	-GTCG-----	-CTCGGAC
Enneapogoncenchroides7506	-GTCG-----	-CTCGGAC
Enneapogoncenchroides5213	-GTCG-----	-CTCGGAC
Enneapogonscoparius7487	-GTCG-----	-CTCGGAC
Schmidtiapappophoroides6334	-GTCG-----	-CTCGGAT
Schmidtiakalihariensis7490	-GCCG-----	-CTCGGAC
Schmidtiakalihariensis7486	-GCCG-----	-CTCGGAC
Sporobolusafricanus7476	NNNNNNNNNN	NNNNNNNN
Sporobolusconsimilis9354	-ATTG-----	-CTCGCAC
Sporobolusfimbriatus9328	-ATTG-----	-CTTCAAC

APPENDIX E. Indels coded by GapCoder for *ITS* data set. Where missing data was coded in the sequence data set (N), the corresponding indel was coded as ?. The indel characters are coded with 1 for present, 0 for missing and – for inapplicable. As the gap matrix was added directly to the sequencing matrix the numbering continues from the last character in the sequence data set. Due to the large size of the matrix and to keep sequences together, this appendix starts on the next page.

	669 728
IMPERATACYLINDRICA	??10001---0000100000001000100-011000111100110000010-10110-0010
SORGHUMHALEPENSE	1010001---0000100000001000100-011000111100110000010-10110-0010
PANICUMLANIPES	0010001---0000100000000010-1--011000111100110000010-10110-0010
PANICUMSTAPFIANUM	0010001---0000100000000010-1--011000111100110000010-10110-0010
KARROOCHLOAPURPUREA6241	?????????????010001--000100-011000011100110000010-10110-0010
CHAETOBROMUSINVOLUCRATES6284	??0010
Merxmuellerarangei	011000000100001000001000100-011000011100110000010-10110-0010
Centropodiaglauca	0110000001000010001--000100-011000011100110000010-10110-0010
Cynodondactylon5248	0110000101000010l----000100-011000011100110000010-10110-0011
Cynodondactylon7480	011000010100000101----000100-011000011100110000010-10110-0011
Cynodondactylon	011000000100000101----000100-011000011100110000010-10110-0010
Eleusinecoracana	0010000001000010001--000100-011000011100110001010-10110-0010
Eleusineindica	0010000001000010001--000100-011000011100110001010-10110-0010
Chlorisvirgata6616	0110000001000010001--000100-011000011100110000010-10110-0010
Chlorisvirgata7498	0110000001000010001--000100-011000011100110000010-10110-0010
Eustachyspaspaloides5597	0000000001000010001--000100-1-000001110011000010-10110-0010
Harpochloafalx6530	0110000101000010001--000100-011000011100110000010-10110-0010
Harpochloafalx5118	??????????????????????00100-011000011100110000010-10110-0010
Harpochloafalx6670	0110000101000010001--000100-011000011100110000010-10110-0010
Rendliaaltera5133	0110000001000010001--000100-011000011100110000010-10110-0010
Leptochloafusca7622	0110000001000010001--000100-011000011100110000010-10110-0010
Enteropogonmacrostachyus9339	0110110001000010001--000100-011000011100110000000-1010-0010
Astreblalappacea	0110000001000010001--000100-011000011100110000010--1110-0010
Muhlenbergiarichardsonis	011000000100000000001000100-010000011110110000000110110-0010
Triodiastenostachya	0110000001000010001--001-00-001000011100110000010-10110-0010
Microchloacaffra5146	011000000100000101----000-01-011000011100110000010-10110-0010
Dactylocteniumaegyptium9326	0110000001001010001--0000000011000010100010000l-1-101???0000
Tragusberteronianus6620	011000000100000101----001-00-011000011100110000010-101-1-0010
Tragusracemosus7108	0110000001000010001--001-00-011000011100110000010-101-1-0010
Traguskoelerioides6729	0110000001000010001--001-00-011000011100110000010-101-1-0010
Polevansiarigida7621	0110000001000110000l001-00-011000011100110000010-101-1-0010
Perotispatens9323	0110000011000010010-000000010011000111001100000l0-101000001 0
Eragrostiscurvula6529	??????????1100-100010000100-011000011100100000010-10010-0010
Eragrostisobtusa6623	????????????????010-0000100-011001011100100010010-10010-0010
Eragrostisobtusa6732	01100000001000-100010000100-011001011100100010010-10010-0010
Eragrostisechinochloidea7485	????????????????00010000100-011001011100100010010-10010-0010
Eragrostispseudobtusa7508	01100000001000-100010000100-011001011100100010010-10010-0010
Eragrostisechinochloidea5933	01100000011000-100010000100-011001011100100010010-10010-0010
Eragrostislehmanniana20	01100000011000-100010000100-011001011100100000010-00010-0010
Eragrostiscurvula5191	??????????1000-100010000100-011001011100100000010-10010-0010
Eragrostischloromelas6947	01100000011000-100010000100-011001011100100000010-10010-0010
Eragrostischloromelas7474	01100000011000-100010000100-011001011100101000010-10010-0010
Eragrostisracemosa6533	???????????001-100010000100-011001011100101000010-10010-1110
Eragrostisbiflora6705	01100000011000-100010000100-011001011100101000010-10010-0010
Eragrostissuperba7470	01100000011000-100010000100-011001011100100100010-10010-0010
Eragrostiscapensis6551	01100000011000-1010-0000100-011001011100100100010-10010-0010
Eragrostiscapensis6532	????????????????010-0000100-011001011100100100010-10010-0010
Pogonarthriasquarrosa7483	????????????????????????????011001011100100100010-10010-0010
Pogonarthriasquarrosa7504	01100000011000-100010000100-011001011100100100010-10010-0010
Catalepisgracilis6962	01100000011000-100010000100-011001011100101000010-10010-0010
Catalepisgracilis6653	???????????000-100010000100-011001011100101000010-10010-0010
Cladoraphiscyperoides5704	??????????1000-100010000100-011001011100100100010-10010-0010
Cladoraphisspinosa6335	??????????1000-100010000100-011001011100100100010-10010-0010
Cladoraphisspinosa4885	01110000011000-100010000100-011001011100100100010-10010-0010
Cladoraphiscyperoides4894	????????????????00010000100-011001011100100100010-10010-0010
Fingerhuthiaafricana4349	01100000011000-100010000100-011000011100101000010-10110-0010
Fingerhuthiaafricana7507	01100000011000-100010000100-011000011100101000010-10110-0010
Fingerhuthiaafricana4879	01100000011000-100010000100-011000011100101000010-10110-0010
Entoplocamiaaristulata9353	01100000011000-100010000100-011000011100101000010-10110-0010
Enneapogonscoparius18	????????????00-100010000100-011000011100100100010-10110-0010
Enneapogoncenchroides7506	01100000011000-100010000100-011010011100100100010-101001001 0
Enneapogoncenchroides5213	01100000011000-100010000100-011000011100100100010-10110-0010
Enneapogonscoparius7487	01100000011000-100010000100-011000011100100100010-10110-0010
Schmidtiapappophoroides6334	01100000011000-100010000100-010000011100100100010-10110-0010
Schmidtiakalihariensis7490	01100000011000-100010000100-011000011100100100010-10110-0010
Schmidtiakalihariensis7486	????????????00-100010000100-011000011100100100010-10110-0010
Sporobolusafricanus7476	01100000011000-100010000100-010000001101-00100010-10110-0010
Sporobolusconsimilis9354	01100000011000-100010001-00-001000011101-00100010-101000010
Sporobolusfimbriatus9328	01100000011000-100010100100-001000011001-00100010-10110-0010

	729 788
IMPERATACYLINDRICA	0011-0-01-01000000110000000001010000100?????????????????????
SORGHUMHALEPENSE	0011-0-01-01000000110000000001000000100?????????????????????
PANICUMLANIPES	0011-0-01-010000001100000000010001-01--001---0000000000000
PANICUMSTAPFIANUM	000010-01-010000001100000000010001-01--001---0000000000000
KARROOCHLOAPURPUREA6241	0011-0-01-0-100000110000000001000011-00010001010000001000100
CHAETOBROMUSINVOLUCRATES6284	1--000001-00000000110000000001001101-0001000001000000001000100
Merxmuellerarangei	1----1-01-000000001100000000001000101-000100000100000001000100
Centropodiaglauca	1----1-01-100000001100000000001000101-000100000100000001000100
Cynodondactylon5248	001--1-01-0000010011000001-01000101-00010000010000000000100
Cynodondactylon7480	001--1-01-0000010011000001-01000101-00010000010000000000100
Cynodondactylon	001--1-01-0000010011000001-01000101-00010000010000000000100
Eleusinecoracana	001--1-11-0000000011010001-01000101-000100000-1000000000101
Eleusineindica	001--1-11-0000000011010001-01000101-000100000-1000000000101
Chlorisvirgata6616	1----1-01-00000000110000010100010l-00010000010000000000100
Chlorisvirgata7498	1----1-01-000000001100000101000101-00010000010000000000100
Eustachyspaspaloides5597	1----1-01-00000100110001-0-01000100-001-0000010000000000100
Harpochloafalx6530	1----1-01-00000010110001-0-010001000100-10000--10-00-0000100
Harpochloafalx5118	1----1-01-00000010110001-0-010001000100-10000--10-00-0000100
Harpochloafalx6670	1----1-01-00000010110001-0-010001000100-10000--10-00-0000100
Rendliaaltera5133	1----1-01-00000100110001-0-0100010110001000001000000000000100
Leptochloafusca7622	1----1-01-00000100110001-0-0100010110001000001000000000000100
Enteropogonmacrostachyus9339	1----1-01-00000100010001-0-0100010110001000001000000000000000
Astreblalappacea	1----1-01-00000100110001-0-0100010110001000001000000000000100
Muhlenbergiarichardsonis	1----1-01-00000100110001-0-0100010110001000001000000000000100
Triodiastenostachya	001--1-01-0--1-100110001-0-0100010110001000001000000000000100
Microchloacaffra5146	1--000101-00000000110001-0-0100010110001000001000000000000100
Dactylocteniumaegyptium9326	1----1-01-00000100110001-0-010001011000100001-000000000010-
Tragusberteronianus6620	1----1-01-00000100110001-0-0100010110001000001000000000000100
Tragusracemosus7108	1----1-01-00000100110001-0-01???????????????????????????????
Traguskoelerioides6729	1----1-01-00000100110001-0-01000101-00010000010000000000100
Polevansiarigida7621	1----1-01-00000100110001-0-01100101-00010000010000000000100
Perotispatens9323	1--1-0-01-00001100110001-0-01000101-000000000000000000000-10
Eragrostiscurvula6529	1----1-01-000001001100000000001000101-00010000000000000000100
Eragrostisobtusa6623	1----1-01-000001001100000000001000101-000100000---1--0-0000100
Eragrostisobtusa6732	1----1-01-000001001100000000001000101-000100000---1--0-0000100
Eragrostisechinochloidea7485	1----1-01-000001001100000000001000101-000100000---1--0-0000100
Eragrostispseudobtusa7508	1----1-01-000001001100000000001000101-000100000---1--0-0000100
Eragrostisechinochloidea5933	1----1-01-000001001100000000001000101-000100000---1--0-0000100
Eragrostislehmanniana20	1----1-01-000001001100000000001000101-00010000000000000000100
Eragrostiscurvula5191	1----1-01-000001001100000000001000101-00010000000000000000100
Eragrostischloromelas6947	1----1-01-000001001100000000001000101-00010000000000000000100
Eragrostischloromelas7474	1----1-01-000001001100000000001000101-0001010000000100-0000100
Eragrostisracemosa6533	1----1-01-000001011100000000001000101-0001000000000100-000010?
Eragrostisbiflora6705	1----1-01-000001001100000000001000101-0001010000000100-0000100
Eragrostissuperba7470	1----1-01-000001001100000000001000101-000100000-1000000000100
Eragrostiscapensis6551	1----1-01-000001001100000000001000101-0001000000000-10-0000100
Eragrostiscapensis6532	1----1-01-000001001100000000011000101-0001000000000100-0010100
Pogonarthriasquarrosa7483	1----1-01-000001001100000000001000101-0001000000000--1-0000100
Pogonarthriasquarrosa7504	1----1-01-000001001100000000001000101-0001000000000--1-0000100
Catalepisgracilis6962	1----1-01-000001001100000000001000101-0001010000000100-0000100
Catalepisgracilis6653	1----1-01-000001001100000000001000101-0001010000000100-0000100
Cladoraphiscyperoides5704	1----1-01-000001001100000000001000101-0001010000000-10-0000100
Cladoraphisspinosa6335	1----1-01-000001001100000000001000101-0001010000000-10-0000100
Cladoraphisspinosa4885	1----1-01-000001001100000000001000101-0001010000000-10-0000100
Cladoraphiscyperoides4894	1----1-01-000001001100000000001000101-0001010000000-10-0000100
Fingerhuthiaafricana4349	1----1-01-000001001100000000001000101-0001000100000-10-0000100
Fingerhuthiaafricana7507	1----1-01-000001001100000000001000101-0001000100000-10-0000100
Fingerhuthiaafricana4879	1----1-01-000001001100000000001000101-0001000100000-10-0000100
Entoplocamiaaristulata9353	1----1-01-000001001100000000001000101-0001000100000-10-0000100
Enneapogonscoparius18	1----1-01-000001001100000000001000101-0001000000000000010001100
Enneapogoncenchroides7506	1----1-01-000001001100000000001000101-0001000000000000010001100
Enneapogoncenchroides5213	1----1-01-000001001100000000001000101-0001000000000000010001100
Enneapogonscoparius7487	1----1-01-000001001100000000001000101-0001000000000000010001100
Schmidtiapappophoroides6334	1----1-01-000001001100000000001000101-0001000000000000010000100
Schmidtiakalihariensis7490	1----1-01-000001001100000000001000101-0001000000000000010000100
Schmidtiakalihariensis7486	1----1-01-000001001100000000001000101-0001000000000000010000100
Sporobolusafricanus7476	1--1-0-001000001001000101000100010??????????????????????????
Sporobolusconsimilis9354	1--1-0-000000001001000001001000101-00010000010000000001-0100
Sporobolusfimbriatus9328	0101-0-000000001001010001001000101-00010000000000000000010100

	789 810
IMPERATACYLINDRICA	??????????????????????
SORGHUMHALEPENSE	??????????????????????
PANICUMLANIPES	00010-0000000000001001
PANICUMSTAPFIANUM	00010-0000000000000001
KARROOCHLOAPURPUREA6241	0100010000001000000101
CHAETOBROMUSINVOLUCRATES6284	00010-0000001000000100
Merxmuellerarangei	00010-00001---0-000101
Centropodiaglauca	000-1--0-0001000000101
Cynodondactylon5248	000000001001--0-000101
Cynodondactylon7480	000000001001--0-000101
Cynodondactylon	000000001001--0-000101
Eleusinecoracana	0-0000000001--0-000101
Eleusineindica	0-0000000001--0-000101
Chlorisvirgata6616	000000000001--0-000101
Chlorisvirgata7498	000000000001--0-000101
Eustachyspaspaloides5597	00000-10-001--0-000101
Harpochloafalx6530	000-1--0-001--0-000101
Harpochloafalx5118	000-1--0-001--0-000101
Harpochloafalx6670	000-1--0-001--0-000101
Rendliaaltera5133	000000001001--0-000101
Leptochloafusca7622	00000-10-001--0-000101
Enteropogonmacrostachyus9339	00000-10-001--0-000101
Astreblalappacea	00000-10-001--0-000101
Muhlenbergiarichardsonis	00000-10-001--0-000101
Triodiastenostachya	00000-10-001--0-000101
Microchloacaffra5146	00000-10-001--0-000101
Dactylocteniumaegyptium9326	1------0-0000001000101
Tragusberteronianus6620	00000-10-000010-000101
Tragusracemosus7108	??????????????????????
Traguskoelerioides6729	00000-10-000010-000101
Polevansiarigida7621	00000-10-0000-1-000101
Perotispatens9323	00000-10-001--0-000101
Eragrostiscurvula6529	00000000-101--0-000101
Eragrostisobtusa6623	00000000-101--0-00011-
Eragrostisobtusa6732	00000000-101--0-00011-
Eragrostisechinochloidea7485	00000000-101--0-00011-
Eragrostispseudobtusa7508	00000000-101--0-00011-
Eragrostisechinochloidea5933	00000000-101--0-00011-
Eragrostislehmanniana20	00000000-101--0-000101
Eragrostiscurvula5191	00000000-101--0-000101
Eragrostischloromelas6947	00000000-101--0-000101
Eragrostischloromelas7474	00000000-101--0-000101
Eragrostisracemosa6533	??????????????????????
Eragrostisbiflora6705	00000000-101--0-000101
Eragrostissuperba7470	00000000-101--0-000101
Eragrostiscapensis6551	00000000-101--0-000101
Eragrostiscapensis6532	00000--1--00010-010101
Pogonarthriasquarrosa7483	00000000-101--0-10011-
Pogonarthriasquarrosa7504	00000000-101--0-10011-
Catalepisgracilis6962	00000000-101--0-000101
Catalepisgracilis6653	00000000-101--0-000101
Cladoraphiscyperoides5704	00000000-101--0-000101
Cladoraphisspinosa6335	00000000-101--0-000101
Cladoraphisspinosa4885	00000000-101--0-000101
Cladoraphiscyperoides4894	00000000-101--0-000101
Fingerhuthiaafricana4349	00000000-101--0-000101
Fingerhuthiaafricana7507	00000000-101--0-000101
Fingerhuthiaafricana4879	00000000-101--0-000101
Entoplocamiaaristulata9353	00000000-101--0-000101
Enneapogonscoparius18	00000000-101--0-000101
Enneapogoncenchroides7506	00000000-101--0-000101
Enneapogoncenchroides5213	00000000-101--0-000101
Enneapogonscoparius7487	00000000-101--0-000101
Schmidtiapappophoroides6334	00000000-101--0-000101
Schmidtiakalihariensis7490	00000000-101--0-000101
Schmidtiakalihariensis7486	00000000-101--0-000101
Sporobolusafricanus7476	??????????????????????
Sporobolusconsimilis9354	001000001001--0-010101
Sporobolusfimbriatus9328	001000001001--0-000101

APPENDIX F. Table of correspondence between the indels and the regions they represent (Appendix E) generated by GapCoder for the *ITS* dataset.

Indel Character	Sequence Region	Indel Character	Sequence Region	Indel Character	Sequence Region
669	9–9	**717**	214–216	**765**	584–587
670	15–15	**718**	215–215	**766**	590–592
671	34–34	**719**	224–224	**767**	591–592
672	42–42	**720**	224–225	**768**	592–592
673	43–43	**721**	235–235	**769**	592–593
674	53–53	**722**	240–241	**770**	599–599
675	54–70	**723**	240–243	**771**	600–602
676	60–60	**724**	240–240	**772**	600–600
677	61–61	**725**	376–376	**773**	601–602
678	64–65	**726**	391–391	**774**	602–602
679	73–73	**727**	423–423	**775**	602–603
680	86–86	**728**	426–426	**776**	602–604
681	90–90	**729**	439–440	**777**	602–606
682	92–92	**730**	439–439	**778**	603–604
683	94–94	**731**	440–440	**779**	603–606
684	94–95	**732**	444–456	**780**	603–607
685	103–107	**733**	444–455	**781**	604–604
686	103–106	**734**	444–457	**782**	606–608
687	104–107	**735**	444–454	**783**	608–609
688	104–106	**736**	469–469	**784**	609–609
689	105–107	**737**	484–487	**785**	613–613
690	108–108	**738**	486–487	**786**	615–615
691	113–113	**739**	490–490	**787**	615–616
692	116–119	**740**	491–491	**788**	619–620
693	117–119	**741**	491–492	**789**	619–625
694	117–121	**742**	491–493	**790**	620–620
695	117–120	**743**	493–493	**791**	622–622
696	117–118	**744**	497–497	**792**	623–624
697	125–126	**745**	498–498	**793**	623–625
698	126–126	**746**	506–506	**794**	624–624
699	132–132	**747**	511–511	**795**	624–625
700	139–139	**748**	515–515	**796**	624–626
701	143–147	**749**	516–516	**797**	625–625
702	148–148	**750**	519–519	**798**	625–626
703	150–150	**751**	525–525	**799**	633–636
704	153–153	**752**	528–531	**800**	634–635
705	162–162	**753**	528–528	**801**	634–636
706	170–173	**754**	529–532	**802**	635–636
707	180–180	**755**	529–531	**803**	635–637
708	181–183	**756**	539–539	**804**	636–636
709	182–183	**757**	544–544	**805**	642–642
710	188–188	**758**	556–556	**806**	643–643
711	193–193	**759**	563–563	**807**	647–647
712	194–194	**760**	565–566	**808**	651–651
713	196–196	**761**	566–566	**809**	653–661
714	197–197	**762**	574–574	**810**	656–661
715	198–198	**763**	582–583		
716	214–215	**764**	582–582		

APPENDIX G. Aligned sequence data of chloridoid and outgroup taxa for *trn*L-F. Numbers indicate the consecutive positions of 1 to 1191 (5' to 3') from the beginning of the *trn*L intron region to the end of the *trn*L-F intergenic spacer region. Dashes denote gaps. Arrows indicate the beginning of the *trn*L intron, *trn*L exon and *trn*L-F intergenic spacer regions. N indicates large regions of missing data where sequencing reactions failed.

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                                  ⬇
                                  1                                                  50
PHRAGMITESAUSTRALIS6557           NNNNTGTAT- GAGCCT-GGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
ARISTIDAADSCENSIONIS6540          NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
KARROOCHLOAPURPUREA6241           NNT-TGTATT GAGCCT-GGT A-GGAAACCT GCTAAGTGGT AACTTCCAAA
CHAETOBROMUSINVOLUCRATES6284      AAT-TGTATT GAGCCTTGGT ATGGAA-CCT GCTAAGTGGT AACTTCCAAA
SORGHUMHALEPENSE                  NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNTTCCAAA
IMPERATACYLINDRICA                NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNTTCCAAA
PANICUMLANIPES                    GATATGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
PANICUMSTAPFIANUM                 GATATGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Eleusinecoracana                  GAT-TGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Eleusineindica                    GAT-TGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Cynodondactylon                   GAT-TGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Cynodondactylon7480               NNNNNNNNNN NNNNNT-GGT ATGGAAACCT GCTACGTGGT AACTTCCAAA
Chlorisvirgata6616                GAT-TGTAT- GAGCCT-GGT ATGGAA-CCT GCTAAGTGGT AACTTCCAAA
Chlorisvirgata7498                NNNNNNNNNN NNNNNNNNNN NNGAAA-CCT GCTAAGTGGT AACTTCCAAA
Eustachyspaspaloides5597          NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Harpochloafalx6530                GAT-TGTATT GAGCCTTGGT ATGGA--CCT GCTAAGTGGT AACTTCCAAA
Harpochloafalx6670                GAT-TGTATT GAGCCTTGGT ATGGAA-CCT GCTAAGTGGT AACTTCCAAA
Harpochloafalx5118                NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Rendliaaltera5133                 NNNNNNNNNN NNNNNNNNNN NNNNNNNCCT GCTAAGTGGT AACTTCCAAA
Leptochloafusca7622               NNNNNNNNNN NNNNNNNGGT ATGGAA-CCT GCTAAGTGGT AACTTCCAAA
Enteropogonmacrostachyus9339      NNNNNNNNNN NNNNNNNNNN ATGGAA-CCT GCTAAGTGGT AACTTCCAAA
Dactylocteniumaegyptium9326       NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Tragusberteronianus6620           NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNCAAA
Tragusracemosus7108               NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Traguskoelerioides6729            NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Polevansiarigida7621              NNNNNNNNNN NNNNNNNNNN NNGGAAACCT GCTAAGTGGT AACTTCCAAA
Perotispatens9323                 NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostiscurvula6529             GAT-TGTATT GAGCCTTGGT ATGGAA--CT GCTAAGTGGT AACTTCCAAA
Eragrostisobtusa6623              GAT-TGTATT GAGC-TTGGT ATGGAAACCT GGTAAGTGGT AACTTCCAAA
Eragrostisobtusa6732              NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostisechinochloidea7485      GAT-TGTATT GAGC-TTGGT ATGGAAA-CT GCTAAGTGGT AACTTCCAAA
Eragrostispseudobtusa7508         GAT-TGTATT GAGCC-TGGT ATGGAA--CT GCTAAGTGGT AACTTCCAAA
Eragrostislehmanniana20           NNNNNGTATT GAGCCTTG-T ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Eragrostischloromelas6947         GAT-TGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Eragrostischloromelas7474         GAT-TGTATT GAG-CTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Eragrostisracemosa6533            GAT-TGTATT GAGCCTCGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Eragrostisbiflora6705             NNNNNNNNNN NNNNNNNNNN NNGGAAACCT GCTAAGTGGT AACTTCCAAA
Eragrostissuperba7470             GAT-TGTATT GAGCCTTGGT ATGGAA--CT GCTAAGTGGT AACTTCCAAA
Eragrostiscapensis6551            GAT-TGTATT GAG-CT-GGT ATGGAA-CCT GCTAAGTGGT GACTTCCAAA
Eragrostiscapensis6532            NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostislehmanniana7514         GAT-TGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Pogonarthriasquarrosa7483         NNNNNNNNNN NNNNNNNNNN NNNNNNNCCT GCTAGGTGGT AACTTCCAAA
Pogonarthriasquarrosa7504         GAT-TGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Catalepisgracilis6962             GAT-TGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT A-CTTCCAAA
Catalepisgracilis6653             NNNNNNNNNN NNNNNNNGGT ATGGAAACCT GCTAAGTGGT A-CTTCCAAA
Cladoraphiscyperoides5704         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Cladoraphisspinosa6335            NNNNNNNNNN NNNNNNNGGT ATGGAAACCT GCTAAGTGAT AACTTCCAAA
Cladoraphiscyperoides4894         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Fingerhuthiaafricana7507          GAT-TGTATT GAG-CT-GGT ATGGAAA-CT GCTAAGTGGT AACTTCCAAA
Entoplocamiaaristulata9353        NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Enneapogonscoparius18             NNNNNNNNNN NNNNNNNNNN NNNNNNNCCT GCTAAGTGGT AACTTCCAAA
Enneapogoncenchroides7506         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN AACTTCCAAA
Enneapogonscoparius7486           GAT-TGTATT GAGCCTTGGT ATGGAAA-CT GCTAAGTGGT AACTTCCAAA
Schmidtiapappophoroides6334       NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNCTTCCAAA
Schmidtiakalihariensis7490        NNNNTGTATT GAGC--TGGT ATGGAA--CT GCTAAGTGGT AACTTCCAAA
Schmidtiakalihariensis7487        GAT-TGTATT GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Sporobolusafricanus7476           GAT--GTAT- GAGCCT-GGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Sporobolusconsimilis9354          GAT-TGTATT GAG-CT-GGT ATGGGAACCT GTTAAGTGGT AACTTCCAAA
Sporobolusfimbriatus7509          GAT-TGTAT- GAGCCTTGGT ATGGAAACCT GCTAAGTGGT AACTTCCAAA
Sporoboluspyramidalis6966         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Sporobolusfimbriatus9328          NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
```

	51				100
PHRAGMITESAUSTRALIS6557	TTCAGAGAAC	CCCTGGAAT-	AAAAATGGGC	AATCCTGAGC	CAAATCC-TT
ARISTIDAADSCENSIONIS6540	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	TTCAGAGAAA	CCCTGGAATT	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
CHAETOBROMUSINVOLUCRATES6284	TTCAGAGAAA	CCCTGGAATT	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
SORGHUMHALEPENSE	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCACT
IMPERATACYLINDRICA	TTCAGAGAAA	CC-TGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCACT
PANICUMLANIPES	TTCAGAGAAA	CCCGGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
PANICUMSTAPFIANUM	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eleusinecoracana	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eleusineindica	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Cynodondactylon	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Cynodondactylon7480	TTCAGAGAA-	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Chlorisvirgata6616	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Chlorisvirgata7498	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Harpochloafalx6670	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Harpochloafalx5118	NNNNNNNNNN	NNNNNNNNNN	NNNNNNGGGC	AATCCTGAGC	CAAGTCCCTT
Rendliaaltera5133	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTG
Leptochloafusca7622	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Enteropogonmacrostachyus9339	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Dactylocteniumaegyptium9326	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Tragusberteronianus6620	TTCAGACAAT	CCCTGCAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Tragusracemosus7108	NNNNNNNNNN	NNNNNNAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Traguskoelerioides6729	NNNNNNNNNN	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Polevansiarigida7621	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Perotispatens9323	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostiscurvula6529	TTCAGAGAA-	CCCTGGAAGG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostisobtusa6623	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	TTCAGAGAAA	CC-TGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostispseudobtusa7508	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostislehmanniana20	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostischloromelas6947	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostischloromelas7474	TTCAGAGAAA	CCCCGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostisracemosa6533	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostisbiflora6705	TTCAGAGAAA	CCCAGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostissuperba7470	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Eragrostiscapensis6551	TTCAGAGA-A	CCCTGGAATG	AAAAATGGGC	AATC-TGAGC	CAAATCCCTT
Eragrostiscapensis6532	NNNNNNNNNN	NNNNNNNNNN	NNNNNTGGGC	A-TCCTGAGC	CAAATCCCTT
Eragrostislehmanniana7514	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Pogonarthriasquarrosa7483	T-CAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Pogonarthriasquarrosa7504	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Catalepisgracilis6962	TTCAGAGAA-	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTG
Catalepisgracilis6653	TTCAGAGAA-	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTG
Cladoraphiscyperoides5704	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cladoraphisspinosa6335	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Cladoraphiscyperoides4894	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Fingerhuthiaafricana7507	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATC-TGAGC	CAAATCCCTT
Entoplocamiaaristulata9353	NNNNNNNNNN	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Enneapogonscoparius18	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Enneapogoncenchroides7506	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Enneapogonscoparius7486	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Schmidtiapappophoroides6334	TTCAGACAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Schmidtiakalihariensis7490	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Schmidtiakalihariensis7487	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Sporobolusafricanus7476	TTCAGAGAAA	CCCTGGAATC	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Sporobolusconsimilis9354	TTCAGAGAAA	CCCTGGAATC	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Sporobolusfimbriatus7509	TTCAGAGAAA	CCCTGGAATG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Sporoboluspyramidalis6966	NNNNNNNNNN	NNNNNNNNNG	AAAAATGGGC	AATCCTGAGC	CAAATCCCTT
Sporobolusfimbriatus9328	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN

	101				150
PHRAGMITESAUSTRALIS6557	TTTT-----G	AAAAAA---C	AGGTGGTTCT	CAAACTAGAA	CCCAAAGGGA
ARISTIDAADSCENSIONIS6540	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	CAAACTAGAA	CCCAAAGGAA
KARROOCHLOAPURPUREA6241	TTTT-----G	AAAAA----C	ACGTGGTCCT	CAAACTAGAA	CCCAAAGAAA
CHAETOBROMUSINVOLUCRATES6284	TTTT-----G	AAAAAA---C	AAGCGGTCCT	CAAACTAGAA	CCCAAAGGAA
SORGHUMHALEPENSE	TTTTT----C	AAAAAA----	--GTGGTTCT	CAAACTAGAA	CCCAAAGGAA
IMPERATACYLINDRICA	TTTTT----G	AAAAAA---C	AAGTG-----	CAAACTAGAA	CCCAAAGGAA
PANICUMLANIPES	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
PANICUMSTAPFIANUM	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Eleusinecoracana	TTTTTCATTT	TAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Eleusineindica	TTTTTCATTT	TAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Cynodondactylon	TTTT-----G	AAAAA----C	AAGTGGTTCT	CAAACCAGAA	CCCAAAGGAA
Cynodondactylon7480	TTTT-----G	AAAAA----C	AAGTGGTTCT	CAAACCAGAA	CCCAAAGGAA
Chlorisvirgata6616	TTTT-----T	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Chlorisvirgata7498	TTTT-----T	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	TTTT-----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Harpochloafalx6670	TTTT-----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Harpochloafalx5118	TTTT-----G	AAAA------	---TGGTTCT	CAAA-TATAA	CCC---GGAA
Rendliaaltera5133	TTTT-----G	AAAAA----C	AAGTGGTTCT	CAAACAAGAA	CCCAAAGGAA
Leptochloafusca7622	TTT------G	AAAAA----C	AGGTGGTTTT	CAAACTAGAA	CCCAAAGGAA
Enteropogonmacrostachyus9339	TTTT-----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Dactylocteniumaegyptium9326	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Tragusberteronianus6620	TTTTG----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Tragusracemosus7108	TTTTG----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Traguskoelerioides6729	TTTTG----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Polevansiarigida7621	TTTTT----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Perotispatens9323	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNAA	CCCAAAGCAA
Eragrostiscurvula6529	TTTT-----G	AAAAAR---C	AAGKGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostisobtusa6623	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostispseudobtusa7508	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostislehmanniana20	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostischloromelas6947	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostischloromelas7474	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostisracemosa6533	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostisbiflora6705	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostissuperba7470	TTTT-----G	AAAAAG---C	AAGGGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostiscapensis6551	TTA------G	AAAAAA---C	AAGTGGTTCT	CAA-CTAGAA	CCCAAATGAA
Eragrostiscapensis6532	TTA------G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Eragrostislehmanniana7514	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Pogonarthriasquarrosa7483	TTA------G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Pogonarthriasquarrosa7504	TTA------G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Catalepisgracilis6962	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Catalepisgracilis6653	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Cladoraphiscyperoides5704	NNNNNNNNNN	NNNNNNNNNN	NNNTGGTTCT	CAAACTAGAA	CCCAAATGAA
Cladoraphisspinosa6335	TTTT-----G	AAAAAAAAAC	AAGTGGTTCT	CAAACTAGAA	TCCAAATGAA
Cladoraphiscyperoides4894	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NAAACTAGAA	CCCAAATGAA
Fingerhuthiaafricana7507	TTTT-----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAATTAA
Entoplocamiaaristulata9353	TTTT-----G	AAAAA----C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Enneapogonscoparius18	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	TCCAAATGAA
Enneapogoncenchroides7506	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	TCCAAATGAA
Enneapogonscoparius7486	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	TCCAAATGAA
Schmidtiapappophoroides6334	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	TCCAAATGAA
Schmidtiakalihariensis7490	TTTT-----G	AAAAAAA--C	AAACGGTTCT	CAAACTAGAA	CCCAAATGAA
Schmidtiakalihariensis7487	TTTT-----G	AAAAAAA--C	AAGCGGTTCT	CAAACTAGAA	CCCAAATGAA
Sporobolusafricanus7476	TTTT-----T	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAAAGAA
Sporobolusconsimilis9354	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAAGGAA
Sporobolusfimbriatus7509	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Sporoboluspyramidalis6966	TTTT-----G	AAAAAA---C	AAGTGGTTCT	CAAACTAGAA	CCCAAATGAA
Sporobolusfimbriatus9328	NNNNNNNNNN	NNNNNNNNNN	NNGTGGTTCT	CAAACTAGAA	CCCAAAGGAA

	151				200
PHRAGMITESAUSTRALIS6557	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
ARISTIDAADSCENSIONIS6540	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
KARROOCHLOAPURPUREA6241	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
CHAETOBROMUSINVOLUCRATES6284	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
SORGHUMHALEPENSE	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
IMPERATACYLINDRICA	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
PANICUMLANIPES	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
PANICUMSTAPFIANUM	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Eleusinecoracana	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Eleusineindica	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Cynodondactylon	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Cynodondactylon7480	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Chlorisvirgata6616	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Chlorisvirgata7498	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Harpochloafalx6670	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Harpochloafalx5118	AAGG------	ATCTGTGCCG	ACACTCAATG	GAAGCTGTTC	TAACGAATCG
Rendliaaltera5133	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Leptochloafusca7622	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Enteropogonmacrostachyus9339	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Dactylocteniumaegyptium9326	NNNNNNNNNN	NNNNNNNNNN	NNNNNCAATG	GAAGCTGTTC	TAACGAATCG
Tragusberteronianus6620	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Tragusracemosus7108	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Traguskoelerioides6729	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Polevansiarigida7621	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Perotispatens9323	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Eragrostiscurvula6529	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostisobtusa6623	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostispseudobtusa7508	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostislehmanniana20	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostischloromelas6947	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostischloromelas7474	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostisracemosa6533	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostisbiflora6705	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostissuperba7470	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostiscapensis6551	AAGG-ATAGG	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostiscapensis6532	AAGGGATAGG	ATAGGTGCAG	AGGCTCAATG	GAAGCTATTC	TAACGAATCG
Eragrostislehmanniana7514	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Pogonarthriasquarrosa7483	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
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Catalepisgracilis6962	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Catalepisgracilis6653	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Cladoraphiscyperoides5704	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Cladoraphisspinosa6335	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Cladoraphiscyperoides4894	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Fingerhuthiaafricana7507	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Entoplocamiaaristulata9353	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Enneapogonscoparius18	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Enneapogoncenchroides7506	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Enneapogonscoparius7486	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Schmidtiapappophoroides6334	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Schmidtiakalihariensis7490	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Schmidtiakalihariensis7487	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Sporobolusafricanus7476	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCA
Sporobolusconsimilis9354	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTGTTC	TAACGAATCG
Sporobolusfimbriatus7509	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Sporoboluspyramidalis6966	AAGG------	ATAGGTGCAG	AGACTCAATG	GAAGCTATTC	TAACGAATCG
Sporobolusfimbriatus9328	AAGG------	ATAGGTGCAG	ACACTCAATG	GAAGCTGTTC	TAACGAATCC

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                                      201                                                250
PHRAGMITESAUSTRALIS6557               AGGT--AATT ACGTTGTGTC GGTAGTGAAA C-----TCCC TCTA------
ARISTIDAADSCENSIONIS6540              AGGT--AATT ACGTTGTGTT GGTAGTGGAA C-----TCTC TCTC------
KARROOCHLOAPURPUREA6241               AGGT--AATT ACGTTGTGTT GGTAGTGTAA C-----GCCC TCTA------
CHAETOBROMUSINVOLUCRATES6284          AGGT--AATT GCGTTGTGCT GGTAGTGTAA T-----TCCT TCTA------
SORGHUMHALEPENSE                      AAGT------ ---------- ---------- ---------- ----------
IMPERATACYLINDRICA                    AAGT------ ---------- ---------- ---------- ----------
PANICUMLANIPES                        AA--GTAATT ACGTTGTGTT GGTAGTGGAA C-----TCCC TCGA------
PANICUMSTAPFIANUM                     AA--GTAATT ACGTTGTGTT GGTAGTGGAA C-----TCCC TCGA------
Eleusinecoracana                      AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Eleusineindica                        AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Cynodondactylon                       AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Cynodondactylon7480                   AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Chlorisvirgata6616                    AGGTGTAATT ACGTTGTGTT GGTAGCGAAA C-----TCCC TCTC------
Chlorisvirgata7498                    AGGTGTAATT ACGTTGTGTT GGTAGCGAAA C-----TCCC TCTA-----A
Eustachyspaspaloides5597              NNNNNNNNNT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Harpochloafalx6530                    AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TTTAATTTAA
Harpochloafalx6670                    AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TTTAATTTAA
Harpochloafalx5118                    AGGTGTAATT ACTTTGTGTT GGTAGTGAAA C-----TCCC TTTAATTTAA
Rendliaaltera5133                     AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Leptochloafusca7622                   AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Enteropogonmacrostachyus9339          AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Dactylocteniumaegyptium9326           AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTACTTTAA
Tragusberteronianus6620               AGGTGTAATT ACGTTGTGTT GGTAGTGCAA C-----TTCC TCTA-----A
Tragusracemosus7108                   AGGTGTAATT ACGTTGTGTT GGTAGTGCAA C-----TTCC TCTA-----A
Traguskoelerioides6729                AGGTGTAATT ACGTTGTGTT GGTAGTGCAA C-----TTCC TCTA-----A
Polevansiarigida7621                  AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Perotispatens9323                     AGGTATAATT ACGTTGTGTG GGTAGTGAAC C-----TTCC TCTA-----A
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Eragrostisobtusa6623                  AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Eragrostisobtusa6732                  NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostisechinochloidea7485          AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCT-------
Eragrostispseudobtusa7508             AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Eragrostislehmanniana20               AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Eragrostischloromelas6947             AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCT-------
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Eragrostislehmanniana7514             AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Pogonarthriasquarrosa7483             AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Pogonarthriasquarrosa7504             AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Catalepisgracilis6962                 AAGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Catalepisgracilis6653                 AAGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Cladoraphiscyperoides5704             AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Cladoraphisspinosa6335                AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Cladoraphiscyperoides4894             AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TNCC TCTA------
Fingerhuthiaafricana7507              AGGTGTAATT ACGTTGTGTT GGTAGTGAAA CTAAACTCCC TCTA------
Entoplocamiaaristulata9353            AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Enneapogonscoparius18                 AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Enneapogoncenchroides7506             AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Enneapogonscoparius7486               AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Schmidtiapappophoroides6334           AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Schmidtiakalihariensis7490            AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Schmidtiakalihariensis7487            AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA------
Sporobolusafricanus7476               AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Sporobolusconsimilis9354              AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCTA-----A
Sporobolusfimbriatus7509              AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Sporoboluspyramidalis6966             AGGTGTAATT ACGTTGTGTT GGTAATGAAA C-----TCCC TCTA------
Sporobolusfimbriatus9328              AGGTGTAATT ACGTTGTGTT GGTAGTGAAA C-----TCCC TCAA-----A
```

	251				300
PHRAGMITESAUSTRALIS6557	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
ARISTIDAADSCENSIONIS6540	----------	---AATTAGA	GAAAGAAAAA	GAAGGGCTTT	ATACATCTAA
KARROOCHLOAPURPUREA6241	----------	---AATTAGA	GAAAGAA---	---GGGCTT-	ATACATCTAA
CHAETOBROMUSINVOLUCRATES6284	----------	---AATTAGA	GAAAGAG---	---GGGCTT-	ATACATCTAA
SORGHUMHALEPENSE	----------	----------	----------	----------	----------
IMPERATACYLINDRICA	----------	----------	----------	----------	----------
PANICUMLANIPES	----------	---AATTATA	GAAAGAA---	---GGGCTTT	ATACATCTAA
PANICUMSTAPFIANUM	----------	---AATTATA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eleusinecoracana	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GAGCTTT	ATACATCTAA
Eleusineindica	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GAGCTTT	ATACATCTAA
Cynodondactylon	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Cynodondactylon7480	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Chlorisvirgata6616	----------	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Chlorisvirgata7498	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eustachyspaspaloides5597	ATTACTAAAA	CTAAATTAGA	GAAAGAA---	---GGGCTTT	ATCCATCTAA
Harpochloafalx6530	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Harpochloafalx6670	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Harpochloafalx5118	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Rendliaaltera5133	ATTAT-----	-TAAATTAGA	GAAAGAG---	---GGGCTTT	ATACATCTAA
Leptochloafusca7622	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GAGCTTT	ATACATCTAA
Enteropogonmacrostachyus9339	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Dactylocteniumaegyptium9326	A--AC-----	-GAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCGAA
Tragusberteronianus6620	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Tragusracemosus7108	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Traguskoelerioides6729	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Polevansiarigida7621	ATTAC-----	-TAAATTAGA	GAAAGAA---	---AGGCTTT	ATACATCTAA
Perotispatens9323	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGGCTTT	ATACACCTAA
Eragrostiscurvula6529	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACAT-TAA
Eragrostisobtusa6623	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	----------	-----TTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eragrostispseudobtusa7508	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eragrostislehmanniana20	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eragrostischloromelas6947	----------	-----TTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eragrostischloromelas7474	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eragrostisracemosa6533	----------	---AATTTGA	G---------	----------	----------
Eragrostisbiflora6705	----------	---AATTTGA	GAAAGAG---	---GGGCTTT	ATACATCTAA
Eragrostissuperba7470	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	AT----CTAA
Eragrostiscapensis6551	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eragrostiscapensis6532	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Eragrostislehmanniana7514	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Pogonarthriasquarrosa7483	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Pogonarthriasquarrosa7504	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Catalepisgracilis6962	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Catalepisgracilis6653	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Cladoraphiscyperoides5704	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Cladoraphisspinosa6335	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Cladoraphiscyperoides4894	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Fingerhuthiaafricana7507	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATATATCTAA
Entoplocamiaaristulata9353	----------	---AATTAGA	GAAAGAA---	---GC-CTTT	ATACATCTAA
Enneapogonscoparius18	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Enneapogoncenchroides7506	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Enneapogonscoparius7486	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Schmidtiapappophoroides6334	----------	---AATTCGA	GAAAGAA---	---GGGCTGT	ATACATCTAA
Schmidtiakalihariensis7490	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Schmidtiakalihariensis7487	----------	---AATTAGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Sporobolusafricanus7476	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GAACTTT	ATACATCTAA
Sporobolusconsimilis9354	ATTAC-----	-TAAATTAGA	GAAAGAA---	---GGACTTT	ATACATCTAA
Sporobolusfimbriatus7509	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Sporoboluspyramidalis6966	----------	---AATTTGA	GAAAGAA---	---GGGCTTT	ATACATCTAA
Sporobolusfimbriatus9328	ATTAC-----	-TAAATTAAA	GAAAGAA---	---GGACTTT	ATACATTTAA

	301				350
PHRAGMITESAUSTRALIS6557	TACACACCTA	TAGATACTGA	CATAGCAAAT	GATTAATCAC	AGAACCCATA
ARISTIDAADSCENSIONIS6540	TACACACGTA	TAGATACTGA	CATAGCAAAC	GACTAATCAC	AAAACCCATA
KARROOCHLOAPURPUREA6241	TACACACGTA	TAGATACTGA	CATAGGAAAC	GATTAATCAC	CGAACCTATA
CHAETOBROMUSINVOLUCRATES6284	TACACACGTA	TAGATACTGA	CATAGGAAAC	GATTAATCAC	AGAACCCATA
SORGHUMHALEPENSE	----------	----------	----AATAAC	GATTAATCAC	AGAACCCATA
IMPERATACYLINDRICA	----------	----------	----AATAAC	GATTAATCAC	AGAACCCATA
PANICUMLANIPES	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAT	AGAACCCATA
PANICUMSTAPFIANUM	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAT	AGAACCCATA
Eleusinecoracana	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eleusineindica	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Cynodondactylon	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Cynodondactylon7480	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Chlorisvirgata6616	TACACACGTA	TACATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Chlorisvirgata7498	TACACACGTA	TACATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eustachyspaspaloides5597	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Harpochloafalx6530	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Harpochloafalx6670	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Harpochloafalx5118	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Rendliaaltera5133	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATTAC	AGAACCCATA
Leptochloafusca7622	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Enteropogonmacrostachyus9339	TACACACGTA	TAGATACTGA	CATGGCAAAC	GATTAATCAC	AGAACCCATA
Dactylocteniumaegyptium9326	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Tragusberteronianus6620	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Tragusracemosus7108	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Traguskoelerioides6729	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Polevansiarigida7621	TACACACGTA	TAGATACTGA	GATAGCAAAC	GATTAATCAC	AGAACCCATA
Perotispatens9323	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCCC	AGAACCCATA
Eragrostiscurvula6529	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCMTA
Eragrostisobtusa6623	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eragrostispseudobtusa7508	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eragrostislehmanniana20	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eragrostischloromelas6947	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eragrostischloromelas7474	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eragrostisracemosa6533	----------	----------	----------	--------AC	AGAACCCGTA
Eragrostisbiflora6705	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Eragrostissuperba7470	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCCTA
Eragrostiscapensis6551	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAT	AGAACCCATA
Eragrostiscapensis6532	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAT	AGAACCCATA
Eragrostislehmanniana7514	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Pogonarthriasquarrosa7483	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Pogonarthriasquarrosa7504	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Catalepisgracilis6962	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Catalepisgracilis6653	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Cladoraphiscyperoides5704	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Cladoraphisspinosa6335	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Cladoraphiscyperoides4894	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Fingerhuthiaafricana7507	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Entoplocamiaaristulata9353	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCC-TA
Enneapogonscoparius18	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Enneapogoncenchroides7506	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Enneapogonscoparius7486	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Schmidtiapappophoroides6334	TACACACGTA	TAGATACTGA	AATAG-----	GATTAATCAC	AGAACCCATA
Schmidtiakalihariensis7490	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Schmidtiakalihariensis7487	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Sporobolusafricanus7476	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCGTA
Sporobolusconsimilis9354	TACACACGTA	TAGATGCTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Sporobolusfimbriatus7509	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Sporoboluspyramidalis6966	TACACACGTA	TAGATACTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA
Sporobolusfimbriatus9328	TACACACGTA	TAGATGCTGA	CATAGCAAAC	GATTAATCAC	AGAACCCATA

	351				400
PHRAGMITESAUSTRALIS6557	TCATAATAT-	-----AGGTT	CTTTATTTAT	TTATTTTTT	AGAATGAAAT
ARISTIDAADSCENSIONIS6540	TCATAATAT-	-----AGGTT	CTTT------	-TTTTTTTTT	AGAATGAAAT
KARROOCHLOAPURPUREA6241	TCATAATAT-	-----AGGTT	CTTTATTTT-	--TTTTTTTT	AGAATGAAAT
CHAETOBROMUSINVOLUCRATES6284	TCATAATAT-	-----AGGTT	CTTTATTTC-	----TTTTTT	AGAATGAAAT
SORGHUMHALEPENSE	TTATAATAT-	-----AGGTT	CTTTATTTT-	----ATTTTG	AGAATGAAAT
IMPERATACYLINDRICA	TTATAATAT-	-----AGGTT	CTTTATTTT-	----ATTTTT	AGAATGAAAT
PANICUMLANIPES	TCATAATAT-	-----AGGTT	CTTTATTTT-	---ATTTTTT	AGAATGAAAT
PANICUMSTAPFIANUM	TCATAATAT-	-----AGGTT	CTTTATTTT-	---ATTTTTT	AGAATGAAAT
Eleusinecoracana	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eleusineindica	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Cynodondactylon	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Cynodondactylon7480	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Chlorisvirgata6616	CGATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Chlorisvirgata7498	CGATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eustachyspaspaloides5597	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Harpochloafalx6530	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AAAATGAAAT
Harpochloafalx6670	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTG	AAAATGAAAT
Harpochloafalx5118	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTA	AAAATGAAAT
Rendliaaltera5133	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Leptochloafusca7622	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Enteropogonmacrostachyus9339	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Dactylocteniumaegyptium9326	CCATAATAT-	-----AGGTT	CTTYATTTA-	----TTTTTT	AGAATGAAAT
Tragusberteronianus6620	CCATAATAT-	-----AGGTT	CTTTATTTT-	----TTTTTT	AGAATGAAAT
Tragusracemosus7108	CCATAATAT-	-----AGGTT	CTTTATTTT-	----TTTTTT	AGAATGAAAT
Traguskoelerioides6729	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Polevansiarigida7621	CCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTAT	AGAATGAAAT
Perotispatens9323	CCATAATAT-	AGTATAGGTT	CCTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostiscurvula6529	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostisobtusa6623	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostispseudobtusa7508	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostislehmanniana20	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostischloromelas6947	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostischloromelas7474	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostisracemosa6533	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostisbiflora6705	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	TGAATGAAAT
Eragrostissuperba7470	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostiscapensis6551	TCATAATAT-	-----AGGTT	CCTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostiscapensis6532	TCATAATAT-	-----AGGTT	CCTTATTTA-	----TTTTTT	AGAATGAAAT
Eragrostislehmanniana7514	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Pogonarthriasquarrosa7483	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Pogonarthriasquarrosa7504	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Catalepisgracilis6962	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Catalepisgracilis6653	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Cladoraphiscyperoides5704	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Cladoraphisspinosa6335	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Cladoraphiscyperoides4894	TCATAATAT-	-----AGGTT	CTTTATTTA-	----ATTTTT	AGAATGAAAT
Fingerhuthiaafricana7507	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Entoplocamiaaristulata9353	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Enneapogonscoparius18	TCATAATATA	TAT--AGGTT	CTTTATTTA-	-TTTTTTTTT	A-AATGAAAT
Enneapogoncenchroides7506	TCATAATATA	T----AGGTT	CTTTATTTAT	TTTTTTTTTT	AGAATGAAAT
Enneapogonscoparius7486	TCATAATATA	TAT--AGGTT	CTTTATTTA-	-TTTTTTTTT	A-AATGAAAT
Schmidtiapappophoroides6334	TCATAATATA	TAT--AGGTT	CTTTATTTT-	----TTTTTT	AGAATGAAAT
Schmidtiakalihariensis7490	TCATAATATA	TATATAGGTT	CTTTATTTA-	----TTTTTT	AAAATGAAAT
Schmidtiakalihariensis7487	TCATAATATA	TATATAGGTT	CTTTATTTA-	----TTTTTT	AAAATGAAAT
Sporobolusafricanus7476	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Sporobolusconsimilis9354	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Sporobolusfimbriatus7509	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Sporoboluspyramidalis6966	TCATAATAT-	-----AGGTT	CTTTATTTA-	----TTTTTT	AGAATGAAAT
Sporobolusfimbriatus9328	TCATAATAT-	-----AGGTT	TTTTATTTA-	----TTTTTT	AGAATGAAAT

	401				450
PHRAGMITESAUSTRALIS6557	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTGT-
ARISTIDAADSCENSIONIS6540	TAGGGATGAT	TATGAAATAA	AAAATTCAGA	A-TTTT----	-GGAATTAT-
KARROOCHLOAPURPUREA6241	TAGAAATGAA	TATGAAATAG	AAAATTCTGA	AATTTTT-TT	-AGAATTAT-
CHAETOBROMUSINVOLUCRATES6284	TAGAAATGAA	TATGAAATAG	AAAATTCAGA	A-TTTTT-TT	-CGAATTAT-
SORGHUMHALEPENSE	TAGGAATGAT	TATGAAATAG	AAAATTCATA	A-TTTTT-TT	-AGAATTAT-
IMPERATACYLINDRICA	TAGGAATGAT	TATGAAATAG	AAAATTCCTA	A-TTTTT-TT	-AGAATTAT-
PANICUMLANIPES	TAGGAATGAT	TATGAAATAT	AAAATTCTGA	A-TTTTTTTT	TAGAATTAT-
PANICUMSTAPFIANUM	TAGGAATGAT	TATGAAATAT	AAAATTCTGA	A-TTTTT-TT	TAGAATTAT-
Eleusinecoracana	TTGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Eleusineindica	TTGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Cynodondactylon	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Cynodondactylon7480	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Chlorisvirgata6616	TAGGAATGAT	TATGAAATAG	AAAATTCTAA	A-TTTTT-T-	-AGAATTATA
Chlorisvirgata7498	TAGGAATGAT	TATGAAATAG	AAAATTCTAA	A-TTTTT-T-	-AGAATTATA
Eustachyspaspaloides5597	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Harpochloafalx6530	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Harpochloafalx6670	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Harpochloafalx5118	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Rendliaaltera5133	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	TAGAATTAT-
Leptochloafusca7622	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-GGAATTAT-
Enteropogonmacrostachyus9339	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Dactylocteniumaegyptium9326	TAGGAATGAT	TATGAAATAG	AAAATTTTGA	A-TTTTT-TT	-AGAATTAT-
Tragusberteronianus6620	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-CGAATTAT-
Tragusracemosus7108	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-CGAATTAT-
Traguskoelerioides6729	TAGGAATGAT	TATGAAATAG	AAAATTCAGA	A-TTTTT-TT	-CGAATTAT-
Polevansiarigida7621	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Perotispatens9323	TAGGAATGAT	TATGAAATAG	GAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Eragrostiscurvula6529	TAGGAATGAT	TATGAAATAK	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Eragrostisobtusa6623	TAGGAATGAT	TATGAAATAG	AAAATTCAGA	A-TTTTTATT	-AGAATTAT-
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Eragrostispseudobtusa7508	TAGGAATGAT	TATGAAATAG	AAAATTCAGA	A-TTTTTATT	-AGAATTAT-
Eragrostislehmanniana20	TAGGAATGAT	TATGAAATAK	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Eragrostischloromelas6947	TAGGAATGAT	TATGAAATAT	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Eragrostischloromelas7474	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Eragrostisracemosa6533	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Eragrostisbiflora6705	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Eragrostissuperba7470	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Eragrostiscapensis6551	TAGGAGTGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	TAGAATTAT-
Eragrostiscapensis6532	TAGGAGTGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	TAGAATTAT-
Eragrostislehmanniana7514	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Pogonarthriasquarrosa7483	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Pogonarthriasquarrosa7504	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Catalepisgracilis6962	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Catalepisgracilis6653	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Cladoraphiscyperoides5704	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Cladoraphisspinosa6335	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Cladoraphiscyperoides4894	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Fingerhuthiaafricana7507	TAGGAATGAT	TATGAAATAG	CAAATTCTGC	A-TTTTTATT	-AGAATTAT-
Entoplocamiaaristulata9353	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Enneapogonscoparius18	TAGGAATGAT	TATGAAATAG	AAAATTCTGC	A-TTTTTATT	-AGAATTAT-
Enneapogoncenchroides7506	TAGGAATGAT	TATGAAATAG	AAAATTCTGC	A-TTTTTATT	-AGAATTAT-
Enneapogonscoparius7486	TAGGAATGAT	TATGAAATAG	AAAATTCTGC	A-TTTTTATT	-AGAATTAT-
Schmidtiapappophoroides6334	TAGGAATGAT	TATGAAATAG	AAAATTCTTA	A-TTTTTATT	-AGAATTAT-
Schmidtiakalihariensis7490	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Schmidtiakalihariensis7487	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Sporobolusafricanus7476	TTGGAATGAT	TATGAAATAA	AAAATTCTGA	A-TTTTT-TT	-AGAATTAG-
Sporobolusconsimilis9354	TAGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-TT	-AGAATTAT-
Sporobolusfimbriatus7509	TAGGAATGAT	TATGAAATAT	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Sporoboluspyramidalis6966	TAGGAATGAT	TATGAAATAT	AAAATTCTGA	A-TTTTTATT	-AGAATTAT-
Sporobolusfimbriatus9328	TGGGAATGAT	TATGAAATAG	AAAATTCTGA	A-TTTTT-T-	-AGAATTAT-

	451				500
PHRAGMITESAUSTRALIS6557	-----TGTGA	ATCCATTCCA	ATCGAATATT	GAGTAATCAA	ATCCTTCAAT
ARISTIDAADSCENSIONIS6540	-----TGTGA	-----TTCCA	ATCAAATATT	GAGTAATCAA	ATCCTTCAAT
KARROOCHLOAPURPUREA6241	-----TGTGA	ATCCATTCCA	ATTGAATATT	GAGTAATCAA	ATTCTTCAAT
CHAETOBROMUSINVOLUCRATES6284	-----TGTGA	ATCTATTCCA	ATTGAATATT	GAGTAATCAA	ATCCTTCAAT
SORGHUMHALEPENSE	-----TGTGA	ATCTATTCCA	ATCGAATATT	GAGTAATCAA	ATCCTTCAAT
IMPERATACYLINDRICA	-----TGTGA	ATCTATTCCA	ATCGAATATT	GAGTAATCAA	ATCCTTCAAT
PANICUMLANIPES	-----TGTGA	ATCCATTCCA	ATCGAATATT	GAGTAATCAA	ATCCTTCAAT
PANICUMSTAPFIANUM	-----TGTGA	ATCCATTCCA	ATCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eleusinecoracana	-----TGTGA	ATCTATTCCT	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eleusineindica	-----TGTGA	ATCTATTCCT	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Cynodondactylon	-----TGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ACCCTTCAAT
Cynodondactylon7480	-----TGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ACCCTTCAAT
Chlorisvirgata6616	ATTATTGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Chlorisvirgata7498	ATTATTGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eustachyspaspaloides5597	-----TGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ACCCTTCAAT
Harpochloafalx6530	-----TGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Harpochloafalx6670	-----TGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Harpochloafalx5118	-----TGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Rendliaaltera5133	-----TGTGA	ATCTATTCCC	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Leptochloafusca7622	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Enteropogonmacrostachyus9339	-----TGTGA	ATCTATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Dactylocteniumaegyptium9326	-----TGTGA	ATCCATTCCC	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Tragusberteronianus6620	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAATAATCAA	ATCCTTCAAT
Tragusracemosus7108	-----TGTGA	ATTCATTCCA	CTCGAATATT	GAATAATCAA	ATCCTTCAAT
Traguskoelerioides6729	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAATAATCAA	ATCCTTCAAT
Polevansiarigida7621	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAATAATCAA	ATCTTTCAAT
Perotispatens9323	-----TGTGA	ATCCATTTCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostiscurvula6529	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostisobtusa6623	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNCAAT
Eragrostisechinochloidea7485	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostispseudobtusa7508	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostislehmanniana20	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostischloromelas6947	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostischloromelas7474	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostisracemosa6533	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostisbiflora6705	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostissuperba7470	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostiscapensis6551	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostiscapensis6532	-----TGTGA	ATCCATTCCC	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Eragrostislehmanniana7514	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Pogonarthriasquarrosa7483	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Pogonarthriasquarrosa7504	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Catalepisgracilis6962	-----TGTGA	ATCCATTCCA	CTCGAATATA	GAGTAATCAA	ATCCTTCAAT
Catalepisgracilis6653	-----TGTGA	ATCCATTCCA	CTCGAATATA	GAGTAATCAA	ATCCTTCAAT
Cladoraphiscyperoides5704	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Cladoraphisspinosa6335	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Cladoraphiscyperoides4894	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Fingerhuthiaafricana7507	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Entoplocamiaaristulata9353	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Enneapogonscoparius18	-----TGTGA	ATCCATTCCA	CTCAAATATT	GAGTAATCAG	ATCCTTCATT
Enneapogoncenchroides7506	-----TGTGA	ATCCATTCCA	CTCAAATATT	GAGTAATCAG	ATTCTTCATT
Enneapogonscoparius7486	-----TGTGA	ATCCATTCCA	CTCAAATATT	GAGTAATCAG	ATCCTTCATT
Schmidtiapappophoroides6334	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCATT
Schmidtiakalihariensis7490	-----TGGGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Schmidtiakalihariensis7487	-----TGGGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Sporobolusafricanus7476	-----TGGAA	TTCCATTCCA	CTCGAATATT	GAATAATCAA	ATCCTTCAAT
Sporobolusconsimilis9354	-----TGTGA	ATCCATTCCA	CTCGAAT---	----------	----------
Sporobolusfimbriatus7509	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Sporoboluspyramidalis6966	-----TGTGA	ATCCATTCCA	CTCGAATATT	GAGTAATCAA	ATCCTTCAAT
Sporobolusfimbriatus9328	-----TGTGA	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN

	501				550
PHRAGMITESAUSTRALIS6557	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGTGGA---	--TTAATCGG
ARISTIDAADSCENSIONIS6540	TCATTGTTTT	CAAGAT----	-CTTTT-AAA	AAGTGGA---	--TTAATCGG
KARROOCHLOAPURPUREA6241	TCATT-TTTT	TGAGAT----	-CCTTT-AAA	A-GTGGA---	--TTAATCGA
CHAETOBROMUSINVOLUCRATES6284	TCATT-TTTT	TGAGAT----	-CTTTT-AAA	AAGCGGA---	--TTAATCGG
SORGHUMHALEPENSE	TCATTGTTTT	CGAGAT----	-CTTTT-AAA	AAGTGGA---	--TTAATCGG
IMPERATACYLINDRICA	TCATTGTTTT	CGAGAT----	-CTTTT-AAA	AAGTGGA---	--TTAATCGG
PANICUMLANIPES	TCATTGTTTT	-GAGAT----	-CTTCA-AAA	AAGTGGA---	--TTAATCGA
PANICUMSTAPFIANUM	TCATTGTTTT	-GAGAT----	-CTTCA-AAA	AAGTGGA---	--TTAATCGA
Eleusinecoracana	TCATTGTTTT	TGAGAT----	-CTTTT-TAA	AATAGGA---	--TTAATCGG
Eleusineindica	TCATTGTTTT	TGAGAT----	-CTTTT-TAA	AATAGGA---	--TTAATCGG
Cynodondactylon	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AATAGGA---	--TTAATCGG
Cynodondactylon7480	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AATAGGA---	--TTAATCGG
Chlorisvirgata6616	TCATTGTTTT	TGAGAT----	-ATTT--AAA	AATAGGA---	--TTAATCGG
Chlorisvirgata7498	TCATTGTTTT	TGAGAT----	-ATTT--AAA	AATAGGA---	--TTAATCGG
Eustachyspaspaloides5597	TCATTGTTTT	TGAGATNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	TCATTGTTTT	TGAGAT----	-ATTTT-TAA	AATAGGA---	--TTAATCCG
Harpochloafalx6670	TCATTGTTTT	TGAGAT----	-ATTTT-AAA	AATAGGA---	--TTAATCCG
Harpochloafalx5118	TCATTGTTTT	TGAGAT----	-ATTTT-AAA	AATAGGA---	--TTAATCCG
Rendliaaltera5133	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AATAAGA---	--TTAATCGG
Leptochloafusca7622	TCATTGTTTT	TGAGAT----	-ATTTA-AAA	AATAGGA---	--TTAATCGG
Enteropogonmacrostachyus9339	TCATTGTTTT	TGAGAT----	-CTTTA-AAA	AATAGGA---	--TTAATCGG
Dactylocteniumaegyptium9326	TCATTGTTTT	TGAGATT---	-AAAAA-AAA	AATAGGA---	--TTAATCGG
Tragusberteronianus6620	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AATAAGA---	--TTAATCGG
Tragusracemosus7108	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AATAAGA---	--TTAATCGG
Traguskoelerioides6729	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AATAAGA---	--TTAATCGG
Polevansiarigida7621	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AATAAGA---	--TTAATCGG
Perotispatens9323	TCATTGTTTT	TGAGAT----	-ATTTT-TAA	AATAGGA---	--TTAATCGG
Eragrostiscurvula6529	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostisobtusa6623	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostisobtusa6732	TCATTGTTTT	TGGAGT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostisechinochloidea7485	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostispseudobtusa7508	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostislehmanniana20	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostischloromelas6947	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostischloromelas7474	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostisracemosa6533	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostisbiflora6705	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGT
Eragrostissuperba7470	TCATTGTTTT	TGAGATCCTT	TATTTT-TAA	AAGAGGA---	--TTAATCGT
Eragrostiscapensis6551	TCATTGTTTT	TGAGAT----	-CCTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostiscapensis6532	TCATTGTTTT	TGAGAT----	-CCTTT-AAA	AAGAGGA---	--TTAATCGG
Eragrostislehmanniana7514	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Pogonarthriasquarrosa7483	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Pogonarthriasquarrosa7504	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Catalepisgracilis6962	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Catalepisgracilis6653	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Cladoraphiscyperoides5704	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Cladoraphisspinosa6335	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Cladoraphiscyperoides4894	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Fingerhuthiaafricana7507	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGAA---	--TTAATCGG
Entoplocamiaaristulata9353	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Enneapogonscoparius18	TCATTGTTTT	TCAGAT----	-CTTTTTAAA	AAGAGGATTA	GATTAATCGG
Enneapogoncenchroides7506	TCATTGTTTT	TCAGAT----	-CTTTTTAAA	AAGAGGATTA	GATTAATCGG
Enneapogonscoparius7486	TCATTGTTTT	TCAGAT----	-CTTTTTAAA	AAGAGGATTA	GATTAATCGG
Schmidtiapappophoroides6334	TCATTGTTTT	TCAGAT----	-CTTTT-AAA	AAGAGGATTA	GATTAATTGG
Schmidtiakalihariensis7490	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Schmidtiakalihariensis7487	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Sporobolusafricanus7476	TCATTGTTTT	TGAGATTTTT	TATTTT-AAA	AAGAAGA---	--TTAATCGG
Sporobolusconsimilis9354	----------	----------	---------A	AAGAAGA---	--TTAATCGG
Sporobolusfimbriatus7509	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Sporoboluspyramidalis6966	TCATTGTTTT	TGAGAT----	-CTTTT-AAA	AAGAGGA---	--TTAATCGG
Sporobolusfimbriatus9328	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN

	551				600
PHRAGMITESAUSTRALIS6557	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
ARISTIDAADSCENSIONIS6540	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
KARROOCHLOAPURPUREA6241	ACGAGAATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
CHAETOBROMUSINVOLUCRATES6284	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
SORGHUMHALEPENSE	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
IMPERATACYLINDRICA	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
PANICUMLANIPES	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
PANICUMSTAPFIANUM	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eleusinecoracana	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eleusineindica	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Cynodondactylon	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Cynodondactylon7480	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Chlorisvirgata6616	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Chlorisvirgata7498	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Harpochloafalx6670	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Harpochloafalx5118	-CGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Rendliaaltera5133	ACGAGGATAA	AGAGAGAGTC	CCATTTTACA	TGTCAATAGT	GACAACAATG
Leptochloafusca7622	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Enteropogonmacrostachyus9339	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Dactylocteniumaegyptium9326	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Tragusberteronianus6620	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Tragusracemosus7108	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Traguskoelerioides6729	GCGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Polevansiarigida7621	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Perotispatens9323	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostiscurvula6529	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostisobtusa6623	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostisobtusa6732	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostisechinochloidea7485	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostispseudobtusa7508	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostislehmanniana20	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostischloromelas6947	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostischloromelas7474	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostisracemosa6533	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostisbiflora6705	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostissuperba7470	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostiscapensis6551	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Eragrostiscapensis6532	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GGCAACAATG
Eragrostislehmanniana7514	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Pogonarthriasquarrosa7483	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Pogonarthriasquarrosa7504	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Catalepisgracilis6962	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Catalepisgracilis6653	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Cladoraphiscyperoides5704	ACGAGGATAA	AGAGAGAGTC	CCATTTTACA	TGTCAATACT	GACAACAATG
Cladoraphisspinosa6335	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Cladoraphiscyperoides4894	GCGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Fingerhuthiaafricana7507	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Entoplocamiaaristulata9353	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Enneapogonscoparius18	ACGAGGATAA	AGAGAGAGTC	CCATTTTACA	TGTCAATACT	GACAACAATG
Enneapogoncenchroides7506	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Enneapogonscoparius7486	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Schmidtiapappophoroides6334	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Schmidtiakalihariensis7490	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Schmidtiakalihariensis7487	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Sporobolusafricanus7476	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Sporobolusconsimilis9354	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Sporobolusfimbriatus7509	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATACT	GACAACAATG
Sporoboluspyramidalis6966	ACGAGGATAA	AGAGAGAGTC	CCATTCTACA	TGTCAATGGT	GACAACAATG
Sporobolusfimbriatus9328	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNCAATG

	601				650
PHRAGMITESAUSTRALIS6557	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
ARISTIDAADSCENSIONIS6540	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
KARROOCHLOAPURPUREA6241	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAGGTC	GTGAGGGTTC
CHAETOBROMUSINVOLUCRATES6284	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAGGTC	GTGAGGGTTC
SORGHUMHALEPENSE	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
IMPERATACYLINDRICA	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
PANICUMLANIPES	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGNNNNN
PANICUMSTAPFIANUM	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGNNNNN
Eleusinecoracana	AAATTTCTAG	TAAAAGGNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	AAATTTCTAG	TAAAAGGNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	AAATTTCTAG	TAAAAGGNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Chlorisvirgata6616	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Chlorisvirgata7498	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	AAATTTCTAG	TAAAAGGAAA	ATCCGTGGAC	TTTTTAAGTC	GTGAGGGTTC
Harpochloafalx6670	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTTTAAGTC	GGGAGGGTTC
Harpochloafalx5118	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTTTAAGTC	GTGAGGGTTC
Rendliaaltera5133	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGGC	TTTATAAGTC	GTGAGGGTTC
Leptochloafusca7622	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Enteropogonmacrostachyus9339	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTCTAAGTC	GTGAGGGTTC
Dactylocteniumaegyptium9326	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Tragusberteronianus6620	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Tragusracemosus7108	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Traguskoelerioides6729	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Polevansiarigida7621	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Perotispatens9323	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGCC	TTTATAAGTC	GTGAGGGTTC
Eragrostiscurvula6529	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTT	GTGAGGGTTC
Eragrostisobtusa6623	AAATTTCTAG	TAAAAGGNNN	NNNNGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eragrostisobtusa6732	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eragrostisechinochloidea7485	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTATAAAGTC	GTGAGGGTTC
Eragrostispseudobtusa7508	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eragrostislehmanniana20	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eragrostischloromelas6947	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTT	GTGAGGGTTC
Eragrostischloromelas7474	AAATTT-TAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eragrostisracemosa6533	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eragrostisbiflora6705	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eragrostissuperba7470	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Eragrostiscapensis6551	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	ATGAGGGTTC
Eragrostiscapensis6532	AAATTTTTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	ATGAGGGTTC
Eragrostislehmanniana7514	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTCTAAGTC	GTGAGGGTTC
Pogonarthriasquarrosa7483	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Pogonarthriasquarrosa7504	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Catalepisgracilis6962	AAATTTCTAG	TANNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Catalepisgracilis6653	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Cladoraphiscyperoides5704	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Cladoraphisspinosa6335	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Cladoraphiscyperoides4894	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Fingerhuthiaafricana7507	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Entoplocamiaaristulata9353	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Enneapogonscoparius18	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Enneapogoncenchroides7506	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Enneapogonscoparius7486	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Schmidtiapappophoroides6334	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Schmidtiakalihariensis7490	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Schmidtiakalihariensis7487	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Sporobolusafricanus7476	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Sporobolusconsimilis9354	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC
Sporobolusfimbriatus7509	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTT	GTGAGGGTTC
Sporoboluspyramidalis6966	AAATNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Sporobolusfimbriatus9328	AAATTTCTAG	TAAAAGGAAA	ATCCGTCGAC	TTTATAAGTC	GTGAGGGTTC

	651				700
PHRAGMITESAUSTRALIS6557	AAGTCCCTCT	ATCCCCAAAC	CCTCTTTTAT	TTACTAACCC	TAGTATTTAT
ARISTIDAADSCENSIONIS6540	AAGTCCCTCT	ATCCCCAAAC	CCTCTTTTAT	TCCCTAACCA	TAGTATTTAT
KARROOCHLOAPURPUREA6241	AAGTCCCTCT	ATCCCCAAAC	CCTCTTTTAT	TCCCTAACCA	TAGTATTTAT
CHAETOBROMUSINVOLUCRATES6284	AAGTCCCTCT	ATCCCCAAAC	CCTCGTTTAT	TCCCTAACCA	TAGTATTTAT
SORGHUMHALEPENSE	AAGTCCCTCT	ATCCCCAAAC	CCTCTTTTAT	TCGCTAACCA	TAGTTGTTAT
IMPERATACYLINDRICA	AAGTCCCTCT	ATCCCCAAAC	CCTCTTTTAT	TCCCTAACCA	TAGTTGTTAT
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Chlorisvirgata6616	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Chlorisvirgata7498	AAGTCCCTTT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eustachyspaspaloides5597	NNNNNNNNNT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Harpochloafalx6530	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Harpochloafalx6670	AAGTCCCTTT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Harpochloafalx5118	AAGTCCCTTT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Rendliaaltera5133	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTAAT
Leptochloafusca7622	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCG	TAGTATTTAT
Enteropogonmacrostachyus9339	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Dactylocteniumaegyptium9326	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Tragusberteronianus6620	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	-AC--TTTAT
Tragusracemosus7108	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	-AC--TTTAT
Traguskoelerioides6729	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	-AC--TTTAT
Polevansiarigida7621	AAGTCCCTTT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	-A--------
Perotispatens9323	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAATCA	TAGTATTTAT
Eragrostiscurvula6529	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostisobtusa6623	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostisobtusa6732	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostisechinochloidea7485	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostispseudobtusa7508	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostislehmanniana20	AAGTCCCTCT	ATCCCCAAAC	CCTTCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostischloromelas6947	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostischloromelas7474	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostisracemosa6533	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TTCCTAACCA	TAGTATTTAT
Eragrostisbiflora6705	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TACTATTTAT
Eragrostissuperba7470	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TCGTATTTAT
Eragrostiscapensis6551	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostiscapensis6532	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Eragrostislehmanniana7514	AAGTCCCTCT	ATCCCCAAAC	CCTTCTTTAT	TCCCTAACCA	TAGTATTTAT
Pogonarthriasquarrosa7483	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Pogonarthriasquarrosa7504	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Catalepisgracilis6962	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNCCA	TAGTATTTAT
Catalepisgracilis6653	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Cladoraphiscyperoides5704	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Cladoraphisspinosa6335	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Cladoraphiscyperoides4894	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Fingerhuthiaafricana7507	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Entoplocamiaaristulata9353	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Enneapogonscoparius18	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTAAT
Enneapogoncenchroides7506	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTAAT
Enneapogonscoparius7486	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTAAT
Schmidtiapappophoroides6334	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTAAT
Schmidtiakalihariensis7490	AAGTCCCTCT	ATCCCCAAAC	CCTCCCTTAT	TCCCTAACCA	TAGTTTTAAT
Schmidtiakalihariensis7487	AAGTCCCTCT	ATCCCCAAAC	CCTCCCTTAT	TCCCTAACCA	TAGTTTTAAT
Sporobolusafricanus7476	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Sporobolusconsimilis9354	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Sporobolusfimbriatus7509	AAGTCCCTCT	ATCCCCAAAC	CCTCCTTTAT	TCCCTAACCA	TAGTATTTAT
Sporoboluspyramidalis6966	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Sporobolusfimbriatus9328	AAGTCCCTCT	ATCCCCAAAC	CCCCCTTTAT	TCCCTAACCA	TAGTATTTAT

	701				750
PHRAGMITESAUSTRALIS6557	-----CCTTT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	--AAGATTCA
ARISTIDAADSCENSIONIS6540	-----CCTCT	TTTTT-TTT-	ATGAATGCAA	TGGGTTT---	--AAGATTCA
KARROOCHLOAPURPUREA6241	-----CCTAT	TTTTT-TTT-	-------CAA	TAGGTTT---	--AAGATTCA
CHAETOBROMUSINVOLUCRATES6284	-----CCTAT	TTTTT-TTTT	-------CAA	TGGGTTT---	--AAGATTCA
SORGHUMHALEPENSE	-----CCT-T	TTTTT---TT	AT-----CAA	TGGGTTT---	--AAGATTCA
IMPERATACYLINDRICA	-----CCT-T	TTTTTCTTTT	AT-----CAA	TGGGTTT---	--AAGATTCA
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	-----CCTCT	TTTCTCTTTT	AT-----CTA	TGG-TTCAAG	ACAAGATTCA
Chlorisvirgata6616	-----CCTCT	TTTCTCTTTT	AT-----CGA	TGGGTT----	-CAAGATTCA
Chlorisvirgata7498	-----CCTCT	TTTCTCTTTT	AT-----CGA	TGGGTT----	-CAAGATTCA
Eustachyspaspaloides5597	-----CCTCT	TTTCTCTTTT	AT-----CAA	TGGGTTCAAG	ACAAGATTCA
Harpochloafalx6530	-----CCTCT	TTTCTCTTTT	AT-----CAA	TGGGTT----	-CAAGATTCA
Harpochloafalx6670	-----CCTCT	TTTCTCTTTT	AT-----CAA	TGGGTT----	-CAAGATTCA
Harpochloafalx5118	-----CCTCT	TTTCTCTTTT	AT-----CAA	TGGGTT----	-CAAGATTCA
Rendliaaltera5133	-----CCTCT	TTTYTCTTTT	MT-----CAA	TGGGTTYAAG	ACAAGATTCA
Leptochloafusca7622	CTTATCCTCT	TTTCTCTTTT	AT-----CAA	TGGGTT----	-CAAGATTCA
Enteropogonmacrostachyus9339	-----CCTCT	TTTCTCTTTT	AT-----CAA	TGGGTT----	-CAAGATTCA
Dactylocteniumaegyptium9326	-----CCTCT	TTTCTCTTTT	AT-----CAA	TGGGTT----	-CAAGATTCA
Tragusberteronianus6620	----------	----TCCCTA	AC-----CAA	TGGGTT----	-CAAGATTCA
Tragusracemosus7108	----------	----TCCCTA	AC-----CAA	TGGGTT----	-CAAGATTCA
Traguskoelerioides6729	----------	----TCCCTA	AC-----CAA	TGGGTT----	-CAAGATTCA
Polevansiarigida7621	----------	----------	----------	TGGGTT----	-CAAGATTCA
Perotispatens9323	CTTATCCTCT	TTTCTCTTTT	AT-----CAA	TGGGTT----	-CAAGATTCA
Eragrostiscurvula6529	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGATTT---	-CAAGATTCA
Eragrostisobtusa6623	-----CCTAT	TTTTTCTTTT	ATCAATGCAA	TGGGTTT---	-CAAGATTCA
Eragrostisobtusa6732	-----CCTAT	TTTTTCTTTT	ATCAATGCAA	TGGGTTT---	-CAAGATTCA
Eragrostisechinochloidea7485	-----CCTAT	TTTATCTTTT	ATCAATGCAA	TGGGTTT---	-CAAGATTCA
Eragrostispseudobtusa7508	-----CCTAT	TTTTTCTTTT	ATCAATGCAA	TGGGTTT---	-CAAGATTCA
Eragrostislehmanniana20	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGATTT---	-CAAGATTCA
Eragrostischloromelas6947	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGATTT---	-CAAGATTCA
Eragrostischloromelas7474	-----CCTAT	TTTTTCTTTT	AT-----CAA	CGGGTTT---	-CAAGATTCA
Eragrostisracemosa6533	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Eragrostisbiflora6705	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Eragrostissuperba7470	-----CCTCT	TTTTTCTTTT	AG-----CAA	GGGGTTT---	-CAAGATTCA
Eragrostiscapensis6551	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Eragrostiscapensis6532	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Eragrostislehmanniana7514	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGATTT---	-CAAGATTCA
Pogonarthriasquarrosa7483	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGATTT---	-CAAGATTCA
Pogonarthriasquarrosa7504	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGATTT---	-CAAGATTCA
Catalepisgracilis6962	-----CCTTT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Catalepisgracilis6653	-----CCTTT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Cladoraphiscyperoides5704	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Cladoraphisspinosa6335	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Cladoraphiscyperoides4894	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Fingerhuthiaafricana7507	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Entoplocamiaaristulata9353	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Enneapogonscoparius18	-----CCTCT	TTTTTCTTTT	CT-----CAA	TGGGTTT---	-CAAGATTCA
Enneapogoncenchroides7506	-----CCTCT	TTTTTCTTTT	CT-----CAA	TGGGTTT---	-CAAGATTCA
Enneapogonscoparius7486	-----CCTCT	TTTTTCTTTT	CT-----CAA	TGGGTTT---	-CAAGATTCA
Schmidtiapappophoroides6334	-----CCTCT	TTTTTCTTTT	CT-----CAA	TGGGTTT---	-CAAGATTCA
Schmidtiakalihariensis7490	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Schmidtiakalihariensis7487	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTTT---	-CAAGATTCA
Sporobolusafricanus7476	CCTATCCTCT	TTTTTCTTTT	AT-----TAA	----------	----------
Sporobolusconsimilis9354	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTTCAA-	ACAAAATTCA
Sporobolusfimbriatus7509	-----CCTAT	TTTTTCTTTT	AT-----CAA	TGGATTT---	-CAAGATTCA
Sporoboluspyramidalis6966	NNNNNNNNNN	NNNNNNNTTT	AT-----CAA	TGGATTT---	-CAAGATTCA
Sporobolusfimbriatus9328	-----CCTCT	TTTTTCTTTT	AT-----CAA	TGGGTT----	-CGAGATTCA

	751				800
PHRAGMITESAUSTRALIS6557	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA
ARISTIDAADSCENSIONIS6540	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTCCGAAGA
KARROOCHLOAPURPUREA6241	TTAGCT----	TTCTCATTCT	ATT-----CT	TTCACAAAGG	ACTGCAAAGA
CHAETOBROMUSINVOLUCRATES6284	TTAGCT----	TTCTCATTCT	ATT-----CA	TTCACAAAGG	AATGCAAAGA
SORGHUMHALEPENSE	CTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGACAA
IMPERATACYLINDRICA	CTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGACAA
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	TTAGCTTGCT	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCAAAGA
Chlorisvirgata6616	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCAAAGA
Chlorisvirgata7498	TTAGCT----	TTCTCATTYT	ACT-----CT	TTCACAAAGG	AGTGCAAAGA
Eustachyspaspaloides5597	TTAGTT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCAAAGA
Harpochloafalx6530	TTAGTT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCAAAGA
Harpochloafalx6670	TTAGTT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCAAAGA
Harpochloafalx5118	TTAGTT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCAAAGA
Rendliaaltera5133	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCRCAAAGG	AGTGCRAAGA
Leptochloafusca7622	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA
Enteropogonmacrostachyus9339	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCAAAGA
Dactylocteniumaegyptium9326	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	GGTGCGAAGA
Tragusberteronianus6620	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAAA
Tragusracemosus7108	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAAA
Traguskoelerioides6729	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAAA
Polevansiarigida7621	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA
Perotispatens9323	TTAGCT----	TTCTCATTAT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA
Eragrostiscurvula6529	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostisobtusa6623	TTAGCT----	TTCTCATTCT	ACTTTACTCT	TTCATAAAGG	AGTGCGAAGA
Eragrostisobtusa6732	TTAGCT----	TTCTCATTCT	ACTTTACTCT	TTCATAAAGG	AGTGCGAAGA
Eragrostisechinochloidea7485	TTAGCT----	TTCTCATTCT	ACTCTACTCT	TTCATAAAGG	AGTGCGAAGA
Eragrostispseudobtusa7508	TTAGCT----	TTCTCATTCT	ACTTTACTCT	TTCATAAAGG	AGTGCGAAGA
Eragrostislehmanniana20	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostischloromelas6947	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostischloromelas7474	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostisracemosa6533	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostisbiflora6705	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostissuperba7470	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostiscapensis6551	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostiscapensis6532	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Eragrostislehmanniana7514	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Pogonarthriasquarrosa7483	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Pogonarthriasquarrosa7504	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Catalepisgracilis6962	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Catalepisgracilis6653	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Cladoraphiscyperoides5704	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Cladoraphisspinosa6335	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Cladoraphiscyperoides4894	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Fingerhuthiaafricana7507	TTAGTT----	TTCTCATTCT	ACT-----CT	TTCATAAAAG	AGAGCGAAGA
Entoplocamiaaristulata9353	TTAGTT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Enneapogonscoparius18	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA
Enneapogoncenchroides7506	TTAGCT----	TTCTCATTCT	ATT-----CT	TTCACAAAGG	AGTGCGAAGA
Enneapogonscoparius7486	TTAGCT----	TTCTCATTCT	ACT-----TT	TTCACAAAGG	AGTGCGAAGA
Schmidtiapappophoroides6334	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAATG	AGTGCGAAGA
Schmidtiakalihariensis7490	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA
Schmidtiakalihariensis7487	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA
Sporobolusafricanus7476	----------	----------	----------	----------	----------
Sporobolusconsimilis9354	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA
Sporobolusfimbriatus7509	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Sporoboluspyramidalis6966	TTAGTT----	TTCTCATTCT	ACT-----CT	TTCATAAAGG	AGTGCGAAGA
Sporobolusfimbriatus9328	TTAGCT----	TTCTCATTCT	ACT-----CT	TTCACAAAGG	AGTGCGAAGA

	801				850
PHRAGMITESAUSTRALIS6557	GAACTCAATG	GATCTTATGC	TATTCATTAA	AATGGATCTT	ATGCTATTCA
ARISTIDAADSCENSIONIS6540	GAACTCAATG	GATCTTATGC	TATTCATTAA	A-TGGAT---	----------
KARROOCHLOAPURPUREA6241	GAACTCAATG	GATCTTATGC	TATTCATTAA	A-TGGAT---	----------
CHAETOBROMUSINVOLUCRATES6284	GAACTCAATG	GATCTTATGC	TATTCATTAA	A-TGGAT---	----------
SORGHUMHALEPENSE	GAACTCAATG	AATCTTATGC	TATTCATTAA	A-TAGAT---	----------
IMPERATACYLINDRICA	GAACTCAATG	AATCTTATGC	TATTCATTAA	A-TAGAT---	----------
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Chlorisvirgata6616	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Chlorisvirgata7498	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eustachyspaspaloides5597	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Harpochloafalx6530	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Harpochloafalx6670	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Harpochloafalx5118	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Rendliaaltera5133	RAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Leptochloafusca7622	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Enteropogonmacrostachyus9339	GAACTCAATA	AATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Dactylocteniumaegyptium9326	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Tragusberteronianus6620	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Tragusracemosus7108	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Traguskoelerioides6729	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Polevansiarigida7621	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Perotispatens9323	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostiscurvula6529	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostisobtusa6623	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostisobtusa6732	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostisechinochloidea7485	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostispseudobtusa7508	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostislehmanniana20	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostischloromelas6947	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostischloromelas7474	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostisracemosa6533	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostisbiflora6705	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostissuperba7470	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Eragrostiscapensis6551	GAACTCAATA	GATCTTATGT	TATTCAGTAA	A-TAGAT---	----------
Eragrostiscapensis6532	GAACTCAATA	GATCTTATGT	TATTCAGTAA	A-TAGAT---	----------
Eragrostislehmanniana7514	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Pogonarthriasquarrosa7483	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Pogonarthriasquarrosa7504	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Catalepisgracilis6962	GAACTCAATA	GATCTTATGC	TATTCGTTAA	A-TAGAT---	----------
Catalepisgracilis6653	GAACTCAATA	GATCTTATGC	TATTCGTTAA	A-TAGAT---	----------
Cladoraphiscyperoides5704	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Cladoraphisspinosa6335	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Cladoraphiscyperoides4894	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Fingerhuthiaafricana7507	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Entoplocamiaaristulata9353	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Enneapogonscoparius18	AAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Enneapogoncenchroides7506	AAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Enneapogonscoparius7486	AAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Schmidtiapappophoroides6334	AAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Schmidtiakalihariensis7490	AAACTCAATG	GATCTTATGC	TATTTATTAA	A-TAGAT---	----------
Schmidtiakalihariensis7487	AAACTCAATG	GATCTTATGC	TATTTATTAA	A-TAGAT---	----------
Sporobolusafricanus7476	----------	-----TATGC	TATTCATTAA	A-TGGAT---	----------
Sporobolusconsimilis9354	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-CGGAT---	----------
Sporobolusfimbriatus7509	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Sporoboluspyramidalis6966	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TAGAT---	----------
Sporobolusfimbriatus9328	GAACTCAATA	GATCTTATGC	TATTCATTAA	A-TGGAT---	----------

	851				900
PHRAGMITESAUSTRALIS6557	TTAAATAGAT	TTCTTTTT--	---TATT---	----------	----------
ARISTIDAADSCENSIONIS6540	----------	TTATTTTT--	---TATT---	----------	----------
KARROOCHLOAPURPUREA6241	----------	TTCTTTTT--	---TATT---	----------	----------
CHAETOBROMUSINVOLUCRATES6284	----------	TTCTTTTT--	---TATT---	----------	----------
SORGHUMHALEPENSE	-------GAT	TTCTTTTT--	---TATCTCT	TTTTTTTTTA	TTTATTAGAG
IMPERATACYLINDRICA	-------GAT	TTCTTTTT--	---TATTTCT	TTTTTTTT--	TTTATTT-AT
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	----------	TTCTTTTT--	---TATT---	----------	----------
Chlorisvirgata6616	----------	TTCTTTTT--	---TATT---	----------	----------
Chlorisvirgata7498	----------	TTCTTTTT--	---TATT---	----------	----------
Eustachyspaspaloides5597	----------	TTCTTTTT--	---TATT---	----------	----------
Harpochloafalx6530	----------	TTCTTTTT--	---TATT---	----------	----------
Harpochloafalx6670	----------	TTCTTTTT--	---TATT---	----------	----------
Harpochloafalx5118	----------	TTCTTTTT--	---TATT---	----------	----------
Rendliaaltera5133	----------	TTCTTTTT--	---TATT---	----------	----------
Leptochloafusca7622	----------	TTCTTTTT--	---TATT---	----------	----------
Enteropogonmacrostachyus9339	----------	TTCTTTTT--	---TATT---	----------	----------
Dactylocteniumaegyptium9326	----------	TGCTTTTT--	---TATT---	----------	----------
Tragusberteronianus6620	----------	TTCTTTTT--	---TATT---	----------	----------
Tragusracemosus7108	----------	TTCTTTTT--	---TATT---	----------	----------
Traguskoelerioides6729	----------	TTCTTTTT--	---TATT---	----------	----------
Polevansiarigida7621	----------	TTCTTTTT--	---TATT---	----------	----------
Perotispatens9323	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostiscurvula6529	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostisobtusa6623	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostisobtusa6732	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostisechinochloidea7485	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostispseudobtusa7508	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostislehmanniana20	----------	TTCTTTTTT-	---TATT---	----------	----------
Eragrostischloromelas6947	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostischloromelas7474	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostisracemosa6533	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostisbiflora6705	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostissuperba7470	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostiscapensis6551	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostiscapensis6532	----------	TTCTTTTT--	---TATT---	----------	----------
Eragrostislehmanniana7514	----------	TTCTTTTTT-	---TATT---	----------	----------
Pogonarthriasquarrosa7483	----------	TTCTTTTT--	---TATT---	----------	----------
Pogonarthriasquarrosa7504	----------	TTCTTTTT--	---TATT---	----------	----------
Catalepisgracilis6962	----------	TTCTTTTT--	---TATT---	----------	----------
Catalepisgracilis6653	----------	TTCTTTTT--	---TATT---	----------	----------
Cladoraphiscyperoides5704	----------	TTCTTTTT--	---TATT---	----------	----------
Cladoraphisspinosa6335	----------	TTCTTTTT--	---TATT---	----------	----------
Cladoraphiscyperoides4894	----------	TTCTTTTT--	---TATT---	----------	----------
Fingerhuthiaafricana7507	----------	TACTTTTT--	---TATT---	----------	----------
Entoplocamiaaristulata9353	----------	TTCTTTTT--	---TATT---	----------	----------
Enneapogonscoparius18	----------	TTCTTTTT--	---TATT---	----------	----------
Enneapogoncenchroides7506	----------	TTCTTTTT--	---TATT---	----------	----------
Enneapogonscoparius7486	----------	TTCTTTTT--	---TATT---	----------	----------
Schmidtiapappophoroides6334	----------	TTCTTTTT--	---TATT---	----------	----------
Schmidtiakalihariensis7490	----------	TTCTTTTT--	---TATT---	----------	----------
Schmidtiakalihariensis7487	----------	TTCTTTTT--	---TATT---	----------	----------
Sporobolusafricanus7476	----------	TTCTTTTTGA	TTTTATT---	----------	----------
Sporobolusconsimilis9354	----------	TTCTTTTTTA	TTTTATT---	----------	----------
Sporobolusfimbriatus7509	----------	TTCTTTTT--	---TATT---	----------	----------
Sporoboluspyramidalis6966	----------	TTCTTTTT--	---TATT---	----------	----------
Sporobolusfimbriatus9328	----------	TACTTTTT--	---TATT---	----------	----------

	901				950
PHRAGMITESAUSTRALIS6557	-AGAGTATCG	GCAAGGA---	---------A	TCTCGATTAT	TAATTAGATT
ARISTIDAADSCENSIONIS6540	-AGAGTATCG	GCAAGGA---	---------A	TCTCGATTAT	TAATTAGATT
KARROOCHLOAPURPUREA6241	-AGAGTATCA	GAAAGAA---	---------A	TCCCCATTAG	TAATTCGATT
CHAETOBROMUSINVOLUCRATES6284	-AGAGTATCG	GCAAGAA---	---------A	TCCCCATTAT	TAATTCGATT
SORGHUMHALEPENSE	TACAGTATCG	GCAAGGA---	---------A	TCTCGATTAT	TAATTCGATT
IMPERATACYLINDRICA	TAGAGTATCG	GCAAGGA---	---------A	TCTCGATTAT	TAATTCGATT
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	-AGAGTATCC	GCAAAAA---	---------A	TCTCAATTAT	TAATTAAATT
Chlorisvirgata6616	-AGAGTATCC	ATAAAAA---	---------A	TCTCAATTAT	TAATTAAATT
Chlorisvirgata7498	-AGAGTATCC	ATAAAAA---	---------A	TCTCAATTAT	TAATTAAATT
Eustachyspaspaloides5597	-AGAGTATCC	GCAAAAA---	---------A	TCTCAATTAT	TAATTTAATT
Harpochloafalx6530	-AGAGTATCC	GCAAAAA---	---------A	TCTCAATTAT	TAATGAAATT
Harpochloafalx6670	-AGAGTATCC	GCAAAAA---	---------A	TCTCAATTAT	TAATGAAATT
Harpochloafalx5118	-AGAGTATCC	GCAAAAA---	---------A	TCTCAATTAT	TAATGAAATT
Rendliaaltera5133	-AGAGTATYS	GCAARRA---	---------A	TCTCAATTAT	TAATTRAATT
Leptochloafusca7622	-AGAGTATCC	GCAAAAA---	---------A	TCTCAATTAT	TATTTTAATT
Enteropogonmacrostachyus9339	-AGAGTATCC	GCAAAAATAG	AGTATCCGCA	TCTCAATTAT	TAATGAAATT
Dactylocteniumaegyptium9326	-AGAGTATCC	ACAAAAA---	---------A	TCTCAATTAT	TAATTTAATT
Tragusberteronianus6620	-CGAGTATCC	GCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT
Tragusracemosus7108	-CGAGTATCC	GCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT
Traguskoelerioides6729	-CGAGTATCC	TCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT
Polevansiarigida7621	-TGAGTATCC	GCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT
Perotispatens9323	-AGAGTATCC	GAAAAAA---	---------A	TCTCAATTAT	TAATGAAATT
Eragrostiscurvula6529	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostisobtusa6623	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostisobtusa6732	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostisechinochloidea7485	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TACTTAAATT
Eragrostispseudobtusa7508	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostislehmanniana20	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostischloromelas6947	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostischloromelas7474	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostisracemosa6533	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostisbiflora6705	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostissuperba7470	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostiscapensis6551	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostiscapensis6532	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Eragrostislehmanniana7514	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Pogonarthriasquarrosa7483	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Pogonarthriasquarrosa7504	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Catalepisgracilis6962	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Catalepisgracilis6653	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Cladoraphiscyperoides5704	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Cladoraphisspinosa6335	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Cladoraphiscyperoides4894	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Fingerhuthiaafricana7507	-AGAGTATCG	GC--GGA---	---------A	TCTCAATTAT	TAATTAAATT
Entoplocamiaaristulata9353	-AGAGTATCG	GC--GGA---	---------A	TCTCAATTAT	TAATTAAATT
Enneapogonscoparius18	-AGAGTATTG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Enneapogoncenchroides7506	-AGAGTATTG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Enneapogonscoparius7486	-AGAGTATTG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Schmidtiapappophoroides6334	-AGAGTATTG	ACAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Schmidtiakalihariensis7490	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Schmidtiakalihariensis7487	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Sporobolusafricanus7476	-AGAGTATCC	GCAAAGA---	---------A	TCTTAATTAT	TAATTTAATT
Sporobolusconsimilis9354	-AGAGTATCC	GCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT
Sporobolusfimbriatus7509	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Sporoboluspyramidalis6966	-AGAGTATCG	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT
Sporobolusfimbriatus9328	-AGAGTATCC	ACAAAGA---	---------A	TTTAAATTAT	TAATTTAATT

	951				1000
PHRAGMITESAUSTRALIS6557	TT--------	----------	-------TAA	GTATTA----	-------TTA
ARISTIDAADSCENSIONIS6540	TT--------	----------	-------TAA	GTATTA----	-------TTA
KARROOCHLOAPURPUREA6241	TT--------	----------	-------TAA	GTATTTTTTT	ATTAATATTA
CHAETOBROMUSINVOLUCRATES6284	CT--------	----------	-------TAA	TTATTATTTT	ATTAA-----
SORGHUMHALEPENSE	TTTT------	----------	-------TAA	GTATTA----	-------TTA
IMPERATACYLINDRICA	TTTT------	----------	-------TAA	GTATTA----	-------TTA
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	TA--------	----------	-------TAA	GTATTA----	-------TTA
Chlorisvirgata6616	TC--------	----------	-------TAA	GTATTA----	-------TTA
Chlorisvirgata7498	TC--------	----------	-------TAA	GTATTA----	-------TTA
Eustachyspaspaloides5597	TA--------	----------	-------TAA	GTATTA----	-------TTA
Harpochloafalx6530	TA--------	----------	-------TAA	GTATTA----	-------TTA
Harpochloafalx6670	TA--------	----------	-------TAA	GTATTA----	-------TTA
Harpochloafalx5118	TT--------	----------	-------TAA	GTATTA----	-------TTA
Rendliaaltera5133	TATAAGTWTT	AT--------	-------TAA	GTATTA----	-------TTA
Leptochloafusca7622	TA--------	----------	-------TAA	GTATTA----	-------TTA
Enteropogonmacrostachyus9339	TA--------	----------	-------TAA	GTATTA----	-------TTA
Dactylocteniumaegyptium9326	TA--------	----------	-------TAA	GTATTA----	-------TTA
Tragusberteronianus6620	AA--------	----------	-------TAA	GTATTA----	-------TTA
Tragusracemosus7108	AA--------	----------	-------TAA	GTATTA----	-------TTA
Traguskoelerioides6729	AA--------	----------	-------TAA	GTATTA----	-------TTA
Polevansiarigida7621	TATAAGAATT	TATTACAATT	TATAAGATAA	GTATTA----	-------TTA
Perotispatens9323	AA--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostiscurvula6529	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostisobtusa6623	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostisobtusa6732	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostisechinochloidea7485	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostispseudobtusa7508	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostislehmanniana20	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostischloromelas6947	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostischloromelas7474	AT--------	----------	-------TAA	TTATTA----	-------TTA
Eragrostisracemosa6533	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostisbiflora6705	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostissuperba7470	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostiscapensis6551	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostiscapensis6532	AT--------	----------	-------TAA	GTATTA----	-------TTA
Eragrostislehmanniana7514	AT--------	----------	-------TAA	GTATTA----	-------TTA
Pogonarthriasquarrosa7483	AT--------	----------	-------TAA	GTATTA----	-------TTA
Pogonarthriasquarrosa7504	AT--------	----------	-------TAA	GTATTA----	-------TTA
Catalepisgracilis6962	AT--------	----------	-------TAA	TTATTA----	-------TTA
Catalepisgracilis6653	AT--------	----------	-------TAA	TTATTA----	-------TTA
Cladoraphiscyperoides5704	ATA-------	----------	-------TAA	GTATTAT---	-------TTA
Cladoraphisspinosa6335	ATA-------	----------	-------TAA	GTATTAT---	-------TTA
Cladoraphiscyperoides4894	ATA-------	----------	-------TAA	GTATTAT---	-------TTA
Fingerhuthiaafricana7507	TT--------	----------	-------TAA	GTATTA----	-------TTA
Entoplocamiaaristulata9353	TT--------	----------	-------TAA	GTATTA----	-------TTA
Enneapogonscoparius18	TTT-------	----------	-------GAA	GTATTA----	-TTAATATTA
Enneapogoncenchroides7506	TT--------	----------	-------GAA	GTATTA----	-TTAATATTA
Enneapogonscoparius7486	TTT-------	----------	-------GAA	GTATTA----	-TTAATATTA
Schmidtiapappophoroides6334	TT--------	----------	-------GAA	GTATTA----	-TTAATATTA
Schmidtiakalihariensis7490	TT--------	----------	-------GAA	GTATTA----	-TTAATATTA
Schmidtiakalihariensis7487	TT--------	----------	-------GAA	GTATTA----	-TTAATATTA
Sporobolusafricanus7476	TT--------	----------	-------TAA	GTATTA----	-------TTA
Sporobolusconsimilis9354	TT--------	----------	-------TAA	GTATTA----	-------TTA
Sporobolusfimbriatus7509	AT--------	----------	-------TAA	GTATTA----	-------TTA
Sporoboluspyramidalis6966	AT--------	----------	-------TAA	GTATTA----	-------TTA
Sporobolusfimbriatus9328	TG--------	----------	-------GAA	TTATTA----	-------TTA

	1001				1050
PHRAGMITESAUSTRALIS6557	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
ARISTIDAADSCENSIONIS6540	AGTA------	----------	------AGCC	ATCCATAATG	CATAGGAC--
KARROOCHLOAPURPUREA6241	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
CHAETOBROMUSINVOLUCRATES6284	----------	----------	----------	----------	----------
SORGHUMHALEPENSE	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
IMPERATACYLINDRICA	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Chlorisvirgata6616	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Chlorisvirgata7498	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eustachyspaspaloides5597	AGTA------	----------	------AGCC	GTCCACAATG	CATAGGAC--
Harpochloafalx6530	AGTA------	----------	------AGCC	ATCTACAATG	CATAGGAC--
Harpochloafalx6670	AGTA------	----------	------AGCC	ATCTACAATG	CATAGGAC--
Harpochloafalx5118	AGTA------	----------	------AGCC	ATCTACAATG	CATAGGAC--
Rendliaaltera5133	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Leptochloafusca7622	ACTA------	----------	------AGCC	ATCCACAATG	TATAGGAC--
Enteropogonmacrostachyus9339	AGTA------	----------	------AGCC	ATCCACAATG	TATAGGAC--
Dactylocteniumaegyptium9326	CGTA------	----------	------AGTC	ATCCACAATG	CATAGGAC--
Tragusberteronianus6620	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Tragusracemosus7108	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Traguskoelerioides6729	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Polevansiarigida7621	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Perotispatens9323	AGTA------	----------	------AGCC	GTCCACAATG	CATAGGAC--
Eragrostiscurvula6529	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eragrostisobtusa6623	AGTA------	----------	------AGCC	ATCCACAATG	CATCGGAC--
Eragrostisobtusa6732	AGTA------	----------	------AGCC	ATCCACAATG	CATCGGAC--
Eragrostisechinochloidea7485	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eragrostispseudobtusa7508	AGTA------	----------	------AGCC	ATCCACAATG	CATCGGAC--
Eragrostislehmanniana20	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eragrostischloromelas6947	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eragrostischloromelas7474	AATA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eragrostisracemosa6533	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eragrostisbiflora6705	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eragrostissuperba7470	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Eragrostiscapensis6551	AGTA------	----------	------AGCC	GTCCACAATG	CATAGGAC--
Eragrostiscapensis6532	AGTA------	----------	------AGCC	GTCCACAATG	CATAGGAC--
Eragrostislehmanniana7514	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Pogonarthriasquarrosa7483	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Pogonarthriasquarrosa7504	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Catalepisgracilis6962	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Catalepisgracilis6653	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Cladoraphiscyperoides5704	AGTA------	----------	------AGCC	ATCCACAATG	CATAGTAC--
Cladoraphisspinosa6335	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Cladoraphiscyperoides4894	AGTATT--AT	T---------	TAAGTAAGCC	ATCCACAATG	CATAGGAC--
Fingerhuthiaafricana7507	AGTA------	----------	------ATCC	ATCCACAATG	CATAGGAC--
Entoplocamiaaristulata9353	AGTAATCCAT	CCACAATGCA	TAAGTAATCC	ATCCACAATG	CATAGGAC--
Enneapogonscoparius18	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Enneapogoncenchroides7506	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Enneapogonscoparius7486	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Schmidtiapappophoroides6334	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Schmidtiakalihariensis7490	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGACCA
Schmidtiakalihariensis7487	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGACCA
Sporobolusafricanus7476	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Sporobolusconsimilis9354	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAT--
Sporobolusfimbriatus7509	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Sporoboluspyramidalis6966	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--
Sporobolusfimbriatus9328	AGTA------	----------	------AGCC	ATCCACAATG	CATAGGAC--

	1051				1100
PHRAGMITESAUSTRALIS6557	------TACC	CTCTCAC---	ATTTCCAAAT	TTGGAATAGA	ATACTTT---
ARISTIDAADSCENSIONIS6540	------TACC	CCTC------	ATTTCCAAAT	T-----TGGA	ATACTTT---
KARROOCHLOAPURPUREA6241	------TACT	CCCC------	ATTTCAAAAT	TAGGAATGGA	AAACTTT---
CHAETOBROMUSINVOLUCRATES6284	----------	----------	---------C	TAGGAATGGA	AAACTTG---
SORGHUMHALEPENSE	------TACC	CCTCCCC---	ATTTCCTAAT	TTTGAATGGA	ATACTTT---
IMPERATACYLINDRICA	------TACC	CCTCCCC---	ATTTCCTAAT	TTGGAATGGA	ATACTTT---
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	------TATC	CCCCCCCC--	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Chlorisvirgata6616	------TACC	CCCCCCCCC-	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Chlorisvirgata7498	------TACC	CCCCCCCCCC	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Eustachyspaspaloides5597	------TATC	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Harpochloafalx6530	------TACC	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT
Harpochloafalx6670	------TACC	CCCCCCCC--	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT
Harpochloafalx5118	------TACC	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT
Rendliaaltera5133	------TAGC	CCCCCTT---	-TTTCCAAAT	TAGGAATGGA	ATACTTT---
Leptochloafusca7622	------TATC	CCCCTCCC--	ATTTCTAAAA	TAGGAATGGA	ATACTTT---
Enteropogonmacrostachyus9339	------TACT	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Dactylocteniumaegyptium9326	------TACC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Tragusberteronianus6620	------TACC	CCCCC-----	GTTTCCAAAT	TAGGAATGGA	ATACTTT---
Tragusracemosus7108	------TACC	CCCCC-----	GTTTCCAAAT	TAGGAATGGA	ATACTTT---
Traguskoelerioides6729	------TACC	CCCCC-----	GTTTCCAAAT	TAGGAATGGA	ATACTTT---
Polevansiarigida7621	------TACC	CCCCCC----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Perotispatens9323	------TATC	CCCCCCCCC-	ATTTCCAAAT	TAGGGATGGA	ATACTTT---
Eragrostiscurvula6529	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Eragrostisobtusa6623	------TATC	CCCCC-----	ATTTACAAAT	TAGGAATGGA	ATACTTT---
Eragrostisobtusa6732	------TATC	CCCCC-----	ATTTACAAAT	TAGGAATGGA	ATACTTT---
Eragrostisechinochloidea7485	------TATC	CCCCC-----	ATTTACAAAT	TAGGAATGGA	ATACTTT---
Eragrostispseudobtusa7508	------TATC	CCCCC-----	ATTTACAAAT	TAGGAATGGA	ATACTTT---
Eragrostislehmanniana20	------TACC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Eragrostischloromelas6947	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Eragrostischloromelas7474	------TATC	CCCC------	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Eragrostisracemosa6533	------TATC	CCCCG-----	ATTTCAAAAT	TAGGAATGGA	ATACTTT---
Eragrostisbiflora6705	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Eragrostissuperba7470	------TATC	CCCCC-----	ATTTCTAAAT	TAGGAATGGA	ATACTTT---
Eragrostiscapensis6551	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Eragrostiscapensis6532	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Eragrostislehmanniana7514	------TACC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Pogonarthriasquarrosa7483	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Pogonarthriasquarrosa7504	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Catalepisgracilis6962	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Catalepisgracilis6653	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Cladoraphiscyperoides5704	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT
Cladoraphisspinosa6335	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT
Cladoraphiscyperoides4894	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT
Fingerhuthiaafricana7507	------TATC	CCCCC-----	ATTTCTAAAT	TAGGAATGGA	ATACTTT---
Entoplocamiaaristulata9353	------TATC	CCCCC-----	ATTTCTAAAT	TAGGAATGGA	ATACTTT---
Enneapogonscoparius18	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Enneapogoncenchroides7506	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATAGA	ATACTTT---
Enneapogonscoparius7486	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Schmidtiapappophoroides6334	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Schmidtiakalihariensis7490	TAGGACTATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Schmidtiakalihariensis7487	TAGGACTATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Sporobolusafricanus7476	------TATC	CCCCCCCC-T	AATTCAAAAT	TAGGAATGGA	ATACTTT---
Sporobolusconsimilis9354	------TATC	C---------	------AAAT	TAGGAATGGA	ATACTTT---
Sporobolusfimbriatus7509	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Sporoboluspyramidalis6966	------TATC	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---
Sporobolusfimbriatus9328	------TACC	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTT---

	1101				1150
PHRAGMITESAUSTRALIS6557	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
ARISTIDAADSCENSIONIS6540	----------	---ATT-TTT	TTTTACTCCC	TTTAATT---	----GACATA
KARROOCHLOAPURPUREA6241	----------	--AACTGATT	TTTTAATCCC	TTTAATTGAC	AATTGACATA
CHAETOBROMUSINVOLUCRATES6284	----------	--AATTGATT	TTTTAATCCC	TTTAATT---	----GACATA
SORGHUMHALEPENSE	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
IMPERATACYLINDRICA	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	----------	---ATTGATT	TTTTAGTCTC	TTTAATT---	----GACATA
Chlorisvirgata6616	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Chlorisvirgata7498	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eustachyspaspaloides5597	----------	---ATTGATT	TTTTAGTCTC	TTTAATT---	----GACATA
Harpochloafalx6530	GATTGAATAC	TTTATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Harpochloafalx6670	GATTGAATAC	TTTATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Harpochloafalx5118	GATTGAATAC	TTTATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Rendliaaltera5133	----------	---ATTAATT	TTTTAGTCTC	TTTAATT---	----GACATA
Leptochloafusca7622	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Enteropogonmacrostachyus9339	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Dactylocteniumaegyptium9326	----------	---TTTGATT	TTTTAGTCCC	ATTAATT---	----GACATA
Tragusberteronianus6620	----------	---ATTGATT	TTT-AGTCTC	TTTAATT---	----GACATA
Tragusracemosus7108	----------	---ATTGATT	TTT-AGTCTC	TTTAATT---	----GACATA
Traguskoelerioides6729	----------	---ATTGATT	TTT-AGTCTC	TTTAATT---	----GACATA
Polevansiarigida7621	----------	---ATTGATT	TTT-AGTCTC	TTTAATT---	----GACATA
Perotispatens9323	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostiscurvula6529	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostisobtusa6623	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostisobtusa6732	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostisechinochloidea7485	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostispseudobtusa7508	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostislehmanniana20	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostischloromelas6947	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostischloromelas7474	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostisracemosa6533	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostisbiflora6705	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostissuperba7470	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostiscapensis6551	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostiscapensis6532	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Eragrostislehmanniana7514	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Pogonarthriasquarrosa7483	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Pogonarthriasquarrosa7504	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Catalepisgracilis6962	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Catalepisgracilis6653	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Cladoraphiscyperoides5704	GATT------	-----TGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Cladoraphisspinosa6335	GATT------	-----TGATT	TTTT-----C	TTTAATT---	----GACATA
Cladoraphiscyperoides4894	GATT------	-----TGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Fingerhuthiaafricana7507	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Entoplocamiaaristulata9353	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Enneapogonscoparius18	----------	---ATTGATC	TTTTAGTCCC	TTTAATT---	----GACATA
Enneapogoncenchroides7506	----------	---ATTGAT-	TTTTAGTCCC	TTTAATT---	----GACATA
Enneapogonscoparius7486	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Schmidtiapappophoroides6334	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Schmidtiakalihariensis7490	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Schmidtiakalihariensis7487	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Sporobolusafricanus7476	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Sporobolusconsimilis9354	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Sporobolusfimbriatus7509	----------	---ATTGATT	TTTTGGTCCC	TTTAATT---	----GACATA
Sporoboluspyramidalis6966	----------	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA
Sporobolusfimbriatus9328	----------	---ATTTATT	TTTTAGTCCC	TTTAATT---	----GACATA

	1151			1191
PHRAGMITESAUSTRALIS6557	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
ARISTIDAADSCENSIONIS6540	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AAAAAGG
KARROOCHLOAPURPUREA6241	GATGCAAATA	CTCTAGTAGG	ATGATGCACA	----AGAAAGG
CHAETOBROMUSINVOLUCRATES6284	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
SORGHUMHALEPENSE	GATGCAAATA	CTTTACTAAG	ATGATGCACN	NNNNNNNNNNN
IMPERATACYLINDRICA	GATGCAAATA	CTTTACTAAG	ATGATGCACN	NNNNNNNNNNN
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNNN
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNNN
Cynodondactylon7480	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Chlorisvirgata6616	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Chlorisvirgata7498	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eustachyspaspaloides5597	GATGCAAATA	CTCTGCTAGG	ATGATGCACA	----AGAAGGG
Harpochloafalx6530	AATGCAAATA	CTCTACTAGG	ATGATGCACA	CACAAGAAAGG
Harpochloafalx6670	AATGCAAATA	CTCTACTAGG	ATGATGCACA	CACAAGAAAGG
Harpochloafalx5118	AATGCAAATA	CTCTACTAGG	ATGATGCACA	CACAAGAAAGG
Rendliaaltera5133	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Leptochloafusca7622	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Enteropogonmacrostachyus9339	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Dactylocteniumaegyptium9326	AATGGAAATA	CTCTACTAG-	ATGATGTACA	----AGAAAGG
Tragusberteronianus6620	GATGCAAATA	CTCTACTAGG	ATGATACACA	----AGAAAGG
Tragusracemosus7108	GATGCAAATA	CTCTACTAGG	ATGATACACA	----AGAAAGG
Traguskoelerioides6729	GATGCAAATA	CTCTACTAGG	ATGATACACA	----AGAAAGG
Polevansiarigida7621	GATGCAAATA	CTCTACTAGC	ATGATACACA	----AGAAAGG
Perotispatens9323	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostiscurvula6529	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostisobtusa6623	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostisobtusa6732	GATGCAAATA	CTCTACTAGG	ATGGATGCCC	----AGAAAGG
Eragrostisechinochloidea7485	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostispseudobtusa7508	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostislehmanniana20	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----ACAAAGG
Eragrostischloromelas6947	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostischloromelas7474	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGA
Eragrostisracemosa6533	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGCAAGG
Eragrostisbiflora6705	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostissuperba7470	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostiscapensis6551	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostiscapensis6532	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostislehmanniana7514	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Pogonarthriasquarrosa7483	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Pogonarthriasquarrosa7504	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Catalepisgracilis6962	GATCCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Catalepisgracilis6653	GATCCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Cladoraphiscyperoides5704	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Cladoraphisspinosa6335	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Cladoraphiscyperoides4894	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Fingerhuthiaafricana7507	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Entoplocamiaaristulata9353	GATGTAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Enneapogonscoparius18	GATGCAAATA	CTCTACTAG-	ATGATGTACA	----AGAAAGG
Enneapogoncenchroides7506	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Enneapogonscoparius7486	GATGCAAATA	CTCTACTAGG	ATGATGTACA	----ACAAAGG
Schmidtiapappophoroides6334	GATGCAAATA	CTCCACTAGG	ATGATGCACA	----AGAAAGG
Schmidtiakalihariensis7490	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Schmidtiakalihariensis7487	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Sporobolusafricanus7476	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Sporobolusconsimilis9354	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Sporobolusfimbriatus7509	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Sporoboluspyramidalis6966	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Sporobolusfimbriatus9328	GATGCAAATA	CTCTACTAGG	ATGATGCACA	----AGAAAGG

APPENDIX H. Indels coded by GapCoder for *trn*L-F data set. Where missing data was coded in the sequence data set (N), the corresponding indel was coded as ?. The indel characters are coded with 1 for present, 0 for missing and – for inapplicable. As the gap matrix was added directly to the sequencing matrix the numbering continues from the last character in the sequence data set.

```
                                 1192                                                     1251
PHRAGMITESAUSTRALIS6557          ?010000100000000000100101-0010-00001-0100101----010000001---
ARISTIDAADSCENSIONIS6540         ????????????????????????????????0001-0100101----000000001---
KARROOCHLOAPURPUREA6241          1000000101000000000000001-01-0-00001-0100101----010100001---
CHAETOBROMUSINVOLUCRATES6284     1000000000100000000000001-0010-00001-0100101----010100001---
SORGHUMHALEPENSE                 ????????????????000000000100-1-00001-0-1--------0-----001---
IMPERATACYLINDRICA               ????????????????00100000010010-10001-0-1--------0-----001---
PANICUMLANIPES                   0000000000000000000000001-0010-00001-1000101----010000001---
PANICUMSTAPFIANUM                0000000000000000000000001-0010-00001-1000101----010000001---
Eleusinecoracana                 1000000000000000000000000010-00001-0001001001010000001---
Eleusineindica                   1000000000000000000000000010-00001-0001001001010000001---
Cynodondactylon                  1000000000000000000000001-01-0-00001-0001001001010000001---
Cynodondactylon7480              ?????0100000000010000001-01-0-00001-0001001001010000001---
Chlorisvirgata6616               1010000100010000000000001-01-0-00001-0000100-1--010000001---
Chlorisvirgata7498               ?????????0100000000000001-01-0-00001-0001001001010000001---
Eustachyspaspaloides5597         ??????????????????????????????????????0010010000100000001---
Harpochloafalx6530               1000000001-0000000000001-01-0-00001-0001000001010000001---
Harpochloafalx6670               1000000000100000000000001-01-0-00001-0001000001010000001---
Harpochloafalx5118               ????????????????????00001-1----00111-0001000001010000001---
Rendliaaltera5133                ????????????0000000000001-01-0-00001-0001001001010000001---
Leptochloafusca7622              ???????0001000000000001--01-0-00001-0001001001010000001---
Enteropogonmacrostachyus9339     ????????0010000000000001-01-0-00001-0001001001010000001---
Dactylocteniumaegyptium9326      ?????????????????????????????????????0001000011010000001---
Tragusberteronianus6620          ??????????????0000000000101-0-00001-0001001001010000001---
Tragusracemosus7108              ??????????????????000000101-0-00001-0001001001010000001---
Traguskoelerioides6729           ?????????????????0000000101-0-00001-0001001001010000001---
Polevansiarigida7621             ?????????0000000000000000101-0-00001-0001001001010000001---
Perotispatens9323                ??????????????????????????????????01-0001001001010000000100
Eragrostiscurvula6529            10000000000-1-00010000001-0010-00001-0000101----010001001---
Eragrostisobtusa6623             1000100000000000000000001-0010-00001-0000101----010000001---
Eragrostisobtusa6732             ????????????????????????????????????????????????????????????
Eragrostisechinochloidea7485     1000100000000100001000001-0010-00001-000011-----010000001---
Eragrostispseudobtusa7508        10000010000-1-00000000001-0010-00001-0000101----010000001---
Eragrostislehmanniana20          ??0000001000000000000001-0010-00001-0000101----010000001---
Eragrostischloromelas6947        1000000000000000000000001-0010-00001-000011-----010000001---
Eragrostischloromelas7474        1001000000000000000000001-0010-00001-0000101----010000001---
Eragrostisracemosa6533           1000000000000000000000001-0010-00001-0000101----1------01---
Eragrostisbiflora6705            ?????????0000000000000001-0010-00001-0000101----010000001---
Eragrostissuperba7470            10000000000-1-00000000001-0010-00001-0000101----010010001---
Eragrostiscapensis6551           10010001000100001000010l--0010-0100010001101----010000001---
Eragrostiscapensis6532           ????????????????????1001--0010-0000000000101----010000001---
Eragrostislehmanniana7514        1000000000000000000000001-0010-00001-0000101----010000001---
Pogonarthriasquarrosa7483        ????????????000100000001--0010-00001-0000101----010000001---
Pogonarthriasquarrosa7504        100000000000000000000001--0010-00001-0000101----010000001---
Catalepisgracilis6962            1000000000000010010000001-0010-00001-0000101----010000001---
Catalepisgracilis6653            ???????000000010010000001-0010-00001-0000101----010000001---
Cladoraphiscyperoides5704        ??????????????????????????????00001-0000101----010000001---
Cladoraphisspinosa6335           ???????000000000000000001-0000000001-0000101----010000001---
Cladoraphiscyperoides4894        ????????????????????????????????0001-0000101----010000001---
Fingerhuthiaafricana7507         1001000100000100000001001-01-0-00001-0000001----010000001---
Entoplocamiaaristulata9353       ??????????????????0000001-01-0-00001-0000101----011000011---
Enneapogonscoparius18            ????????????0000000000001-0010-00001-0000101----010000000001
Enneapogoncenchroides7506        ??????????????00000000001-0010-00001-0000101----01000000001-
Enneapogonscoparius7486          1000000000000100000000001-0010-00001-0000101----010000000001
Schmidtiapappophoroides6334      ???????????????0000000001-0010-00001-0000101----010000100001
Schmidtiakalihariensis7490       ?000-1-0000-1-00000000001-000100001-0000101----010000000000
Schmidtiakalihariensis7487       1000000000000000000000001-000100001-0000101----010000000000
Sporobolusafricanus7476          -110000100000000000000001-0010-00001-0001001001010000001---
Sporobolusconsimilis9354         1001000100000000000000001-0010-00001-0001001001010000001---
Sporobolusfimbriatus7509         1010000000000000000000001-0010-00001-0000101----010000001---
Sporoboluspyramidalis6966        ???????????????????000001-0010-00001-0000101----010000001---
Sporobolusfimbriatus9328         ???????????????????????????????00001-0001001001010000001---
```

	1252 … 1311
PHRAGMITESAUSTRALIS6557	00000101010110000l-0101000001000000010001--110001-1--011---1
ARISTIDAADSCENSIONIS6540	1000--011---110001-0101000001001010000001--1111-1-1--011---1
KARROOCHLOAPURPUREA6241	0100--000101100101-01110000010010-1--0001--1111-1-1--011---0
CHAETOBROMUSINVOLUCRATES6284	0-1---010101100101-01010000010010001-0001--1111-1-1--011---0
SORGHUMHALEPENSE	0-1---010101100001-010100000101-100010001--111011-00001001-1
IMPERATACYLINDRICA	0-1---010101100001-0101000001010000010001--111011-01101001-1
PANICUMLANIPES	0-01--010000100011-010100???????????????????????????????????
PANICUMSTAPFIANUM	0-01--010100100011-010100???????????????????????????????????
Eleusinecoracana	0-1---010101100001-010100???????????????????????????????????
Eleusineindica	0-1---010101100001-010100???????????????????????????????????
Cynodondactylon	0-1---010101100001-010100???????????????????????????????????
Cynodondactylon7480	0-1---010101100001-01010000010000000101000001111-1-1--011---1
Chlorisvirgata6616	0-1---01011-000001-1-0100000100000000010010--1111-1-1--011---1
Chlorisvirgata7498	0-1---01011-000001-1-0100000100000000010010--1111-1-1--011---1
Eustachyspaspaloides5597	0-1---0101011000????????00010000000010000001111-1-1--011---1
Harpochloafalx6530	0-1---010101100001-010100000100000000010010--1111-1-1--011---1
Harpochloafalx6670	0-1---010101100001-010100000100000000010010--1111-1-1--011---1
Harpochloafalx5118	0-1---010101100001-010110000100000000010010--1111-1-1--011---1
Rendliaaltera5133	0-1---010100100001-01010000010000000010000001111-1-1--0100011
Leptochloafusca7622	0-1---010101100001-010100000000000000010010--1111-1-1--011---1
Enteropogonmacrostachyus9339	0-1---010101100001-010100000100000000010010--1111-1-1--001---1
Dactylocteniumaegyptium9326	0-1---0101011000010101000001000000000010010--1111-1-1--011---1
Tragusberteronianus6620	0-1---010101100001-010100101-1-0000010010--1111-1-1--011---1
Tragusracemosus7108	0-1---010101100001-010100101-1-0000010010--1111-1-1--011---1
Traguskoelerioides6729	0-1---010101100001-010100101-1-0000010010--1111-1-1--011---1
Polevansiarigida7621	0-1---010101100001-01010011----------0010--1111-1-1--0100001
Perotispatens9323	0-1---010101100001-010100000000000000010010--1111-1-1--011---1
Eragrostiscurvula6529	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Eragrostisobtusa6623	0-1---010001100001-0101000001000000000000001-1011-1-1--011---1
Eragrostisobtusa6732	???????????????001-0101000001000000000000001-1011-1-1--011---1
Eragrostisechinochloidea7485	0-1---010001100001-0101000001000000000000001-1011-1-1--011---1
Eragrostispseudobtusa7508	0-1---010001100001-0101000001000000000000001-1011-1-1--011---1
Eragrostislehmanniana20	0-1---010001100001-0101000001000000000100001-1111-011--011---1
Eragrostischloromelas6947	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Eragrostischloromelas7474	0-1---010001100001-0101010001000000000100001-1111-1-1--011---1
Eragrostisracemosa6533	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Eragrostisbiflora6705	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Eragrostissuperba7470	0-1---01000110000000101000001000000000100001-1111-1-1--011---1
Eragrostiscapensis6551	0-1---010000100001-0101000001000000000100001-1111-1-1--011---1
Eragrostiscapensis6532	0-1---010000100001-0101000001000000000100001-1111-1-1--011---1
Eragrostislehmanniana7514	0-1---010001100001-0101000001000000000100001-1111-011--011---1
Pogonarthriasquarrosa7483	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Pogonarthriasquarrosa7504	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Catalepisgracilis6962	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Catalepisgracilis6653	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Cladoraphiscyperoides5704	0-1---010001100001-0101000001000000000100001-1111-1-1--0101--0
Cladoraphisspinosa6335	0-1---010001100001-0101000001000000000100001-1111-1-1--0101--0
Cladoraphiscyperoides4894	0-1---010001100001-0101000001000000000100001-1111-1-1--0101--0
Fingerhuthiaafricana7507	0-1---010001100001-0101000001000000000100001-1111-1-1--111---1
Entoplocamiaaristulata9353	0-1---010001100001-0101000001000000000100001-1111-1-1--111---1
Enneapogonscoparius18	00001-110001100001-0000000001000000000100001-1111-1-1--0101--0
Enneapogoncenchroides7506	000000010001100001-0000000001000000000100001-1111-1-1--011---0
Enneapogonscoparius7486	00001-110001100001-0000000001000000000100001-1111-1-1--0101--0
Schmidtiapappophoroides6334	0-1---010001100001-0100000001000000000100001-1111-1-1--011---0
Schmidtiakalihariensis7490	0-1---010001100001-0101000001000000000100001-1111-1-1--011---0
Schmidtiakalihariensis7487	0-1---010001100001-0101000001000000000100001-1111-1-1--011---0
Sporobolusafricanus7476	0-1---01010110000000101000000000000011-------11-001--011---1
Sporobolusconsimilis9354	0-1---010101101------01000001000000001000011111-001--011---1
Sporobolusfimbriatus7509	0-1---010001100001-0101000001000000000100001-1111-1-1--011---1
Sporoboluspyramidalis6966	0-1---010001100001-01010??????????000100001-1111-1-1--011---1
Sporobolusfimbriatus9328	0-1---01011-1???????????00001000000010010--1111-1-1--011---1

	1312 1338
PHRAGMITESAUSTRALIS6557	--01--1000010---01-00000101
ARISTIDAADSCENSIONIS6540	--01--101---0---11-01000101
KARROOCHLOAPURPUREA6241	0001--101---0---00100000001
CHAETOBROMUSINVOLUCRATES6284	001-------------00100000101
SORGHUMHALEPENSE	--01--1000010---01-0000010?
IMPERATACYLINDRICA	--01--1000010---01-0000010?
PANICUMLANIPES	???????????????????????????
PANICUMSTAPFIANUM	???????????????????????????
Eleusinecoracana	???????????????????????????
Eleusineindica	???????????????????????????
Cynodondactylon	???????????????????????????
Cynodondactylon7480	--01--10000001--01-00000101
Chlorisvirgata6616	--01--100000000101-00000101
Chlorisvirgata7498	--01--100000000001-00000101
Eustachyspaspaloides5597	--01--1000010---01-00000101
Harpochloafalx6530	--01--1000010---00000000100
Harpochloafalx6670	--01--10000001--00000000100
Harpochloafalx5118	--01--1000010---00000000100
Rendliaaltera5133	--01--10000-1---01-00000101
Leptochloafusca7622	--01--10000001--01-00000101
Enteropogonmacrostachyus9339	--01--1000010---01-00000101
Dactylocteniumaegyptium9326	--01--1001--0---01-00000111
Tragusberteronianus6620	--01--1001--0---01-00010101
Tragusracemosus7108	--01--1001--0---01-00010101
Traguskoelerioides6729	--01--1001--0---01-00010101
Polevansiarigida7621	--01--10001-0---01-00010101
Perotispatens9323	--01--100000000101-00000101
Eragrostiscurvula6529	--01--1001--0---01-00000101
Eragrostisobtusa6623	--01--1001--0---01-00000101
Eragrostisobtusa6732	--01--1001--0---01-00000101
Eragrostisechinochloidea7485	--01--1001--0---01-00000101
Eragrostispseudobtusa7508	--01--1001--0---01-00000101
Eragrostislehmanniana20	--01--1001--0---01-00000101
Eragrostischloromelas6947	--01--1001--0---01-00000101
Eragrostischloromelas7474	--01--101---0---01-00000101
Eragrostisracemosa6533	--01--1001--0---01-00000101
Eragrostisbiflora6705	--01--1001--0---01-00000101
Eragrostissuperba7470	--01--1001--0---01-00000101
Eragrostiscapensis6551	--01--1001--0---01-00000101
Eragrostiscapensis6532	--01--1001--0---01-00000101
Eragrostislehmanniana7514	--01--1001--0---01-00000101
Pogonarthriasquarrosa7483	--01--1001--0---01-00000101
Pogonarthriasquarrosa7504	--01--1001--0---01-00000101
Catalepisgracilis6962	--01--1001--0---01-00000101
Catalepisgracilis6653	--01--1001--0---01-00000101
Cladoraphiscyperoides5704	0101--1001--0---00010000101
Cladoraphisspinosa6335	0101--1001--0---00010001101
Cladoraphiscyperoides4894	0100111001--0---00010000101
Fingerhuthiaafricana7507	--01--1001--0---01-00000101
Entoplocamiaaristulata9353	--00001001--0---01-00000101
Enneapogonscoparius18	1001--1001--0---01-00000111
Enneapogoncenchroides7506	1001--1001--0---01-00100101
Enneapogonscoparius7486	1001--1001--0---01-00000101
Schmidtiapappophoroides6334	1001--1001--0---01-00000101
Schmidtiakalihariensis7490	1001--0001--0---01-00000101
Schmidtiakalihariensis7487	1001--0001--0---01-00000101
Sporobolusafricanus7476	--01--100000001001-00000101
Sporobolusconsimilis9354	--01--11--------01-00000101
Sporobolusfimbriatus7509	--01--1001--0---01-00000101
Sporoboluspyramidalis6966	--01--1001--0---01-00000101
Sporobolusfimbriatus9328	--01--1000010---01-00000101

APPENDIX I. Table of correspondence between the indels and the regions they represent (Appendix H) generated by GapCoder for the *trn*L-F data set.

Indel Character	Sequence Region	Indel Character	Sequence Region	Indel Character	Sequence Region
1192	4–4	**1241**	278–283	**1290**	734–734
1193	4–5	**1242**	286–286	**1291**	737–741
1194	10–10	**1243**	290–290	**1292**	738–742
1195	14–14	**1244**	293–296	**1293**	738–741
1196	15–15	**1245**	297–297	**1294**	740–740
1197	15–16	**1246**	326–330	**1295**	757–760
1198	16–16	**1247**	348–348	**1296**	774–778
1199	17–17	**1248**	360–365	**1297**	832–832
1200	19–19	**1249**	360–360	**1298**	838–860
1201	22–22	**1250**	362–365	**1299**	838–857
1202	26–27	**1251**	364–365	**1300**	869–873
1203	27–27	**1252**	375–381	**1301**	870–873
1204	27–28	**1253**	380–382	**1302**	878–901
1205	28–28	**1254**	380–384	**1303**	889–890
1206	42–42	**1255**	380–383	**1304**	898–898
1207	52–52	**1256**	380–381	**1305**	913–914
1208	59–59	**1257**	381–381	**1306**	918–929
1209	60–60	**1258**	392–392	**1307**	953–977
1210	63–63	**1259**	432–432	**1308**	954–977
1211	70–70	**1260**	437–441	**1309**	955–977
1212	82–82	**1261**	438–438	**1310**	963–977
1213	85–85	**1262**	440–441	**1311**	987–997
1214	98–98	**1263**	441–441	**1312**	987–991
1215	104–109	**1264**	450–455	**1313**	988–997
1216	105–109	**1265**	461–465	**1314**	996–1079
1217	106–109	**1266**	478–529	**1315**	1005–1026
1218	115–123	**1267**	506–506	**1316**	1007–1008
1219	116–119	**1268**	511–511	**1317**	1012–1020
1220	117–119	**1269**	517–521	**1318**	1049–1056
1221	117–122	**1270**	518–521	**1319**	1062–1076
1222	118–119	**1271**	526–527	**1320**	1065–1070
1223	126–130	**1272**	527–527	**1321**	1066–1070
1224	134–134	**1273**	532–532	**1322**	1067–1070
1225	135–135	**1274**	538–542	**1323**	1068–1070
1226	144–146	**1275**	551–551	**1324**	1068–1071
1227	155–160	**1276**	607–607	**1325**	1069–1070
1228	155–155	**1277**	691–691	**1326**	1069–1069
1229	203–204	**1278**	693–730	**1327**	1070–1070
1230	205–206	**1279**	694–695	**1328**	1082–1086
1231	205–324	**1280**	701–705	**1329**	1098–1113
1232	211–211	**1281**	701–714	**1330**	1098–1112
1233	232–236	**1282**	709–709	**1331**	1105–1115
1234	244–265	**1283**	716–716	**1332**	1117–1117
1235	245–263	**1284**	716–718	**1333**	1120–1120
1236	245–249	**1285**	720–720	**1334**	1124–1124
1237	245–261	**1286**	720–727	**1335**	1125–1129
1238	252–253	**1287**	721–727	**1336**	1138–1144
1239	256–261	**1288**	723–727	**1337**	1170–1170
1240	272–338	**1289**	731–815	**1338**	1181–1184

APPENDIX J. Alignment of combined *ITS*+*trn*L-F sequencing data. Numbers indicate the consecutive positions of 1 to 1831 (5' to 3') from the beginning of the *ITS*1 region to the end of the *trn*L-F region. Dashes denote gaps. Arrows indicate the beginning of the *ITS* and *trn* regions. N indicates large regions of missing data where sequencing reactions failed.

	⬇ 1				50
IMPERATACYLINDRICA	NNNNNNNNNN	NNNNNNNNNN	NNNCCGCGAA	CGA-GTCTCT	CGTGCCGCCG
SORGHUMHALEPENSE	TCGTGACC-T	TAAACAAAAC	AGACCGTGAA	CAT-GTCTCT	CATGTCGTCG
PANICUMLANIPES	TCGTGACCCT	TAAACAAAAC	AGACCGTGAA	CGT-GTCATC	CATGTCGTCT
PANICUMSTAPFIANUM	TCGTGACCCT	TAAACAAAAC	AGACCGTGAA	CAT-GTCATC	CATGTCGTCG
KARROOCHLOAPURPUREA6241	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	TCGTGACCCT	GACC-AAAAC	AAACCGTGAA	CCT-GTCACC	TATGCTGCCG
Cynodondactylon	TCGTGACCCT	GATG-AAAAC	AACCCGTGAA	TTT-GTCACC	TATGCTGCCG
Eleusinecoracana	TCGTGACCCT	AAACCAAAAC	AAACCGTGAA	CAT-GTCATC	CATGCTGCCG
Eleusineindica	TCGTGACCCT	AAACCAAAAC	AAACCGTGAA	CAT-GTCATC	CATGCTGCCG
Chlorisvirgata6616	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CAT-GTCATC	TATGCTGCCG
Chlorisvirgata7498	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CAT-GTCATC	TATGCTGCCG
Eustachyspaspaloides5597	TCGTTACCCT	GACCCAAAAT	AGACCGTGAA	CATTGTCATC	TAAGCTGCCG
Harpochloafalx6530	TCGTGACCCT	GACC-AAAAG	AGACTGTGAA	CAT-GTCATC	CATGCTGCTG
Harpochloafalx5118	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6670	TAGTGATCCT	GACC-AAAAG	AGACTGTGAA	CAT-GTCATC	CATGCTGGTG
Rendliaaltera5133	TCGTGACACT	GACC-AAAAT	AGACTGTGAA	CAT-GTCATC	CATGCTGCCG
Leptochloafusca7622	TCGTGACCCT	GACC-AAAAC	AGACCACGAA	CAT-GTCATC	CATGCTGCCG
Enteropogonmacrostachyus9339	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CAT-GTCATC	CA-GCGGCCG
Dactylocteniumaegyptium9326	TCGTGACCCT	GACC-AAAAY	AGACCGTGAA	CGC-GTCATC	CATGGTGCCG
Tragusberteronianus6620	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATGCTCCCG
Tragusracemosus7108	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATGCTCCCG
Traguskoelerioides6729	TCKTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATGCTCCCG
Polevansiarigida7621	TCGTGACCCT	GACC-AAAAC	ACACCGTGAA	CAT-GTCATC	CATGCTCCCG
Perotispatens9323	TCGTGACCCT	GACC-AAAAG	AGATCGTGAA	CTT-GTCATC	TATCTTACTA
Eragrostiscurvula6529	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisobtusa6623	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisobtusa6732	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATCCTGCCG
Eragrostisechinochloidea7485	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostispseudobtusa7508	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATCCTTCCG
Eragrostislehmanniana20	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATCTTGCCG
Eragrostischloromelas6947	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATCCTGCCG
Eragrostischloromelas7474	TCGTGACCCT	TACC-AAAAC	AGACCGCGAR	CAT-GTCATC	CATGCTGCCG
Eragrostisracemosa6533	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisbiflora6705	TCGTGACCCT	TAAC-AAAAC	AGACCGCGAA	CAT-GTCATC	CATGCTGCCG
Eragrostissuperba7470	TCGTGACCCT	AACC-AAAAC	AGACCGCGAA	CGT-GTCATC	CATGCTCCCG
Eragrostiscapensis6551	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATGCCGCCG
Eragrostiscapensis6532	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Pogonarthriasquarrosa7483	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Pogonarthriasquarrosa7504	TCGTGACCCT	GAAC-AAAAC	AGACCGTGAA	CGT-GTCATC	CATCTTGCCG
Catalepisgracilis6962	TCGTGACCCT	TAAC-AAAAC	AGACCGCGAA	CAT-GTCATC	CATGCTGCCG
Catalepisgracilis6653	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cladoraphiscyperoides5704	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cladoraphisspinosa6335	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cladoraphiscyperoides4894	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Fingerhuthiaafricana7507	TCGTGACCCT	TACG-AAAAC	AGACCGTGAA	CAT-GTCACC	CATGCCGTCG
Entoplocamiaaristulata9353	TCGTGACCCT	TACC-AAAAC	AGACCGTGAA	CAT-GTCATC	CATGCCGTCG
Enneapogonscoparius18	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Enneapogoncenchroides7506	TCGTGATCCT	GACC-AAAAC	AGACCGCGAA	CGT-GTTATC	TAAGCCGCCG
Enneapogonscoparius7487	TCGTGACCCT	GACC-AAAAC	AGACCGTGAA	CGT-GTTATC	CAAGCCGCCG
Schmidtiapappophoroides6334	TCGTGACCCT	TAAG-AAAAC	AGACCCCGAA	CGA-GTCATC	CATCCCGCCG
Schmidtiakalihariensis7490	TCGTGACCCT	GACC-AAAAC	AGACCGCGAA	CGC-GTCATC	CATGCCGCCG
Schmidtiakalihariensis7486	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Sporobolusafricanus7476	TCGTGACCCT	AAAC-AAAAC	AGACTGTGAA	TAT-GTCTTC	CATGCTGTCA
Sporobolusconsimilis9354	TCGTGACCCT	AACC-AAAAG	AGACTGTGAA	TAT-GTCATC	CATTCTGTCG
Sporobolusfimbriatus9328	TCGTGACCCT	AACC-AAAAT	AGACTGTGAA	CAT-GTCATC	AATTCCACCG

	51				100
IMPERATACYLINDRICA	GGC-------	----------	TCCGGCCCGG	CCAAGGCCCC	CGAGCTCCGT
SORGHUMHALEPENSE	AGC-------	----------	TTTGGCTCGG	CCAAGGTCCC	CTTGCTCCAA
PANICUMLANIPES	GGC-------	----------	TACGGCCCGA	CCAAGGCCCC	CAACCTTCGT
PANICUMSTAPFIANUM	GGC-------	----------	TACGTTCCGA	CCAAGGCCCC	CCTTCACATT
KARROOCHLOAPURPUREA6241	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	CGACCTCCGT
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	GTTGATGGG-	CTT--GCACC	TATCTCTCGG	TCTAGGCCAC	CGACCTTCTT
Cynodondactylon	GTTGATGGAG	CTT--GCACC	TATCTCTCGG	TCTAGGCCAC	CGACCTTCTT
Eleusinecoracana	GGCGATGGGT	CTT--GCACC	CATCTCTTGG	AACAGGGCGG	CCACCTTCTT
Eleusineindica	GGCGATGGGT	CTT--GCACC	CATCTCTTGG	AACAGGGCGG	CCACCTTCTT
Chlorisvirgata6616	TTWGATGGGT	CTT--GCACC	TATCTCTCGG	TTTAGGCCGC	CAACCTTCTT
Chlorisvirgata7498	TTTGATGGGT	CTT--GCACC	TATCTCTCGG	TTTAGGCCGC	CAACCTTCTT
Eustachyspaspaloides5597	GTTGATAGGT	CTT--GCACC	TATCTCTCGG	TCTAGGCCAC	CAACCTTCTT
Harpochloafalx6530	GTTGATGGG-	CTT--GCACC	TATCTCCCGG	TCTTGGCCAC	TGACCTTCTT
Harpochloafalx5118	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6670	GTTGATGGG-	CTT--GCCCC	TATCTCCCGG	TTTTGGCCAC	TGACCTTCTT
Rendliaaltera5133	GTTGATGGGG	CTT--GCACC	TATCTCTTGG	TCTAGGCCAC	CAACCCTCTT
Leptochloafusca7622	GGTGATGGGG	CTT--GCACC	CGTCTCCCGG	TCTTGGCCAC	CGACCTTCTT
Enteropogonmacrostachyus9339	GG-GATGGGG	CTT--GCACC	TATCTTGTCA	CGGTATCCCC	CGATCCTCTT
Dactylocteniumaegyptium9326	GTTGACGGGG	CTC--GCACC	CGTCTCTCGG	TAGGGCAGG-	CGACCTTCCT
Tragusberteronianus6620	AGTGATGGGT	CTT--GCACC	CGTCTCTTGG	CCCTGGGCTC	CGAACTTCGA
Tragusracemosus7108	AGTGATGGGT	CTT--GCACC	CGTCTCTTGG	CCCTGGGCTC	CGAACTTCGA
Traguskoelerioides6729	AGTGACGGGT	CTT--GCACC	CGTCTCTTGG	CCCTGGGCTC	CGAACTTCGA
Polevansiarigida7621	AGNGATGGGS	CTT--GCACC	CATCTCTCGG	TCCATGGCTC	C-AACTTCTC
Perotispatens9323	GGTGATGGGG	-TA--GCACC	TGTCTCCTAG	TATTGGTGAC	TTACCTTCCT
Eragrostiscurvula6529	NNNNNNNNNN	NNNNNNNNTC	AA-CTCCCGG	CTTAG-CCCC	AGA-CTTCCG
Eragrostisobtusa6623	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNGCT
Eragrostisobtusa6732	GGTGACGGGG	CTTTTGCCTC	GC-CTCCCGG	CTTAGGCCCC	AGA-CTTCCG
Eragrostisechinochloidea7485	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostispseudobtusa7508	GGTGACGGGG	CTTTTGCCTC	GC-CTCCCGG	CTTAGGCCCC	AGA-CTTCCG
Eragrostislehmanniana20	GGWGACGGGG	CTT--GCCTC	GG-CTCCCGG	CTTAGGCCCC	AGA-CTTCCA
Eragrostischloromelas6947	GGTGACGGGG	CTT--GCCTC	GR-CTCCCGG	CTTAGGCCCC	AGA-CTTCCG
Eragrostischloromelas7474	GGTGACGGGG	CTT--GCCTC	GC-CTCCCGG	CTTAGGTCCC	AGA-CTTCCG
Eragrostisracemosa6533	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNAGGCCCC	A-A-CTTTCG
Eragrostisbiflora6705	GGTGACGGGG	CTT--GCCTC	GC-CTCCCGG	CTTAGGTCCC	AGA-CTTCTG
Eragrostissuperba7470	GGCGACGGGG	CTC--ACCTC	GC-CTCCCGG	TTTAGGCCCC	AGA-CTTTCG
Eragrostiscapensis6551	GCTGACGGGG	CTC--GCCTC	GC-CTCCCGG	CTTAGGCCCC	TGT-CTTCCT
Eragrostiscapensis6532	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNCCT
Pogonarthriasquarrosa7483	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Pogonarthriasquarrosa7504	AGTTACGGGG	CCT--GCCTC	GT-CACTCGG	CTTAGGCCCC	AGA-CTTCCG
Catalepisgracilis6962	GGTGATGGGG	CTA--GCCTC	GC-CTCCCGG	CTTAGGTCCC	AGA-CTTCCT
Catalepisgracilis6653	NNNNNNNNNN	NNNNNNNNNN	NNNNTCCCGG	CTTAGGTCCC	AAA-CTTCCT
Cladoraphiscyperoides5704	NNNNNNNNNN	NNNNNNNNTC	GC-CTCTCGA	CTTAGGCCCC	AGA-CTTTCG
Cladoraphisspinosa6335	NNNNNNNNNN	NNNNNNNCTC	GC-CTCTCGA	CTTAGGCCCC	AGA-CTTTCG
Cladoraphiscyperoides4894	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Fingerhuthiaafricana7507	GGCGACGGGG	CTT--GCTCC	GC-CTCCCGA	CATAGGCCCC	AGA-CTTCTT
Entoplocamiaaristulata9353	GGCGATAGGG	CTT--GCCTT	GT-CTCCCGA	CTTAGGCCCC	CGA-TCTCCG
Enneapogonscoparius18	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNCGA	TGT-CAGCCT
Enneapogoncenchroides7506	GAAGACGGGG	CTC--RCCTC	GC-CTCCCGG	CATCGGCCGA	TGT-CATCCT
Enneapogonscoparius7487	GAAGACGGGG	CTC--GCCCC	GC-CTCCCGG	CCTCGGCCGA	TGT-CGTCCT
Schmidtiapappophoroides6334	GGAGACGGGG	CTT--GCCTC	GC-CTCACGG	CATCGGCTGA	TGA-CCTCCT
Schmidtiakalihariensis7490	GGAGACGGGG	CTC--GCCTC	GC-CTCACGG	CATCGGCCGA	TGA-CCTCCT
Schmidtiakalihariensis7486	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNCGA	TGA-CCTCCT
Sporobolusafricanus7476	GGTGATGGTC	ATT--GCACT	GT-CTCTTGG	CTTGGACCCT	TGT-CGTTCT
Sporobolusconsimilis9354	GGCGACGGTT	CTT--GCACC	GT-CTCTCGG	CATAGACCCT	TAT-CTTTCT
Sporobolusfimbriatus9328	GGTGATGGCC	ATA--RTGTC	GT-CTCCTGG	CATGGGCCTC	TAT-CCTTCT

	101				150
IMPERATACYLINDRICA	CCC---GGGG	CGGAG---GG	GCCG-CAACA	-GAACCCACG	GCGCCTAG-G
SORGHUMHALEPENSE	CCT---GGGG	CAGAG---GG	GCCA-CAAAA	-GAACCCACG	GCGCCTTA-G
PANICUMLANIPES	TTCGTTGGAT	G-GAG-----	GCCG-CCAAA	-GAACCCACG	GCGCCAAA-G
PANICUMSTAPFIANUM	TTTGTTGGAG	G-GAG-----	GCCG-CCAAA	-GAACCCAGG	GCGCCGAA-G
KARROOCHLOAPURPUREA6241	CA----GGAG	GAGAG---TG	GCCG-CAAAA	-GAACCAACG	GCGCCGAACG
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	C-----AGAA	GGGCG---GG	GTGC-CAAAA	-GAACCCACG	GCGCCGTATG
Cynodondactylon	C-----AGAA	GGGCG---GG	GTGC-CAAAA	-GAACCCACG	GCGCCGTATG
Eleusinecoracana	TG----TAGA	AGGTG---GT	GGTC-CAAAA	-GAACCTACG	GCGCCGCATG
Eleusineindica	TG----TAGA	AGGTG---GT	GGTC-CAAAA	-GAACCTACG	GCGCCGCATG
Chlorisvirgata6616	CC----AGAG	GGATG---CG	TGGC-CAAAA	-GAACCCACG	GCGTCGTATG
Chlorisvirgata7498	CC----AGAG	GGATG---CG	TGGC-CAAAA	-GAACCCACG	GCGTCGTATG
Eustachyspaspaloides5597	AC----GGAG	GGATG---GT	GTG--CAAAA	AGAACCCACG	GCGCTGTATG
Harpochloafalx6530	TT----GGAG	TGATT---GT	GTGC-CAAAG	-GAACCCACG	GCGCTGTATG
Harpochloafalx5118	NNNNNNNNNN	TGATT---GT	GTGC-CAAAG	-GAACCCACG	GCGCTGTATG
Harpochloafalx6670	TT----GGAG	TGATT---GT	GTGC-CAAAG	-GAACCCACG	GCGCTGTATG
Rendliaaltera5133	TT----GGAG	GGACG---GG	GTGC-CAAAA	-GAACTCATG	GCGCTGTATA
Leptochloafusca7622	CG----MGAG	GKACG---GG	GACC-CAAAA	-GAACCCACG	GCGCCGTTTG
Enteropogonmacrostachyus9339	CC----TGGG	GGACG---GG	GGCC-CAAAA	-GAACCCACG	GCGCCGTATG
Dactylocteniumaegyptium9326	TC----GGAG	GGGAGGAGGG	GCCC-CAAAA	-GAACCCACG	GCACCGTATG
Tragusberteronianus6620	T-----AGAG	GGGA----GG	GGCC-CAAAA	-GAACCCACG	GCGCCGTATG
Tragusracemosus7108	TC----AGAG	GGGA----GG	GGCC-CAAAA	-GAACCCACG	GCGCCGTATG
Traguskoelerioides6729	TC----AGAG	GGGA----GG	GGCC-CAAAA	-GAACCCACG	GCGCCGTATG
Polevansiarigida7621	ATT---ASAG	GCAA----GG	GGCC-CAAAA	-GAACCCACG	GCGCCGTATG
Perotispatens9323	T----AGGGA	TGGTG--AGT	GGCCACAAAA	-GAACCC-CG	GCGCCGTGTG
Eragrostiscurvula6529	TA---TGGAG	GGCTG---GA	GCCG-CAAAA	-GAACCCACG	GCGCCATCTG
Eragrostisobtusa6623	A----TGGAG	GGCTG---GA	GCCG-CAAAA	-GAACCCACG	GCGCCG-ATG
Eragrostisobtusa6732	TA---TGGAG	GGCTG---GA	GCCG-CAAAA	-GAACCCACG	GCGCCG-ATG
Eragrostisechinochloidea7485	TA---TGGAG	GGATG---GA	GCCG-CAAAA	-GAACCCACG	GCGCCG-ATG
Eragrostispseudobtusa7508	TA---TGGAG	GGCTG---GA	GCCG-CAAAA	-GAACCCACG	GCGCCG-ATG
Eragrostislehmanniana20	TA---TGGAG	GGCTG---GA	GCCG-CAAAA	-GAACCCACG	GCGCCA-TCG
Eragrostischloromelas6947	TA---TGGAG	GGCTG---GA	GCCG-CAAAA	-GAACCCACG	GCGCCA-TCT
Eragrostischloromelas7474	TA---TGGAG	GGCTG---GG	GCCG-CAAAA	-GAACCCACG	GCGCCA-TGG
Eragrostisracemosa6533	TA---CSGAG	GGATG---GG	GCCG-CAAAA	-GAACCCACG	GCGCCA-TCG
Eragrostisbiflora6705	TA---TGGAG	GTTTG---GG	GCCG-CAAAA	-GAACCCACG	GCGCCA-TCG
Eragrostissuperba7470	TA---TGGAG	GGATG---GG	GCCA-CAACA	-GAACCCACG	GCGCCG-ATG
Eragrostiscapensis6551	T----TGGAG	GGCTA---GG	GCCG-CAAAA	-GAACCCACG	GCGCCG-ATG
Eragrostiscapensis6532	T----TGGAG	GGGTA---GG	GCCG-CAAAA	-GAACCCACG	GCGCCG-ATG
Pogonarthriasquarrosa7483	NNNNNNNNNN	NNNNNNNNNN	NCCA-CAAAA	-GAACCCACA	GCGCCG-ATG
Pogonarthriasquarrosa7504	TA---TGGAG	GGCTG---GA	GCCG-CAAAA	-GAACCCACG	GCGCCG-ATG
Catalepisgracilis6962	TA---TGGAG	GGATG---GG	GCCG-CAAAA	-GAACCCACG	GCGCCA-TCG
Catalepisgracilis6653	TA---TGGAG	GGATG---GG	GCCG-CAAAA	-GAACCCACG	GCGCCA-TCG
Cladoraphiscyperoides5704	TA---TGGAT	GGCTG---GG	GCCG-CAACA	-AAACCCACG	GCGCCG-ATG
Cladoraphisspinosa6335	TA---TGGAT	GGCTG---GG	GCCG-CAACA	-AAACCCACG	GCGCCG-ATG
Cladoraphiscyperoides4894	NA---TGGAT	GGCTG---GG	GCCG-CAACA	-AAACCCACG	GCGCCG-ATG
Fingerhuthiaafricana7507	TA---TGGAG	GGATG---GG	GCCG-CAACA	-GAACCCACG	GCGCCGTATG
Entoplocamiaaristulata9353	CT---TGGTG	GTTTG---GG	GCCG-CAACA	-GAACCCACG	GCGCCGTATG
Enneapogonscoparius18	CA---CGGAG	GGCTT---CG	GACA-CAAAA	-GAACCCACG	GCGCCGGTTG
Enneapogoncenchroides7506	CA---CGGAG	GGCTT---CG	GCCA-CAAAA	-GAACCCACG	G-----GCTG
Enneapogonscoparius7487	CA---CGGAG	GGCTT---CG	GCCA-CAAAA	-GAACCCACG	GCGCCGGTTG
Schmidtiapappophoroides6334	AA---CGGAG	GGTCT---CG	GCCA-CAAAA	AGAACACACG	GCGCCGGTTG
Schmidtiakalihariensis7490	CA---CGGAG	GGCTT---CG	GCCA-CAAAA	-GAACCCACG	GCGCCGGTTG
Schmidtiakalihariensis7486	CA---CGGAG	GGCTT---CG	GCCA-CAAAA	-GAACCCACG	GCGCCGGTTG
Sporobolusafricanus7476	CA---TGAAG	GGGAA---GG	GTCT-CAAAC	AGAACCCACG	GCGCTGGATG
Sporobolusconsimilis9354	TG---TGGAG	GGGA----GG	GTCCCCAACA	-GAACCCACG	GCGCCGGATG
Sporobolusfimbriatus9328	TA---T-GAC	GGGTG---TG	GTCCACAAAA	-GAACCCACG	ACGTCGGATG

	151				200
IMPERATACYLINDRICA	G-CGTCAAGG	-AACACTT--	--CTATTGCC	--TTGC-TCG	GCGGAGCGGT
SORGHUMHALEPENSE	G-CGTCAAGG	-AACACTC--	--ATGTTGCC	--TTGC-ACA	GCGGAGTGGT
PANICUMLANIPES	G-CGTCAAGG	-AACACTG--	--ATATTGCC	--TTGC-TTG	GGGTCTTGTT
PANICUMSTAPFIANUM	G-CGTCAAGG	-AACACTG--	--ATATTGCC	--TTGC-TTG	GGGTCTTGTT
KARROOCHLOAPURPUREA6241	G-CGTCAAGG	-AACACTT--	--ATATTGCC	--TTGC-GCG	CGGCGGTGGC
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	G-CGTCAAGG	-AGAACTA--	--ATGTTGCC	--TTGC-TTG	GGGCCTCGGC
Cynodondactylon	G-CGTCAAGG	-AGAACTA--	--ATGTTGCC	--TTGC-TTG	GGGCCTCGGC
Eleusinecoracana	G-CGTCAAGG	-AAAACTA--	--ATATTGCT	--TTGC-CGG	TGGTC-CATT
Eleusineindica	G-CGTCAAGG	-AAAACTA--	--ATATTGCT	--TTGC-CGG	TGGTC-CATT
Chlorisvirgata6616	G-CGTCAAGG	-AAAACAT--	--ATGTTGCC	--TTGC-CTG	GGGCTGTGAT
Chlorisvirgata7498	G-CGTCAAGG	-AAAACAT--	--ATGTTGCC	--TTGC-CTG	GGGCTGTGAT
Eustachyspaspaloides5597	G-CGTCAAGG	-ATGACTT--	--ATATTGCC	--TTGC-TTG	GGGCCACGAT
Harpochloafalx6530	G-CGTCAAGG	-AAAAGTA--	--ATATTGAC	--TTGC-CTG	GGGCCACAAC
Harpochloafalx5118	G-CGTCAAGG	-AAAAGTA--	--ATATTGAC	--TTGC-CTG	GGGCCACAAC
Harpochloafalx6670	G-CGTCAAGG	-AAAAGTA--	--ATATTGAC	--TTGC-CTG	GGGCCACAAC
Rendliaaltera5133	G-CGTCAAGG	-AAAACTA--	--ATATTGCC	--TTGC-ATG	GGGCCATGGC
Leptochloafusca7622	G-CGTCAAGG	-AAAACTA--	--ATATTGCC	--TTGC-CTG	GGGCGACGTC
Enteropogonmacrostachyus9339	G-CGTCAAGG	-AAAACTA--	--ATATTGCC	--TTGC-TTG	GGGCCATGAC
Dactylocteniumaegyptium9326	G-TGTCAAGG	AGACCAAT--	--ATTTGCCA	ATTTGC-TCG	GGTCGA-GAC
Tragusberteronianus6620	G-CGTCAAGG	-AACACTT--	--GTTTTGCA	--GTAC-TCG	GGGAAACGAT
Tragusracemosus7108	G-CGTCAAGG	-AACACTT--	--GTTTTGCA	--GTAC-TCG	GGGAAACGAT
Traguskoelerioides6729	G-CGTCAAGG	-AACACTT--	--GTTTTGCA	--GTAC-TCA	GAGAAACGAT
Polevansiarigida7621	G-CGTCAAGG	-AACACTT--	--GTTTTGCA	--TTGC-TTG	GGGAAGCTAT
Perotispatens9323	G-CGTCAAGG	-AACACAA--	--ATGTTGCC	--TTGC-TTG	GTGTAATGTC
Eragrostiscurvula6529	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCTCAA	GGATTGTGAC
Eragrostisobtusa6623	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCCAA	GGTC-GCGAC
Eragrostisobtusa6732	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCCAA	GGTC-GCGAC
Eragrostisechinochloidea7485	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCCAA	GGTC-GCGAC
Eragrostispseudobtusa7508	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCCAA	GGTC-GCGAC
Eragrostislehmanniana20	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCTCAA	GGTTTGTGAC
Eragrostischloromelas6947	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCTCAA	GGATTGTGAC
Eragrostischloromelas7474	G-CGTCAAGG	-AATACTA--	--ATATTGCC	--TTGCCCAA	G-TTCACGAT
Eragrostisracemosa6533	G-CGTCAAGG	-AACACTA--	--ATGTTGCC	--TTGCCCAA	G-TTCATGAC
Eragrostisbiflora6705	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCCAA	G-TTCACGAC
Eragrostissuperba7470	G-CGTCAAGG	-AACACTA--	--CTATTGCC	--TTGCCCAA	GG-TCGCGAT
Eragrostiscapensis6551	G-CGTCAAGG	-AACACTA--	--TTGTTGCA	--TTGCCCAA	GG-TCGCGTT
Eragrostiscapensis6532	G-CGTCAAGG	-AACACTA--	--TTGTTGCA	--TTGCCCAA	GG-TCGCGTT
Pogonarthriasquarrosa7483	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCCAA	GG-TCACGAA
Pogonarthriasquarrosa7504	G-CGTCAAGG	-AACCATA--	--ATATTGCC	--TTGCCCAA	GG-TCACGAT
Catalepisgracilis6962	G-CGTCAAGG	-AATACCA--	--ATATTGCC	--TTGCCCAA	G-TTTATGAT
Catalepisgracilis6653	G-CGTCAAGG	-AATACCA--	--ATATTGCC	--TTGCCCAA	G-TTTATGAT
Cladoraphiscyperoides5704	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCTAA	GG-CCGTGTT
Cladoraphisspinosa6335	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCCAA	GG-CCGTGTT
Cladoraphiscyperoides4894	G-CGTCAAGG	-AACACTA--	--ATATTGCC	--TTGCCTAA	GG-CCGTGTT
Fingerhuthiaafricana7507	G-CGTCAAGG	-AACACTT--	--CTATTGCA	--ATGCCCAA	G-ATTGTGAT
Entoplocamiaaristulata9353	G-CGTCAAGG	-AACACTA--	--TTATTGCT	--TTGCCCAA	G-ACCGTGAT
Enneapogonscoparius18	G-CGTCAAGG	-AACACTT--	--ATATTGCC	--TTGCCCAA	GG-TTGCGGT
Enneapogoncenchroides7506	G-CGTCAAGG	-AACACTT--	--ATATTGCC	--TTGCCCAA	GG-CTGCGGT
Enneapogonscoparius7487	G-CGTCAAGG	-AACACTT--	--ATATTGCC	--TTGCCCAA	GG-TTGCGGT
Schmidtiapappophoroides6334	G-CGTCAAGG	-AACACTA--	--ATGTTGCC	--TTGCCCAA	AG-TCGCGGT
Schmidtiakalihariensis7490	G-CGTCAAGG	-AACACTG--	--ATATTGCC	--TTGCCCAA	GG-CTGCGGC
Schmidtiakalihariensis7486	G-CGTCAAGG	-AACACTG--	--ATATTGCC	--TTGCCCAA	GG-CTGCGGC
Sporobolusafricanus7476	GGCGTCAAGG	-AACACTG--	--ATGTTGC-	--TTGCTTGG	GG-TTTTGGC
Sporobolusconsimilis9354	G-CGTCAAGG	-AATACTA--	--ATGTTGC-	--TTGCTCGG	GG-TTACGGC
Sporobolusfimbriatus9328	A-CGTCAAGG	-AACACTTTT	ATTTATTGC-	--TTGCACAA	TG-GTGTGAA

	201				250
IMPERATACYLINDRICA	CGGCCTGCCT	TC--CGCTCC	CC-GCGCAGC	GAT-GATA--	TCTTAATCCA
SORGHUMHALEPENSE	CGGCATGCCT	TC--CGCTCC	CT-GAGCAGC	GAT-GATA--	TCTTAATCCA
PANICUMLANIPES	CGGCCTGCCG	CG--CAAGCC	CC-GTGCAAT	GTT-GCTA--	TCTTAATCAA
PANICUMSTAPFIANUM	CGGCTTGCCG	CG--CATGTC	CC-ATGCAAT	GTT-GCTA--	TCCAAATCCA
KARROOCHLOAPURPUREA6241	CGGCCTGCCG	GA--CGCTCC	GT-GCGCAGC	GAT-TGTA--	TACTAATCCA
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cynodondactylon7480	CGGCTTGCCG	GA--TGCACC	CC-TTGCAGC	GAT-GCTA--	TGGAAAATCA
Cynodondactylon	CGGCTTGCCG	GA--TGCACC	CC-TTGCAGC	GAT-GCTA--	TGGAAAATCA
Eleusinecoracana	TGGCATGCCC	TA--TGTACC	CC-GTGCAGT	GAT-GCAT--	TGTTAAGTCA
Eleusineindica	TGGCATGCCG	TA--TGTACC	CC-GTGCAGT	GAT-GCAT--	TGTTAAGTCA
Chlorisvirgata6616	CGGCTTGCCG	GA--CACACC	TC-TCGCAGC	GAT-GCTA--	TGAAATTTCA
Chlorisvirgata7498	CGGCTTGCCG	GA--CACACC	TC-TCGCAGC	GAT-GCTA--	TGAAATTTCA
Eustachyspaspaloides5597	CGGCTTGCCG	GA--CGTACT	CC-TAGCAGC	GAT-GCKT--	TGGAAATTCA
Harpochloafalx6530	TGGCTTGCTG	GA--CGCACC	CG-GTGCAGT	GAT-GCTA--	TAAAAATTTA
Harpochloafalx5118	TGGCTTGCTG	GA--CGCACC	CG-GTGCAGT	GAT-GCTA--	TAAAAATTTA
Harpochloafalx6670	TGGCTTGCTG	GA--CGCACC	CG-GTGCAGT	GAT-GCTA--	TAAAAATTTA
Rendliaaltera5133	CGGCTTGCTG	GA--CATACC	CC-TTGCAGC	GAT-GCTA--	TATAAATTCT
Leptochloafusca7622	CGGCCTGCTG	GA--TGCACC	CC-CTGCAGC	GAT-GCTA--	TGTAGATACA
Enteropogonmacrostachyus9339	CGGCTTGCCG	GACGTGCACC	CG--TGCAGA	GATTGATA--	TGGAAATTCA
Dactylocteniumaegyptium9326	CGGCTAGCCG	GA---GAACC	CC-GCGCAGC	GAT-GCTANN	NNNNNNNNNN
Tragusberteronianus6620	CGGCTTGCCG	AA--CGAACC	TC-GGGTTGC	ACT-GATA--	--TTAATCAA
Tragusracemosus7108	CGGCTTGCCG	AA--CGAACC	TC-GGGTTGC	ACT-GATA--	--TTAATCAA
Traguskoelerioides6729	CGGCTTGCCG	AA--CGTWCC	TC-GGGTTGC	RCT-GATA--	--TTAATCAA
Polevansiarigida7621	CGGCTTGCCG	GA--CGCACC	CC-AGGCTGC	ATT-GATA--	--TTAATCAA
Perotispatens9323	TGGCTTGCTG	GA--TGTGAA	TC-AAGCATT	GAT-GCTATA	TATTAATCCA
Eragrostiscurvula6529	CGGCTTGCCG	GA--AACGTC	TT-GAGCAGC	GATACCTA--	TCGTAATCCA
Eragrostisobtusa6623	CGGCTTGCCG	GA--CGTGTC	TT-GAGCAGC	GATACCTA--	TCATAATCCA
Eragrostisobtusa6732	CGGCTTGCCG	GA--CGTGTC	TT-GAGCAGC	GATACCTA--	TCATAATCCA
Eragrostisechinochloidea7485	CGGCTTGCCG	GA--CGTGTC	TT-GAGCAGC	GATACCTA--	TCATAATCCA
Eragrostispseudobtusa7508	CGGCTTGCCG	GA--CGTGTC	TT-GAGCAGC	GATACCTA--	TCATAATCCA
Eragrostislehmanniana20	CGGCTTGCCG	GT--AACGTC	TTTGAGCAGC	GATACCTA--	TTGTAATCCA
Eragrostischloromelas6947	CGGCTTGCCG	GA--AACATC	TT-GAGCAGC	GATACCTA--	TCGTAATCCA
Eragrostischloromelas7474	CGGCTTGCCG	GA--CGCGTC	TT-GAGCGGC	GATACCTA--	TCTTAATCCA
Eragrostisracemosa6533	CGGCTTGCCG	GA--CGTGTC	TT-GAGCGGC	GATACCTA--	TTGTAATCCA
Eragrostisbiflora6705	CGGCTTGCCG	GA--CGCGAC	TT-GAGCGGC	GATACCTA--	TCTTAATCCA
Eragrostissuperba7470	CGGCCTGCCG	AG--CGCGTC	TT-GAGCAGC	GATACCTA--	TTGTAATCCA
Eragrostiscapensis6551	TGGCTTGCCG	GA--CACGTC	TT-GAGCAGC	GATACCTA--	CCATAATCCA
Eragrostiscapensis6532	TGGCTTGCCG	GA--CACGTC	TT-GAGCAGC	GATACCTA--	CCATAATCCA
Pogonarthriasquarrosa7483	CGGCTTGTCG	GA--CGTGTC	TT-GAGCAGC	GATACATA--	TCATAATCCA
Pogonarthriasquarrosa7504	CGGCTTGCCG	GA--CGTGTC	TT-GAGCAGC	GATACATA--	TCATAATCCA
Catalepisgracilis6962	CGGCTTGCCG	GA--CAAGTC	TT-GAGCAGC	GATACCTA--	TCTTAATCCA
Catalepisgracilis6653	CGGCTTGCCG	GA--CAAGTC	TT-GAGCAGC	GATACCTA--	TCTTAATCCA
Cladoraphiscyperoides5704	TGGCCTGCCA	AA--CGCGTC	TT-GGGCAGC	GATACCAA--	TTATAATCCA
Cladoraphisspinosa6335	TGGCCTGCCG	GA--CGCGTC	TT-GGGCAGC	GATACCCA--	TTATAATCCA
Cladoraphiscyperoides4894	TGGCCTGCCA	AA--CGCGTC	TT-GGGCAGC	GATACCAA--	TTATAATCCA
Fingerhuthiaafricana7507	CGGCCTGCCG	AA--CGCGTC	TT-GGGCAGC	GAT-GATA--	TCTTAATCCA
Entoplocamiaaristulata9353	CGGCTTGCCG	GA--CGCGTC	TT-GAGCAGC	GAT-GCTA--	TCTTAATCCA
Enneapogonscoparius18	CGGCATGCCG	GA--CGCGCC	TT-GAGCAGC	GAT-GCTA--	TGTTAATCCA
Enneapogoncenchroides7506	CGGCATGCCG	GA--CGCGTC	TT-GAGCAGC	GAT-GCTA-A	TGTTAATCCA
Enneapogonscoparius7487	CGGCATGCCG	GA--CGCGCC	TT-GAGCAGC	GAT-GCTA--	TGTTAATCCA
Schmidtiapappophoroides6334	CGGCATGCCG	GA--CGCGTT	TG-GAGCAGG	GAT-GCTA--	TCTTAASCRA
Schmidtiakalihariensis7490	CGGCATGCCG	TT--CGCGTC	TT-GAGCAGC	GAT-GCTA--	TCTCAATCCA
Schmidtiakalihariensis7486	CGGCATGCCG	TT--CGCGTC	TT-GAGCAGC	GAT-GCTA--	TCTCAATCCA
Sporobolusafricanus7476	CAGCCTGCTG	GC--AGATCC	CT-GAGCTGC	GAT-GGTA--	CCTTAATCCA
Sporobolusconsimilis9354	CGGCCTGCTG	GA--CGAGCC	CT-GTGCTGC	GAT-GCTATA	CCTGAATCCA
Sporobolusfimbriatus9328	CTTCTTGTTT	GA--TACACC	TT-GTGCTGT	GAT-GCTA--	CCTTAATCCA

	251				300
IMPERATACYLINDRICA	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
SORGHUMHALEPENSE	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
PANICUMLANIPES	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
PANICUMSTAPFIANUM	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
KARROOCHLOAPURPUREA6241	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGCA
CHAETOBROMUSINVOLUCRATES6284	NNNNNNNNNN	NGGAAAGGAT	ATTTAGTTTT	TCGCATTGAT	GAAGATCGTA
Cynodondactylon7480	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Cynodondactylon	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Eleusinecoracana	CATGACTCTC	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Eleusineindica	CATGACTCTC	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Chlorisvirgata6616	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Chlorisvirgata7498	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Eustachyspaspaloides5597	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Harpochloafalx6530	CATGACTCTT	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Harpochloafalx5118	CATGACTCTT	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Harpochloafalx6670	CATGACTCTT	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Rendliaaltera5133	CATGACTCTC	GGCAACGGAT	ATCTTGGCTC	TTGCATCGAT	GAAGAACGTA
Leptochloafusca7622	CATGACTCTC	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Enteropogonmacrostachyus9339	CATGACTCTT	GGCAACGGAT	ATCTCGGCTC	TTGCATCGAT	GAAGAACGTA
Dactylocteniumaegyptium9326	NNNNNNNNNN	NGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Tragusberteronianus6620	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Tragusracemosus7108	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Traguskoelerioides6729	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Polevansiarigida7621	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Perotispatens9323	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAATAACGTA
Eragrostiscurvula6529	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostisobtusa6623	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostisobtusa6732	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostisechinochloidea7485	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostispseudobtusa7508	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAASGTA
Eragrostislehmanniana20	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostischloromelas6947	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostischloromelas7474	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostisracemosa6533	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAANNNNNNN
Eragrostisbiflora6705	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostissuperba7470	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostiscapensis6551	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Eragrostiscapensis6532	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Pogonarthriasquarrosa7483	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Pogonarthriasquarrosa7504	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Catalepisgracilis6962	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAAAGTA
Catalepisgracilis6653	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Cladoraphiscyperoides5704	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAANNNNNNN
Cladoraphisspinosa6335	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Cladoraphiscyperoides4894	CATGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Fingerhuthiaafricana7507	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Entoplocamiaaristulata9353	CACGACTCTC	GGCAACGGAT	ATCTCGGCTC	TCGCATCGAT	GAAGAACGTA
Enneapogonscoparius18	AACGACTCTC	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Enneapogoncenchroides7506	AACGACTCTC	GGCAAGGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Enneapogonscoparius7487	AACGACTCTC	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Schmidtiapappophoroides6334	CACGACTTTT	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Schmidtiakalihariensis7490	CACGACTCTC	GGCAACGGAT	ATCTTGGCTC	TTGCATCGAT	GAAGACNNNN
Schmidtiakalihariensis7486	CACGACTCTC	GGCAACGGAT	ATCTTGGCTC	TTGCATCGAT	GAAGAACGTA
Sporobolusafricanus7476	TAAGACTCTC	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA
Sporobolusconsimilis9354	TAAGACTCTC	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAANNNNNNN
Sporobolusfimbriatus9328	CAAGACTCTC	GGCAACGGAT	ATCTTGGCTC	TCGCATCGAT	GAAGAACGTA

	301				350
IMPERATACYLINDRICA	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
SORGHUMHALEPENSE	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
PANICUMLANIPES	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
PANICUMSTAPFIANUM	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
KARROOCHLOAPURPUREA6241	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
CHAETOBROMUSINVOLUCRATES6284	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGG	AACCATGAGT
Cynodondactylon7480	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Cynodondactylon	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Eleusinecoracana	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Eleusineindica	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Chlorisvirgata6616	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCAAGT
Chlorisvirgata7498	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCAAGT
Eustachyspaspaloides5597	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Harpochloafalx6530	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCAAGT
Harpochloafalx5118	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCAAGT
Harpochloafalx6670	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCAAGT
Rendliaaltera5133	GCAAAATGCG	ATACTTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Leptochloafusca7622	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Enteropogonmacrostachyus9339	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Dactylocteniumaegyptium9326	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Tragusberteronianus6620	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Tragusracemosus7108	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Traguskoelerioides6729	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Polevansiarigida7621	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Perotispatens9323	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Eragrostiscurvula6529	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostisobtusa6623	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostisobtusa6732	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostisechinochloidea7485	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostispseudobtusa7508	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostislehmanniana20	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostischloromelas6947	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostischloromelas7474	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostisracemosa6533	NCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostisbiflora6705	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostissuperba7470	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostiscapensis6551	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Eragrostiscapensis6532	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Pogonarthriasquarrosa7483	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Pogonarthriasquarrosa7504	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Catalepisgracilis6962	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Catalepisgracilis6653	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Cladoraphiscyperoides5704	NCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Cladoraphisspinosa6335	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Cladoraphiscyperoides4894	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Fingerhuthiaafricana7507	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Entoplocamiaaristulata9353	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Enneapogonscoparius18	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Enneapogoncenchroides7506	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Enneapogonscoparius7487	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Schmidtiapappophoroides6334	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGCGA	ACCATCGAGT
Schmidtiakalihariensis7490	NNNNNNNNNN	NNNNCTGGTG	TGAATTGCAG	AATCCGGTGA	ACCATCGAGT
Schmidtiakalihariensis7486	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCATGA	ACCATCGAGT
Sporobolusafricanus7476	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT
Sporobolusconsimilis9354	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NATCCCGTGA	ACCATCGAGT
Sporobolusfimbriatus9328	GCAAAATGCG	ATACCTGGTG	TGAATTGCAG	AATCCCGTGA	ACCATCGAGT

	351				400
IMPERATACYLINDRICA	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGTCGAGGG	CACGTCTGCC
SORGHUMHALEPENSE	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	CGGCCGAGGG	CACGTCTGCC
PANICUMLANIPES	TTTTGAACGC	AAGTTGCGCC	CGAGACCTTC	TGGTTGAGGG	CACGCCTGCC
PANICUMSTAPFIANUM	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTT	TGGTTGAGGG	CACGTCTGCC
KARROOCHLOAPURPUREA6241	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGTCGAGGG	CACTCCTGCC
CHAETOBROMUSINVOLUCRATES6284	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGCCTGCC
Cynodondactylon7480	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTG	TGGCCGAGGG	CACGTCTGCC
Cynodondactylon	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTG	TGGCCGAGGG	CACGTCTGCC
Eleusinecoracana	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTT	TGGTCGAGGG	CACGTCTGCC
Eleusineindica	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTT	TGGTCGAGGG	CACGTCTGCC
Chlorisvirgata6616	TTTTGAACGC	AAGTTGCGCC	TAAGGCCTTT	TGGCCAAGGG	CACGTCTGCC
Chlorisvirgata7498	TTTTGAACGC	AAGTTGCGCC	TAAGGCCTTT	TGGCCAAGGG	CACGTCTGCC
Eustachyspaspaloides5597	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTT	TGGTCGAGGG	CACGTCTGCC
Harpochloafalx6530	TTTTGAATGC	AAGTTGCGCC	CGAGGCCTTT	TGGCTAAGGG	TACGTTTGCT
Harpochloafalx5118	TTTTGAATGC	AAGTTGCGCC	CGAGGCCTTT	TGGCTAAGGG	TACGTTTGCT
Harpochloafalx6670	TTTTGAATGC	AAGTTGCGCC	CGAGGCCTTT	TGGCTAAGGG	TACGTTTGCT
Rendliaaltera5133	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTT	GGGTTGAGGG	CACGTCTGCC
Leptochloafusca7622	TTTTGAACGC	AAGTTGCGCC	TGAGGCCTTC	TGGCTGAGGG	CACGTCTGCC
Enteropogonmacrostachyus9339	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTT	CGGCCGAGGG	CACGTCTGCC
Dactylocteniumaegyptium9326	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTCC	TGACCGAGGG	CACGTCTGCC
Tragusberteronianus6620	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Tragusracemosus7108	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Traguskoelerioides6729	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Polevansiarigida7621	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Perotispatens9323	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTT	TGGTTGAGGG	CACGTCTGCC
Eragrostiscurvula6529	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Eragrostisobtusa6623	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGTCGAGGG	CACGTCTGCC
Eragrostisobtusa6732	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGTCGAGGG	CACGTCTGCC
Eragrostisechinochloidea7485	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Eragrostispseudobtusa7508	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGTCGAGGG	CACGTCTGCC
Eragrostislehmanniana20	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Eragrostischloromelas6947	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Eragrostischloromelas7474	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Eragrostisracemosa6533	TTTTGAACGC	AAGTTGCGCC	CGAG-CCTTC	TGGCCGAGG-	CACGTCTGCC
Eragrostisbiflora6705	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGTCGAGGG	CACGTCTGCC
Eragrostissuperba7470	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Eragrostiscapensis6551	TTTTGAACGC	AAGTTGCGCC	CGAGACCTTC	TGGTTGAGGG	CACGTCTGCC
Eragrostiscapensis6532	TTTTGAACGC	AAGTTGCGCC	CGAGACCTTC	TGGTTGAGGG	CACGTCTGCC
Pogonarthriasquarrosa7483	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Pogonarthriasquarrosa7504	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Catalepisgracilis6962	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Catalepisgracilis6653	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Cladoraphiscyperoides5704	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Cladoraphisspinosa6335	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCAAGGG	CACGTCTGCC
Cladoraphiscyperoides4894	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Fingerhuthiaafricana7507	TTTTGAACGC	AAGTTGCGCC	CGAGACCTTC	TGGTCGAGGG	CACGTCTGCC
Entoplocamiaaristulata9353	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGCCTGCC
Enneapogonscoparius18	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Enneapogoncenchroides7506	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Enneapogonscoparius7487	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Schmidtiapappophoroides6334	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Schmidtiakalihariensis7490	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Schmidtiakalihariensis7486	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTTC	TGGCCGAGGG	CACGTCTGCC
Sporobolusafricanus7476	TTTTGAACGC	AAGTTGCGCC	TGAGGCCTCC	TGGTTGAGGG	CACGTCTGCC
Sporobolusconsimilis9354	TTTTGAACGC	AAGTTGCGCC	CGAGGCCTCC	TGGTTGAGGG	CACGTCTGCC
Sporobolusfimbriatus9328	TTTTGAACGC	AAGTTGCGCC	TGAGGCCACT	TGGTCGAGGG	CACGTCTGCC

	401				450
IMPERATACYLINDRICA	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCAAC	CCACCCTC-G	GG--------
SORGHUMHALEPENSE	TGGGCGTCAC	GCCAACAGAC	A-CTCCCAAC	CCACCCTC-G	GG--------
PANICUMLANIPES	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCAAC	CCATCCTT-G	GG--------
PANICUMSTAPFIANUM	TGGGCGTCAC	GCCAAAAGAC	A-CTCCTACC	CCATACTATG	GG--------
KARROOCHLOAPURPUREA6241	TGGGCGTCAC	GCCAAAAGAC	G-CTCCCRCC	CTACCTTT-G	GG--------
CHAETOBROMUSINVOLUCRATES6284	TGGGCGTCAC	GCCAAAAGAC	A-CTCCGAAC	CCCCCAA--C	GCAAGTTGTA
Cynodondactylon7480	TGGGCGTCAC	GCCAAAAGAC	A-CT-CCACC	GCAATCCC-G	GT--------
Cynodondactylon	TGGGCGTCAC	GCCAAAAGAC	A-CTTCCACC	GCAATCCC-G	GT--------
Eleusinecoracana	TGGGCGTCAC	GTCAAAAGAC	A-CTCCCTAC	CATTCCTT-G	GT--------
Eleusineindica	TGGGCGTCAC	GTCAAAAGAC	A-CTCCCTAC	CATTCCTT-G	GT--------
Chlorisvirgata6616	TGGGCGTCAC	GCCAAAAGAC	A-CTCCACAC	CAACTCT--G	GT--------
Chlorisvirgata7498	TGGGCGTCAC	GCCAAAAGAC	A-CTCCACAC	CAACTCT--G	GT--------
Eustachyspaspaloides5597	TGGGCGTCAC	GCCAAAAGAC	A-CTCCATAC	CCAACCC--G	GT--------
Harpochloafalx6530	TGGGCGTCAC	ACCAAAAGAC	A-CTCCACAC	CTGTCCT--G	GT--------
Harpochloafalx5118	TGGGCGTCAC	ACCAAAAGAC	A-CTCCACAC	CTGTCCT--G	GT--------
Harpochloafalx6670	TGGGCGTCAC	ACCAAAAGAC	A-CTCCACAC	CTGTCCT--G	GT--------
Rendliaaltera5133	TGGGCGTCAT	GTGAAAAGAC	A-CTCCACAC	CAAATCC--A	GT--------
Leptochloafusca7622	TGGGCGTCAC	GCCAAAAGAC	A-CTCTGCAC	CTACCCT--G	GT--------
Enteropogonmacrostachyus9339	TGGGCGTCAC	ACCAAAAGAC	A-CTCCAAAC	CAATCCC--G	GT--------
Dactylocteniumaegyptium9326	TGGGCGTCAC	GCCAGTATAC	AACTCCCCAC	CCATCCC--G	GT--------
Tragusberteronianus6620	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CAATCTT--G	GT--------
Tragusracemosus7108	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CAATCTT--G	GT--------
Traguskoelerioides6729	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CAATCTT--G	GT--------
Polevansiarigida7621	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CAAACTT--G	GT--------
Perotispatens9323	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCTAC	CCAATTT--G	GT--------
Eragrostiscurvula6529	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Eragrostisobtusa6623	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CAATCAT--G	GT--------
Eragrostisobtusa6732	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CAATCAT--G	GT--------
Eragrostisechinochloidea7485	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CAATCAT--G	GT--------
Eragrostispseudobtusa7508	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CAATCAT--G	GT--------
Eragrostislehmanniana20	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Eragrostischloromelas6947	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Eragrostischloromelas7474	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Eragrostisracemosa6533	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Eragrostisbiflora6705	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Eragrostissuperba7470	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCTAC	CCATCGT--G	GT--------
Eragrostiscapensis6551	TGGGCGTCAC	GCCAAAAGAC	A-CTCCACAC	CCATCGT--G	GT--------
Eragrostiscapensis6532	TGGGCGTCAC	GCCAAAAGAC	A-CTCCACAC	CCATCGT--G	GT--------
Pogonarthriasquarrosa7483	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Pogonarthriasquarrosa7504	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Catalepisgracilis6962	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Catalepisgracilis6653	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCAT--G	GT--------
Cladoraphiscyperoides5704	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCAACTC--G	GT--------
Cladoraphisspinosa6335	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCAACTC--G	GT--------
Cladoraphiscyperoides4894	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCAACTC--G	GT--------
Fingerhuthiaafricana7507	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCGC--G	GT--------
Entoplocamiaaristulata9353	TGGGCGTCAC	GCCAAAAGAC	A-CTCCAAAC	CCATCCC--G	GT--------
Enneapogonscoparius18	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATACA--G	GT--------
Enneapogoncenchroides7506	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATACC--G	GT--------
Enneapogonscoparius7487	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATACA--G	GT--------
Schmidtiapappophoroides6334	TGGGCGTCAC	GGCAAAAGAC	A-CTCCCGAC	CCAACCC--G	GT--------
Schmidtiakalihariensis7490	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCTC--G	GT--------
Schmidtiakalihariensis7486	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCAC	CCATCTC--G	GT--------
Sporobolusafricanus7476	TGGGCGTCAC	GCCAAGTGAC	A-CTTCACTA	CCATTCT--G	GT--------
Sporobolusconsimilis9354	TGGGCGTCAC	GCCAAAAGAC	A-CTCCCCTG	CCATCCT--G	GT--------
Sporobolusfimbriatus9328	TGGGCGTCAC	GCGAAAAGAC	A-CTCCCCCA	CCCTTCA-TG	GA--------

	451				500
IMPERATACYLINDRICA	-----GAGGG	ACGTGGTGTT	TGGACCCCCG	CG----CCG-	CAGGGCGCGG
SORGHUMHALEPENSE	-----GAGGG	ATGTGGTTTT	TGGCTCCCCG	TG----CCG-	CATGGCGCGG
PANICUMLANIPES	-----TACGG	ACGTGGTGTT	TGGCTCCCCA	TG----CCT-	CATGGTGTGG
PANICUMSTAPFIANUM	----GTACGG	ATGTGGTGTT	TGGCTCCCCT	TG----CCT-	TGCGGCATGG
KARROOCHLOAPURPUREA6241	-----TGAGG	ATGCGGTGTA	TGGCTCCTCG	TG----CCG-	-TGAGGCGCG
CHAETOBROMUSINVOLUCRATES6284	ACGGGAACGG	ACGCGGCATA	TGGCCCCCCG	TG----TCCG	CAAGGCGCGG
Cynodondactylon7480	------CTGG	ACGTGGTGTT	TGGCCCCTCA	TT----CCAT	AGTGT-ATGG
Cynodondactylon	------CTGG	ACGTGGTGTT	TGGCCCCTCA	TT----CCAT	AGTGT-ATGG
Eleusinecoracana	------GTGG	ACGTGGA-TT	TGGCTCCTCA	TG----CCTT	AGGGCGTGGT
Eleusineindica	------GTGG	ACGTGGA-TT	TGGCTCCTCA	TG----CCTT	CGGGCGTGGT
Chlorisvirgata6616	------ATGG	ACGTGGTGTT	TGGCCCCCCA	TA----CCAC	ATGGTTATGA
Chlorisvirgata7498	------ATGG	AYGTGGTGTT	TGGCCCCCCA	TA----CCAC	ATGGTTATGA
Eustachyspaspaloides5597	------ATGG	ATGTGGTGTT	TGGCCCCTCA	TC----CCAT	AGGGT-ATGA
Harpochloafalx6530	------TTGG	ATGTGGTGCA	TGGCCCCTCA	TA----CCAT	CGGGTT-TGA
Harpochloafalx5118	------TTGG	ATGTGGTGCA	TGGCCCCTCA	TA----CCAT	CGGGTT-TGA
Harpochloafalx6670	------TTGG	ATGTGGTGCA	TGGCCCCTCA	TA----CCAT	CGGGTT-TGA
Rendliaaltera5133	------CTGG	ACGTGGTATT	TGGCCCCTCA	TC----CTAT	AAGGT-ATGA
Leptochloafusca7622	------GTGG	ACGTGGTGTT	TGGCCCCTCA	TG----CCGC	AGGGT-GTGG
Enteropogonmacrostachyus9339	------CTGG	ACGTGGTGTT	TGGCCCCTCA	TG----CCCC	AGGGT-GTGG
Dactylocteniumaegyptium9326	------GCGG	ACGTGGTGTC	CGGCCCCTCG	TG----CCTC	CGGGC-GCGG
Tragusberteronianus6620	------GTGG	ATGTGGTATT	TGGCCCCTCG	TT----CCTT	ATGGC-ACGG
Tragusracemosus7108	------GTGG	ATGTGGTATT	TGGCCCCTCR	TT----CCTT	ATGGC-ACGG
Traguskoelerioides6729	------GTGG	ATGTGGTATT	TGGCCCCTCG	TT----CCTT	ATGGC-ACGG
Polevansiarigida7621	------GAGG	ACGTGGTATT	TGGCCCCTCG	TT----CCGT	ATGGC-RCGG
Perotispatens9323	-----GGTGG	ATGTGGTGTT	TGGCTCCTCG	TG----CCGT	C-GGT-GCGG
Eragrostiscurvula6529	------GTGG	ACGTGGCATT	TGGCTCCCCG	TG----CCAC	ATGGT-GCGG
Eragrostisobtusa6623	------GCGG	ATGTGGCATT	TGGCTCTCCG	TG----CCAT	ACGGC-GCGG
Eragrostisobtusa6732	------GCGG	ATGTGGCATT	TGGCTCTCCG	TG----CCAT	ACGGC-GCGG
Eragrostisechinochloidea7485	------GCGG	ATGTGGCATT	TGGCTCCCCG	TG----CCAC	ACGGC-GCGG
Eragrostispseudobtusa7508	------GCGG	ATGTGGCATT	TGGCTCTCCG	TG----CCAT	ACGGC-GCGG
Eragrostislehmanniana20	------GTGG	ACGTGGCATT	TGGCTCCCCG	TG----CCAC	ATGGT-GCGG
Eragrostischloromelas6947	------GTGG	ACGTGGCATT	TGGCTYCCCG	TG----CCAC	ATGGT-GCGG
Eragrostischloromelas7474	------GTGG	ACGTGGCATT	TGGCTCCCCG	TG----CCTC	ACGGT-GCGG
Eragrostisracemosa6533	------GTGG	ACGTGGCATT	TGGCTCCCCG	TG----CCAC	ACGGG-GCGG
Eragrostisbiflora6705	------GTGG	ATGTGGCATT	TGGCTCCCCG	TG----CCTC	ACGGT-GCGG
Eragrostissuperba7470	------GTGG	ATGTGGCATT	TGGCTCCCCG	TG----CCAC	ATGGT-GCGG
Eragrostiscapensis6551	------GCGG	ATGTGGCATT	TGGCTCCCCG	TG----CYGC	ATGGT-GCGG
Eragrostiscapensis6532	------GCGG	ATGTGGCATT	TGGCTCCCCG	TG----CTGC	ATGGT-GCGG
Pogonarthriasquarrosa7483	------GCGG	ACGTGGCATT	TGGCTCCCCG	TG----CCTC	ACGGT-GCGG
Pogonarthriasquarrosa7504	------GCGG	ACGTGGCATT	TGGCTCCCCG	TG----CCTC	ACGGT-GCGG
Catalepisgracilis6962	------GTGG	ACGTGGCATT	TGGCTCCCCG	TG----CCTC	ACGGT-GCGG
Catalepisgracilis6653	------GTGG	ACGTGGCATT	TGGCTCCCCG	TG----CCTC	ACGGT-GCGG
Cladoraphiscyperoides5704	------GTGG	ATGTGGCATT	TGGCTCCCCG	TG----CCGC	ACGGT-GCGG
Cladoraphisspinosa6335	------GCGG	ATGTGGCATT	TGGCTCCCCG	TG----CCGC	ACGGT-GCGG
Cladoraphiscyperoides4894	------GTGG	ATGTGGCATT	TGGCTCCCCG	TG----CCGC	ACGGT-GCGG
Fingerhuthiaafricana7507	------GCGG	ACGTGGCATT	TGGCTCCCCG	TG----CCAA	ACGGC-GCGG
Entoplocamiaaristulata9353	------GCGG	ACGTGGCATT	TGGCTCCCCG	TG----CCAA	ACGGC-ACGG
Enneapogonscoparius18	------GTGG	ACGTGGTGTT	TGGCTCCCCG	TG----CCAC	AAGGC-GCGG
Enneapogoncenchroides7506	------GTGG	ACGTGGTGTT	TGGCTCCCCG	TG----CCAC	GAGGC-GCGG
Enneapogonscoparius7487	------GTGG	ACGTGGTGTT	TGGCTCCCCG	TG----CCAC	AAGGC-GCGG
Schmidtiapappophoroides6334	------GAGG	ACGTGGCATT	TGGCTCCCCG	TG----CCAC	ATGGC-ATGG
Schmidtiakalihariensis7490	------GCGG	ACGTGGCATT	TGGCTCCCCG	TG----CCAC	ATGGT-GCGG
Schmidtiakalihariensis7486	------GCGG	ACGTGGCATT	TGGCTCCCCG	TG----CCAC	ATGGT-GCGG
Sporobolusafricanus7476	-----ATTGG	ATGTGGATTC	TGACCTTCCA	TGCC--TGAA	AGGGC-GTGG
Sporobolusconsimilis9354	-----GCTGG	ATGTGGCGTC	TGGTCTTCCA	TGCCACTAGA	AAGGA-GTGG
Sporobolusfimbriatus9328	-----GCGGG	ATGTGGTGTT	TGGCCTTCCG	TGTCATGTGA	ATGGT-TCGG

	501				550
IMPERATACYLINDRICA	TGGGCCGAA-	GTT-GGGGCT	GCCGGCGAAC	CGCGCCGGGC	AC-AGCACGT
SORGHUMHALEPENSE	TGGGCCGAA-	GTT-GGGGCT	GCCGGCGATT	CGTGTCGGGC	AC-AGCACGT
PANICUMLANIPES	TGGGCTGAA-	GTT-GGGGCT	GCCGGCATAC	CGTGCCGGGC	ACCTGCATGT
PANICUMSTAPFIANUM	TGGGCTAAA-	GTT-GTGGCT	GCCGGCATAC	CGTGTCGGGC	ACCTGCATGT
KARROOCHLOAPURPUREA6241	TGGGCCGAA-	GTT-GCGGCT	GCCGGCGTAC	CGTGCCGGGC	AC-AGCACAT
CHAETOBROMUSINVOLUCRATES6284	TGGGCCGAA-	GTT-GGGGCT	GCCGGCGCAC	CCGGCTGGGC	AC-AGCACAA
Cynodondactylon7480	TGGGCCAAA-	GAG-GCGGCT	GCCGGCG---	-GTGCCGGTC	AC-AGCAGAT
Cynodondactylon	TGGGCCAAA-	GAG-GAGGCT	GCCGGCG---	-GTGCCGGTC	AC-AGCAGAT
Eleusinecoracana	GGACCAAAG-	ATG-GAG-CT	GCCGGTT---	-GTGCCGATC	GC-AGCACAA
Eleusineindica	GGACCAAAG-	ATG-GAG-CT	GCCGGTT---	-GTGCCGATC	GC-AGCACAA
Chlorisvirgata6616	TGGGCTTAA-	GAT-GTGGCT	ATCGGCA---	GGTGCCGATC	AG-AGCACAA
Chlorisvirgata7498	TGGGCTTAA-	GAT-GTGGCT	ATCGGCA---	GGTGCCGATC	AK-AGCACAA
Eustachyspaspaloides5597	TGGGCCAAA-	GAT-GCGGTT	GCCGGT----	GGTGCTGATC	AC-AGCACAT
Harpochloafalx6530	TGGGCCAAA-	GTT-GCGGAT	GGCGGC----	GGTGCTGAAC	AC-AGCACAT
Harpochloafalx5118	TGGGCCAAA-	GTT-GCGGAT	GGCGGC----	GGTGCTGAAC	AC-AGCACAT
Harpochloafalx6670	TGGGCCAAA-	GTT-GCGGAT	GGCGGC----	GGTGCTGAAC	AC-AGCACAT
Rendliaaltera5133	TGGGCCAAA-	AAT-GTGGCT	GCCGGT----	GGTGCCGATC	AC-AGCACTT
Leptochloafusca7622	TGGGCCAAA-	TTT-GGGGCT	GCCGGC----	GGTGCCGATC	AC-AGCACAA
Enteropogonmacrostachyus9339	TAGGCCAAAA	GAT-GGGGCT	GCCGGC----	GGTGCCGATC	AC-AGCACAA
Dactylocteniumaegyptium9326	TGGGCCAAA-	GTT-GGGGCT	GCCGGC----	CGTGCCGATC	AC-AGCACGA
Tragusberteronianus6620	TGGGCCGAA-	GTT-AGGGCT	GCCGGC----	GGTGCCGATC	AC-AGCACAT
Tragusracemosus7108	TGGGCCGAA-	GTT-ACGGCT	GCCGGC----	GGTGCCGATC	AC-AGCACAT
Traguskoelerioides6729	TGGACCGAA-	GTT-AGGGCT	GCCGGC----	GGTGCCGATC	AC-AGCACAT
Polevansiarigida7621	TGGGCCGAA-	GTT-AGGGCT	GCCGGC----	GGTGCCGATC	AC-AGCACAT
Perotispatens9323	TGGGCCAAA-	GTA-GGGGAT	ACCGGC----	AGTGCATCTC	AC-AGCACAA
Eragrostiscurvula6529	TGGGCCGAA-	GTT-GGGGCT	GCCGGTTTAC	GATACCGGTC	AC-AGCACAA
Eragrostisobtusa6623	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAA	GGTACCGGTC	AC-AGCACAA
Eragrostisobtusa6732	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAA	GGTACCGGTC	AC-AGCACAA
Eragrostisechinochloidea7485	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAA	GSTACCGGTC	AC-AGCACAA
Eragrostispseudobtusa7508	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAA	GGTACCGGTC	AC-AGCACAA
Eragrostislehmanniana20	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAC	GATACCGGTC	AC-AGCACAA
Eragrostischloromelas6947	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAC	GATACCGGTC	AC-AGCACAA
Eragrostischloromelas7474	TGGGCCGAA-	GAT-GGGGCT	GCCGGCTTAT	GGTGCCGGTC	AC-AGCACAA
Eragrostisracemosa6533	TGGG-CCAA-	ATT-GGGCTG	CCCGGCTTAC	GGGGCCGGTC	AC-ATCACAA
Eragrostisbiflora6705	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAC	GGTGTCGGTC	AC-AGCACAA
Eragrostissuperba7470	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAT	GGTACCGGTC	AC-AGCACAA
Eragrostiscapensis6551	TGGGCCTAA-	GTT-GGGGCT	GCCGGCTTAT	GGTACCGGTC	AC-AGCACAA
Eragrostiscapensis6532	TGGGCCTAA-	GTT-GGGGCT	GCCGGCTTAT	GGTACCG-TC	AC-AGCACTT
Pogonarthriasquarrosa7483	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAC	GGTACCGGTC	AC-AGCACAA
Pogonarthriasquarrosa7504	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAC	GGTACCGGTC	AC-AGCACAA
Catalepisgracilis6962	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAA	GGTGCCGGTC	AC-AGCACAA
Catalepisgracilis6653	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAA	GGTGCCGGTC	AC-AGCACAA
Cladoraphiscyperoides5704	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAC	GGTACCGGTC	AC-AGCACAA
Cladoraphisspinosa6335	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAC	GGTACCGGTC	AC-AGCACAA
Cladoraphiscyperoides4894	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAC	GGTACCGGTC	AC-AGCACAA
Fingerhuthiaafricana7507	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAT	GGTACCGGTC	AC-AGCACAA
Entoplocamiaaristulata9353	TGGGCCGAA-	GTT-GGGGCT	GCCGGCTTAT	GGTACCGGTC	AC-AGCACAA
Enneapogonscoparius18	TGGGCCGAA-	GTT-GGGGCT	GCCGGTGAAA	GGTACCGGTC	AC-AGCGCAA
Enneapogoncenchroides7506	TGGGCCGAA-	GTT-GGGGCT	GCCGGTGAAA	GGTACCGGTC	AC-AGCGCAA
Enneapogonscoparius7487	TGGGCCGAA-	GTT-GGGGCT	GCCGGTGAAA	GGTACCGGTC	AC-AGCGCAA
Schmidtiapappophoroides6334	TGGGCCTAA-	GTT-GGGGTT	GCCGATGAAA	GGTACCGGTC	AG-AGCACAA
Schmidtiakalihariensis7490	TGGGCCGAA-	GTT-GGGGCT	GCCGGTGAAA	GGTACCGGTC	AC-AGCACAA
Schmidtiakalihariensis7486	TGGGCCGAA-	GTT-GGGGCT	GCCGGTGAAA	GGTACCGGTC	AC-AGCACAA
Sporobolusafricanus7476	TAGGCTAAA-	GTAAGAGGCT	GCT-GC-GAT	GGTGCTAGTC	AC-AGCACTT
Sporobolusconsimilis9354	TAGGCTAAA-	GTAAGAGGCT	GCTGGC-TAT	GGTGCCGGTC	AC-AGCACTT
Sporobolusfimbriatus9328	TGGACTAAA-	GTAT-AGGCT	GCTAGC-TAT	GGGGCTGGTC	AT-AGCACTT

	551				600
IMPERATACYLINDRICA	GGTGGGCGAC	A-TCAGTTGT	TCTCGGTGCA	--GCGCCCCN	NNNNNNNNNN
SORGHUMHALEPENSE	GGTGGGCGAC	ACTTAGTTGT	TCTCGGTGCA	--GCGCCCCN	NNNNNNNNNN
PANICUMLANIPES	GGTGGGCGAC	A-TAAGTTGT	TCTCGGTGCA	--GTGTCC--	-TGTCACG--
PANICUMSTAPFIANUM	GGTGGGCGAC	A-TTAGTTGT	TCTCGGTGCA	--GTGTCC--	-TGACACG--
KARROOCHLOAPURPUREA6241	GGTGGTCGAC	CAAAAGTTGT	CA-CGGTGTT	--GTGCCTCG	-GTGCGTA-C
CHAETOBROMUSINVOLUCRATES6284	GGTGGGCGTA	ACA--TCCCT	TCAACGTGTM	--GTGCCTCG	-GCCGGTAGC
Cynodondactylon7480	GGTGGATGGC	ACAA-GTTAT	TCTCGGTGTT	--GTGATCCT	-GACAACTCC
Cynodondactylon	GGTGGATGGC	ACAA-GTTAT	TCTCGGTGTT	--GTGATCCT	-GACAACTCC
Eleusinecoracana	GGTGGATGAC	GAAT-GTTGT	TCTCACTGCT	--TTGATCGA	-AACAGCTCC
Eleusineindica	GGTGGATGAC	GAAT-GTTGT	TCTCACTGCT	--TTGATCGA	-AACAGCTCC
Chlorisvirgata6616	GGTGGATGAC	ACAT-GTTAT	TCTCGGTGTT	--ATGATCTG	-GAGAACTCC
Chlorisvirgata7498	GGTGGATGAC	ACAT-GTTAT	TCTCGGTGTT	--ATGATCTG	-SAGAACTCC
Eustachyspaspaloides5597	GGTGGATAAC	ACAA-GTTAT	TCTCGGTGTT	TTATTGAAT-	-CATGACACT
Harpochloafalx6530	GGTGGATGAC	ACAT-GTTAT	TCTCGGTGTT	TT----CGTT	--CGGACACA
Harpochloafalx5118	GGTGGATGAC	ACAT-GTTAT	TCTCGGTGTT	TT----CGTT	--CGGACACA
Harpochloafalx6670	GGTGGATGAC	ACAT-GTTAT	TCTCGGTGTT	TT----CGTT	--CGGACACA
Rendliaaltera5133	GGTGGATGAC	ACAA-GTTAT	TCTCTGTGCT	--ATTATCTG	-GACAACTCC
Leptochloafusca7622	GGTGGATGAC	GCAA-GTTGT	TCTCGGTGTT	--ATGATCCG	-GACCACTCC
Enteropogonmacrostachyus9339	GGTGGATGAC	GCAA-GTTGT	TCTCGGTGTT	--AGGATCCG	-GTGCACTAA
Dactylocteniumaegyptium9326	GGTGGATGAC	GCAT-GTTGT	TCTCAGTGCT	--AAAATCGG	-TACAGCTT-
Tragusberteronianus6620	GGTGGATAAC	GCGA-GTTGT	TCTCGGTGCT	--ATGATTCG	-GACTCCTTT
Tragusracemosus7108	GGNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Traguskoelerioides6729	GGTGGATAAC	GCGA-GTTGT	TCTCGGTGCT	--ATGATTCG	-GACTCCTTT
Polevansiarigida7621	GGTG-ATGAC	TTTT-GTTGT	TCTCGGTGCT	--ATGGTTCG	-GATGCCTTT
Perotispatens9323	GGTGGATGGC	ACAG-GTTAT	TCTCGGTGCT	--GTGATGCT	GTATTTGATT
Eragrostiscurvula6529	GGTGGGTGAC	ACAT-AGTGT	TCTCGCTGCT	--GTGGCCTG	-GATCATTGC
Eragrostisobtusa6623	GGTGGGTGAC	ACAT-AGTGT	TCTCGCTGTT	--GTGGCCTG	-GACTATTGC
Eragrostisobtusa6732	GGTGGGTGAC	ACAT-AGTGT	TCTCGCTGTT	--GTGGCCAG	-GACTATTGC
Eragrostisechinochloidea7485	GGTGGGTGAC	ACGT-AGTGT	TCTCGCTGTT	--GTGGCCTG	-AGCTATTGC
Eragrostispseudobtusa7508	GGTGGGTGAC	ACAT-AGTGT	TCTCGCTGTT	--GTGGCCTG	-GACTATTGC
Eragrostislehmanniana20	GGTGGGTGAC	ACTT-AGTGT	TCTCGCTGTT	--GTGGCCTG	-GATCATTGC
Eragrostischloromelas6947	GGTGGGTGAC	ACAT-AGTGT	TCTCGCTGCT	--GTGGCCTG	-GATCATTGC
Eragrostischloromelas7474	GGTGGGTGAC	ACTC-GGTGT	TCTCGCTGCT	--GTGACTCT	-AACCGT-GC
Eragrostisracemosa6533	GGGGGGTGAC	ACAC-GGTGT	TCTCGCTGCT	--GTGACTTG	-AATCGTTGC
Eragrostisbiflora6705	GGTGGGTGAC	ACTT-GGTGT	TCTCGCTGCT	--GTGACTTG	-AACCGT-GC
Eragrostissuperba7470	GGTGGGTGAC	ACAT-AGTGC	TCTCGCTGCT	--GTGGCCTG	-GATCAATGC
Eragrostiscapensis6551	GGTGGGTGAC	ACAC-GGTGT	TCTCGCTGTT	--GTGACCTC	-TACCGCTGC
Eragrostiscapensis6532	GGTGGACAAC	ATGC-GTTGT	TCTCGGAGTT	--GTGACTTG	-TACTGCTTC
Pogonarthriasquarrosa7483	GGTGGGTGAC	ACAT-GGTGT	TCTCGCTGCT	--GTGACATG	-GACCGCTGC
Pogonarthriasquarrosa7504	GGTGGGTGAC	ACAT-GGTGT	TCTCGCTGCT	--GTGACATG	-GACCGCTGC
Catalepisgracilis6962	GGTGGGTGAC	ACTC-GGTGT	TYTCGCTGCT	--GTGACTTG	-AACTGT-GC
Catalepisgracilis6653	GGTGGGTGAC	ACTC-GGTGT	TCTCGCTGCT	--GTGACTTG	-AACTGT-GC
Cladoraphiscyperoides5704	GGTGGGTGAC	ACAT-GTTGT	TCTCGCTGCT	--GTGACATG	-GCCGCT-GC
Cladoraphisspinosa6335	GGTGGGTGAC	ACAT-GTTGT	TCTCGCTGCT	--GTGACATG	-GCCGCT-GC
Cladoraphiscyperoides4894	GGTGGGTGAC	ACAT-GTTGT	TCTCGCTGCT	--GTGACATG	-GCCGCT-GC
Fingerhuthiaafricana7507	GGTGGGTGAC	ACTT-GWTGT	TCTCGCTGCT	--GCGACACG	-GACCGTT-C
Entoplocamiaaristulata9353	GGTGGGTGAC	ACTT-AGTGT	TCTCGCTGCT	--GCGACCTG	-GACCGTT-G
Enneapogonscoparius18	GGTGGGTGAC	ACAA-GGTGT	TCTCGCCGCA	--GTGGCTCG	-GATCACATC
Enneapogoncenchroides7506	GGTGGGTGAC	ACAC-GGTGT	TCTCGCCGCA	--GTGGCTCG	-GATCACATC
Enneapogonscoparius7487	GGTGGGTGAC	ACAA-GGTGT	TCTCGCCGCA	--GTGGCTCG	-GATCACATC
Schmidtiapappophoroides6334	GGTGGGTGAC	ACGC-GGTGT	TCTCGCTGCT	--CTGACTTG	-GATCACTGC
Schmidtiakalihariensis7490	GGTGGGTGAC	ACAA-GGTGT	TCTCGCTGCC	--GTGACTCG	-GATCCATGA
Schmidtiakalihariensis7486	GGTGGGTGAC	ACAA-GGTGT	TCTCGCTGCC	--GTGACTCG	-GATCCATGA
Sporobolusafricanus7476	GGTGGACAAC	ATGC-GTTGT	TCTCGGAGTN	NNNNNNNNNN	NNNNNNNNNN
Sporobolusconsimilis9354	GGTGGACAAC	GTCG-GTTGT	TCTCGGAGTT	--GTGACTTG	-TACTGGTTT
Sporobolusfimbriatus9328	GGTGGATGAC	AAAT-GTTGT	TCTCGGAGTT	--GTGACATG	-TATTGCTTC

	601				650
IMPERATACYLINDRICA	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
SORGHUMHALEPENSE	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMLANIPES	-CAGCTAGCT	CCTTGGCCTA	A--AGGACCC	ATTTACGACC	GTAGC-CCTT
PANICUMSTAPFIANUM	-CAGCTAGCT	CCATAGCCTC	A--AGGACCC	ATTTACGACC	GTAGCGCCTT
KARROOCHLOAPURPUREA6241	-CAG---CGA	TAC-GGCC-T	TT-ACGACCC	TT--GAGACC	GCAGCGCTC-
CHAETOBROMUSINVOLUCRATES6284	-CGG---CAT	CAT-GGCCCT	T--CCGACCC	TT--ACACCG	CTAGCGCTC-
Cynodondactylon7480	-CGGTCATGT	TAT-GCCCCT	TTT-GGACCC	AT---GGTTT	GGAGCGTAT-
Cynodondactylon	-CGGTCATGT	TAT-GCCCCT	TTT-GGACCC	AT---GGTTT	GGAGCGTAT-
Eleusinecoracana	--GGTGATGC	AAT-GGC--T	CTATGGACCC	AT---GGATT	AAAGTGCAT-
Eleusineindica	--GGTGATGC	AAT-GGC--T	CTATGGACCC	AT---GGATT	GAAGTGCAT-
Chlorisvirgata6616	-TTGCTATGT	TAT-GGCCCT	TAATTGACCC	AT---GGTTT	TGAGTGCAT-
Chlorisvirgata7498	-TTGCTATGT	TAT-GGCCCT	TAATTGACCC	AT---GGTTT	TGAGTGCAT-
Eustachyspaspaloides5597	-CGGTCATGT	CAA-GCCCCT	TT--AGACCC	AT---GAATT	TGAGCGCAT-
Harpochloafalx6530	---GTCATGT	TAT-GCCCTT	T---GGACCC	AT---GGTTT	TGAGTGCAT-
Harpochloafalx5118	---GTCATGT	TAT-GCCCTT	T---GGACCC	AT---GGTTT	TGAGTGCAT-
Harpochloafalx6670	---GTCATGT	TAT-GCCCTT	T---GGACCC	AT---GGTTT	TGAGTGCAT-
Rendliaaltera5133	-CGGTCACCT	GAT-GCCCCC	TTT-GGACCC	AA---GGTTT	GGTGCACAT-
Leptochloafusca7622	-TGGTGATGT	TAT-GGCCCT	TT--GGACCC	AT---CGAGT	GGAGCACGT-
Enteropogonmacrostachyus9339	-CGGTGATGT	TTGCGGCCCT	TT--GGACCC	WT---GGTTA	GGAGCGCAC-
Dactylocteniumaegyptium9326	-CGTGTGACC	CTC-GGG---	----ACCCCC	ATTT-GACCG	AAGGTGCAT-
Tragusberteronianus6620	-TGGCTGTGT	TCT-GGCCCT	CT--GGACCC	ATT--AGACT	GAAGCACAC-
Tragusracemosus7108	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Traguskoelerioides6729	-CGGCTGTGT	TAT-GGCCCT	CT--GGACCC	ATT--AGACT	GAAGCACAC-
Polevansiarigida7621	-CGGCTAAGT	TAG-GGCCCT	CT--GGACCC	ATT---GACT	GAAGCACAC-
Perotispatens9323	CTGGTGTTAC	AAC--ATCCC	AT--GGACTC	AT---ACATC	GAGATGCAA-
Eragrostiscurvula6529	TATGGCATGA	AAT-GGCCCT	CAT--GACCC	AT---CAACC	GATGCGCAT-
Eragrostisobtusa6623	-----CGTGC	AAT-GGCTCT	CAT--GACCC	AT---CAACC	GAAGCGCAT-
Eragrostisobtusa6732	-----CGTGC	AAT-GGCTCT	CAT--GACCC	AT---CAACC	GAAGCGCAT-
Eragrostisechinochloidea7485	-----CGTGC	AAT-GGCTCT	CAT--GACCC	AT---CAACC	GAAGCGCAT-
Eragrostispseudobtusa7508	-----CGTGC	AAT-GGCTCT	CAT--GACCC	AT---CAACC	GAAGCGCAT-
Eragrostislehmanniana20	TATGGCATGA	AAT-GGCCCT	CAC--GACCC	AT---CAACC	GATGCGCAT-
Eragrostischloromelas6947	TATGGCATGA	AAT-GGCCCT	CAT--GACCC	AT---CAACC	GATGCGCAT-
Eragrostischloromelas7474	A--GGCATAC	AAT-GGCCCT	CAC--GACCC	AT---CAACC	GAAGCGCAT-
Eragrostisracemosa6533	A--TGCATGC	AAT-GGNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisbiflora6705	A--GGTATGC	AAT-GGCCCT	CAC--GACCC	AT---CAATC	GAAGCGTAC-
Eragrostissuperba7470	--TGGTACAC	AAT-GGCCCT	CAT--GACCC	AT---CAACC	GAAGCGCAC-
Eragrostiscapensis6551	C----TATGC	AAT-AGTCCT	CGC--GACCC	AT---CAACC	GAAGCGCAT-
Eragrostiscapensis6532	C--GGCG-AC	ATT-GGCACT	TT---GGACC	CAT--GAATT	G-AGCAAAT-
Pogonarthriasquarrosa7483	C-----ATGC	AAG-GGCCCT	TGT--GACCC	AT---CAACC	-AAGCGCAT-
Pogonarthriasquarrosa7504	C-----ATGC	AAG-GGCCCT	TGT--GACCC	AT---CAACC	-AAGCGCAT-
Catalepisgracilis6962	A--GGCATGC	AAT-GGCCCT	CAT--GACCC	AT---GAACC	AAAGAGCAT-
Catalepisgracilis6653	A--GGCATGC	AAT-GGCCCT	CAT--GACCC	AT---GAACC	AAAGAGCAT-
Cladoraphiscyperoides5704	C----TATGC	AAT-GGCCCT	CAT--GACCC	AT---CAACC	GATGCGCAC-
Cladoraphisspinosa6335	C----TATGC	AAT-GGCCCT	CAT--GACCC	AT---CAACC	GATGCGCAC-
Cladoraphiscyperoides4894	C----TATGC	AAT-GGCCCT	CAT--GACCC	AT---CAACC	GATGCGCAC-
Fingerhuthiaafricana7507	C----AAGGC	AAT-TACCCT	CAT--GACCC	AT---CGACC	GAAGCGCAC-
Entoplocamiaaristulata9353	C----AAGGC	AAC-GACCCT	CAT--GACCC	AT---CGACC	GAAGCGCAC-
Enneapogonscoparius18	CA-GGCAAGC	A-T-GGCCCT	CAA--GACCC	AT---CGACC	GTAGCGCAC-
Enneapogoncenchroides7506	CA-GGCAAGC	A-T-GGCCCT	CAA--GACCC	AT---CGACC	GTAGCGCAC-
Enneapogonscoparius7487	CA-GGCAAGC	A-T-GGCCCT	CAA--GACCC	AT---CGACC	GTAGCGCAC-
Schmidtiapappophoroides6334	CT-GGCAAGC	AAT-GGACCT	CAC--GACCC	AT---CAACC	GGAGCGCAC-
Schmidtiakalihariensis7490	CT-GGCAAGC	AAT-GGCCCT	CAT--GACCC	TT---CGACC	GTAGCGCAC-
Schmidtiakalihariensis7486	CT-GGCAAGC	AAT-GGCCCT	CAT--GACCC	TT---CGACC	GTAGCGCAC-
Sporobolusafricanus7476	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Sporobolusconsimilis9354	-CCGCG--AC	ACT-GGCCCT	-TA-GGACCC	AT---GAATC	T-AGCATCG-
Sporobolusfimbriatus9328	TAGCGAT-AG	TAT-GGCTGT	-TA-TGACCC	AT---GCATC	GGAGCTTTG-

	651				700
IMPERATACYLINDRICA	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
SORGHUMHALEPENSE	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMLANIPES	GGTG------	CTCGGACGAT	ATGTATTGAG	CCTTGGTATG	GAAACCTGCT
PANICUMSTAPFIANUM	GGTG------	CTCGGACGAT	ATGTATTGAG	CCTTGGTATG	GAAACCTGCT
KARROOCHLOAPURPUREA6241	GACG------	CTCGGACNNT	-TGTATTGAG	CCT-GGTA-G	GAAACCTGCT
CHAETOBROMUSINVOLUCRATES6284	GTCACTCGGA	TCGCGACAAT	-TGTATTGAG	CCTTGGTATG	GAA-CCTGCT
Cynodondactylon7480	GTAG------	CTCGGACNNN	NNNNNNNNNN	NNT-GGTATG	GAAACCTGCT
Cynodondactylon	GTAG------	CTCGGACGAT	-TGTATTGAG	CCTTGGTATG	GAAACCTGCT
Eleusinecoracana	GTTT------	ATCAAACGAT	-TGTATTGAG	CCTTGGTATG	GAAACCTGCT
Eleusineindica	GTTT------	ATCAAACGAT	-TGTATTGAG	CCTTGGTATG	GAAACCTGCT
Chlorisvirgata6616	GCCG------	CTCGGTCGAT	-TGTAT-GAG	CCT-GGTATG	GAA-CCTGCT
Chlorisvirgata7498	GCCG------	CTCGGTCNNN	NNNNNNNNNN	NNNNNNNNNG	AAA-CCTGCT
Eustachyspaspaloides5597	GTTG------	CTTTGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	GCTT------	CTTGGACGAT	-TGTATTGAG	CCTTGGTATG	GA--CCTGCT
Harpochloafalx5118	GCTT------	CTTGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6670	GCTT------	CTTGGACGAT	-TGTATTGAG	CCTTGGTATG	GAA-CCTGCT
Rendliaaltera5133	GTTG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNCCTGCT
Leptochloafusca7622	GTTG------	CTCGGACNNN	NNNNNNNNNN	NNNNGGTATG	GAA-CCTGCT
Enteropogonmacrostachyus9339	GTTG------	CTCGTACNNN	NNNNNNNNNN	NNNNNNNATG	GAA-CCTGCT
Dactylocteniumaegyptium9326	GTTA------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Tragusberteronianus6620	GTTG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Tragusracemosus7108	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Traguskoelerioides6729	GTTG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Polevansiarigida7621	GTTG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNG	GAAACCTGCT
Perotispatens9323	GTCA------	CTTGAACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostiscurvula6529	GTCG------	CTCGGACGAT	-TGTATTGAG	CCTTGGTATG	GAA--CTGCT
Eragrostisobtusa6623	G---------	CTCGGACGAT	-TGTATTGAG	C-TTGGTATG	GAAACCTGGT
Eragrostisobtusa6732	G---------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	G---------	CTCGGACGAT	-TGTATTGAG	C-TTGGTATG	GAAA-CTGCT
Eragrostispseudobtusa7508	G---------	CTCGGACGAT	-TGTATTGAG	CC-TGGTATG	GAA--CTGCT
Eragrostislehmanniana20	GTCG------	CTCGGACNNN	NNGTATTGAG	CCTTG-TATG	GAAACCTGCT
Eragrostischloromelas6947	GTCG------	CTCGGACGAT	-TGTATTGAG	CCTTGGTATG	GAAACCTGCT
Eragrostischloromelas7474	GTCG------	CTCGGACGAT	-TGTATTGAG	CTTGGTATG	GAAACCTGCT
Eragrostisracemosa6533	NNNNNNNNNN	NNNNNNNGAT	-TGTATTGAG	CCTCGGTATG	GAAACCTGCT
Eragrostisbiflora6705	GTCG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNG	GAAACCTGCT
Eragrostissuperba7470	GTCG------	CTCGGACGAT	-TGTATTGAG	CCTTGGTATG	GAA--CTGCT
Eragrostiscapensis6551	GTCG------	CTCGGACGAT	-TGTATTGAG	-CT-GGTATG	GAA-CCTGCT
Eragrostiscapensis6532	GTTG------	CTCGAACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Pogonarthriasquarrosa7483	G---------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNCCTGCT
Pogonarthriasquarrosa7504	G---------	CTCGGACGAT	-TGTATTGAG	CCTTGGTATG	GAAACCTGCT
Catalepisgracilis6962	GTTG------	CTTGGACGAT	-TGTATTGAG	CCTTGGTATG	GAAACCTGCT
Catalepisgracilis6653	GTTG------	CTTGGACNNN	NNNNNNNNNN	NNNNGGTATG	GAAACCTGCT
Cladoraphiscyperoides5704	GTCG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cladoraphisspinosa6335	GTCG------	CTCGGACNNN	NNNNNNNNNN	NNNNGGTATG	GAAACCTGCT
Cladoraphiscyperoides4894	GTCG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Fingerhuthiaafricana7507	GTCG------	CTCGGACGAT	-TGTATTGAG	-CT-GGTATG	GAAA-CTGCT
Entoplocamiaaristulata9353	GTCG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Enneapogonscoparius18	GTCG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNCCTGCT
Enneapogoncenchroides7506	GTCG------	CTCGGACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Enneapogonscoparius7487	GTCG------	CTCGGACGAT	-TGTATTGAG	CCTTGGTATG	GAAA-CTGCT
Schmidtiapappophoroides6334	GTCG------	CTCGGATNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Schmidtiakalihariensis7490	GCCG------	CTCGGACNNN	NTGTATTGAG	C--TGGTATG	GAA--CTGCT
Schmidtiakalihariensis7486	GCCG------	CTCGGACGAT	-TGTATTGAG	CCTTGGTATG	GAAACCTGCT
Sporobolusafricanus7476	NNNNNNNNNN	NNNNNNNGAT	--GTAT-GAG	CCT-GGTATG	GAAACCTGCT
Sporobolusconsimilis9354	ATTG------	CTCGCACGAT	-TGTATTGAG	-CT-GGTATG	GGAACCTGTT
Sporobolusfimbriatus9328	ATTG------	CTTCAACNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN

	701				750
IMPERATACYLINDRICA	NNNNNNNNNN	TTCCAAATTC	AGAGAAACC-	TGGAATGAAA	AATGGGCAAT
SORGHUMHALEPENSE	NNNNNNNNNN	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
PANICUMLANIPES	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	GGGAATGAAA	AATGGGCAAT
PANICUMSTAPFIANUM	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
KARROOCHLOAPURPUREA6241	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATTAAA	AATGGGCAAT
CHAETOBROMUSINVOLUCRATES6284	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATTAAA	AATGGGCAAT
Cynodondactylon7480	ACGTGGTAAC	TTCCAAATTC	AGAGAA-CCC	TGGAATGAAA	AATGGGCAAT
Cynodondactylon	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eleusinecoracana	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eleusineindica	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Chlorisvirgata6616	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Chlorisvirgata7498	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Harpochloafalx5118	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNGGGCAAT
Harpochloafalx6670	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Rendliaaltera5133	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Leptochloafusca7622	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Enteropogonmacrostachyus9339	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Dactylocteniumaegyptium9326	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Tragusberteronianus6620	NNNNNNNNNN	NNNCAAATTC	AGACAATCCC	TGCAATGAAA	AATGGGCAAT
Tragusracemosus7108	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNAATGAAA	AATGGGCAAT
Traguskoelerioides6729	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNCCC	TGGAATGAAA	AATGGGCAAT
Polevansiarigida7621	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Perotispatens9323	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostiscurvula6529	AAGTGGTAAC	TTCCAAATTC	AGAGAA-CCC	TGGAAGGAAA	AATGGGCAAT
Eragrostisobtusa6623	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	AAGTGGTAAC	TTCCAAATTC	AGAGAAACC-	TGGAATGAAA	AATGGGCAAT
Eragrostispseudobtusa7508	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eragrostislehmanniana20	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eragrostischloromelas6947	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eragrostischloromelas7474	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	CGGAATGAAA	AATGGGCAAT
Eragrostisracemosa6533	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eragrostisbiflora6705	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	AGGAATGAAA	AATGGGCAAT
Eragrostissuperba7470	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Eragrostiscapensis6551	AAGTGGTGAC	TTCCAAATTC	AGAGA-ACCC	TGGAATGAAA	AATGGGCAAT
Eragrostiscapensis6532	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNTGGGCA-T
Pogonarthriasquarrosa7483	AGGTGGTAAC	TTCCAAAT-C	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Pogonarthriasquarrosa7504	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Catalepisgracilis6962	AAGTGGTA-C	TTCCAAATTC	AGAGAA-CCC	TGGAATGAAA	AATGGGCAAT
Catalepisgracilis6653	AAGTGGTA-C	TTCCAAATTC	AGAGAA-CCC	TGGAATGAAA	AATGGGCAAT
Cladoraphiscyperoides5704	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Cladoraphisspinosa6335	AAGTGATAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Cladoraphiscyperoides4894	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Fingerhuthiaafricana7507	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Entoplocamiaaristulata9353	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNCCC	TGGAATGAAA	AATGGGCAAT
Enneapogonscoparius18	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Enneapogoncenchroides7506	NNNNNNNAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Enneapogonscoparius7487	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Schmidtiapappophoroides6334	NNNNNNNNNC	TTCCAAATTC	AGACAAACCC	TGGAATGAAA	AATGGGCAAT
Schmidtiakalihariensis7490	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Schmidtiakalihariensis7486	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATGAAA	AATGGGCAAT
Sporobolusafricanus7476	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATCAAA	AATGGGCAAT
Sporobolusconsimilis9354	AAGTGGTAAC	TTCCAAATTC	AGAGAAACCC	TGGAATCAAA	AATGGGCAAT
Sporobolusfimbriatus9328	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN

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                                  751                                                 800
IMPERATACYLINDRICA                CCTGAGCCAA ATCCACTTTT TT----GAAA AAA---CAAG TG-----CAA
SORGHUMHALEPENSE                  CCTGAGCCAA ATCCACTTTT TT----CAAA AAA------G TGGTTCTCAA
PANICUMLANIPES                    CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
PANICUMSTAPFIANUM                 CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
KARROOCHLOAPURPUREA6241           CCTGAGCCAA ATCCCTTTTT T-----GAAA AA----CACG TGGTCCTCAA
CHAETOBROMUSINVOLUCRATES6284      CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG CGGTCCTCAA
Cynodondactylon7480               CCTGAGCCAA ATCCCTTTTT T-----GAAA AA----CAAG TGGTTCTCAA
Cynodondactylon                   CCTGAGCCAA ATCCCTTTTT T-----GAAA AA----CAAG TGGTTCTCAA
Eleusinecoracana                  CCTGAGCCAA ATCCCTTTTT TTCATTTTAA AAA---CAAG TGGTTCTCAA
Eleusineindica                    CCTGAGCCAA ATCCCTTTTT TTCATTTTAA AAA---CAAG TGGTTCTCAA
Chlorisvirgata6616                CCTGAGCCAA ATCCCTTTTT T-----TAAA AA----CAAG TGGTTCTCAA
Chlorisvirgata7498                CCTGAGCCAA ATCCCTTTTT T-----TAAA AA----CAAG TGGTTCTCAA
Eustachyspaspaloides5597          NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Harpochloafalx6530                CCTGAGCCAA ATCCCTTTTT T-----GAAA AA----CAAG TGGTTCTCAA
Harpochloafalx5118                CCTGAGCCAA GTCCCTTTTT T-----GAAA A--------- TGGTTCTCAA
Harpochloafalx6670                CCTGAGCCAA ATCCCTTTTT T-----GAAA AA----CAAG TGGTTCTCAA
Rendliaaltera5133                 CCTGAGCCAA ATCCCTGTTT T-----GAAA AA----CAAG TGGTTCTCAA
Leptochloafusca7622               CCTGAGCCAA ATCCCTTTTT ------GAAA AA----CAGG TGGTTTTCAA
Enteropogonmacrostachyus9339      CCTGAGCCAA ATCCCTTTTT T-----GAAA AA----CAAG TGGTTCTCAA
Dactylocteniumaegyptium9326       NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Tragusberteronianus6620           CCTGAGCCAA ATCCCTTTTT TG----GAAA AA----CAAG TGGTTCTCAA
Tragusracemosus7108               CCTGAGCCAA ATCCCTTTTT TG----GAAA AA----CAAG TGGTTCTCAA
Traguskoelerioides6729            CCTGAGCCAA ATCCCTTTTT TG----GAAA AA----CAAG TGGTTCTCAA
Polevansiarigida7621              CCTGAGCCAA ATCCCTTTTT TT----GAAA AA----CAAG TGGTTCTCAA
Perotispatens9323                 NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostiscurvula6529             CCTGAGCCAA ATCCCTTTTT T-----GAAA AAR---CAAG KGGTTCTCAA
Eragrostisobtusa6623              CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Eragrostisobtusa6732              NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN
Eragrostisechinochloidea7485      CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Eragrostispseudobtusa7508         CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Eragrostislehmanniana20           CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Eragrostischloromelas6947         CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Eragrostischloromelas7474         CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Eragrostisracemosa6533            CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Eragrostisbiflora6705             CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Eragrostissuperba7470             CCTGAGCCAA ATCCCTTTTT T-----GAAA AAG---CAAG GGGTTCTCAA
Eragrostiscapensis6551            C-TGAGCCAA ATCCCTTTTA ------GAAA AAA---CAAG TGGTTCTCAA
Eragrostiscapensis6532            CCTGAGCCAA ATCCCTTTTA ------GAAA AAA---CAAG TGGTTCTCAA
Pogonarthriasquarrosa7483         CCTGAGCCAA ATCCCTTTTA ------GAAA AAA---CAAG TGGTTCTCAA
Pogonarthriasquarrosa7504         CCTGAGCCAA ATCCCTTTTA ------GAAA AAA---CAAG TGGTTCTCAA
Catalepisgracilis6962             CCTGAGCCAA ATCCCTGTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Catalepisgracilis6653             CCTGAGCCAA ATCCCTGTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Cladoraphiscyperoides5704         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN TGGTTCTCAA
Cladoraphisspinosa6335            CCTGAGCCAA ATCCCTTTTT T-----GAAA AAAAAACAAG TGGTTCTCAA
Cladoraphiscyperoides4894         NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNAA
Fingerhuthiaafricana7507          C-TGAGCCAA ATCCCTTTTT T-----GAAA AA----CAAG TGGTTCTCAA
Entoplocamiaaristulata9353        CCTGAGCCAA ATCCCTTTTT T-----GAAA AA----CAAG TGGTTCTCAA
Enneapogonscoparius18             CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Enneapogoncenchroides7506         CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Enneapogonscoparius7487           CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Schmidtiapappophoroides6334       CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Schmidtiakalihariensis7490        CCTGAGCCAA ATCCCTTTTT T-----GAAA AAAA--CAAA CGGTTCTCAA
Schmidtiakalihariensis7486        CCTGAGCCAA ATCCCTTTTT T-----GAAA AAAA--CAAG CGGTTCTCAA
Sporobolusafricanus7476           CCTGAGCCAA ATCCCTTTTT T-----TAAA AAA---CAAG TGGTTCTCAA
Sporobolusconsimilis9354          CCTGAGCCAA ATCCCTTTTT T-----GAAA AAA---CAAG TGGTTCTCAA
Sporobolusfimbriatus9328          NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNG TGGTTCTCAA
```

	801				850
IMPERATACYLINDRICA	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
SORGHUMHALEPENSE	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
PANICUMLANIPES	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
PANICUMSTAPFIANUM	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
KARROOCHLOAPURPUREA6241	ACTAGAACCC	AAAGAAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
CHAETOBROMUSINVOLUCRATES6284	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Cynodondactylon7480	ACCAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Cynodondactylon	ACCAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eleusinecoracana	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eleusineindica	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Chlorisvirgata6616	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Chlorisvirgata7498	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Harpochloafalx5118	A-TATAACCC	---GGAAAAG	G------ATC	TGTGCCGACA	CTCAATGGAA
Harpochloafalx6670	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Rendliaaltera5133	ACAAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Leptochloafusca7622	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Enteropogonmacrostachyus9339	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Dactylocteniumaegyptium9326	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNCAATGGAA
Tragusberteronianus6620	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Tragusracemosus7108	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Traguskoelerioides6729	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Polevansiarigida7621	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Perotispatens9323	NNNNNAACCC	AAAGCAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostiscurvula6529	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostisobtusa6623	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostispseudobtusa7508	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostislehmanniana20	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostischloromelas6947	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostischloromelas7474	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostisracemosa6533	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostisbiflora6705	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostissuperba7470	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Eragrostiscapensis6551	-CTAGAACCC	AAATGAAAAG	G-ATAGGATA	GGTGCAGAGA	CTCAATGGAA
Eragrostiscapensis6532	ACTAGAACCC	AAATGAAAAG	GGATAGGATA	GGTGCAGAGG	CTCAATGGAA
Pogonarthriasquarrosa7483	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Pogonarthriasquarrosa7504	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Catalepisgracilis6962	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Catalepisgracilis6653	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Cladoraphiscyperoides5704	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Cladoraphisspinosa6335	ACTAGAATCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Cladoraphiscyperoides4894	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Fingerhuthiaafricana7507	ACTAGAACCC	AAATTAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Entoplocamiaaristulata9353	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Enneapogonscoparius18	ACTAGAATCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Enneapogoncenchroides7506	ACTAGAATCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Enneapogonscoparius7487	ACTAGAATCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Schmidtiapappophoroides6334	ACTAGAATCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Schmidtiakalihariensis7490	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Schmidtiakalihariensis7486	ACTAGAACCC	AAATGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Sporobolusafricanus7476	ACTAGAACCC	AAAAGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Sporobolusconsimilis9354	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGAGA	CTCAATGGAA
Sporobolusfimbriatus9328	ACTAGAACCC	AAAGGAAAAG	G------ATA	GGTGCAGACA	CTCAATGGAA

	851				900
IMPERATACYLINDRICA	GCTGTTCTAA	CGAATCGAAG	T---------	----------	----------
SORGHUMHALEPENSE	GCTGTTCTAA	CGAATCGAAG	T---------	----------	----------
PANICUMLANIPES	GCTGTTCTAA	CGAATCGAA-	-GTAATTACG	TTGTGTTGGT	AGTGGAAC--
PANICUMSTAPFIANUM	GCTGTTCTAA	CGAATCGAA-	-GTAATTACG	TTGTGTTGGT	AGTGGAAC--
KARROOCHLOAPURPUREA6241	GCTGTTCTAA	CGAATCGAGG	T--AATTACG	TTGTGTTGGT	AGTGTAAC--
CHAETOBROMUSINVOLUCRATES6284	GCTGTTCTAA	CGAATCGAGG	T--AATTGCG	TTGTGCTGGT	AGTGTAAT--
Cynodondactylon7480	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Cynodondactylon	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Eleusinecoracana	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Eleusineindica	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Chlorisvirgata6616	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGCGAAAC--
Chlorisvirgata7498	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGCGAAAC--
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNTACG	TTGTGTTGGT	AGTGAAAC--
Harpochloafalx6530	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Harpochloafalx5118	GCTGTTCTAA	CGAATCGAGG	TGTAATTACT	TTGTGTTGGT	AGTGAAAC--
Harpochloafalx6670	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Rendliaaltera5133	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Leptochloafusca7622	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Enteropogonmacrostachyus9339	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Dactylocteniumaegyptium9326	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Tragusberteronianus6620	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGCAAC--
Tragusracemosus7108	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGCAAC--
Traguskoelerioides6729	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGCAAC--
Polevansiarigida7621	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Perotispatens9323	GCTGTTCTAA	CGAATCGAGG	TATAATTACG	TTGTGTGGGT	AGTGAACC--
Eragrostiscurvula6529	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	ARTGAAAS--
Eragrostisobtusa6623	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Eragrostispseudobtusa7508	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Eragrostislehmanniana20	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Eragrostischloromelas6947	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Eragrostischloromelas7474	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Eragrostisracemosa6533	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Eragrostisbiflora6705	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Eragrostissuperba7470	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAG--
Eragrostiscapensis6551	GCTATTCTAA	CGAATCGAGG	TGTAATA-CG	TTGTGTTGGT	AGTGAAAC--
Eragrostiscapensis6532	GCTATTCTAA	CGAATCGAGG	TGTAATATCG	TTGTGTTGGT	AGTGAATC--
Pogonarthriasquarrosa7483	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Pogonarthriasquarrosa7504	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Catalepisgracilis6962	GCTATTCTAA	CGAATCGAAG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Catalepisgracilis6653	GCTATTCTAA	CGAATCGAAG	TGTAATTACG	TTGTGTTGGT	AATGAAAC--
Cladoraphiscyperoides5704	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Cladoraphisspinosa6335	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Cladoraphiscyperoides4894	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Fingerhuthiaafricana7507	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAACTA
Entoplocamiaaristulata9353	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Enneapogonscoparius18	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Enneapogoncenchroides7506	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Enneapogonscoparius7487	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Schmidtiapappophoroides6334	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Schmidtiakalihariensis7490	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Schmidtiakalihariensis7486	GCTATTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Sporobolusafricanus7476	GCTGTTCTAA	CGAATCAAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Sporobolusconsimilis9354	GCTGTTCTAA	CGAATCGAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--
Sporobolusfimbriatus9328	GCTGTTCTAA	CGAATCCAGG	TGTAATTACG	TTGTGTTGGT	AGTGAAAC--

	901				950
IMPERATACYLINDRICA	----------	----------	----------	----------	----------
SORGHUMHALEPENSE	----------	----------	----------	----------	----------
PANICUMLANIPES	---TCCCTCG	A---------	----------	AATTATAGAA	AGAAGGGCTT
PANICUMSTAPFIANUM	---TCCCTCG	A---------	----------	AATTATAGAA	AGAAGGGCTT
KARROOCHLOAPURPUREA6241	---GCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
CHAETOBROMUSINVOLUCRATES6284	---TCCTTCT	A---------	----------	AATTAGAGAA	AGAGGGGCTT
Cynodondactylon7480	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Cynodondactylon	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Eleusinecoracana	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGAGCTT
Eleusineindica	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGAGCTT
Chlorisvirgata6616	---TCCCTCT	C---------	--------TA	AATTAGAGAA	AGAAGGGCTT
Chlorisvirgata7498	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Eustachyspaspaloides5597	---TCCCTCT	A-----AATT	ACTAAAACTA	AATTAGAGAA	AGAAGGGCTT
Harpochloafalx6530	---TCCCTTT	AATTTAAATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Harpochloafalx5118	---TCCCTTT	AATTTAAATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Harpochloafalx6670	---TCCCTTT	AATTTAAATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Rendliaaltera5133	---TCCCTCT	A-----AATT	AT------TA	AATTAGAGAA	AGAGGGGCTT
Leptochloafusca7622	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGAGCTT
Enteropogonmacrostachyus9339	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Dactylocteniumaegyptium9326	---TCCCTCT	ACTTTAAA--	AC------GA	AATTAGAGAA	AGAAGGGCTT
Tragusberteronianus6620	---TTCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Tragusracemosus7108	---TTCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Traguskoelerioides6729	---TTCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Polevansiarigida7621	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAAGGCTT
Perotispatens9323	---TTCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGGCTT
Eragrostiscurvula6529	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Eragrostisobtusa6623	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	---TCCCTCT	----------	----------	--TTTGAGAA	AGAAGGGCTT
Eragrostispseudobtusa7508	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Eragrostislehmanniana20	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Eragrostischloromelas6947	---TCCCTCT	----------	----------	--TTTGAGAA	AGAAGGGCTT
Eragrostischloromelas7474	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Eragrostisracemosa6533	---TCCCTCT	A---------	----------	AATTTGAG--	----------
Eragrostisbiflora6705	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAGGGGCTT
Eragrostissuperba7470	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Eragrostiscapensis6551	---TTCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Eragrostiscapensis6532	---TTCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Pogonarthriasquarrosa7483	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Pogonarthriasquarrosa7504	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Catalepisgracilis6962	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Catalepisgracilis6653	---TCCCTCT	A---------	----------	AATTTGAGAA	AGAAGGGCTT
Cladoraphiscyperoides5704	---TCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Cladoraphisspinosa6335	---TCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Cladoraphiscyperoides4894	---TNCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Fingerhuthiaafricana7507	AACTCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Entoplocamiaaristulata9353	---TCCCTCT	A---------	----------	AATTAGAGAA	AGAAGC-CTT
Enneapogonscoparius18	---TCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Enneapogoncenchroides7506	---TCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Enneapogonscoparius7487	---TCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Schmidtiapappophoroides6334	---TCCCTCT	A---------	----------	AATTCGAGAA	AGAAGGGCTG
Schmidtiakalihariensis7490	---TCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Schmidtiakalihariensis7486	---TCCCTCT	A---------	----------	AATTAGAGAA	AGAAGGGCTT
Sporobolusafricanus7476	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGAACTT
Sporobolusconsimilis9354	---TCCCTCT	A-----AATT	AC------TA	AATTAGAGAA	AGAAGGACTT
Sporobolusfimbriatus9328	---TCCCTCA	A-----AATT	AC------TA	AATTAAAGAA	AGAAGGACTT

	951				1000
IMPERATACYLINDRICA	----------	----------	----------	-----AATAA	CGATTAATCA
SORGHUMHALEPENSE	----------	----------	----------	-----AATAA	CGATTAATCA
PANICUMLANIPES	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
PANICUMSTAPFIANUM	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
KARROOCHLOAPURPUREA6241	-ATACATCTA	ATACACACGT	ATAGATACTG	ACATAGGAAA	CGATTAATCA
CHAETOBROMUSINVOLUCRATES6284	-ATACATCTA	ATACACACGT	ATAGATACTG	ACATAGGAAA	CGATTAATCA
Cynodondactylon7480	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Cynodondactylon	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eleusinecoracana	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eleusineindica	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Chlorisvirgata6616	TATACATCTA	ATACACACGT	ATACATACTG	ACATAGCAAA	CGATTAATCA
Chlorisvirgata7498	TATACATCTA	ATACACACGT	ATACATACTG	ACATAGCAAA	CGATTAATCA
Eustachyspaspaloides5597	TATCCATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Harpochloafalx6530	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Harpochloafalx5118	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Harpochloafalx6670	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Rendliaaltera5133	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATTA
Leptochloafusca7622	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Enteropogonmacrostachyus9339	TATACATCTA	ATACACACGT	ATAGATACTG	ACATGGCAAA	CGATTAATCA
Dactylocteniumaegyptium9326	TATACATCGA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Tragusberteronianus6620	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Tragusracemosus7108	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Traguskoelerioides6729	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Polevansiarigida7621	TATACATCTA	ATACACACGT	ATAGATACTG	AGATAGCAAA	CGATTAATCA
Perotispatens9323	TATACACCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCC
Eragrostiscurvula6529	TATACAT-TA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostisobtusa6623	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostispseudobtusa7508	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostislehmanniana20	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostischloromelas6947	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostischloromelas7474	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostisracemosa6533	----------	----------	----------	----------	---------A
Eragrostisbiflora6705	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostissuperba7470	TAT----CTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostiscapensis6551	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Eragrostiscapensis6532	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Pogonarthriasquarrosa7483	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Pogonarthriasquarrosa7504	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Catalepisgracilis6962	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Catalepisgracilis6653	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Cladoraphiscyperoides5704	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Cladoraphisspinosa6335	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Cladoraphiscyperoides4894	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Fingerhuthiaafricana7507	TATATATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Entoplocamiaaristulata9353	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Enneapogonscoparius18	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Enneapogoncenchroides7506	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Enneapogonscoparius7487	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Schmidtiapappophoroides6334	TATACATCTA	ATACACACGT	ATAGATACTG	AAATAG----	-GATTAATCA
Schmidtiakalihariensis7490	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Schmidtiakalihariensis7486	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Sporobolusafricanus7476	TATACATCTA	ATACACACGT	ATAGATACTG	ACATAGCAAA	CGATTAATCA
Sporobolusconsimilis9354	TATACATCTA	ATACACACGT	ATAGATGCTG	ACATAGCAAA	CGATTAATCA
Sporobolusfimbriatus9328	TATACATTTA	ATACACACGT	ATAGATGCTG	ACATAGCAAA	CGATTAATCA

	1001				1050
IMPERATACYLINDRICA	CAGAACCCAT	ATTATAATAT	------AGGT	TCTTTATTTT	-----ATTTT
SORGHUMHALEPENSE	CAGAACCCAT	ATTATAATAT	------AGGT	TCTTTATTTT	-----ATTTT
PANICUMLANIPES	TAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTT	----ATTTTT
PANICUMSTAPFIANUM	TAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTT	----ATTTTT
KARROOCHLOAPURPUREA6241	CCGAACCTAT	ATCATAATAT	------AGGT	TCTTTATTTT	---TTTTTTT
CHAETOBROMUSINVOLUCRATES6284	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTC	-----TTTTT
Cynodondactylon7480	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Cynodondactylon	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eleusinecoracana	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eleusineindica	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Chlorisvirgata6616	CAGAACCCAT	ACGATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Chlorisvirgata7498	CAGAACCCAT	ACGATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eustachyspaspaloides5597	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Harpochloafalx6530	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Harpochloafalx5118	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Harpochloafalx6670	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Rendliaaltera5133	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Leptochloafusca7622	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Enteropogonmacrostachyus9339	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Dactylocteniumaegyptium9326	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTYATTTA	-----TTTTT
Tragusberteronianus6620	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTT	-----TTTTT
Tragusracemosus7108	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTT	-----TTTTT
Traguskoelerioides6729	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Polevansiarigida7621	CAGAACCCAT	ACCATAATAT	------AGGT	TCTTTATTTA	-----TTTTA
Perotispatens9323	CAGAACCCAT	ACCATAATAT	AGTATAGGT	TCCTTATTTA	-----TTTTT
Eragrostiscurvula6529	CAGAACCCMT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostisobtusa6623	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostispseudobtusa7508	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostislehmanniana20	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostischloromelas6947	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostischloromelas7474	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostisracemosa6533	CAGAACCCGT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostisbiflora6705	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostissuperba7470	CAGAACCCCT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Eragrostiscapensis6551	TAGAACCCAT	ATCATAATAT	------AGGT	TCCTTATTTA	-----TTTTT
Eragrostiscapensis6532	TAGAACCCAT	ATCATAATAT	------AGGT	TCCTTATTTA	-----TTTTT
Pogonarthriasquarrosa7483	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Pogonarthriasquarrosa7504	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Catalepisgracilis6962	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Catalepisgracilis6653	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Cladoraphiscyperoides5704	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Cladoraphisspinosa6335	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Cladoraphiscyperoides4894	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----ATTTT
Fingerhuthiaafricana7507	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Entoplocamiaaristulata9353	CAGAACCC-T	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Enneapogonscoparius18	CAGAACCCAT	ATCATAATAT	ATAT--AGGT	TCTTTATTTA	--TTTTTTTT
Enneapogoncenchroides7506	CAGAACCCAT	ATCATAATAT	AT----AGGT	TCTTTATTTA	TTTTTTTTTT
Enneapogonscoparius7487	CAGAACCCAT	ATCATAATAT	ATAT--AGGT	TCTTTATTTA	--TTTTTTTT
Schmidtiapappophoroides6334	CAGAACCCAT	ATCATAATAT	ATAT--AGGT	TCTTTATTTT	-----TTTTT
Schmidtiakalihariensis7490	CAGAACCCAT	ATCATAATAT	ATATATAGGT	TCTTTATTTA	-----TTTTT
Schmidtiakalihariensis7486	CAGAACCCAT	ATCATAATAT	ATATATAGGT	TCTTTATTTA	-----TTTTT
Sporobolusafricanus7476	CAGAACCCGT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Sporobolusconsimilis9354	CAGAACCCAT	ATCATAATAT	------AGGT	TCTTTATTTA	-----TTTTT
Sporobolusfimbriatus9328	CAGAACCCAT	ATCATAATAT	------AGGT	TTTTTATTTA	-----TTTTT

	1051				1100
IMPERATACYLINDRICA	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCCT	AA-TTTTT-T
SORGHUMHALEPENSE	GAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCAT	AA-TTTTT-T
PANICUMLANIPES	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	TAAAATTCTG	AA-TTTTTTT
PANICUMSTAPFIANUM	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	TAAAATTCTG	AA-TTTTT-T
KARROOCHLOAPURPUREA6241	TAGAATGAAA	TTAGAAATGA	ATATGAAATA	GAAAATTCTG	AAATTTTT-T
CHAETOBROMUSINVOLUCRATES6284	TAGAATGAAA	TTAGAAATGA	ATATGAAATA	GAAAATTCAG	AA-TTTTT-T
Cynodondactylon7480	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Cynodondactylon	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Eleusinecoracana	TAGAATGAAA	TTTGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Eleusineindica	TAGAATGAAA	TTTGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Chlorisvirgata6616	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTA	AA-TTTTT-T
Chlorisvirgata7498	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTA	AA-TTTTT-T
Eustachyspaspaloides5597	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Harpochloafalx6530	TAAAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Harpochloafalx5118	AAAAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Harpochloafalx6670	GAAAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Rendliaaltera5133	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Leptochloafusca7622	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Enteropogonmacrostachyus9339	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Dactylocteniumaegyptium9326	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTTTG	AA-TTTTT-T
Tragusberteronianus6620	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Tragusracemosus7108	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Traguskoelerioides6729	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCAG	AA-TTTTT-T
Polevansiarigida7621	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Perotispatens9323	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GGAAATTCTG	AA-TTTTT-T
Eragrostiscurvula6529	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	KAAAATTCTG	AA-TTTTTAT
Eragrostisobtusa6623	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCAG	AA-TTTTTAT
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Eragrostispseudobtusa7508	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCAG	AA-TTTTTAT
Eragrostislehmanniana20	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	KAAAATTCTG	AA-TTTTTAT
Eragrostischloromelas6947	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	TAAAATTCTG	AA-TTTTTAT
Eragrostischloromelas7474	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Eragrostisracemosa6533	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Eragrostisbiflora6705	TTGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Eragrostissuperba7470	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Eragrostiscapensis6551	TAGAATGAAA	TTAGGAGTGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Eragrostiscapensis6532	TAGAATGAAA	TTAGGAGTGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Pogonarthriasquarrosa7483	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Pogonarthriasquarrosa7504	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Catalepisgracilis6962	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Catalepisgracilis6653	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Cladoraphiscyperoides5704	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Cladoraphisspinosa6335	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Cladoraphiscyperoides4894	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Fingerhuthiaafricana7507	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GCAAATTCTG	CA-TTTTTAT
Entoplocamiaaristulata9353	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Enneapogonscoparius18	TA-AATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	CA-TTTTTAT
Enneapogoncenchroides7506	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	CA-TTTTTAT
Enneapogonscoparius7487	TA-AATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	CA-TTTTTAT
Schmidtiapappophoroides6334	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTT	AA-TTTTTAT
Schmidtiakalihariensis7490	TAAAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Schmidtiakalihariensis7486	TAAAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTTAT
Sporobolusafricanus7476	TAGAATGAAA	TTTGGAATGA	TTATGAAATA	AAAAATTCTG	AA-TTTTT-T
Sporobolusconsimilis9354	TAGAATGAAA	TTAGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T
Sporobolusfimbriatus9328	TAGAATGAAA	TTGGGAATGA	TTATGAAATA	GAAAATTCTG	AA-TTTTT-T

	1101				1150
IMPERATACYLINDRICA	T-AGAATTAT	------TGTG	AATCTATTCC	AATCGAATAT	TGAGTAATCA
SORGHUMHALEPENSE	T-AGAATTAT	------TGTG	AATCTATTCC	AATCGAATAT	TGAGTAATCA
PANICUMLANIPES	TTAGAATTAT	------TGTG	AATCCATTCC	AATCGAATAT	TGAGTAATCA
PANICUMSTAPFIANUM	TTAGAATTAT	------TGTG	AATCCATTCC	AATCGAATAT	TGAGTAATCA
KARROOCHLOAPURPUREA6241	T-AGAATTAT	------TGTG	AATCCATTCC	AATTGAATAT	TGAGTAATCA
CHAETOBROMUSINVOLUCRATES6284	T-CGAATTAT	------TGTG	AATCTATTCC	AATTGAATAT	TGAGTAATCA
Cynodondactylon7480	T-AGAATTAT	------TGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Cynodondactylon	T-AGAATTAT	------TGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Eleusinecoracana	T-AGAATTAT	------TGTG	AATCTATTCC	TCTCGAATAT	TGAGTAATCA
Eleusineindica	T-AGAATTAT	------TGTG	AATCTATTCC	TCTCGAATAT	TGAGTAATCA
Chlorisvirgata6616	--AGAATTAT	AATTATTGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Chlorisvirgata7498	--AGAATTAT	AATTATTGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Eustachyspaspaloides5597	T-AGAATTAT	------TGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Harpochloafalx6530	T-AGAATTAT	------TGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Harpochloafalx5118	T-AGAATTAT	------TGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Harpochloafalx6670	T-AGAATTAT	------TGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Rendliaaltera5133	TTAGAATTAT	------TGTG	AATCTATTCC	CCTCGAATAT	TGAGTAATCA
Leptochloafusca7622	T-GGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Enteropogonmacrostachyus9339	T-AGAATTAT	------TGTG	AATCTATTCC	ACTCGAATAT	TGAGTAATCA
Dactylocteniumaegyptium9326	T-AGAATTAT	------TGTG	AATCCATTCC	CCTCGAATAT	TGAGTAATCA
Tragusberteronianus6620	T-CGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAATAATCA
Tragusracemosus7108	T-CGAATTAT	------TGTG	AATTCATTCC	ACTCGAATAT	TGAATAATCA
Traguskoelerioides6729	T-CGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAATAATCA
Polevansiarigida7621	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAATAATCA
Perotispatens9323	T-AGAATTAT	------TGTG	AATCCATTTC	ACTCGAATAT	TGAGTAATCA
Eragrostiscurvula6529	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostisobtusa6623	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostisobtusa6732	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eragrostisechinochloidea7485	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostispseudobtusa7508	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostislehmanniana20	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostischloromelas6947	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostischloromelas7474	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostisracemosa6533	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostisbiflora6705	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostissuperba7470	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostiscapensis6551	TTAGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Eragrostiscapensis6532	TTAGAATTAT	------TGTG	AATCCATTCC	CCTCGAATAT	TGAGTAATCA
Pogonarthriasquarrosa7483	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Pogonarthriasquarrosa7504	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Catalepisgracilis6962	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	AGAGTAATCA
Catalepisgracilis6653	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	AGAGTAATCA
Cladoraphiscyperoides5704	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Cladoraphisspinosa6335	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Cladoraphiscyperoides4894	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Fingerhuthiaafricana7507	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Entoplocamiaaristulata9353	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Enneapogonscoparius18	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCAAATAT	TGAGTAATCA
Enneapogoncenchroides7506	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCAAATAT	TGAGTAATCA
Enneapogonscoparius7487	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCAAATAT	TGAGTAATCA
Schmidtiapappophoroides6334	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Schmidtiakalihariensis7490	T-AGAATTAT	------TGGG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Schmidtiakalihariensis7486	T-AGAATTAT	------TGGG	AATCCATTCC	ACTCGAATAT	TGAGTAATCA
Sporobolusafricanus7476	T-AGAATTAG	------TGGA	ATTCCATTCC	ACTCGAATAT	TGAATAATCA
Sporobolusconsimilis9354	T-AGAATTAT	------TGTG	AATCCATTCC	ACTCGAAT--	----------
Sporobolusfimbriatus9328	--AGAATTAT	------TGTG	ANNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN

	1151				1200
IMPERATACYLINDRICA	AATCCTTCAA	TTCATTGTTT	TCGAGAT---	--CTTTT-AA	AAAGTGGA--
SORGHUMHALEPENSE	AATCCTTCAA	TTCATTGTTT	TCGAGAT---	--CTTTT-AA	AAAGTGGA--
PANICUMLANIPES	AATCCTTCAA	TTCATTGTTT	T-GAGAT---	--CTTCA-AA	AAAGTGGA--
PANICUMSTAPFIANUM	AATCCTTCAA	TTCATTGTTT	T-GAGAT---	--CTTCA-AA	AAAGTGGA--
KARROOCHLOAPURPUREA6241	AATTCTTCAA	TTCATT-TTT	TTGAGAT---	--CCTTT-AA	AA-GTGGA--
CHAETOBROMUSINVOLUCRATES6284	AATCCTTCAA	TTCATT-TTT	TTGAGAT---	--CTTTT-AA	AAAGCGGA--
Cynodondactylon7480	AACCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAATAGGA--
Cynodondactylon	AACCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAATAGGA--
Eleusinecoracana	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-TA	AAATAGGA--
Eleusineindica	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-TA	AAATAGGA--
Chlorisvirgata6616	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--ATTT--AA	AAATAGGA--
Chlorisvirgata7498	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--ATTT--AA	AAATAGGA--
Eustachyspaspaloides5597	AACCCTTCAA	TTCATTGTTT	TTGAGATNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--ATTTT-TA	AAATAGGA--
Harpochloafalx5118	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--ATTTT-AA	AAATAGGA--
Harpochloafalx6670	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--ATTTT-AA	AAATAGGA--
Rendliaaltera5133	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAATAAGA--
Leptochloafusca7622	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--ATTTA-AA	AAATAGGA--
Enteropogonmacrostachyus9339	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTA-AA	AAATAGGA--
Dactylocteniumaegyptium9326	AATCCTTCAA	TTCATTGTTT	TTGAGATT--	--AAAAA-AA	AAATAGGA--
Tragusberteronianus6620	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAATAAGA--
Tragusracemosus7108	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAATAAGA--
Traguskoelerioides6729	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAATAAGA--
Polevansiarigida7621	AATCTTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAATAAGA--
Perotispatens9323	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--ATTTT-TA	AAATAGGA--
Eragrostiscurvula6529	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostisobtusa6623	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostisobtusa6732	NNNNNNNCAA	TTCATTGTTT	TTGGAGT---	--CTTTT-AA	AAAGAGGA--
Eragrostisechinochloidea7485	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostispseudobtusa7508	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostislehmanniana20	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostischloromelas6947	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostischloromelas7474	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostisracemosa6533	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostisbiflora6705	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Eragrostissuperba7470	AATCCTTCAA	TTCATTGTTT	TTGAGATCCT	TTATTTT-TA	AAAGAGGA--
Eragrostiscapensis6551	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CCTTT-AA	AAAGAGGA--
Eragrostiscapensis6532	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CCTTT-AA	AAAGAGGA--
Pogonarthriasquarrosa7483	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Pogonarthriasquarrosa7504	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Catalepisgracilis6962	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Catalepisgracilis6653	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Cladoraphiscyperoides5704	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Cladoraphisspinosa6335	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Cladoraphiscyperoides4894	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Fingerhuthiaafricana7507	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGAA--
Entoplocamiaaristulata9353	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Enneapogonscoparius18	GATCCTTCAT	TTCATTGTTT	TTCAGAT---	--CTTTTTAA	AAAGAGGATT
Enneapogoncenchroides7506	GATTCTTCAT	TTCATTGTTT	TTCAGAT---	--CTTTTTAA	AAAGAGGATT
Enneapogonscoparius7487	GATCCTTCAT	TTCATTGTTT	TTCAGAT---	--CTTTTTAA	AAAGAGGATT
Schmidtiapappophoroides6334	AATCCTTCAT	TTCATTGTTT	TTCAGAT---	--CTTTT-AA	AAAGAGGATT
Schmidtiakalihariensis7490	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Schmidtiakalihariensis7486	AATCCTTCAA	TTCATTGTTT	TTGAGAT---	--CTTTT-AA	AAAGAGGA--
Sporobolusafricanus7476	AATCCTTCAA	TTCATTGTTT	TTGAGATTTT	TTATTTT-AA	AAAGAAGA--
Sporobolusconsimilis9354	----------	----------	----------	----------	AAAGAAGA--
Sporobolusfimbriatus9328	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN

	1201				1250
IMPERATACYLINDRICA	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
SORGHUMHALEPENSE	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
PANICUMLANIPES	---TTAATCG	AACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
PANICUMSTAPFIANUM	---TTAATCG	AACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
KARROOCHLOAPURPUREA6241	---TTAATCG	AACGAGAATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
CHAETOBROMUSINVOLUCRATES6284	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Cynodondactylon7480	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Cynodondactylon	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eleusinecoracana	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eleusineindica	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Chlorisvirgata6616	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Chlorisvirgata7498	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	---TTAATCC	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Harpochloafalx5118	---TTAATCC	G-CGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Harpochloafalx6670	---TTAATCC	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Rendliaaltera5133	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTTTAC	ATGTCAATAG
Leptochloafusca7622	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Enteropogonmacrostachyus9339	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Dactylocteniumaegyptium9326	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Tragusberteronianus6620	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Tragusracemosus7108	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Traguskoelerioides6729	---TTAATCG	GGCGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Polevansiarigida7621	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Perotispatens9323	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostiscurvula6529	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostisobtusa6623	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostisobtusa6732	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostisechinochloidea7485	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostispseudobtusa7508	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostislehmanniana20	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostischloromelas6947	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostischloromelas7474	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostisracemosa6533	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostisbiflora6705	---TTAATCG	TACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostissuperba7470	---TTAATCG	TACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostiscapensis6551	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Eragrostiscapensis6532	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Pogonarthriasquarrosa7483	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Pogonarthriasquarrosa7504	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Catalepisgracilis6962	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Catalepisgracilis6653	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Cladoraphiscyperoides5704	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTTTAC	ATGTCAATAC
Cladoraphisspinosa6335	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Cladoraphiscyperoides4894	---TTAATCG	GGCGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Fingerhuthiaafricana7507	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Entoplocamiaaristulata9353	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Enneapogonscoparius18	AGATTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTTTAC	ATGTCAATAC
Enneapogoncenchroides7506	AGATTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Enneapogonscoparius7487	AGATTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Schmidtiapappophoroides6334	AGATTAATTG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Schmidtiakalihariensis7490	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Schmidtiakalihariensis7486	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Sporobolusafricanus7476	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Sporobolusconsimilis9354	---TTAATCG	GACGAGGATA	AAGAGAGAGT	CCCATTCTAC	ATGTCAATAC
Sporobolusfimbriatus9328	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN

	1251				1300
IMPERATACYLINDRICA	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
SORGHUMHALEPENSE	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
PANICUMLANIPES	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
PANICUMSTAPFIANUM	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
KARROOCHLOAPURPUREA6241	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAGGT
CHAETOBROMUSINVOLUCRATES6284	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAGGT
Cynodondactylon7480	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Cynodondactylon	TGACAACAAT	GAAATTTCTA	GTAAAAGGNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	TGACAACAAT	GAAATTTCTA	GTAAAAGGNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	TGACAACAAT	GAAATTTCTA	GTAAAAGGNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Chlorisvirgata7498	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Harpochloafalx6530	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTGGA	CTTTTTAAGT
Harpochloafalx5118	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTTTAAGT
Harpochloafalx6670	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTTTAAGT
Rendliaaltera5133	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGG	CTTTATAAGT
Leptochloafusca7622	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Enteropogonmacrostachyus9339	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTCTAAGT
Dactylocteniumaegyptium9326	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Tragusberteronianus6620	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Tragusracemosus7108	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Traguskoelerioides6729	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Polevansiarigida7621	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Perotispatens9323	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGC	CTTTATAAGT
Eragrostiscurvula6529	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostisobtusa6623	TGACAACAAT	GAAATTTCTA	GTAAAAGGNN	NNNNNGTCGA	CTTTATAAGT
Eragrostisobtusa6732	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostisechinochloidea7485	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTATAAAGT
Eragrostispseudobtusa7508	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostislehmanniana20	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostischloromelas6947	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostischloromelas7474	TGACAACAAT	GAAATTT-TA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostisracemosa6533	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostisbiflora6705	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostissuperba7470	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostiscapensis6551	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Eragrostiscapensis6532	TGGCAACAAT	GAAATTTTTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Pogonarthriasquarrosa7483	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Pogonarthriasquarrosa7504	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Catalepisgracilis6962	TGACAACAAT	GAAATTTCTA	GTANNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Catalepisgracilis6653	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Cladoraphiscyperoides5704	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Cladoraphisspinosa6335	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Cladoraphiscyperoides4894	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Fingerhuthiaafricana7507	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Entoplocamiaaristulata9353	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Enneapogonscoparius18	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Enneapogoncenchroides7506	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Enneapogonscoparius7487	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Schmidtiapappophoroides6334	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Schmidtiakalihariensis7490	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Schmidtiakalihariensis7486	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Sporobolusafricanus7476	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Sporobolusconsimilis9354	TGACAACAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT
Sporobolusfimbriatus9328	NNNNNNCAAT	GAAATTTCTA	GTAAAAGGAA	AATCCGTCGA	CTTTATAAGT

	1301				1350
IMPERATACYLINDRICA	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCTTTTA	TTCCCTAACC
SORGHUMHALEPENSE	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCTTTTA	TTCGCTAACC
PANICUMLANIPES	CGTGAGNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	CGTGAGNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCTTTTA	TTCCCTAACC
CHAETOBROMUSINVOLUCRATES6284	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCGTTTA	TTCCCTAACC
Cynodondactylon7480	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Chlorisvirgata7498	CGTGAGGGTT	CAAGTCCCTT	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eustachyspaspaloides5597	NNNNNNNNNN	NNNNNNNNNN	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Harpochloafalx6530	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Harpochloafalx5118	CGTGAGGGTT	CAAGTCCCTT	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Harpochloafalx6670	CGGGAGGGTT	CAAGTCCCTT	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Rendliaaltera5133	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Leptochloafusca7622	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Enteropogonmacrostachyus9339	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Dactylocteniumaegyptium9326	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Tragusberteronianus6620	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Tragusracemosus7108	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Traguskoelerioides6729	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Polevansiarigida7621	CGTGAGGGTT	CAAGTCCCTT	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Perotispatens9323	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAATC
Eragrostiscurvula6529	TGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostisobtusa6623	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostisobtusa6732	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostisechinochloidea7485	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostispseudobtusa7508	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostislehmanniana20	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTTCTTTA	TTCCCTAACC
Eragrostischloromelas6947	TGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostischloromelas7474	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostisracemosa6533	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTTCCTAACC
Eragrostisbiflora6705	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostissuperba7470	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostiscapensis6551	CATGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Eragrostiscapensis6532	CATGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Pogonarthriasquarrosa7483	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Pogonarthriasquarrosa7504	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Catalepisgracilis6962	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNCC
Catalepisgracilis6653	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Cladoraphiscyperoides5704	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Cladoraphisspinosa6335	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Cladoraphiscyperoides4894	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Fingerhuthiaafricana7507	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Entoplocamiaaristulata9353	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Enneapogonscoparius18	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Enneapogoncenchroides7506	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Enneapogonscoparius7487	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Schmidtiapappophoroides6334	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Schmidtiakalihariensis7490	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCCTTA	TTCCCTAACC
Schmidtiakalihariensis7486	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCCTTA	TTCCCTAACC
Sporobolusafricanus7476	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Sporobolusconsimilis9354	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCTCCTTTA	TTCCCTAACC
Sporobolusfimbriatus9328	CGTGAGGGTT	CAAGTCCCTC	TATCCCCAAA	CCCCCCTTTA	TTCCCTAACC

	1351				1400
IMPERATACYLINDRICA	ATAGTTGTTA	T-----CCT-	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
SORGHUMHALEPENSE	ATAGTTGTTA	T-----CCT-	TTTTTT---T	TAT-----CA	ATGGGTTT--
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	ATAGTATTTA	T-----CCTA	TTTTTT-TTT	--------CA	ATAGGTTT--
CHAETOBROMUSINVOLUCRATES6284	ATAGTATTTA	T-----CCTA	TTTTTT-TTT	T-------CA	ATGGGTTT--
Cynodondactylon7480	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CT	ATGG-TTCAA
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CG	ATGGGTT---
Chlorisvirgata7498	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CG	ATGGGTT---
Eustachyspaspaloides5597	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CA	ATGGGTTCAA
Harpochloafalx6530	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CA	ATGGGTT---
Harpochloafalx5118	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CA	ATGGGTT---
Harpochloafalx6670	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CA	ATGGGTT---
Rendliaaltera5133	ATAGTATTAA	T-----CCTC	TTTTYTCTTT	TMT-----CA	ATGGGTTYAA
Leptochloafusca7622	GTAGTATTTA	TCTTATCCTC	TTTTCTCTTT	TAT-----CA	ATGGGTT---
Enteropogonmacrostachyus9339	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CA	ATGGGTT---
Dactylocteniumaegyptium9326	ATAGTATTTA	T-----CCTC	TTTTCTCTTT	TAT-----CA	ATGGGTT---
Tragusberteronianus6620	A-AC--TTTA	T---------	-----TCCCT	AAC-----CA	ATGGGTT---
Tragusracemosus7108	A-AC--TTTA	T---------	-----TCCCT	AAC-----CA	ATGGGTT---
Traguskoelerioides6729	A-AC--TTTA	T---------	-----TCCCT	AAC-----CA	ATGGGTT---
Polevansiarigida7621	A-A-------	----------	----------	----------	-TGGGTT---
Perotispatens9323	ATAGTATTTA	TCTTATCCTC	TTTTCTCTTT	TAT-----CA	ATGGGTT---
Eragrostiscurvula6529	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGATTT--
Eragrostisobtusa6623	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TATCAATGCA	ATGGGTTT--
Eragrostisobtusa6732	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TATCAATGCA	ATGGGTTT--
Eragrostisechinochloidea7485	ATAGTATTTA	T-----CCTA	TTTTATCTTT	TATCAATGCA	ATGGGTTT--
Eragrostispseudobtusa7508	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TATCAATGCA	ATGGGTTT--
Eragrostislehmanniana20	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGATTT--
Eragrostischloromelas6947	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGATTT--
Eragrostischloromelas7474	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ACGGGTTT--
Eragrostisracemosa6533	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Eragrostisbiflora6705	ATACTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Eragrostissuperba7470	ATCGTATTTA	T-----CCTC	TTTTTTCTTT	TAG-----CA	AGGGGTTT--
Eragrostiscapensis6551	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Eragrostiscapensis6532	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Pogonarthriasquarrosa7483	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGATTT--
Pogonarthriasquarrosa7504	ATAGTATTTA	T-----CCTA	TTTTTTCTTT	TAT-----CA	ATGGATTT--
Catalepisgracilis6962	ATAGTATTTA	T-----CCTT	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Catalepisgracilis6653	ATAGTATTTA	T-----CCTT	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Cladoraphiscyperoides5704	ATAGTATTTA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Cladoraphisspinosa6335	ATAGTATTTA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Cladoraphiscyperoides4894	ATAGTATTTA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Fingerhuthiaafricana7507	ATAGTATTTA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Entoplocamiaaristulata9353	ATAGTATTTA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Enneapogonscoparius18	ATAGTATTAA	T-----CCTC	TTTTTTCTTT	TCT-----CA	ATGGGTTT--
Enneapogoncenchroides7506	ATAGTATTAA	T-----CCTC	TTTTTTCTTT	TCT-----CA	ATGGGTTT--
Enneapogonscoparius7487	ATAGTATTAA	T-----CCTC	TTTTTTCTTT	TCT-----CA	ATGGGTTT--
Schmidtiapappophoroides6334	ATAGTATTAA	T-----CCTC	TTTTTTCTTT	TCT-----CA	ATGGGTTT--
Schmidtiakalihariensis7490	ATAGTTTTAA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Schmidtiakalihariensis7486	ATAGTTTTAA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTTT--
Sporobolusafricanus7476	ATAGTATTTA	TCCTATCCTC	TTTTTTCTTT	TAT-----TA	A---------
Sporobolusconsimilis9354	ATAGTATTTA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTTCAA
Sporobolusfimbriatus9328	ATAGTATTTA	T-----CCTC	TTTTTTCTTT	TAT-----CA	ATGGGTT---

	1401				1450
IMPERATACYLINDRICA	---AAGATTC	ACTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
SORGHUMHALEPENSE	---AAGATTC	ACTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	---AAGATTC	ATTAGCT---	-TTCTCATTC	TATT-----C	TTTCACAAAG
CHAETOBROMUSINVOLUCRATES6284	---AAGATTC	ATTAGCT---	-TTCTCATTC	TATT-----C	ATTCACAAAG
Cynodondactylon7480	GACAAGATTC	ATTAGCTTGC	TTTCTCATTC	TACT-----C	TTTCACAAAG
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Chlorisvirgata7498	--CAAGATTC	ATTAGCT---	-TTCTCATTY	TACT-----C	TTTCACAAAG
Eustachyspaspaloides5597	GACAAGATTC	ATTAGTT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Harpochloafalx6530	--CAAGATTC	ATTAGTT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Harpochloafalx5118	--CAAGATTC	ATTAGTT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Harpochloafalx6670	--CAAGATTC	ATTAGTT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Rendliaaltera5133	GACAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCRCAAAG
Leptochloafusca7622	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Enteropogonmacrostachyus9339	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Dactylocteniumaegyptium9326	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Tragusberteronianus6620	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Tragusracemosus7108	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Traguskoelerioides6729	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Polevansiarigida7621	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Perotispatens9323	--CAAGATTC	ATTAGCT---	-TTCTCATTA	TACT-----C	TTTCACAAAG
Eragrostiscurvula6529	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Eragrostisobtusa6623	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACTTTACTC	TTTCATAAAG
Eragrostisobtusa6732	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACTTTACTC	TTTCATAAAG
Eragrostisechinochloidea7485	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACTCTACTC	TTTCATAAAG
Eragrostispseudobtusa7508	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACTTTACTC	TTTCATAAAG
Eragrostislehmanniana20	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Eragrostischloromelas6947	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Eragrostischloromelas7474	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Eragrostisracemosa6533	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Eragrostisbiflora6705	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Eragrostissuperba7470	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Eragrostiscapensis6551	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Eragrostiscapensis6532	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Pogonarthriasquarrosa7483	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Pogonarthriasquarrosa7504	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Catalepisgracilis6962	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Catalepisgracilis6653	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Cladoraphiscyperoides5704	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Cladoraphisspinosa6335	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Cladoraphiscyperoides4894	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Fingerhuthiaafricana7507	--CAAGATTC	ATTAGTT---	-TTCTCATTC	TACT-----C	TTTCATAAAA
Entoplocamiaaristulata9353	--CAAGATTC	ATTAGTT---	-TTCTCATTC	TACT-----C	TTTCATAAAG
Enneapogonscoparius18	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Enneapogoncenchroides7506	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TATT-----C	TTTCACAAAG
Enneapogonscoparius7487	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----T	TTTCACAAAG
Schmidtiapappophoroides6334	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAT
Schmidtiakalihariensis7490	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Schmidtiakalihariensis7486	--CAAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Sporobolusafricanus7476	----------	----------	----------	----------	----------
Sporobolusconsimilis9354	-ACAAAATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG
Sporobolusfimbriatus9328	--CGAGATTC	ATTAGCT---	-TTCTCATTC	TACT-----C	TTTCACAAAG

	1451				1500
IMPERATACYLINDRICA	GAGTGCGACA	AGAACTCAAT	GAATCTTATG	CTATTCATTA	AATAGATGAT
SORGHUMHALEPENSE	GAGTGCGACA	AGAACTCAAT	GAATCTTATG	CTATTCATTA	AATAGATGAT
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	GACTGCAAAG	AGAACTCAAT	GGATCTTATG	CTATTCATTA	AATGGAT---
CHAETOBROMUSINVOLUCRATES6284	GAATGCAAAG	AGAACTCAAT	GGATCTTATG	CTATTCATTA	AATGGAT---
Cynodondactylon7480	GAGTGCAAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	GAGTGCAAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Chlorisvirgata7498	GAGTGCAAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eustachyspaspaloides5597	GAGTGCAAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Harpochloafalx6530	GAGTGCAAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Harpochloafalx5118	GAGTGCAAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Harpochloafalx6670	GAGTGCAAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Rendliaaltera5133	GAGTGCRAAG	ARAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Leptochloafusca7622	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Enteropogonmacrostachyus9339	GAGTGCAAAG	AGAACTCAAT	AAATCTTATG	CTATTCATTA	AATAGAT---
Dactylocteniumaegyptium9326	GGGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Tragusberteronianus6620	GAGTGCGAAA	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Tragusracemosus7108	GAGTGCGAAA	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Traguskoelerioides6729	GAGTGCGAAA	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Polevansiarigida7621	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Perotispatens9323	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostiscurvula6529	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostisobtusa6623	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostisobtusa6732	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostisechinochloidea7485	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostispseudobtusa7508	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostislehmanniana20	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostischloromelas6947	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostischloromelas7474	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostisracemosa6533	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostisbiflora6705	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostissuperba7470	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Eragrostiscapensis6551	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	TTATTCAGTA	AATAGAT---
Eragrostiscapensis6532	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	TTATTCAGTA	AATAGAT---
Pogonarthriasquarrosa7483	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Pogonarthriasquarrosa7504	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Catalepisgracilis6962	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCGTTA	AATAGAT---
Catalepisgracilis6653	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCGTTA	AATAGAT---
Cladoraphiscyperoides5704	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Cladoraphisspinosa6335	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Cladoraphiscyperoides4894	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Fingerhuthiaafricana7507	GAGAGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Entoplocamiaaristulata9353	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Enneapogonscoparius18	GAGTGCGAAG	AAAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Enneapogoncenchroides7506	GAGTGCGAAG	AAAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Enneapogonscoparius7487	GAGTGCGAAG	AAAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Schmidtiapappophoroides6334	GAGTGCGAAG	AAAACTCAAT	AGATCTTATG	CTATTCATTA	AATAGAT---
Schmidtiakalihariensis7490	GAGTGCGAAG	AAAACTCAAT	GGATCTTATG	CTATTTATTA	AATAGAT---
Schmidtiakalihariensis7486	GAGTGCGAAG	AAAACTCAAT	GGATCTTATG	CTATTTATTA	AATAGAT---
Sporobolusafricanus7476	----------	----------	------TATG	CTATTCATTA	AATGGAT---
Sporobolusconsimilis9354	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AACGGAT---
Sporobolusfimbriatus9328	GAGTGCGAAG	AGAACTCAAT	AGATCTTATG	CTATTCATTA	AATGGAT---

	1501				1550
IMPERATACYLINDRICA	TTCTTTTT--	---TATTTCT	TTTTTTTT--	TTTATTT-AT	TAGAGTATCG
SORGHUMHALEPENSE	TTCTTTTT--	---TATCTCT	TTTTTTTTTA	TTTATTAGAG	TACAGTATCG
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCA
CHAETOBROMUSINVOLUCRATES6284	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Cynodondactylon7480	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Chlorisvirgata7498	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Eustachyspaspaloides5597	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Harpochloafalx6530	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Harpochloafalx5118	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Harpochloafalx6670	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Rendliaaltera5133	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATYS
Leptochloafusca7622	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Enteropogonmacrostachyus9339	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Dactylocteniumaegyptium9326	TGCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Tragusberteronianus6620	TTCTTTTT--	---TATT---	----------	----------	-CGAGTATCC
Tragusracemosus7108	TTCTTTTT--	---TATT---	----------	----------	-CGAGTATCC
Traguskoelerioides6729	TTCTTTTT--	---TATT---	----------	----------	-CGAGTATCC
Polevansiarigida7621	TTCTTTTT--	---TATT---	----------	----------	-TGAGTATCC
Perotispatens9323	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCC
Eragrostiscurvula6529	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostisobtusa6623	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostisobtusa6732	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostisechinochloidea7485	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostispseudobtusa7508	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostislehmanniana20	TTCTTTTTT-	---TATT---	----------	----------	-AGAGTATCG
Eragrostischloromelas6947	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostischloromelas7474	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostisracemosa6533	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostisbiflora6705	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostissuperba7470	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostiscapensis6551	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Eragrostiscapensis6532	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Pogonarthriasquarrosa7483	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Pogonarthriasquarrosa7504	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Catalepisgracilis6962	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Catalepisgracilis6653	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Cladoraphiscyperoides5704	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Cladoraphisspinosa6335	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Cladoraphiscyperoides4894	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Fingerhuthiaafricana7507	TACTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Entoplocamiaaristulata9353	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Enneapogonscoparius18	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATTG
Enneapogoncenchroides7506	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATTG
Enneapogonscoparius7487	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATTG
Schmidtiapappophoroides6334	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATTG
Schmidtiakalihariensis7490	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Schmidtiakalihariensis7486	TTCTTTTT--	---TATT---	----------	----------	-AGAGTATCG
Sporobolusafricanus7476	TTCTTTTTGA	TTTTATT---	----------	----------	-AGAGTATCC
Sporobolusconsimilis9354	TTCTTTTTTA	TTTTATT---	----------	----------	-AGAGTATCC
Sporobolusfimbriatus9328	TACTTTTT--	---TATT---	----------	----------	-AGAGTATCC

	1551				1600
IMPERATACYLINDRICA	GCAAGGA---	---------A	TCTCGATTAT	TAATTCGATT	TTTT------
SORGHUMHALEPENSE	GCAAGGA---	---------A	TCTCGATTAT	TAATTCGATT	TTTT------
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	GAAAGAA---	---------A	TCCCCATTAG	TAATTCGATT	TT--------
CHAETOBROMUSINVOLUCRATES6284	GCAAGAA---	---------A	TCCCCATTAT	TAATTCGATT	CT--------
Cynodondactylon7480	GCAAAAA---	---------A	TCTCAATTAT	TAATTAAATT	TA--------
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	ATAAAAA---	---------A	TCTCAATTAT	TAATTAAATT	TC--------
Chlorisvirgata7498	ATAAAAA---	---------A	TCTCAATTAT	TAATTAAATT	TC--------
Eustachyspaspaloides5597	GCAAAAA---	---------A	TCTCAATTAT	TAATTTAATT	TA--------
Harpochloafalx6530	GCAAAAA---	---------A	TCTCAATTAT	TAATGAAATT	TA--------
Harpochloafalx5118	GCAAAAA---	---------A	TCTCAATTAT	TAATGAAATT	TT--------
Harpochloafalx6670	GCAAAAA---	---------A	TCTCAATTAT	TAATGAAATT	TA--------
Rendliaaltera5133	GCAARRA---	---------A	TCTCAATTAT	TAATTRAATT	TATAAGTWTT
Leptochloafusca7622	GCAAAAA---	---------A	TCTCAATTAT	TATTTTAATT	TA--------
Enteropogonmacrostachyus9339	GCAAAAATAG	AGTATCCGCA	TCTCAATTAT	TAATGAAATT	TA--------
Dactylocteniumaegyptium9326	ACAAAAA---	---------A	TCTCAATTAT	TAATTTAATT	TA--------
Tragusberteronianus6620	GCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT	AA--------
Tragusracemosus7108	GCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT	AA--------
Traguskoelerioides6729	TCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT	AA--------
Polevansiarigida7621	GCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT	TATAAGAATT
Perotispatens9323	GAAAAAA---	---------A	TCTCAATTAT	TAATGAAATT	AA--------
Eragrostiscurvula6529	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostisobtusa6623	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostisobtusa6732	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostisechinochloidea7485	GCAAGGA---	---------A	TCTCAATTAT	TACTTAAATT	AT--------
Eragrostispseudobtusa7508	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostislehmanniana20	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostischloromelas6947	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostischloromelas7474	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostisracemosa6533	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostisbiflora6705	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostissuperba7470	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostiscapensis6551	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Eragrostiscapensis6532	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Pogonarthriasquarrosa7483	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Pogonarthriasquarrosa7504	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Catalepisgracilis6962	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Catalepisgracilis6653	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	AT--------
Cladoraphiscyperoides5704	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	ATA-------
Cladoraphisspinosa6335	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	ATA-------
Cladoraphiscyperoides4894	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	ATA-------
Fingerhuthiaafricana7507	GC--GGA---	---------A	TCTCAATTAT	TAATTAAATT	TT--------
Entoplocamiaaristulata9353	GC--GGA---	---------A	TCTCAATTAT	TAATTAAATT	TT--------
Enneapogonscoparius18	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	TTT-------
Enneapogoncenchroides7506	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	TT--------
Enneapogonscoparius7487	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	TTT-------
Schmidtiapappophoroides6334	ACAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	TT--------
Schmidtiakalihariensis7490	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	TT--------
Schmidtiakalihariensis7486	GCAAGGA---	---------A	TCTCAATTAT	TAATTAAATT	TT--------
Sporobolusafricanus7476	GCAAAGA---	---------A	TCTTAATTAT	TAATTTAATT	TT--------
Sporobolusconsimilis9354	GCAAAGA---	---------A	TCTCAATTAT	TAATTAAATT	TT--------
Sporobolusfimbriatus9328	ACAAAGA---	---------A	TTTAAATTAT	TAATTTAATT	TG--------

	1601				1650
IMPERATACYLINDRICA	----------	-------TAA	GTATTA----	-------TTA	AGTA------
SORGHUMHALEPENSE	----------	-------TAA	GTATTA----	-------TTA	AGTA------
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	----------	-------TAA	GTATTTTTTT	ATTAATATTA	AGTA------
CHAETOBROMUSINVOLUCRATES6284	----------	-------TAA	TTATTATTTT	ATTAA-----	----------
Cynodondactylon7480	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Chlorisvirgata7498	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eustachyspaspaloides5597	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Harpochloafalx6530	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Harpochloafalx5118	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Harpochloafalx6670	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Rendliaaltera5133	AT--------	-------TAA	GTATTA----	-------TTA	AGTA------
Leptochloafusca7622	----------	-------TAA	GTATTA----	-------TTA	ACTA------
Enteropogonmacrostachyus9339	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Dactylocteniumaegyptium9326	----------	-------TAA	GTATTA----	-------TTA	CGTA------
Tragusberteronianus6620	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Tragusracemosus7108	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Traguskoelerioides6729	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Polevansiarigida7621	TATTACAATT	TATAAGATAA	GTATTA----	-------TTA	AGTA------
Perotispatens9323	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostiscurvula6529	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostisobtusa6623	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostisobtusa6732	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostisechinochloidea7485	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostispseudobtusa7508	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostislehmanniana20	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostischloromelas6947	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostischloromelas7474	----------	-------TAA	TTATTA----	-------TTA	AATA------
Eragrostisracemosa6533	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostisbiflora6705	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostissuperba7470	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostiscapensis6551	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Eragrostiscapensis6532	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Pogonarthriasquarrosa7483	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Pogonarthriasquarrosa7504	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Catalepisgracilis6962	----------	-------TAA	TTATTA----	-------TTA	AGTA------
Catalepisgracilis6653	----------	-------TAA	TTATTA----	-------TTA	AGTA------
Cladoraphiscyperoides5704	----------	-------TAA	GTATTAT---	-------TTA	AGTA------
Cladoraphisspinosa6335	----------	-------TAA	GTATTAT---	-------TTA	AGTA------
Cladoraphiscyperoides4894	----------	-------TAA	GTATTAT---	-------TTA	AGTATT--AT
Fingerhuthiaafricana7507	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Entoplocamiaaristulata9353	----------	-------TAA	GTATTA----	-------TTA	AGTAATCCAT
Enneapogonscoparius18	----------	-------GAA	GTATTA----	-TTAATATTA	AGTA------
Enneapogoncenchroides7506	----------	-------GAA	GTATTA----	-TTAATATTA	AGTA------
Enneapogonscoparius7487	----------	-------GAA	GTATTA----	-TTAATATTA	AGTA------
Schmidtiapappophoroides6334	----------	-------GAA	GTATTA----	-TTAATATTA	AGTA------
Schmidtiakalihariensis7490	----------	-------GAA	GTATTA----	-TTAATATTA	AGTA------
Schmidtiakalihariensis7486	----------	-------GAA	GTATTA----	-TTAATATTA	AGTA------
Sporobolusafricanus7476	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Sporobolusconsimilis9354	----------	-------TAA	GTATTA----	-------TTA	AGTA------
Sporobolusfimbriatus9328	----------	-------GAA	TTATTA----	-------TTA	AGTA------

	1651				1700
IMPERATACYLINDRICA	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
SORGHUMHALEPENSE	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACT
CHAETOBROMUSINVOLUCRATES6284	----------	----------	----------	----------	----------
Cynodondactylon7480	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
Chlorisvirgata7498	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
Eustachyspaspaloides5597	----------	------AGCC	GTCCACAATG	CATAGGAC--	------TATC
Harpochloafalx6530	----------	------AGCC	ATCTACAATG	CATAGGAC--	------TACC
Harpochloafalx5118	----------	------AGCC	ATCTACAATG	CATAGGAC--	------TACC
Harpochloafalx6670	----------	------AGCC	ATCTACAATG	CATAGGAC--	------TACC
Rendliaaltera5133	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TAGC
Leptochloafusca7622	----------	------AGCC	ATCCACAATG	TATAGGAC--	------TATC
Enteropogonmacrostachyus9339	----------	------AGCC	ATCCACAATG	TATAGGAC--	------TACT
Dactylocteniumaegyptium9326	----------	------AGTC	ATCCACAATG	CATAGGAC--	------TACC
Tragusberteronianus6620	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
Tragusracemosus7108	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
Traguskoelerioides6729	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
Polevansiarigida7621	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
Perotispatens9323	----------	------AGCC	GTCCACAATG	CATAGGAC--	------TATC
Eragrostiscurvula6529	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Eragrostisobtusa6623	----------	------AGCC	ATCCACAATG	CATCGGAC--	------TATC
Eragrostisobtusa6732	----------	------AGCC	ATCCACAATG	CATCGGAC--	------TATC
Eragrostisechinochloidea7485	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Eragrostispseudobtusa7508	----------	------AGCC	ATCCACAATG	CATCGGAC--	------TATC
Eragrostislehmanniana20	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC
Eragrostischloromelas6947	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Eragrostischloromelas7474	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Eragrostisracemosa6533	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Eragrostisbiflora6705	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Eragrostissuperba7470	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Eragrostiscapensis6551	----------	------AGCC	GTCCACAATG	CATAGGAC--	------TATC
Eragrostiscapensis6532	----------	------AGCC	GTCCACAATG	CATAGGAC--	------TATC
Pogonarthriasquarrosa7483	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Pogonarthriasquarrosa7504	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Catalepisgracilis6962	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Catalepisgracilis6653	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Cladoraphiscyperoides5704	----------	------AGCC	ATCCACAATG	CATAGTAC--	------TATC
Cladoraphisspinosa6335	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Cladoraphiscyperoides4894	T---------	TAAGTAAGCC	ATCCACAATG	CATAGGAC--	------TATC
Fingerhuthiaafricana7507	----------	------ATCC	ATCCACAATG	CATAGGAC--	------TATC
Entoplocamiaaristulata9353	CCACAATGCA	TAAGTAATCC	ATCCACAATG	CATAGGAC--	------TATC
Enneapogonscoparius18	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Enneapogoncenchroides7506	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Enneapogonscoparius7487	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Schmidtiapappophoroides6334	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Schmidtiakalihariensis7490	----------	------AGCC	ATCCACAATG	CATAGGACCA	TAGGACTATC
Schmidtiakalihariensis7486	----------	------AGCC	ATCCACAATG	CATAGGACCA	TAGGACTATC
Sporobolusafricanus7476	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TATC
Sporobolusconsimilis9354	----------	------AGCC	ATCCACAATG	CATAGGAT--	------TATC
Sporobolusfimbriatus9328	----------	------AGCC	ATCCACAATG	CATAGGAC--	------TACC

	1701				1750
IMPERATACYLINDRICA	CCTCCCC---	ATTTCCTAAT	TTGGAATGGA	ATACTTT---	----------
SORGHUMHALEPENSE	CCTCCCC---	ATTTCCTAAT	TTTGAATGGA	ATACTTT---	----------
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	CCCC------	ATTTCAAAAT	TAGGAATGGA	AAACTTT---	----------
CHAETOBROMUSINVOLUCRATES6284	----------	---------C	TAGGAATGGA	AAACTTG---	----------
Cynodondactylon7480	CCCCCCCC--	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	CCCCCCCCC-	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Chlorisvirgata7498	CCCCCCCCCC	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Eustachyspaspaloides5597	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Harpochloafalx6530	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT	GATTGAATAC
Harpochloafalx5118	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT	GATTGAATAC
Harpochloafalx6670	CCCCCCCC--	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT	GATTGAATAC
Rendliaaltera5133	CCCCCTT---	-TTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Leptochloafusca7622	CCCCTCCC--	ATTTCTAAAA	TAGGAATGGA	ATACTTT---	----------
Enteropogonmacrostachyus9339	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Dactylocteniumaegyptium9326	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Tragusberteronianus6620	CCCCC-----	GTTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Tragusracemosus7108	CCCCC-----	GTTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Traguskoelerioides6729	CCCCC-----	GTTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Polevansiarigida7621	CCCCCC----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Perotispatens9323	CCCCCCCCC-	ATTTCCAAAT	TAGGGATGGA	ATACTTT---	----------
Eragrostiscurvula6529	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostisobtusa6623	CCCCC-----	ATTTACAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostisobtusa6732	CCCCC-----	ATTTACAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostisechinochloidea7485	CCCCC-----	ATTTACAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostispseudobtusa7508	CCCCC-----	ATTTACAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostislehmanniana20	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostischloromelas6947	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostischloromelas7474	CCCC------	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostisracemosa6533	CCCCG-----	ATTTCAAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostisbiflora6705	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostissuperba7470	CCCCC-----	ATTTCTAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostiscapensis6551	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Eragrostiscapensis6532	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Pogonarthriasquarrosa7483	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Pogonarthriasquarrosa7504	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Catalepisgracilis6962	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Catalepisgracilis6653	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Cladoraphiscyperoides5704	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT	GATT------
Cladoraphisspinosa6335	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT	GATT------
Cladoraphiscyperoides4894	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTTATT	GATT------
Fingerhuthiaafricana7507	CCCCC-----	ATTTCTAAAT	TAGGAATGGA	ATACTTT---	----------
Entoplocamiaaristulata9353	CCCCC-----	ATTTCTAAAT	TAGGAATGGA	ATACTTT---	----------
Enneapogonscoparius18	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Enneapogoncenchroides7506	CCCCC-----	ATTTCCAAAT	TAGGAATAGA	ATACTTT---	----------
Enneapogonscoparius7487	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Schmidtiapappophoroides6334	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Schmidtiakalihariensis7490	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Schmidtiakalihariensis7486	CCCCC-----	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------
Sporobolusafricanus7476	CCCCCCCC-T	AATTCAAAAT	TAGGAATGGA	ATACTTT---	----------
Sporobolusconsimilis9354	C---------	------AAAT	TAGGAATGGA	ATACTTT---	----------
Sporobolusfimbriatus9328	CCCCCCC---	ATTTCCAAAT	TAGGAATGGA	ATACTTT---	----------

	1751				1800
IMPERATACYLINDRICA	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
SORGHUMHALEPENSE	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	--AACTGATT	TTTTAATCCC	TTTAATTGAC	AATTGACATA	GATGCAAATA
CHAETOBROMUSINVOLUCRATES6284	--AATTGATT	TTTTAATCCC	TTTAATT---	----GACATA	GATGCAAATA
Cynodondactylon7480	---ATTGATT	TTTTAGTCTC	TTTAATT---	----GACATA	GATGCAAATA
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Chlorisvirgata7498	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eustachyspaspaloides5597	---ATTGATT	TTTTAGTCTC	TTTAATT---	----GACATA	GATGCAAATA
Harpochloafalx6530	TTTATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	AATGCAAATA
Harpochloafalx5118	TTTATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	AATGCAAATA
Harpochloafalx6670	TTTATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	AATGCAAATA
Rendliaaltera5133	---ATTAATT	TTTTAGTCTC	TTTAATT---	----GACATA	GATGCAAATA
Leptochloafusca7622	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Enteropogonmacrostachyus9339	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Dactylocteniumaegyptium9326	---TTTGATT	TTTTAGTCCC	ATTAATT---	----GACATA	AATGGAAATA
Tragusberteronianus6620	---ATTGATT	TTT-AGTCTC	TTTAATT---	----GACATA	GATGCAAATA
Tragusracemosus7108	---ATTGATT	TTT-AGTCTC	TTTAATT---	----GACATA	GATGCAAATA
Traguskoelerioides6729	---ATTGATT	TTT-AGTCTC	TTTAATT---	----GACATA	GATGCAAATA
Polevansiarigida7621	---ATTGATT	TTT-AGTCTC	TTTAATT---	----GACATA	GATGCAAATA
Perotispatens9323	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostiscurvula6529	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostisobtusa6623	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostisobtusa6732	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostisechinochloidea7485	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostispseudobtusa7508	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostislehmanniana20	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostischloromelas6947	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostischloromelas7474	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostisracemosa6533	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostisbiflora6705	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostissuperba7470	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostiscapensis6551	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Eragrostiscapensis6532	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Pogonarthriasquarrosa7483	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Pogonarthriasquarrosa7504	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Catalepisgracilis6962	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATCCAAATA
Catalepisgracilis6653	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATCCAAATA
Cladoraphiscyperoides5704	-----TGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Cladoraphisspinosa6335	-----TGATT	TTTT-----C	TTTAATT---	----GACATA	GATGCAAATA
Cladoraphiscyperoides4894	-----TGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Fingerhuthiaafricana7507	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Entoplocamiaaristulata9353	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGTAAATA
Enneapogonscoparius18	---ATTGATC	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Enneapogoncenchroides7506	---ATTGAT-	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Enneapogonscoparius7487	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Schmidtiapappophoroides6334	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Schmidtiakalihariensis7490	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Schmidtiakalihariensis7486	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Sporobolusafricanus7476	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Sporobolusconsimilis9354	---ATTGATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA
Sporobolusfimbriatus9328	---ATTTATT	TTTTAGTCCC	TTTAATT---	----GACATA	GATGCAAATA

	1801		1831
IMPERATACYLINDRICA	CTTTACTAAG	ATGATGCACN	NNNNNNNNNN
SORGHUMHALEPENSE	CTTTACTAAG	ATGATGCACN	NNNNNNNNNN
PANICUMLANIPES	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
PANICUMSTAPFIANUM	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
KARROOCHLOAPURPUREA6241	CTCTAGTAGG	ATGATGCACA	----AGAAAGG
CHAETOBROMUSINVOLUCRATES6284	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Cynodondactylon7480	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Cynodondactylon	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusinecoracana	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Eleusineindica	NNNNNNNNNN	NNNNNNNNNN	NNNNNNNNNN
Chlorisvirgata6616	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Chlorisvirgata7498	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eustachyspaspaloides5597	CTCTGCTAGG	ATGATGCACA	----AGAAGGG
Harpochloafalx6530	CTCTACTAGG	ATGATGCACA	CACAAGAAAGG
Harpochloafalx5118	CTCTACTAGG	ATGATGCACA	CACAAGAAAGG
Harpochloafalx6670	CTCTACTAGG	ATGATGCACA	CACAAGAAAGG
Rendliaaltera5133	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Leptochloafusca7622	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Enteropogonmacrostachyus9339	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Dactyloctenium aegyptium9326	CTCTACTAG-	ATGATGTACA	----AGAAAGG
Tragusberteronianus6620	CTCTACTAGG	ATGATACACA	----AGAAAGG
Tragusracemosus7108	CTCTACTAGG	ATGATACACA	----AGAAAGG
Traguskoelerioides6729	CTCTACTAGG	ATGATACACA	----AGAAAGG
Polevansiarigida7621	CTCTACTAGC	ATGATACACA	----AGAAAGG
Perotispatens9323	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostiscurvula6529	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostisobtusa6623	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostisobtusa6732	CTCTACTAGG	ATGGATGCCC	----AGAAAGG
Eragrostisechinochloidea7485	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostispseudobtusa7508	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostislehmanniana20	CTCTACTAGG	ATGATGCACA	----ACAAAGG
Eragrostischloromelas6947	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostischloromelas7474	CTCTACTAGG	ATGATGCACA	----AGAAAGA
Eragrostisracemosa6533	CTCTACTAGG	ATGATGCACA	----AGCAAGG
Eragrostisbiflora6705	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostissuperba7470	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostiscapensis6551	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Eragrostiscapensis6532	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Pogonarthriasquarrosa7483	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Pogonarthriasquarrosa7504	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Catalepisgracilis6962	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Catalepisgracilis6653	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Cladoraphiscyperoides5704	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Cladoraphisspinosa6335	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Cladoraphiscyperoides4894	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Fingerhuthiaafricana7507	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Entoplocamiaaristulata9353	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Enneapogonscoparius18	CTCTACTAG-	ATGATGTACA	----AGAAAGG
Enneapogoncenchroides7506	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Enneapogonscoparius7487	CTCTACTAGG	ATGATGTACA	----ACAAAGG
Schmidtiapappophoroides6334	CTCCACTAGG	ATGATGCACA	----AGAAAGG
Schmidtiakalihariensis7490	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Schmidtiakalihariensis7486	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Sporobolusafricanus7476	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Sporobolusconsimilis9354	CTCTACTAGG	ATGATGCACA	----AGAAAGG
Sporobolusfimbriatus9328	CTCTACTAGG	ATGATGCACA	----AGAAAGG

APPENDIX K. Indels coded by GapCoder for combined data set. Where missing data was coded in the sequence data set (N), the corresponding indel was coded as ?. The indel characters are coded with 1 for present, 0 for missing and – for inapplicable. As the gap matrix was added directly to the sequencing matrix the numbering continues from the last character in the sequence data set.

	1832 – 1891
IMPERATACYLINDRICA	??1001---000000000100010-0110001111011000001010110-00100011-
SORGHUMHALEPENSE	101001---000000000100010-0110001111011000001010110-00100011-
PANICUMLANIPES	001001---0000000000010-1-0110001111011000001010110-00100011-
PANICUMSTAPFIANUM	001001---0000000000010-1-0110001111011000001010110-001000001
KARROOCHLOAPURPUREA6241	????????????00001--00010-0110000111011000001010110-00100011-
CHAETOBROMUSINVOLUCRATES6284	???00101--00
Cynodondactylon7480	0110001010000001----00010-0110000111011000001010110-0011001--
Cynodondactylon	011000001000001----00010-0110000111011000001010110-0010001--
Eleusinecoracana	00100000100000001--00010-0110000111011000101010110-0010001--
Eleusineindica	00100000100000001--00010-0110000111011000101010110-0010001--
Chlorisvirgata6616	01100000100000001--00010-0110000111011000001010110-00101----
Chlorisvirgata7498	01100000100000001--00010-0110000111011000001010110-00101----
Eustachyspaspaloides5597	00000000100000001--00010-1-000001110110000010101 10-00101----
Harpochloafalx6530	01100010100000001--00010-0110000111011000001010110-00101----
Harpochloafalx5118	????????????????????0010-0110000111011000001010110-00101----
Harpochloafalx6670	01100010100000001--00010-0110000111011000001010110-00101----
Rendliaaltera5133	01100000100000001--00010-0110000111011000001010110-00101----
Leptochloafusca7622	01100000100000001--00010-0110000111011000001010110-00101----
Enteropogonmacrostachyus9339	01111000100000001--00010-011000011101100000000-1010-00101----
Dactylocteniumaegyptium9326	01100000100100001--00000001100001010010000 1-1101???00001----
Tragusberteronianus6620	011000001000001----001-0-0110000111011000010101-1-00101----
Tragusracemosus7108	01100000100000001--001-0-0110000111011000010101-1-00101----
Traguskoelerioides6729	01100000100000001--001-0-0110000111011000010101-1-00101----
Polevansiarigida7621	011000001000100000 1001-0-0110000111011000010101-1-00101----
Perotispatens9323	01100001100000010-0000001001100011101100000101010000 0101--1-
Eragrostiscurvula6529	??????????11001001000010-0110000111010000001010010-00101----
Eragrostisobtusa6623	??????????????010-000010-0110010111010001001010010-00101----
Eragrostisobtusa6732	011000000100010001000010-0110010111010001001010010-00101----
Eragrostisechinochloidea7485	??????????????0001000010-0110010111010001001010010-00101----
Eragrostispseudobtusa7508	011000000100010001000010-0110010111010001001010010-00101----
Eragrostislehmanniana20	011000001100010001000010-0110010111010000001000010-00101----
Eragrostischloromelas6947	011000001100010001000010-0110010111010000001010010-00101----
Eragrostischloromelas7474	011000001100010001000010-0110010111010100001010010-00101----
Eragrostisracemosa6533	??????????00110001000010-0110010111010100001010010-11101----
Eragrostisbiflora6705	011000001100010001000010-0110010111010100001010010-00101----
Eragrostissuperba7470	011000001100010001000010-0110010111010010001010010-00101----
Eragrostiscapensis6551	011000001100010 10-000010-0110010111010010001010010-00101----
Eragrostiscapensis6532	??????????????010-000010-0110010111010010001010010-00101----
Pogonarthriasquarrosa7483	?????????????????????????0110010111010010001010010-00101----
Pogonarthriasquarrosa7504	011000001100010001000010-0110010111010010001010010-00101----
Catalepisgracilis6962	011000001100010001000010-0110010111010100001010010-00101----
Catalepisgracilis6653	??????????00010001000010-0110010111010100001010010-00101----
Cladoraphiscyperoides5704	?????????100010001000010-0110010111010010001010010-00101----
Cladoraphisspinosa6335	?????????100010001000010-0110010111010010001010010-00101----
Cladoraphiscyperoides4894	??????????????0001000010-0110010111010010001010010-00101----
Fingerhuthiaafricana7507	011000001100010001000010-0110000111010100001010110-00101----
Entoplocamiaaristulata9353	011000001100010001000010-0110000111010100001010110-00101----
Enneapogonscoparius18	???????????0010001000010-0110000111010010001010110-00101----
Enneapogoncenchroides7506	011000001100010001000010-0110100111010010001010100100101----
Enneapogonscoparius7487	011000001100010001000010-0110000111010010001010110-00101----
Schmidtiapappophoroides6334	011000001100010001000010-0100000111010010001010110-00101----
Schmidtiakalihariensis7490	011000001100010001000010-0110000111010010001010110-00101----
Schmidtiakalihariensis7486	???????????0010001000010-0110000111010010001010110-00101----
Sporobolusafricanus7476	011000001100010001000010-0100000111-0010001010110-00101--1-
Sporobolusconsimilis9354	01100000110001000 10001-0-0010000 1111-00100010101000 00101--1-
Sporobolusfimbriatus9328	011000001100010001010010-0010000 1101-0010001010110-00100101-

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IMPERATACYLINDRICA	001-10000011000000001010001007??????????????????????????????
SORGHUMHALEPENSE	001-1000001100000000100000100?????????????????????????????
PANICUMLANIPES	001-1000001100000000001000101--001---000000000000000010-000
PANICUMSTAPFIANUM	001-1000001100000000001000101--001---000000000000000010-000
KARROOCHLOAPURPUREA6241	001--1000011000000001000011000100010100000001000100010001000
CHAETOBROMUSINVOLUCRATES6284	001-0000001100000000 1001-010001000001000000010001000010-000
Cynodondactylon7480	101-00010011000001-010001010001000001000000000010000000001
Cynodondactylon	101-00010011000001-010001010001000001000000000010000000001
Eleusinecoracana	111-00000011010001-0100010100010000 0-10000000001010-0000000
Eleusineindica	111-00000011010001-01000101000100000-10000000001010-0000000
Chlorisvirgata6616	101-0000001100000010100010100010000010000000000100000000000
Chlorisvirgata7498	101-0000001100000010100010100010000010000000000100000000000
Eustachyspaspaloides5597	101-000100110001-0-01000100001-00000100000000000010000000-10-
Harpochloafalx6530	101-000010110001-0-01000100100-10000--10-00-0000100000-1--0-
Harpochloafalx5118	101-000010110001-0-01000100100-10000--10-00-0000100000-1--0-
Harpochloafalx6670	101-000010110001-0-01000100100-10000--10-00-0000100000-1--0-
Rendliaaltera5133	101-000100110001-0-010001010001000001000000000010000000001
Leptochloafusca7622	101-000100110001-0-0100010100010000010000000000010000000-10-
Enteropogonmacrostachyus9339	101-000100010001-0-0100010100010000010000000000000000000-10-
Dactylocteniumaegyptium9326	101-000100110001-0-0100010100010000 1-000000000010-1------0-
Tragusberteronianus6620	101-000100110001-0-0100010100010000010000000000010000000-10-
Tragusracemosus7108	101-000100110001-0-01??????????????????????????????????????
Traguskoelerioides6729	101-000100110001-0-0100010100010000010000000000010000000-10-
Polevansiarigida7621	101-000100110001-0-0110010100010000010000000000010000000-10-
Perotispatens9323	001-001100110001-0-0100010100000000000000000000-1000000-10-
Eragrostiscurvula6529	101-0001001100000000100010100010000000000000000010000000000-
Eragrostisobtusa6623	101-000100110000000010001010001000000---1--0-00001000000000-
Eragrostisobtusa6732	101-000100110000000010001010001000000---1--0-00001000000000-
Eragrostisechinochloidea7485	101-000100110000000010001010001000000---1--0-00001000000000-
Eragrostispseudobtusa7508	101-000100110000000010001010001000000---1--0-00001000000000-
Eragrostislehmanniana20	101-0001001100000000100010100010000000000000000010000000000-
Eragrostischloromelas6947	101-0001001100000000100010100010000000000000000010000000000-
Eragrostischloromelas7474	101-000100110000000010001010001010000000100-00001000000000-
Eragrostisracemosa6533	101-000101110000000010001010001000000000100-000010?????????
Eragrostisbiflora6705	101-000100110000000010001010001010000000100-00001000000000-
Eragrostissuperba7470	101-000100110000000010001010001000000-10000000001000000000-
Eragrostiscapensis6551	101-00010011000000001000101000100000000-10-00001000000000-
Eragrostiscapensis6532	101-000100110000000110001010001000000000100-001010000000--1-
Pogonarthriasquarrosa7483	101-00010011000000001000101000100000000--1-00001000000000-
Pogonarthriasquarrosa7504	101-00010011000000001000101000100000000--1-00001000000000-
Catalepisgracilis6962	101-000100110000000010001010001010000000100-00001000000000-
Catalepisgracilis6653	101-000100110000000010001010001010000000100-00001000000000-
Cladoraphiscyperoides5704	101-00010011000000001000101000101000000-10-00001000000000-
Cladoraphisspinosa6335	101-00010011000000001000101000101000000-10-00001000000000-
Cladoraphiscyperoides4894	101-00010011000000001000101000101000000-10-00001000000000-
Fingerhuthiaafricana7507	101-00010011000000001000101000100010000 0-10-00001000000000-
Entoplocamiaaristulata9353	101-000100110000000010001010001000100000-10-00001000000000-
Enneapogonscoparius18	101-0001001100000000100010100010000000000001000110000000000-
Enneapogoncenchroides7506	101-0001001100000000100010100010000000000001000110000000000-
Enneapogonscoparius7487	101-0001001100000000100010100010000000000001000110000000000-
Schmidtiapappophoroides6334	101-0001001100000000100010100010000000000001000010000000000-
Schmidtiakalihariensis7490	101-0001001100000000100010100010000000000001000010000000000-
Schmidtiakalihariensis7486	101-0001001100000000100010100010000000000001000010000000000-
Sporobolusafricanus7476	0001000100100010100010001 0?????????????????????????????????
Sporobolusconsimilis9354	000000010010000010001000101000100000100000001-0100001000001
Sporobolusfimbriatus9328	0000000100101000100010001010001000000000000000101000010000001

	1952 2011
IMPERATACYLINDRICA	???????????????????????????0001000010010-10001-01---------0-
SORGHUMHALEPENSE	???????????????????????????00000000100-1-00001-01---------0-
PANICUMLANIPES	00000000100100000000000000000000001-0010-00001-1000101----00
PANICUMSTAPFIANUM	00000000000100000000000000000000001-0010-00001-1000101----00
KARROOCHLOAPURPUREA6241	01000000010110000001010000000000001-01-0-00001-0010101----00
CHAETOBROMUSINVOLUCRATES6284	01000000010010000000001000000000001-0010-00001-0010101----00
Cynodondactylon7480	0-1-0-000101????0010000000000100001-01-0-00001-0000100100100
Cynodondactylon	0-1-0-00010110000000000000000000001-01-0-00001-0000100100100
Eleusinecoracana	0-1-0-0001011000000000000000000000000010-00001-0000100100100
Eleusineindica	0-1-0-0001011000000000000000000000000010-00001-0000100100100
Chlorisvirgata6616	0-1-0-00010110100001000100000000001-01-0-00001-0000100-1--00
Chlorisvirgata7498	0-1-0-000101??????????0100000000001-01-0-00001-0000100100100
Eustachyspaspaloides5597	0-1-0-000101??????????????????????????????????????0100100000
Harpochloafalx6530	000001---1---0110110001-010100000100000010010--1111-1--011--
Harpochloafalx5118	0-1-0-000101???????????????????0001-1----00111-0000100000100
Harpochloafalx6670	0-1-0-00010110000000000010000000001-01-0-00001-0000100000100
Rendliaaltera5133	0-1-0-000101?????????????0000000001-01-0-00001-0000100100100
Leptochloafusca7622	0-1-0-000101????????00010000000001--01-0-00001-0000100100100
Enteropogonmacrostachyus9339	0-1-0-000101??????????0010000000001-01-0-00001-0000100100100
Dactylocteniumaegyptium9326	000001000101???????????????????????????????????0000100001100
Tragusberteronianus6620	00010-000101???????????????00000000101-0-00001-0000100100100
Tragusracemosus7108	???????????????????????????????0000101-0-00001-0000100100100
Traguskoelerioides6729	00010-000101??????????????????00000101-0-00001-0000100100100
Polevansiarigida7621	000-1-000101?????????00000000000000101-0-00001-0000100100100
Perotispatens9323	0-1-0-000101????????????????????????????????01-0000100100100
Eragrostiscurvula6529	1-1-0-00010110000000000-1-000100001-0010-00001-0000101----00
Eragrostisobtusa6623	1-1-0-00011-10001000000000000000001-0010-00001-0000101----00
Eragrostisobtusa6732	1-1-0-00011-??
Eragrostisechinochloidea7485	1-1-0-00011-10001000000001000010001-0010-00001-000011-----00
Eragrostispseudobtusa7508	1-1-0-00011-10000010000-1-000000001-0010-00001-0000101----00
Eragrostislehmanniana20	1-1-0-000101??000000100000000000001-0010-00001-0000101----00
Eragrostischloromelas6947	1-1-0-00010110000000000000000000001-0010-00001-000011-----00
Eragrostischloromelas7474	1-1-0-00010110010000000000000000001-0010-00001-0000101----00
Eragrostisracemosa6533	????????????10000000000000000000001-0010-00001-0000101----1-
Eragrostisbiflora6705	1-1-0-000101??????????0000000000001-0010-00001-0000101----00
Eragrostissuperba7470	1-1-0-00010110000000000-1-000000001-0010-00001-0000101----00
Eragrostiscapensis6551	1-1-0-0001011001000100010000100011--0010-0100010001101----00
Eragrostiscapensis6532	-0010-010101???????????????????101--0010-0000000000101----00
Pogonarthriasquarrosa7483	1-1-0-10011-????????????0001000001--0010-00001-0000101----00
Pogonarthriasquarrosa7504	1-1-0-10011-1000000000000000000001--0010-00001-0000101----00
Catalepisgracilis6962	1-1-0-00010110000000000000100100001-0010-00001-0000101----00
Catalepisgracilis6653	1-1-0-000101????????000000100100001-0010-00001-0000101----00
Cladoraphiscyperoides5704	1-1-0-000101?????????????????????????????00001-0000101----00
Cladoraphisspinosa6335	1-1-0-000101????????0000000000000001-000000001-0000101----00
Cladoraphiscyperoides4894	1-1-0-000101??????????????????????????????0001-0000101----00
Fingerhuthiaafricana7507	1-1-0-00010110010001000001000000101-01-0-00001-0000001----00
Entoplocamiaaristulata9353	1-1-0-000101??????????????????00001-01-0-00001-0000101----01
Enneapogonscoparius18	1-1-0-000101?????????????0000000001-0010-00001-0000101----00
Enneapogoncenchroides7506	1-1-0-000101??????????????000000001-0010-00001-0000101----00
Enneapogonscoparius7487	1-1-0-00010110000000000001000000001-0010-00001-0000101----00
Schmidtiapappophoroides6334	1-1-0-000101???????????????00000001-0010-00001-0000101----00
Schmidtiakalihariensis7490	1-1-0-000101?000-1-0000-1-000000001-000100001-0000101----00
Schmidtiakalihariensis7486	1-1-0-00010110000000000000000000001-000100001-0000101----00
Sporobolusafricanus7476	????????????-1100001000000000000000001-0010-00001-0000100100100
Sporobolusconsimilis9354	0-1-0-01010110010001000000000000001-0010-00001-0000100100100
Sporobolusfimbriatus9328	0-1-0-000101?????????????????????????????00001-0000100100100

	2012 2071
IMPERATACYLINDRICA	---001---1---0110110001-01010000010100001000l--1101-01101001
SORGHUMHALEPENSE	---001---1---0110110001-0101000001011-0010001--1101-00001001
PANICUMLANIPES	000001---01--0100010011-010100??????????????????????????????
PANICUMSTAPFIANUM	000001---01--0110010011-010100??????????????????????????????
KARROOCHLOAPURPUREA6241	100001---001-0010110101-011100000100011--0001--1111-1--011--
CHAETOBROMUSINVOLUCRATES6284	100001---1---0110110101-0101000001000101-0001--1111-1--011--
Cynodondactylon7480	000001---1---0110110001-0101000001000000101000001111-1--011--
Cynodondactylon	000001---1---0110110001-010100??????????????????????????????
Eleusinecoracana	000001---1---0110110001-010100??????????????????????????????
Eleusineindica	000001---1---0110110001-010100??????????????????????????????
Chlorisvirgata6616	000001---1---0111-00001-1-0100000100000010010--1111-1--011--
Chlorisvirgata7498	000001---1---0111-00001-1-0100000100000010010--1111-1--011--
Eustachyspaspaloides5597	000001---1---011011000???????0001000000010000001111-1--011--
Harpochloafalx6530	000001---1---0110110001-0101000001000000010010--1111-1--011--
Harpochloafalx5118	000001---1---0110110001-0101100001000000010010--1111-1--011--
Harpochloafalx6670	000001---1---0110110001-0101000001000000010010--1111-1--011--
Rendliaaltera5133	000001---1---0110010001-01010000010000001000000l111-1--01000
Leptochloafusca7622	000001---1---0110110001-0101000000000000010010--1111-1--011--
Enteropogonmacrostachyus9339	000001---1---0110110001-0101000001000000010010--1111-1--001--
Dactylocteniumaegyptium9326	000001---1---01101100001010100000100000010010--1111-1--011--
Tragusberteronianus6620	000001---1---0110110001-010100101-1-000010010--1111-1--011--
Tragusracemosus7108	000001---1---0110110001-010100101-1-000010010--1111-1--011--
Traguskoelerioides6729	000001---1---0110110001-010100101-1-000010010--1111-1--011--
Polevansiarigida7621	000001---1---0110110001-01010011---------0010--1111-1--01000
Perotispatens9323	0000001001---0110110001-0101000000000000010010--1111-1--011--
Eragrostiscurvula6529	001001---1---0100110001-010100000100000000100001-1111-1--011--
Eragrostisobtusa6623	000001---1---0100110001-0101000001000000000001-1011-1--011--
Eragrostisobtusa6732	???????????????????0001-0101000001000000000001-1011-1--011--
Eragrostisechinochloidea7485	000001---1---0100110001-0101000001000000000001-1011-1--011--
Eragrostispseudobtusa7508	000001---1---0100110001-0101000001000000000001-1011-1--011--
Eragrostislehmanniana20	000001---1---0100110001-0101000001000000100001-111011--011--
Eragrostischloromelas6947	000001---1---0100110001-0101000001000000100001-1111-1--011--
Eragrostischloromelas7474	000001---1---0100110001-0101010001000000100001-1111-1--011--
Eragrostisracemosa6533	----01---1---0100110001-0101000001000000100001-1111-1--011--
Eragrostisbiflora6705	000001---1---0100110001-0101000001000000100001-1111-1--011--
Eragrostissuperba7470	010001---1---01001100000101000001000000100001-1111-1--011--
Eragrostiscapensis6551	000001---1---0100010001-0101000001000000100001-1111-1--011--
Eragrostiscapensis6532	000001---1---0100010001-0101000001000000100001-1111-1--011--
Pogonarthriasquarrosa7483	000001---1---0100110001-0101000001000000100001-1111-1--011--
Pogonarthriasquarrosa7504	000001---1---0100110001-0101000001000000100001-1111-1--011--
Catalepisgracilis6962	000001---1---0100110001-0101000001000000100001-1111-1--011--
Catalepisgracilis6653	000001---1---0100110001-0101000001000000100001-1111-1--011--
Cladoraphiscyperoides5704	000001---1---0100110001-0101000001000000100001-1111-1--0101-
Cladoraphisspinosa6335	000001---1---0100110001-0101000001000000100001-1111-1--0101-
Cladoraphiscyperoides4894	000001---1---0100110001-0101000001000000100001-1111-1--0101-
Fingerhuthiaafricana7507	000001---1---0100110001-0101000001000000100001-1111-1--111--
Entoplocamiaaristulata9353	000011---1---0100110001-0101000001000000100001-1111-1--111--
Enneapogonscoparius18	00000000100011100110001-0000000001000000100001-1111-1--0101-
Enneapogoncenchroides7506	00000001-0000100110001-0000000001000000100001-1111-1--011--
Enneapogonscoparius7487	00000000100011100110001-0000000001000000100001-1111-1--0101-
Schmidtiapappophoroides6334	0001000011---0100110001-0100000001000000100001-1111-1--011--
Schmidtiakalihariensis7490	0000000001---0100110001-0101000001000000100001-1111-1--011--
Schmidtiakalihariensis7486	0000000001---0100110001-0101000001000000100001-1111-1--011--
Sporobolusafricanus7476	000001---1---01101100000010100000000000011-------1001--011--
Sporobolusconsimilis9354	000001---1---0110111------0100000100000010000011110001--011--
Sporobolusfimbriatus9328	000001---1---0111-1?????????00001000000010010--1111-1--011--

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IMPERATACYLINDRICA	-1--01--1000010---1-000010?
SORGHUMHALEPENSE	-1--01--1000010---1-000010?
PANICUMLANIPES	???????????????????????????
PANICUMSTAPFIANUM	???????????????????????????
KARROOCHLOAPURPUREA6241	-00001--101---0---010000001
CHAETOBROMUSINVOLUCRATES6284	-0001-------------010000101
Cynodondactylon7480	-1--01--10000001--1-0000101
Cynodondactylon	???????????????????????????
Eleusinecoracana	???????????????????????????
Eleusineindica	???????????????????????????
Chlorisvirgata6616	-1--01--10000000011-0000101
Chlorisvirgata7498	-1--01--10000000001-0000101
Eustachyspaspaloides5597	-1--01--1000010---1-0000101
Harpochloafalx6530	-1--01--1000010---000000100
Harpochloafalx5118	-1--01--1000010---000000100
Harpochloafalx6670	-1--01--10000001--000000100
Rendliaaltera5133	11--01--10000-1---1-0000101
Leptochloafusca7622	-1--01--10000001--1-0000101
Enteropogonmacrostachyus9339	-1--01--1000010---1-0000101
Dactylocteniumaegyptium9326	-1--01--1001--0---1-0000111
Tragusberteronianus6620	-1--01--1001--0---1-0010101
Tragusracemosus7108	-1--01--1001--0---1-0010101
Traguskoelerioides6729	-1--01--1001--0---1-0010101
Polevansiarigida7621	01--01--10001-0---1-0010101
Perotispatens9323	-1--01--10000000011-0000101
Eragrostiscurvula6529	-1--01--1001--0---1-0000101
Eragrostisobtusa6623	-1--01--1001--0---1-0000101
Eragrostisobtusa6732	-1--01--1001--0---1-0000101
Eragrostisechinochloidea7485	-1--01--1001--0---1-0000101
Eragrostispseudobtusa7508	-1--01--1001--0---1-0000101
Eragrostislehmanniana20	-1--01--1001--0---1-0000101
Eragrostischloromelas6947	-1--01--1001--0---1-0000101
Eragrostischloromelas7474	-1--01--101---0---1-0000101
Eragrostisracemosa6533	-1--01--1001--0---1-0000101
Eragrostisbiflora6705	-1--01--1001--0---1-0000101
Eragrostissuperba7470	-1--01--1001--0---1-0000101
Eragrostiscapensis6551	-1--01--1001--0---1-0000101
Eragrostiscapensis6532	-1--01--1001--0---1-0000101
Pogonarthriasquarrosa7483	-1--01--1001--0---1-0000101
Pogonarthriasquarrosa7504	-1--01--1001--0---1-0000101
Catalepisgracilis6962	-1--01--1001--0---1-0000101
Catalepisgracilis6653	-1--01--1001--0---1-0000101
Cladoraphiscyperoides5704	-00101--1001--0---001000101
Cladoraphisspinosa6335	-00101--1001--0---001001101
Cladoraphiscyperoides4894	-00100111001--0---001000101
Fingerhuthiaafricana7507	-1--01--1001--0---1-0000101
Entoplocamiaaristulata9353	-1--00001001--0---1-0000101
Enneapogonscoparius18	-01001--1001--0---1-0000111
Enneapogoncenchroides7506	-01001--1001--0---1-0100101
Enneapogonscoparius7487	-01001--1001--0---1-0000101
Schmidtiapappophoroides6334	-01001--1001--0---1-0000101
Schmidtiakalihariensis7490	-01001--0001--0---1-0000101
Schmidtiakalihariensis7486	-01001--0001--0---1-0000101
Sporobolusafricanus7476	-1--01--10000000101-0000101
Sporobolusconsimilis9354	-1--01--11--------1-0000101
Sporobolusfimbriatus9328	-1--01--1000010---1-0000101

APPENDIX L. Table of correspondence between the indels and the regions they represent (Appendix K) generated by GapCoder for the combined data set.

Indel Character	Sequence Region	Indel Character	Sequence Region	Indel Character	Sequence Region
1832	9–9	**1877**	223–223	**1922**	591–591
1833	15–15	**1878**	223–224	**1923**	591–592
1834	34–34	**1879**	234–234	**1924**	598–598
1835	43–43	**1880**	239–240	**1925**	599–601
1836	53–53	**1881**	239–242	**1926**	599–599
1837	54–70	**1882**	239–239	**1927**	600–601
1838	60–60	**1883**	375–375	**1928**	601–601
1839	61–61	**1884**	390–390	**1929**	601–602
1840	64–65	**1885**	422–422	**1930**	601–603
1841	73–73	**1886**	425–425	**1931**	601–605
1842	86–86	**1887**	438–439	**1932**	602–603
1843	90–90	**1888**	438–438	**1933**	602–605
1844	92–92	**1889**	439–439	**1934**	602–606
1845	94–94	**1890**	443–455	**1935**	603–603
1846	102–106	**1891**	443–454	**1936**	605–607
1847	102–105	**1892**	443–456	**1937**	607–608
1848	103–106	**1893**	468–468	**1938**	608–608
1849	103–105	**1894**	483–486	**1939**	612–612
1850	104–106	**1895**	485–486	**1940**	614–614
1851	107–107	**1896**	490–490	**1941**	614–615
1852	112–112	**1897**	490–491	**1942**	618–619
1853	115–118	**1898**	492–492	**1943**	618–624
1854	116–118	**1899**	496–496	**1944**	619–619
1855	116–120	**1900**	497–497	**1945**	621–621
1856	116–117	**1901**	505–505	**1946**	622–623
1857	124–125	**1902**	510–510	**1947**	622–624
1858	125–125	**1903**	514–514	**1948**	623–623
1859	131–131	**1904**	515–515	**1949**	623–624
1860	138–138	**1905**	518–518	**1950**	623–625
1861	142–146	**1906**	524–524	**1951**	624–624
1862	147–147	**1907**	527–530	**1952**	624–625
1863	149–149	**1908**	527–527	**1953**	633–634
1864	152–152	**1909**	528–531	**1954**	633–635
1865	161–161	**1910**	528–530	**1955**	634–635
1866	169–172	**1911**	538–538	**1956**	634–636
1867	180–182	**1912**	543–543	**1957**	635–635
1868	181–182	**1913**	555–555	**1958**	641–641
1869	187–187	**1914**	562–562	**1959**	642–642
1870	192–192	**1915**	564–565	**1960**	646–646
1871	193–193	**1916**	565–565	**1961**	650–650
1872	195–195	**1917**	573–573	**1962**	652–660
1873	196–196	**1918**	581–582	**1963**	655–660
1874	197–197	**1919**	583–586	**1964**	671–671
1875	213–214	**1920**	589–591	**1965**	671–672
1876	213–215	**1921**	590–591	**1966**	677–677

Indel Character	Sequence Region	Indel Character	Sequence Region	Indel Character	Sequence Region
1967	681–681	**2012**	951–951	**2057**	1399–1402
1968	682–682	**2013**	954–957	**2058**	1401–1401
1969	682–683	**2014**	958–958	**2059**	1418–1421
1970	683–683	**2015**	987–991	**2060**	1435–1439
1971	684–684	**2016**	1009–1009	**2061**	1498–1500
1972	686–686	**2017**	1021–1026	**2062**	1509–1513
1973	689–689	**2018**	1021–1021	**2063**	1510–1513
1974	693–694	**2019**	1023–1026	**2064**	1518–1541
1975	694–694	**2020**	1025–1026	**2065**	1529–1530
1976	694–695	**2021**	1041–1045	**2066**	1538–1538
1977	695–695	**2022**	1041–1044	**2067**	1553–1554
1978	709–709	**2023**	1041–1043	**2068**	1558–1569
1979	719–719	**2024**	1041–1042	**2069**	1593–1617
1980	726–726	**2025**	1053–1053	**2070**	1594–1617
1981	727–727	**2026**	1093–1093	**2071**	1595–1617
1982	730–730	**2027**	1099–1099	**2072**	1603–1617
1983	749–749	**2028**	1101–1102	**2073**	1627–1637
1984	752–752	**2029**	1102–1102	**2074**	1627–1631
1985	771–776	**2030**	1111–1116	**2075**	1628–1637
1986	772–776	**2031**	1139–1190	**2076**	1636–1719
1987	773–776	**2032**	1167–1167	**2077**	1645–1666
1988	782–790	**2033**	1172–1172	**2078**	1647–1648
1989	783–786	**2034**	1178–1182	**2079**	1652–1660
1990	784–786	**2035**	1179–1182	**2080**	1689–1696
1991	784–789	**2036**	1187–1188	**2081**	1702–1716
1992	785–786	**2037**	1188–1188	**2082**	1705–1710
1993	793–797	**2038**	1193–1193	**2083**	1706–1710
1994	801–801	**2039**	1199–1203	**2084**	1707–1710
1995	802–802	**2040**	1212–1212	**2085**	1708–1710
1996	811–813	**2041**	1268–1268	**2086**	1708–1711
1997	822–827	**2042**	1352–1352	**2087**	1709–1710
1998	822–822	**2043**	1354–1391	**2088**	1709–1709
1999	870–871	**2044**	1355–1356	**2089**	1710–1710
2000	872–985	**2045**	1362–1366	**2090**	1738–1753
2001	872–873	**2046**	1362–1375	**2091**	1738–1752
2002	878–878	**2047**	1370–1370	**2092**	1745–1755
2003	899–903	**2048**	1377–1379	**2093**	1760–1760
2004	911–932	**2049**	1377–1377	**2094**	1764–1764
2005	912–930	**2050**	1381–1388	**2095**	1765–1769
2006	912–916	**2051**	1382–1388	**2096**	1778–1784
2007	912–928	**2052**	1384–1388	**2097**	1810–1810
2008	919–920	**2053**	1392–1476	**2098**	1821–1824
2009	923–928	**2054**	1395–1395		
2010	939–999	**2055**	1398–1402		
2011	947–947	**2056**	1399–1403		