

# REVISION, MOLECULAR PHYLOGENY AND BIOLOGY OF THE SPIDER GENUS *MICARIA* WESTRING, 1851 (ARANEAE: GNAPHOSIDAE) IN THE AFROTROPICAL REGION



by  
Ruan Boysen



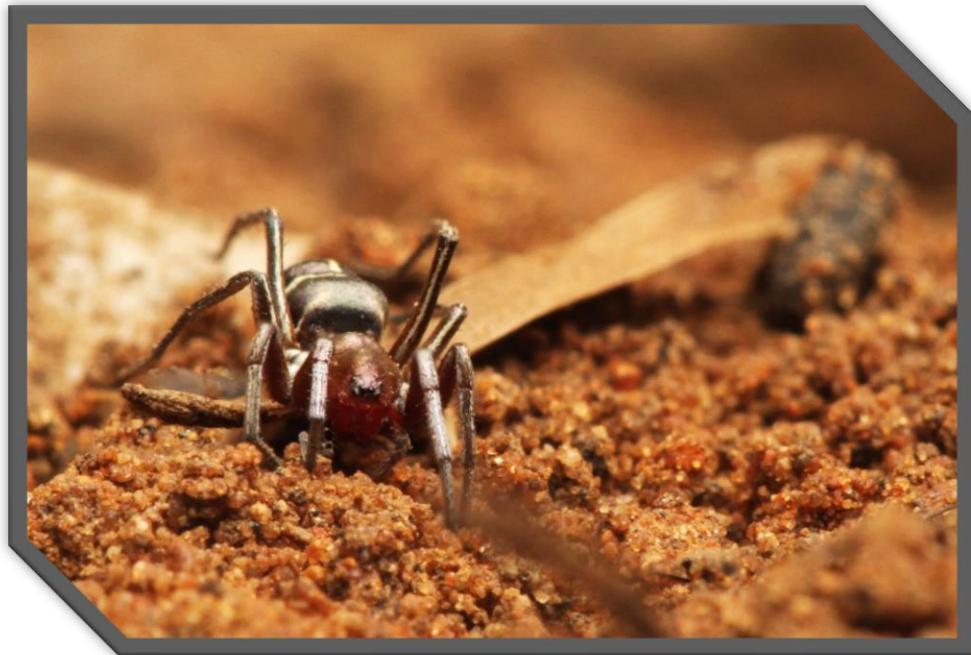
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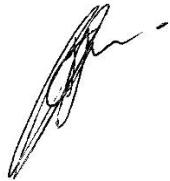
Supervisor: Prof. C.R. Haddad

Co-Supervisor: Prof. S. Pekár



# DECLARATION

I, Ruan Booyens, declare that the Master's research dissertation that I herewith submit at the University of the Free State, is my independent work and that I have not previously submitted it for qualification at another institution of higher education.



02.02.2020

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Ruan Booyens

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Date

# Contents

ABSTRACT .....	5
OPSOMMING .....	7
ACKNOWLEDGEMENTS .....	9
CHAPTER 1 - INTRODUCTION .....	10
1.1.) <i>Micaria</i> morphology .....	10
1.2.) Taxonomic history of <i>Micaria</i> .....	11
1.3.) Phylogenetic relationships .....	12
1.4.) Mimicry.....	13
1.5.) Reproductive biology.....	14
1.6.) Mating plugs.....	15
1.7.) Study aims and objectives .....	17
1.8.) Research Significance .....	18
1.9.) Literature Cited.....	19
CHAPTER 2 – REVISION OF THE AFROTROPICAL <i>MICARIA</i> .....	28
2.1.) Introduction .....	28
2.2.) Materials and Methods.....	30
2.3.) Genus <i>Micaria</i> Westring, 1851 .....	33
2.4.) Key to the <i>Micaria</i> species of the African part of the Afrotropical Region: .....	51
2.5.) Taxonomy .....	55
2.5.1.) <i>Micaria basaliducta</i> sp. nov.....	55
2.5.2.) <i>Micaria beaufortia</i> (Tucker, 1923) .....	60
2.5.3.) <i>Micaria bimaculata</i> sp. nov.....	70
2.5.4.) <i>Micaria bispicula</i> sp. nov.....	75
2.5.5.) <i>Micaria chrysis</i> (Simon, 1910) .....	81
2.5.6.) <i>Micaria duriana</i> sp. nov.....	92
2.5.7.) <i>Micaria felix</i> sp. nov.....	97
2.5.8.) <i>Micaria gagnoa</i> sp. nov.....	106
2.5.9.) <i>Micaria koingnaas</i> sp. nov.....	111
2.5.10.) <i>Micaria latia</i> sp. nov. ....	115

2.5.11.) <i>Micaria laxa</i> sp. nov. ....	119
2.5.12.) <i>Micaria medispina</i> sp. nov.....	122
2.5.13.) <i>Micaria parvotibialis</i> sp. nov. ....	126
2.5.14.) <i>Micaria plana</i> sp. nov. ....	130
2.5.15.) <i>Micaria quadrata</i> sp. nov.....	135
2.5.16.) <i>Micaria quinquemaculosa</i> sp. nov.....	139
2.5.17.) <i>Micaria rironosy</i> sp. nov.....	145
2.5.18.) <i>Micaria salta</i> sp. nov. ....	149
2.5.19.) <i>Micaria scutellata</i> sp. nov. ....	153
2.5.20.) <i>Micaria tersissima</i> Simon, 1910 .....	157
2.6.) Discussion.....	161
2.7.) Literature Cited.....	162
CHAPTER 3: SYSTEMATICS OF <i>MICARIA</i> .....	165
3.1.) Introduction .....	165
3.2.) Materials and Methods.....	166
3.3.) Results .....	167
3.4.) Discussion.....	182
3.5.) Literature Cited.....	184
CHAPTER 4: BIOLOGY, BEHAVIOUR AND MYRMECOMORPHY OF <i>MICARIA</i> , WITH EMPHASIS ON THE AFROTROPICAL SPECIES.....	186
4.1.) Introduction .....	186
4.2.) Materials and methods.....	187
4.3.) Results .....	188
4.4) Discussion.....	194
4.5.) Literature Cited.....	196
CHAPTER 5: CONCLUDING REMARKS .....	198

# ABSTRACT

The genus *Micaria* Westring, 1851 (Araneae, Gnaphosidae) is a group of small (1.85 - 5 mm) ant-like spiders that can be distinguished from other gnaphosids by their piriform gland spigots that are similar in size to the major ampullate gland spigots. According to the World Spider Catalog, there are 105 species of *Micaria* in the world, of which only four species are known from the Afrotropical Region, namely *M. chrysia* (Simon, 1910), *M. tersissima* Simon, 1910, *M. beaufortia* (Tucker, 1923) and *M. ignea* (O. Pickard-Cambridge, 1872). The objectives of this study were to revise *Micaria* in the Afrotropical Region, providing new and updated records for each of the species, evaluating the relationships between them using COI barcoding data, and providing information on their biology, mimetic relationships and feeding ecology. These objectives were met by collecting fresh material from the KwaZulu-Natal, Western Cape, Northern Cape, and Free State provinces in South Africa. Fresh material of *M. tersissima* and *M. chrysia* were collected from their type localities, Komaggas and Port Nolloth (Northern Cape Province), respectively, for identification and DNA analyses. Material from eight collections yielded a variety of species of *Micaria* from countries throughout the Afrotropical Region. Male and female genitalia were dissected and cleaned using a pancreatin solution. The left leg II of male and female representatives of each species was preserved in absolute ethanol and sent to the Canadian Centre for DNA Barcoding (CCDB) for DNA barcoding (COI gene). The data were aligned using Mega X software and molecular analyses were performed using MrBayes for Bayesian Inference (BI) and RaxML for maximum likelihood (ML) analyses. Morphological analysis of the collected and voucher material yielded 17 new species for the Afrotropical Region, namely *M. basaliducta* **sp. nov.**, *M. bimaculata* **sp. nov.**, *M. bispicula* **sp. nov.**, *M. durbanica* **sp. nov.**, *M. felix* **sp. nov.**, *M. gagnoa* **sp. nov.**, *M. koingaas* **sp. nov.**, *M. latia* **sp. nov.**, *M. laxa* **sp. nov.**, *M. medispina* **sp. nov.**, *M. parvotibialis* **sp. nov.**, *M. plana* **sp. nov.**, *M. quadrata* **sp. nov.**, *M. quinquemaculosa* **sp. nov.**, *M. rivo* **sp. nov.**, *M. salta* **sp. nov.** and *M. scutellata* **sp. nov.**. The maximum likelihood analysis recovered *Micaria* (*sensu lato*) as monophyletic and the *subopaca*

group as paraphyletic, sharing a clade with *M. aenea* Thorell, 1871, *M. longipes* Emerton, 1890 and *M. alpina* (L. Koch, 1872). The *pulicaria* species group was recovered as polyphyletic in both the BI and ML analyses. Four Afrotropical species were recovered sister to *M. formicaria* (Sundevall, 1831) and may possibly form a new clade with the *M. rossica* / *M. foxi* group. Twenty feeding trials using Collembola, Hemiptera, Blattodea and Hymenoptera on a combination of sub-adult and adult *M. beaufortia* individuals show that 40% (n=8) and 45% (n=9) of Collembola and Hemiptera prey items were accepted. The results were considerably lower for Blattodea (5%, n=1) and Hymenoptera (0%, n=0) prey items. The potential ant (Hymenoptera: Formicidae) models of four *Micaria* species were identified and are as follows: *M. beaufortia* is a mimic of *Anoplolepis custodiens* F. Smith, 1858 (Formicinae) ants; *Lepisiota* (Formicinae) ants could potentially be the model of *M. quinquemaculosa* sp. nov. and *M. chrysis*; *M. felix* sp. nov. is potentially a mimic of *Monomorium* spp. (Myrmecinae) ants. In conclusion, this study was the first to revise the genus *Micaria* for the Afrotropical Region and resulted in the description of 17 new species, bringing the total for the region to 20 species. Nine of these species now have COI barcoding data uploaded to the Barcode of Life Data Systems (BOLD).

**Key words:** Afrotropical, BOLD, Gnaphosidae, *Micaria*, molecular phylogenetic.

# OPSOMMING

Die genus *Micaria* Westring, 1851 (Araneae, Gnaphosidae) sluit in klein (1.85 - 5 mm) mieragtige spinnekoppe wat van ander Gnaphosidae onderskei kan word deur hulle piriforme klierspigots wat soortgelyk is in grootte aan die groot ampullêre klierspigots. Volgens die “World Spider Catalog” is daar tans 105 spesies *Micaria* in die wêreld, waarvan slegs vier vanaf die Afrotropiese Wyk bekend is, naamlik *Micaria chrysia* (Simon, 1910), *M. tersissima* Simon, 1910, *M. beaufortia* (Tucker, 1923) en *M. ignea* (O. Pickard-Cambridge, 1872). Die doel van hierdie studie was om die genus *Micaria* in die Afrotropiese Wyk te hersien, om nuwe en opgedateerde rekords vir elk van die spesies te gee, die verwantskappe tussen hulle te evalueer deur van COI genetiese data gebruik te maak, en inligting oor hulle biologie, nabootsing verwantskappe en voedingsekologie te verskaf. Hierdie doelwitte is bereik deur vars material vanaf die KwaZulu-Natal, Wes-Kaap, Noord-Kaap en Vrystaat provinsies in Suid-Afrika te versamel. Vars materiaal vir *M. tersissima* en *M. chrysia* was onderskeidelik in hulle tiep-lokaliteite, Komaggas en Port Nolloth (Noord-Kaap Provinsie), versamel. Materiaal van agt versamelings het verskillende soorte *Micaria* vanuit die hele Afrotropiese Wyk opgelewer. Geslagsdele van die mannetjies en wyfies was gedissekter en skoongemaak met behulp van 'n pankreatienoplossing. Die linkerbeen II van manlike en vroulike verteenwoordigers van elke spesie is in absoloot etanol bewaar en na die “Canadian Centre for DNA Barcoding” (CCDB) gestuur vir genetiese analiese. Die genetiese data is in lyn gebring met behulp van Mega X-sagteware en molekulêre ontledings is uitgevoer met behulp van MrBayes vir Bayes-inferensie (BI) en RaxML vir maksimumaaneemlikheid (ML) analyses. Morfologiese ontleding van die nuut versamelde en museum versamelings het 17 nuwe spesies vir die Afrotropiese streek opgelewer, naamlik *M. basaliducta* sp. nov., *M. bimaculata* sp. nov., *M. bispicula* sp. nov., *M. durbana* sp. nov., *M. felix* sp. nov., *M. gagnoa* sp. nov., *M. koinggaas* sp. nov., *M. latia* sp. nov., *M. laxa* sp. nov., *M. medispina* sp. nov., *M. parvotibialis* sp. nov., *M. plana* sp. nov., *M. quadrata* sp. nov., *M. quinquemaculosa* sp. nov., *M. rivo* sp. nov., *M. salta* sp. nov. en *M. scutellata* sp. nov.

Die maksimumaaneemlikheid analiese het *Micaria* (*sensu lato*) as monofileties herwin en die *subopaca* groep as parafileties, waar dit 'n klade deel saam met *M. aenea* Thorell, 1871, *M. longipes* Emerton, 1890 en *M. alpina* (L. Koch, 1872). Die *pulicaria* spesiegroep het in die BI en ML analise as polifileties (*sensu stricto*) herstel. Vier Afrotropiese spesies is bevind as suster van *M. formicaria* (Sundevall, 1831) en kan moontlik 'n nuwe klade saam met die *M. rossica* / *M. foxi*-groep vorm. Twintig proewe met Collembola, Hemiptera, Blattodea en Hymenoptera as prooi was op 'n kombinasie van sub-volwasse en volwasse *M. beaufortia* individue uitgevoer en toon dat 40% (n = 8) en 45% (n = 9) van die Collembola en Hemiptera prooi items, onderskeidelik, aanvaar is. Hierdie resultate was aansienlik laer vir die Blattodea (5%, n = 1) en Hymenoptera (0%, n = 0) prooi-items. Die potensiële miermodelle (Hymenoptera: Formicidae) van vyf *Micaria* spesies en is soos volg geïdentifiseer: *M. beaufortia* is 'n nabootser van *Anoplolepis custodiens* F. Smith, 1858 (Formicinae) miere; *Lepisiota* (Formicinae) miere kan moontlik die model van *M. quinquemaculosa* **sp. nov.** en *M. chrysis* wees; *M. felix* **sp. nov.** is moontlik 'n nabootser van *Monomorium* spp. (Myrmecinae) miere; en inligting *M. tersissima* is huidiglik steeds onbekend. Ten slotte, hierdie studie was die eerste om die genus *Micaria* vir die Afrotropiese Wyk te hersien en het uiteindelik geleid daartoe dat 17 nuwe spesies beskryf is, wat die totaal vir die wyk tot 20 spesies bring. Nege van hierdie spesies het nou COI genetiese data beskikbaar op die "Barcode of Life Data Systems" (BOLD).

**Sleutelwoorde:** Afrotropiese, BOLD, Gnaphosidae, *Micaria*, molekulêre filogenie.

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# CHAPTER 1 - INTRODUCTION

## 1.1.) *Micaria* morphology

The family Gnaphosidae (Araneae), also known as flat-bellied ground spiders, are small (2 mm) to large (17 mm) spiders that are very abundant in various parts of the world, excluding the polar and tundra areas (Dippenaar-Schoeman 2014). Azevedo *et al.* (2018) defined Gnaphosidae (*sensu lato*, including *Micaria* Westring, 1851) as a group in which the piriform gland spigots are wider and longer than the major ampullate gland spigots, and are uniform in their morphology. This definition further includes small spiders (1–8 mm in length) that have between one and eight piriform gland spigots that are equal in size to the major ampullate gland spigots and have a tubular shaft with a broad opening. Furthermore, the posterior median eyes (PME) of gnaphosids are flattened and oval, and they have slanted, obliquely depressed endites (Platnick & Shadab 1988; Jocqué & Dippenaar-Schoeman 2006). This is a very large family currently with over 159 genera and 2525 species (World Spider Catalog 2020) within nine subfamilies (Azevedo *et al.* 2018).

Spiders in the genus *Micaria* are small ant-like gnaphosids approximately 2–5 mm in length. They are recognised by their elongate, cylindrical abdomens and squamose or brachiate setae on the legs, abdomen, chelicerae and carapace (Murphy 2007). *Micaria* is further distinguished from other gnaphosids by their piriform gland spigots on the anterior lateral spinnerets, which are retracted into the distal membrane of the spinneret, rendering them invisible when using stereomicroscopy (Murphy 2007).

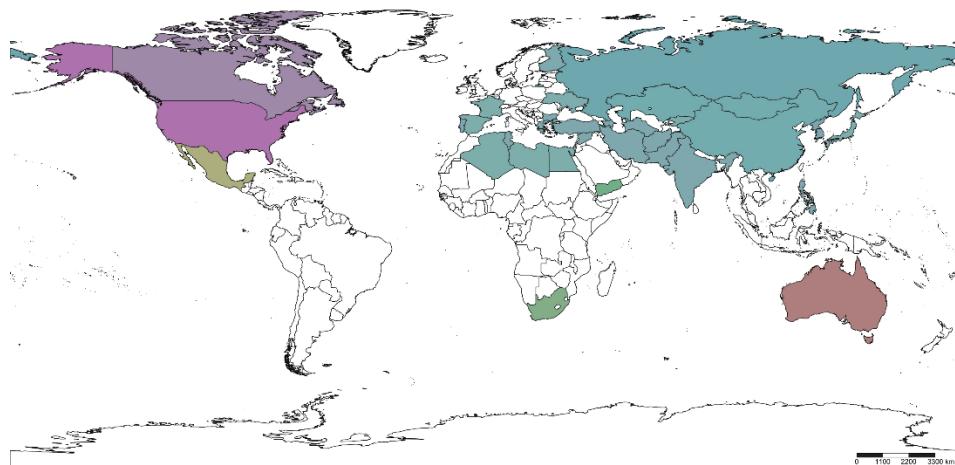
It is well known that *Micaria* are Batesian mimics of ants (Murphy 2007; Pekár *et al.* 2011; Muster & Michalik 2020). They have evolved several adaptations to accommodate this relationship, such as behavioural adaptations, i.e. walking in similar ways and speeds as the ants, morphological adaptations such as abdominal constrictions (Cushing 2012), or colour adaptations such as their inference lighting (Corcobado *et al.* 2016).

## 1.2.) Taxonomic history of *Micaria*

Historically, *Micaria* was placed in the family Clubionidae, within the subfamily Micariinae. However, due to the unique structure of the anterior spinnerets, flattened and oval posterior median eyes (PME), and depressed endites (Reiskind 1969; Platnick & Shadab 1988), the genus was removed from Clubionidae by Mikhailov & Fet (1986) and placed in its own family, Micariidae. However, this placement had not been accepted, and as early as Locket & Millidge (1951) the genus was treated as a gnaphosid.

The type species of the genus *Micaria* is *M. fulgens* (Walckenaer, 1802) from France. This genus is currently considered to be a senior synonym of *Micariolepis* Simon, 1879, *Epikurtomma* Tucker, 1923, *Castanilla* Caporiacco, 1936 and *Arboricaria* Bosmans, 2000 (Murphy 2007; Haddad & Bosmans 2013; Breitling 2017; Wunderlich 2017; World Spider Catalog 2020).

There are 105 species of *Micaria* described, many of which have a Palearctic distribution (Wunderlich 1980). Platnick & Shadab (1988) revised this genus in the Nearctic Region, while Murphy (2007) reported a few species from Australia and the Norwegian Archipelago (Fig. 1).



**Fig. 1.** The worldwide distribution of *Micaria* Westring, 1851 (Gnaphosidae). (**Green**) Afrotropical Region, (**Blue**) Palearctic Region, (**Purple**) Nearctic Region, (**Yellow**) Neotropical Region and (**Red**) Australasian Region.

Only three species have been described from the African part of Afrotropical Region to date, specifically from South Africa, of which two, *M. chrysia* (Simon, 1910) and *M. tersissima* (Simon, 1910), were described from the Northern Cape, and one species, *M. beaufortia* (Tucker, 1923), from Beaufort West in the Western Cape (Marusik & Omelko 2017). One species, *M. ignea* (O. Pickard-Cambridge, 1872) from Yemen, is included in the Asian part of this region. No revision has been done on the Afrotropical *Micaria*, but Bosmans & Blick (2000) and Haddad & Bosmans (2013) have worked on the taxonomy of North African *Micaria*. Of the three Afrotropical species described, only *M. beaufortia* has been redescribed by Marusik & Omelko (2017).

### 1.3.) Phylogenetic relationships

Very little information is available on the morphological and molecular phylogenetic relationships of *Micaria*. Wunderlich (1980) and Platnick & Shadab (1988) revised the European and American fauna, respectively, and the latter constructed a phylogenetic tree based on morphological characteristics. Their study resulted in six defined species groups (*pulicaria*, *alpina*, *browni*, *idana*, *rossica*, and *longipes* groups) and included 30 species. Recent morphological studies show that *Micaria* may not be true gnaphosids because the piriform gland spigots are similar in size to the major ampullate gland spigots, unlike those of the true gnaphosids that are much longer and wider than the major ampullate gland spigots (Azevedo *et al.* 2018).

Wheeler *et al.* (2017) included *Micaria* in a large molecular analysis of Araneae and found *Micaria* (and other gnaphosid terminals) to be spread in between several other gnaphosoid families, such as Trochanteriidae, Ammoxenidae and Lamponidae. These results agree with Azevedo *et al.*'s (2018) results and support the idea that *Micaria* are not a true gnaphosids and may eventually be moved out of Gnaphosidae. A study done by Breitling (2017) used publicly available DNA barcodes on the Barcode of Life Data Systems (BOLD Systems) to construct a phylogenetic tree of *Micaria*, confirming *Arboricaria* as a junior synonym of *Micaria*. His results also provided support for the species groups suggested by Platnick & Shadab (1988).

#### 1.4.) *Mimicry*

Several types of mimicry exist, of which the most prominent in arthropods are: 1) Batesian mimicry, where a palatable organism (i.e. the mimic) adapts to look like an unpalatable organism (i.e. the model) morphologically (Rubio *et al.* 2013), behaviourally (Kitamura & Imafuku 2015) or chemically (Scharff & Hormiga 2012); 2) Müllerian mimicry, which is closely related to Batesian mimicry, but here both the mimic and the model are unpalatable and share distinctive warning signals (Huheey 1976; Speed 1999). There exists a continuum of palatability between Batesian and Mullerian mimicry, and this state is referred to as Quasi-Batesian mimicry. These individuals benefit from each other in that a seemingly lower defended population would gain protection indirectly from the increased predation risk in the better defended population (Speed 1993, 1999; Mallet 1999; Rowland *et al.* 2010).

When considering mimicry, especially in insects, accuracy may not always be the endgame. Inaccurate mimicry exists and is more common than one may imagine, even amongst spiders (Pekár *et al.* 2011). One may wonder why such a strategy would evolve. There are various hypotheses that could be considered when discussing inaccurate mimicry and how it evolved (Kikuchi & Pfennig 2013). One such hypothesis is the “multi-model” hypothesis, suggesting that inaccurate mimicry exists as a result of the adaptations of several model species’ phenotypes. The combination of these different traits will confuse a predator and reduce the risk of predation on the mimic population (Edmunds 2000). Another hypothesis, the “eye of the beholder” hypothesis, suggests that a mimic may be a rather good (or bad) representation of its model. However, from a predator’s perspective the mimic and its model cannot be distinguished (Dittrich *et al.* 1993). Pekár *et al.* (2011) proposed a “multiple predatory” hypothesis, which suggests that inaccurate mimicry can persist when mimics are selected for by different guilds of predators, such as specialists and generalists. Finally, the “relaxed selection” hypothesis suggests that there may not be adequate selection pressures to evolve refined model traits, due to the lack of predation risk. This is usually the case when the mimics are small in size, high in abundance, or the risk of the predator attacking the mimic outweighs the benefit (Penney *et al.* 2012).

Arthropods are exceptional examples of mimicry. In spiders, mimicry is present in various families (Cushing 1997, 2012), such as Gnaphosidae (Pekár *et al.* 2011), Zodariidae (Pekár & Kral 2002; Pekár *et al.* 2005), Salticidae (Elgar & Allan 2006), Thomisidae (Veira *et al.* 2017), Eresidae (Dippenaar-Schoeman 1990), Corinnidae (Rubio *et al.* 2013), Oonopidae and Linyphiidae (Cushing 1997, 2012). The majority of these spiders are ant-mimics (myrmecomorphs), thus making use of similar colouration, body shape (such as abdominal constrictions) and movement. Other models utilised by mimetic spiders include ladybird beetles (Coleoptera, Coccinellidae) (Raška & Pekár 2019), velvet ants (Hymenoptera, Mutillidae) (Haddad 2004; Paul *et al.* 2018) and even lepidopteran larvae (Logunov & Obenauer 2019).

### 1.5.) Reproductive biology

Several reproductive strategies have evolved within arthropods to find their mates and ensure that the mate is fit enough to provide healthy offspring. These strategies involve the use of physical displays, for example *Asemonea* jumping spiders (Salticidae) that perform a sequence of movements to attract their mates (Jackson & Macnab 1991); colour displays, such as the colourful performances male *Maratus* jumping spiders use to court females (Otto & Hill 2011); or chemical cues to determine the sex of the conspecific and potentially initiate mating behaviour, such as the pheromones used by *Adalia* ladybird beetles (Coleoptera, Coccinellidae) (Hemptinne *et al.* 1998).

Sexual cannibalism in spiders is well known and has evolved in numerous spider taxa, such as *Araneus diadematus* Clerck, 1757 (Elgar & Nash 1988), *Dolomedes fimbriatus* (Clerk, 1757) (Arnqvist & Henriksson 1997) and *Argiope keyserlingi* Karsc, 1878 (Elgar *et al.* 2000), to name but a few. The benefit of such an odd behaviour lies in the favour of the male, in that he may sacrifice himself to ensure the survivability of his offspring (Andrade 1996; Welke & Schneider 2012; Zuk 2016).

With regards to *Micaria*, Sentenská & Pekár (2013, 2014) studied the sexual behaviour of *M. sociabilis* Kulczynski, 1897, and found that the species displays reversed sexual cannibalism during periods of low prey availability and high mate availability. This behaviour was also linked to generation overlapping, where younger males encounter

older females from the previous generation, thus acting more aggressively towards them. Furthermore, Sentenská *et al.* (2015) observed the male copulating with the female by approaching her anteriorly and mounting her prosoma before finally inserting his palp into her copulatory opening.

### 1.6.) Mating plugs

Females of several animal species may mate with more than one male, which is referred to as polyandry (Arnqvist & Nilsson 2000). This type of mating behaviour increases female fecundity, allowing a higher chance of survival for the offspring (Eberhard 1985; Garcilazo-Cruz & Alvares-Padilla 2015). Polyandrous and polygamous species' male counterparts thus experience high levels of competition, not only during mating, but also post-copulation (Wigby & Chapman 2004). Therefore, an "arms-race" exists between sexes and within males, allowing males to successfully mate with multiple females and maximising the female's potential to have offspring (Dixon & Anderson 2002; Gage 2004).

Sperm competition, defined as the competition of the sperm of at least two males of the species per female ovary (Simmons & Kotaiho 2002; Wigby & Chapman 2004), is one of the most important drivers of the male-male arms race that exists. The sperm of males that have mated with the same female will have to compete with each other to successfully fertilise the ova (Parker 1970). As a result, males may evolve physical, physiological, and/or behavioural adaptations to avoid sperm competition. These adaptations may aim to replace, displace or even swill out other competing sperm (Parker 1970). Offensive adaptations such as these will allow one male to outcompete another. However, some defensive adaptations also exist to reduce the chance of subsequent mating. Defensive adaptations include mate guarding, where the male physically prevents the female from mating or wards off other males (Stockley 1997); prolonged copulations, in which the male stays copulated for a longer time than required for insemination (Suter & Parkhill 1990); and copulatory plugs (Avila *et al.* 2015).

Copulatory plugs (also known as mating plugs) are sometimes secretions that consist of seminal fluid and proteins produced by the males, and sometimes with the aid of females (Aisenberg & Eberhard 2009; Kuntner *et al.* 2012) or may otherwise be structural. This

tends to coagulate within the reproductive tract of the female (Avila *et al.* 2015). These plugs have been observed in several taxa, including primates (Harcourt & Gardiner 1994; Dixon 1998; Parga *et al.* 2006; Danzy *et al.* 2009), reptiles (Shine *et al.* 2000; Moreira *et al.* 2006), insects (Mann 1984; Baer *et al.* 2001), rodents (Voss 1979) and spiders (Aisenberg & Eberhard 2009; Uhl *et al.* 2014).

Spiders (Araneae) are one of the most frequently studied organisms when it comes to mating plug production. These copulatory plugs may be produced in several parts of the spider's body, including the genital tract of the male (Knoflach 1998), the mouth area, and the accessory gland that is located next to the sperm reservoir in the palpal bulb (Suhm *et al.* 1996; Uhl *et al.* 2014). It has been reported that females could potentially contribute to the production of an effective mating plug (Aisenberg & Eberhard, 2009; Sentenská *et al.* 2015). Some spiders, such as *Trichonephila*, use the entire bulb as a plug (Ramírez & González 1999; Kuntner *et al.* 2012), detaching the pedipalp from the body once copulation has finished (Kuntner *et al.* 2009). Similarly, *Echinotheridion* and *Theridion* also make use of emasculation, but remove their pedipalp and feeding on it as a subadult to maximise locomotion. Then during copulation, the male used the other palp to mate and eventually dies of fatigue with their remaining palp in the female, plugging her (Agnarsson 2006). Another novel mating plug strategy entails the use of the larger strobilate seta as a mating plug, for example in the salticid spider *Maeota setastrobilaris* Garcilazo-Cruz & Álvarez-Padilla, 2015 (Salticidae) (Garcilazo-Cruz & Alvares-Padilla 2015). Little research has been done on the origin of the plug secretion in females, although Knoflach (1998, 2004) did extensive research on comb-footed spiders (Theridiidae). She noted that in *Tidarren varians* Hahn, 1833 the female and male's contributions to the mating plug originate from their genital tracts.

The plug material may take on various forms and consistencies, depending on the taxon in question (Timmermeyer *et al.* 2010). Danzy *et al.* (2009) categorised the consistencies of the mating plug into four categories. Categories one and two entail the fluid and semi-fluid secretions, such as those found in bees (Duvoisin *et al.* 1999) and nematodes (Palopoli *et al.* 2008), respectively. Categories three and four encompass the coagulated

and solid plug material found in animals such as spiders (Kuntner *et al.* 2012; Sentenská *et al.* 2015) and primates (Jensen-Seaman & Li 2003; Parga *et al.* 2006), respectively.

The function of the copulatory plug is to avoid sperm competition. This can be achieved by lowering the receptiveness and attractiveness of the female to subsequent males (Baer *et al.* 2000; Shine *et al.* 2000). Copulatory plugs play a significant role in reducing/preventing sperm backflow and reduce sperm dumping in females (Eberhard 1985; Uhl *et al.* 2014). Both the males and females may benefit from having a plug produced, as males may secure the female and ensure that their sperm fertilises the ova (Poiani 2006). Furthermore, the female may gain nutrients from the male (in the cases where he is devoured) or reduce the level of harassment from other males in the area (Andersson *et al.* 2000).

### 1.7.) Study aims and objectives

- Objectives
  - Revise the genus *Micaria* in the Afrotropical Region and provide updated distribution records for each species.
  - Investigate the phylogenetic relationships within the Afrotropical *Micaria* with the use of COI barcoding data.
  - Provide information on their biology, feeding ecology and their mimetic relationships.
- Aims
  - Examine all the available material collected in the field and received from local and international museums.
  - Prepare material for DNA barcoding using the COI gene region and performing phylogenetic analyses such as Bayesian Inference and Maximum likelihood analyses.
  - Perform feeding trials to determine their feeding habits and also collect the ants associated with *Micaria*.

### 1.8.) Research Significance

The genus *Micaria* had not yet been revised in the Afrotropical Region, and as a result a large gap exists with regards to the distribution of this genus. This study will be the first revision for this genus in sub-Saharan Africa and will provide new and updated records for the region and the associations they may have with other arthropods, such as the ants that they mimic. This data will be uploaded to the Encyclopaedia of Life species lists. Furthermore, the genetic data generated through this study will be made available to the public on the Barcode of Life Data Systems (BOLD) for future studies that aim to solve the monophyly of this genus. Specimens received from the depositories in four major South African collections and three international collections have yielded many new species of the genus from the continent that will be described. Phylogenetic studies on this group would provide a basis for future research in terms of resolving species groups of the genus.

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# CHAPTER 2 – REVISION OF THE AFROTROPICAL *MICARIA*

## 2.1.) *Introduction*

The family Gnaphosidae (Araneae), also known as flat-bellied ground spiders, are small (1.85 mm) to large (17 mm) spiders that are very abundant in various parts of the world, excluding the polar and tundra areas (Murphy 2007). Azevedo *et al.* (2018) defined Gnaphosidae (*sensu lato*, including *Micaria*) as a group in which the piriform gland spigots are wider and longer than the major ampullate gland spigots, and are uniform in their morphology. This definition further includes small spiders (1-8 mm in length) that have between one and eight piriform gland spigots that are equal in size to the major ampullate gland spigots and a tubular shaft with a broad opening. Furthermore, the posterior median eyes (PME) of gnaphosids are flattened and oval, and they have slanted, obliquely depressed endites (Platnick & Shadab 1988; Jocqué & Dippenaar-Schoeman 2006). This is a very large family with over 159 genera (World Spider Catalog 2020) within nine subfamilies currently (Azevedo *et al.* 2018).

Spiders in the genus *Micaria* Westring, 1851 are small ant-like gnaphosids approximately 2–5 mm in length. They are recognised by their elongate, cylindrical abdomen and squamose or brachiate setae on the legs, abdomen, chelicerae and carapace (Murphy 2007). *Micaria* are further distinguished from other gnaphosids by their piriform gland spigots on the anterior lateral spinnerets, which are retracted into the distal membrane of the spinneret, rendering them invisible when using stereomicroscopy (Murphy 2007).

Historically, *Micaria* was placed in the family Clubionidae, within the subfamily Micariinae. However, due to the unique structure of the anterior spinnerets, flattened and oval PME, and depressed endites (Reiskind 1969; Platnick & Shadab 1988), the genus was removed from Clubionidae by Mikhailov & Fet (1986) and placed in its own family, Micariidae.

However, this placement had not been accepted, and as early as Locket & Millidge (1951) the genus was treated as a gnaphosid.

The type species of the genus *Micaria* is *M. fulgens* (Walckenaer, 1802) from France. This genus is currently considered to be a senior synonym of *Micariolepis* Simon, 1879, *Epikurtomma* Tucker, 1923, *Castanilla* Caporiacco, 1936 and *Arboricaria* Bosmans, 2000 (Murphy 2007; Haddad & Bosmans 2013; Breitling 2017; Wunderlich 2017; World Spider Catalog 2020).

Only three species were described from South Africa, of which two, *M. chrysia* (Simon, 1910) and *M. tersissima* (Simon, 1910), were described from the Northern Cape, and one species, *M. beaufortia* (Tucker, 1923), from Beaufort West in the Western Cape of South Africa (Marusik & Omelko 2017). No revision has been done on the *Micaria* of the Afrotropical Region, but Bosmans & Blick (2000) and Haddad & Bosmans (2013) have worked on the taxonomy of the *Micaria* in the northern part of the African continent. Of the three species described, only *M. beaufortia* has been redescribed by Marusik & Omelko (2017).

Very little information is available on the morphological and molecular phylogenetic relationships of *Micaria*. Platnick & Shadab (1988) and Wunderlich (1980) revised the American and European fauna, respectively, and the former constructed a phylogenetic tree based on morphological characteristics. The former authors' study resulted in six defined species groups and included 30 species. These groups were as follows: *pulicaria*, *alpina*, *browni*, *idana*, *rossica*, and *longipes*. Recent morphological studies show that *Micaria* may not be a true gnaphosids because of the piriform gland spigots that are similar in size to the major ampullate gland spigots, unlike that of the true gnaphosids that are much longer and wider than the major ampullate gland spigots (Azevedo *et al.* 2018).

Wheeler *et al.* (2017) included *Micaria* in a large molecular analysis of Araneae and found *Micaria* (and other gnaphosid terminals) spread in between several other gnaphosoid families, such as Trochanteriidae, Ammoxenidae and Lamponidae. These results agree with Azevedo *et al.*'s (2018) results and support the idea that *Micaria* are not true gnaphosids and may eventually be transferred from Gnaphosidae. A study done by

Breitling (2017) used publicly available DNA barcodes on the Barcode of Life Data Systems (BOLD Systems) to construct a phylogenetic tree of *Micaria*, confirming *Arboricaria* as a junior synonym of *Micaria*. His results also provided support for the species groups suggested by Platnick & Shadab (1988).

The aim of this chapter is to provide detailed descriptions Afro tropical *Micaria* species, as well as a dichotomous key to them. Illustrations in the form of line drawings, colour photographs and scanning electron microscope plates are included to illustrate various structures and habitus features of the Afro tropical *Micaria*.

## 2.2.) Materials and Methods

### 2.2.1.) Taxonomy

The specimens used for this study are deposited in several local and international collections, namely National Museum, Bloemfontein, South Africa (NMBA), National Collection of Arachnida at the Agricultural Research Council – Plant Health and Protection, Pretoria, South Africa (NCA), Iziko South African Museum, Cape Town, South Africa (SAMC), KwaZulu-Natal Museum, Pietermaritzburg, South Africa (NMSA), National Museum of Zimbabwe, Bulawayo, Zimbabwe (NMZA), California Academy of Sciences, San Francisco, USA (CAS), Royal Museum for Central Africa, Tervuren, Belgium (MRAC) and Zoological Museum, Berlin, Germany (ZMB). Specimens collected during fieldwork were deposited in the NCA. The material used for the DNA analyses were sourced from the NCA, CAS and MRAC depositories.

The material collected, and voucher specimens were identified and examined for descriptions using a Wild M3C dissection microscope with a Scott Mainz KL150B external light source. Specimens were identified to morphospecies level, where possible, based on the examination on general genitalic structure, colour patterns (where they were consistent), and eye pattern. The genitalia of the males and females were dissected, and in the case of females the genitalia were cleared using a pancreatin solution as described in Alvarez-Padilla & Hormiga (2008). Furthermore, measurements were made of the

somatic and genitalic structures using an eyepiece graticule attached to the stereomicroscope.

Photos were taken of well-preserved specimens of each species and sex, using a Nikon DS-L3 camera system that was mounted on a Nikon SMZ800 stereomicroscope. A series of photos were taken of the genitalia and habitus and stacked in CombineZM (Bercovici *et al.* 2009) software. Traces were made of the genitalia using CorelDraw X8®, on which ink line drawings were prepared. Further processing and genital plate compositions were done using Adobe Photoshop® 2019. All distribution maps were created using SimpleMappr (Shorthouse 2010) (available online at: <https://www.simplemappr.net>). Data collection was done via Microsoft Excel spreadsheets designed by Magalhaes (2019).

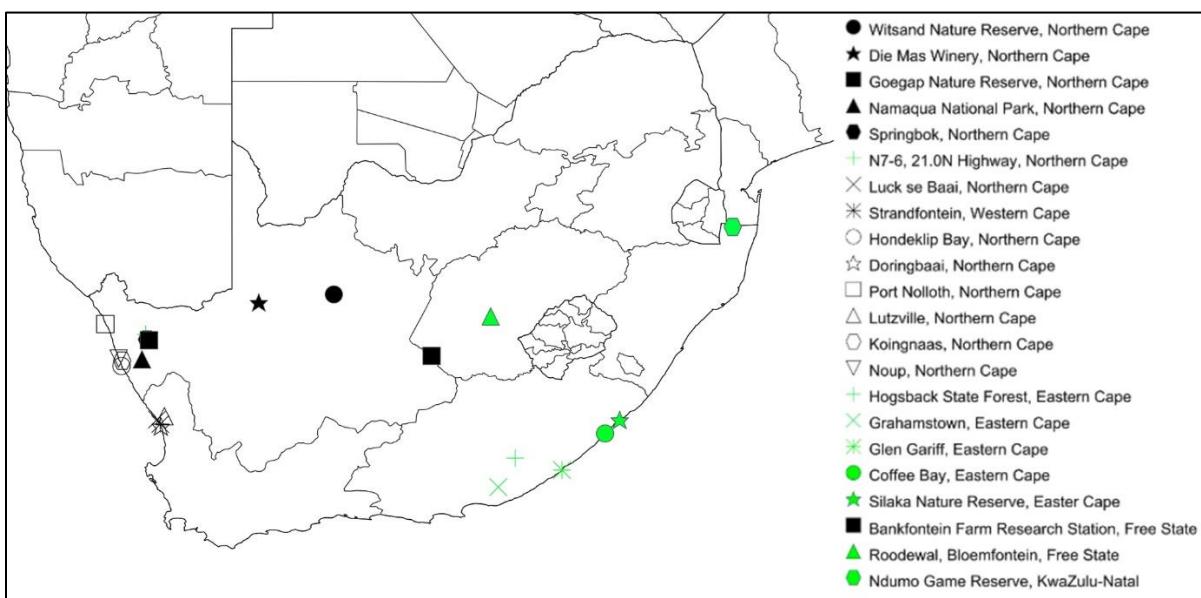
The following abbreviations are used regarding descriptions:

AL – abdomen length; ALE – anterior lateral eyes; AME – anterior median eyes; AW – abdomen width; CL – carapace length; CLH – clypeus height; CW – carapace width; MA – median apophysis; MOQ – median ocular quadrangle; MOQAW – MOQ anterior width; MOQL – MOQ length; MOQPW – MOQ posterior width; PLE – posterior lateral eyes; PME – posterior median eyes; SL – sternum length; SW – sternum width; do – dorsal; pl – prolateral; plv – prolateral ventral; rl – retrolateral; rlv – retrolateral ventral; RTA – retrolateral tibial apophysis; TL – Total length, vt – ventral terminal.

### 2.2.2.) Fieldwork

During July 2017, a field trip was arranged to sample *Micaria* specimens. Particular focus was placed on sampling fresh material of *M. chrysis* (Simon, 1910) and *M. tersissima* Simon, 1910 from the vicinity of their type localities, Port Nolloth and Komaggas in the Northern Cape, respectively (Marusik & Omelko 2017; Haddad & Marusik 2019). Collection sites during this trip included Witsand Nature Reserve, Die Mas Winery vineyard in Kakamas, Kakamas town, Goegap Nature Reserve, Namaqua National Park, Springbok town area, a random site next to the N7 highway (marked as N7-6 21.0N), Luck se Baai in the Northern Cape Province, and Strandfontein, Hondeklip Bay, Doringbaai, Lutzville, Koiingnaas, and Noup in the Western Cape (Fig. 1). Further

sampling took place during November and December 2017 in the Eastern Cape. Sampling sites in the Eastern Cape included Hogsback State Forest, Grahamstown area, Glen Gariff area, Coffee Bay area, and Silaka Nature Reserve (Fig. 1). In April 2018, another fieldtrip was organised to collect samples from Bankfontein Farm, near Luckhof in the western Free State. Furthermore, on field trips during November and December 2018, and January 2019, material was collected from Ndumo Game Reserve, KwaZulu-Natal (Fig. 1). Additional material was collected on a private farm in Roodewal, Bloemfontein, Free State (Fig. 1).



**Fig. 1.** A map showing the localities where fresh *Micaria* material were collected. Each shape (in legend) represents a separate locality.

### 2.3.) Genus **Micaria** Westring, 1851

*Micaria* Westring, 1851: 47; Westring 1861: 330; Wunderlich, 1980: 238; Platnick & Shadab, 1988: 6.

**Type species.** *Aranea fulgens* Walckenaer, 1802 by original designation.

#### *Diagnosis*

The genus *Micaria* can be distinguished from other Gnaphosidae genera by the following characteristics: their anterior lateral spinnerets (ALS) are shorter than other gnaphosids; they have iridescent colouration due to the unique structure of the squamose setae; the piriform gland spigots are small (Murphy 2007; Azevedo *et al.* 2018) and are basically invisible when retracted. They usually have an ant-like appearance, i.e. thin legs and sometimes constricted abdomen, most visible in males. The carapace and abdomen are decorated with squamose setae, sometimes sicate setae, and legs with feathery setae, aculeate setae and lanceolate setae. Their tarsi are pseudo-segmented, with two or four rows of scopulate setae ventrally.

#### *Description*

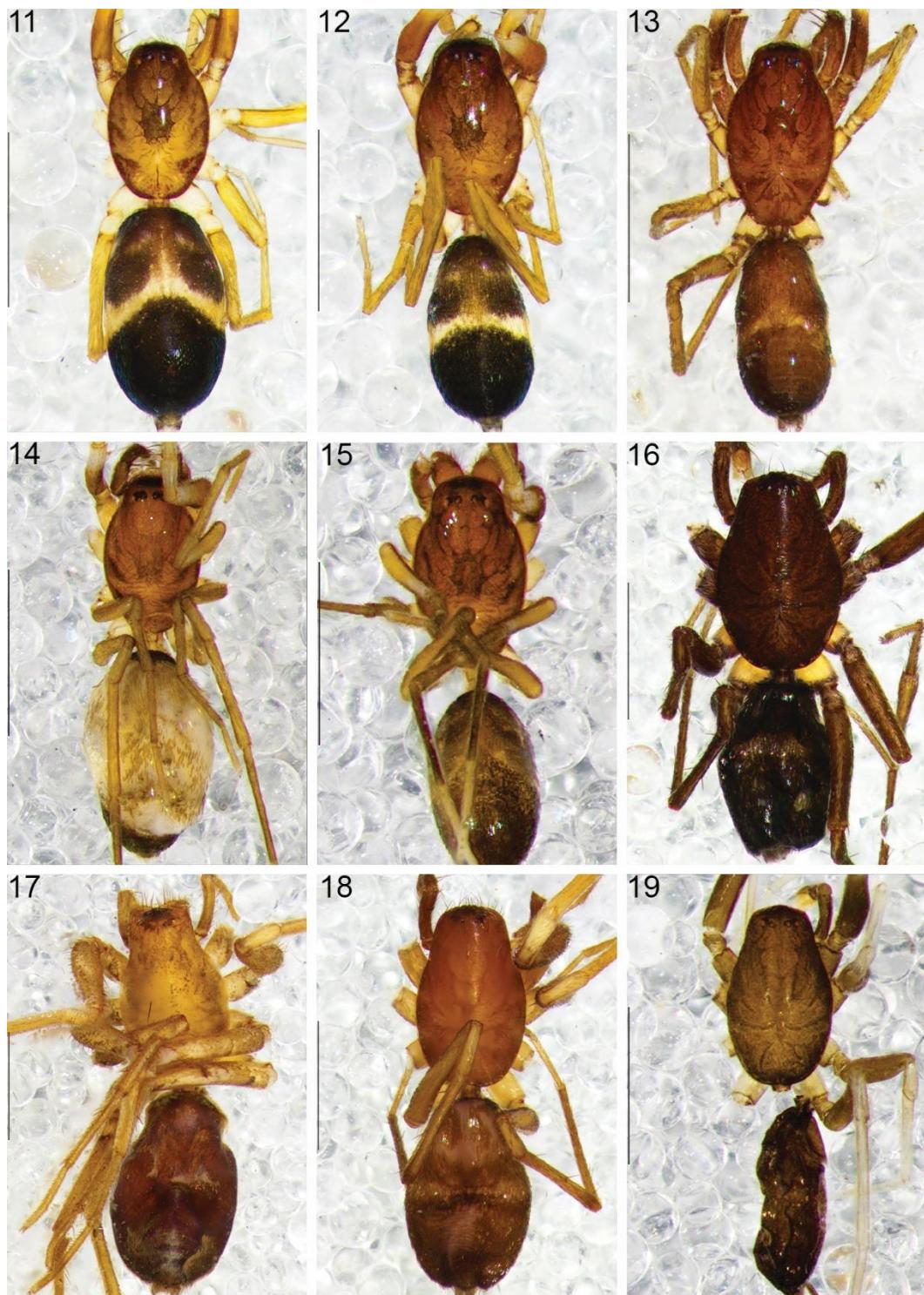
Small to medium sized spiders approximately 1.85 – 5 mm in length; carapace colour ranges from light gold to very dark brown or black (Figs 2–29), decorated with squamose setae responsible for their iridescence; dark striae radiate from middle of carapace towards coxae, sometimes with two white bands on posterior third of carapace that originate close to centre, extending towards postero-lateral margins; carapace smooth, decorated with squamose setae (Figs 30, 31) longer than broad, broadest between coxae I and II (Fig. 32); cephalic area slightly raised, forming “V”-shaped outline towards centre of carapace; posterior margin of carapace variable, either being straight, rounded or indented; fovea absent; 1-3 erect setae present between eye rows; AER usually recurved (Fig. 33), sometimes straight (anterior view); ALE slightly larger than AME; AME closer to ALE than to each other, interdistances between AME variable relative to AME diameter; PER usually procurved in larger species (Fig. 34), slightly recurved in smaller species

(Fig. 35); PME closer to PLE than to each other; MOQPW always wider than MOQAW, MOQL equal to or greater than MOQPW. Chelicerae smooth in texture (Fig. 36), decorated with short to long plumose setae (Figs 37, 38); paturon with two promarginal teeth and one retromarginal tooth (Fig. 39); endites obliquely slanted towards base of chelicerae (Fig. 40); serrula present (Fig. 41), slightly constricted medially, maxillar hair tufts distinct; labium subtriangular, rounded distally, decorated with few setae. Sternum shield-like, longer than broad, decorated with long straight, aculeate setae (Fig. 42) and/or squamose setae (Figs 43, 44, 45); anterior margin straight; widest between coxa I and II. Leg formula 4123, rarely 4312 or 1423; tarsal organ present on distal dorsal margin of tarsi (Fig. 46); slit sensilla present on distal ventral surface of metatarsus and retrolaterally on tarsi (Fig. 47); lyriform organs present (Figs 48-57) on retrolateral margin of patella (position variable); femur of leg I laterally flattened, slightly larger than others; preening comb absent; legs decorated with lanceolate (Figs 58-71), or feathery setae (Figs 72-78), chemosensory setae (Fig. 79), trichobothria (Fig. 80) and aculeate setae (Fig. 81). Scopulate setae on the tibia, metatarsus and tarsus (Figs 82, 83) Claw tuft setae present on tarsi (Fig. 84), claw teeth variable. Abdomen oval, usually dark brown to black; sometimes with median constriction (Fig. 85), more prominent in males; in such cases, anterior half of abdomen may be lighter in colour than posterior half; abdominal patterns variable; decorated with squamose setae (Fig. 86), scattered aculeate setae, occasionally sicate (Fig. 87) and elongate squamose setae on anterior half (Fig. 88); venter usually slightly lighter than dorsum, decorated with squamose setae. ALS similar in size to PLS, larger than PMS, with at least one major ampullate gland and one tartipore, males with no piriform gland spigots (Fig. 89) and females with one piriform gland spigot (Fig. 90); ALS with piriform gland spigots similar in size to major ampullate gland spigots, widened shaft, may be invisible when retracted; PMS short, with one major ampullate gland and at least three minor ampullate glands (Figs 91, 92); PLS with two cylindrical glands basally, and two major ampullate glands (Figs 93, 94). Epigyne weakly sclerotised; anterior hood variable, being either continuous (Fig. 95) or divided in two (Fig. 96); posterior pockets present, their positions variable; copulatory ducts variable, short or elongate, extending medially between spermathecae, originating from the copulatory openings and ending at base of spermathecae; fertilisation ducts short, originating at

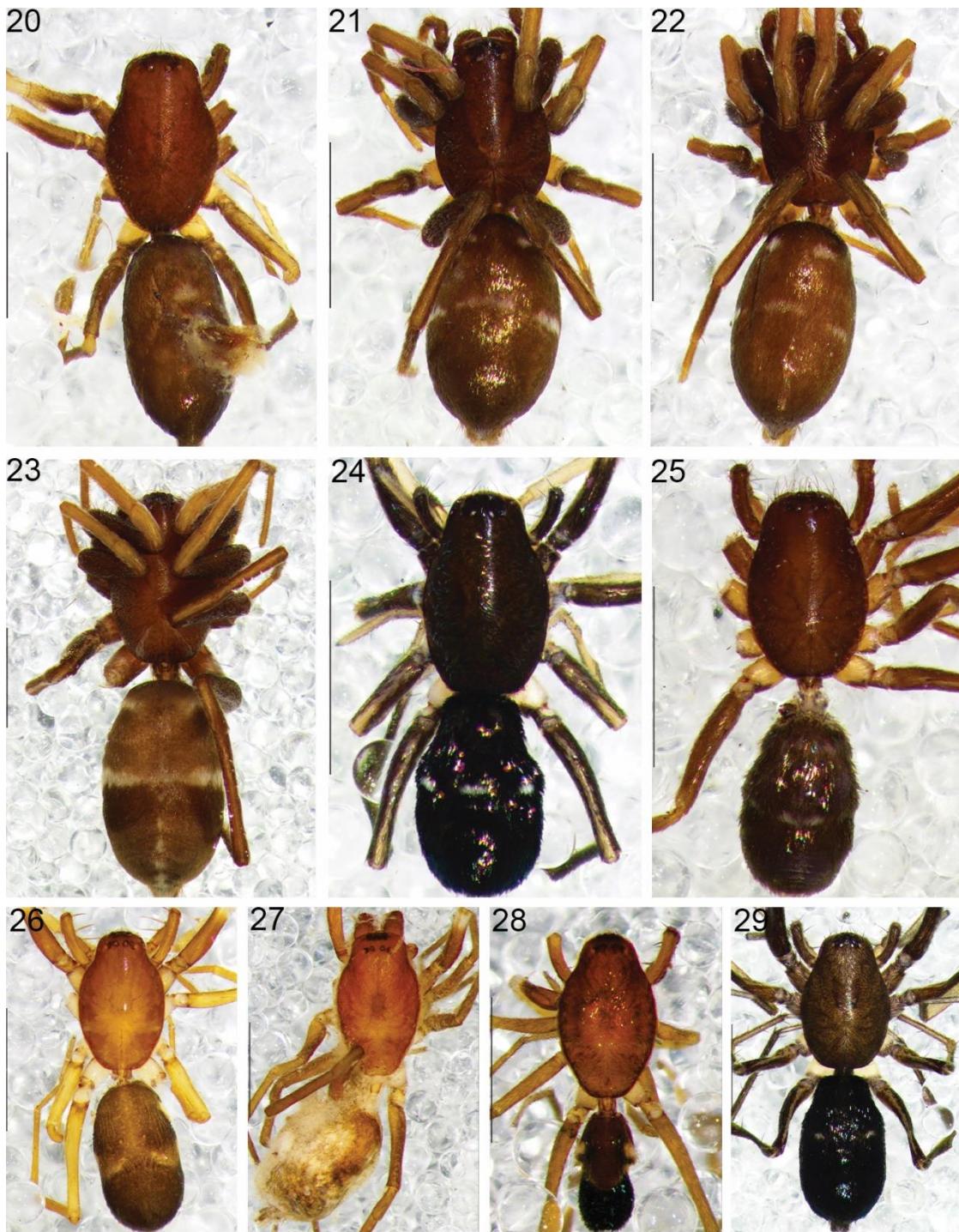
mesal margin of spermathecae, curved. Male palp with cylindrical tegulum; single median apophysis present, usually hook-shaped (Figs 97, 98); tegular apophysis absent; embolus generally originating prolaterally or medially behind apex of tegulum, curving distally and retrolaterally alongside distal tegular margin; embolus tip short, straight or curved, as long as or slightly longer than median apophysis. Single RTA usually present (Figs 99, 100), exceptions with non or two apophyses. Two small spines present on apex of cymbium (Fig. 101).



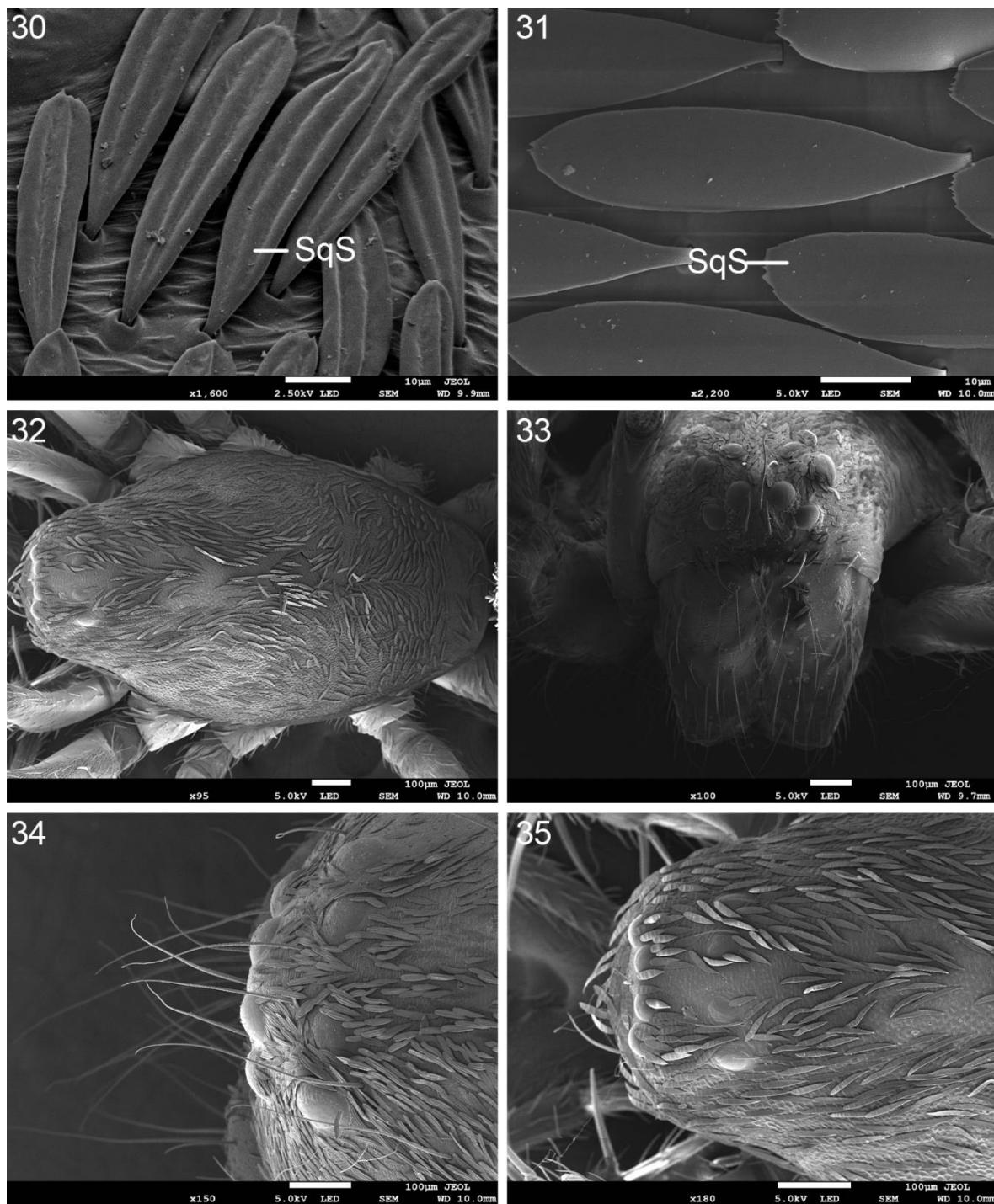
**Figs 2-10.** Stereomicroscope micrographs of the dorsal habitus of Afrotropical *Micaria* species: (2) *Micaria basaliducta* sp. nov. female, (3) male; (4) *M. beaufortia* (Tucker, 1923) female, (5) male; (6) *M. bimaculata* sp. nov. female, (7) male; (8) *M. bispicula* sp. nov. female, (9) male; and (10) *M. chrysis* (Simon, 1910) female. Scale: 1.0 mm.



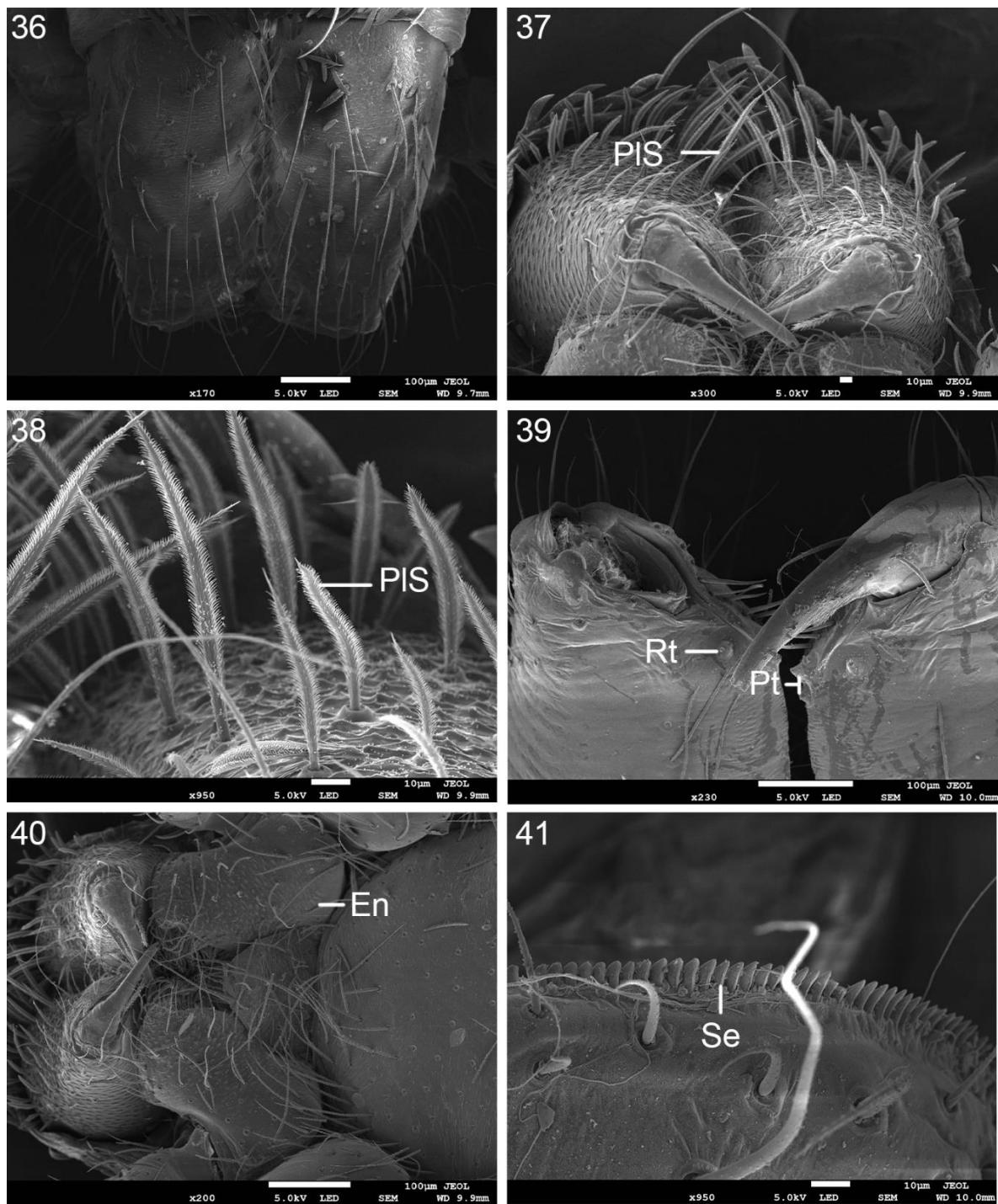
**Figs 11–19.** Stereomicroscope micrographs of the dorsal habitus of Afrotropical *Micaria* species: (11) *Micaria durbana* sp. nov. female, (12) male; (13) *M. felix* sp. nov. male; (14) *M. gagnoa* sp. nov. female, (15) male; (16) *M. koingnaas* sp. nov. male; (17) *M. latia* sp. nov. female; (18) *M. laxa* sp. nov. male; and (19) *M. medispina* sp. nov. male. Scale: 1.0 mm.



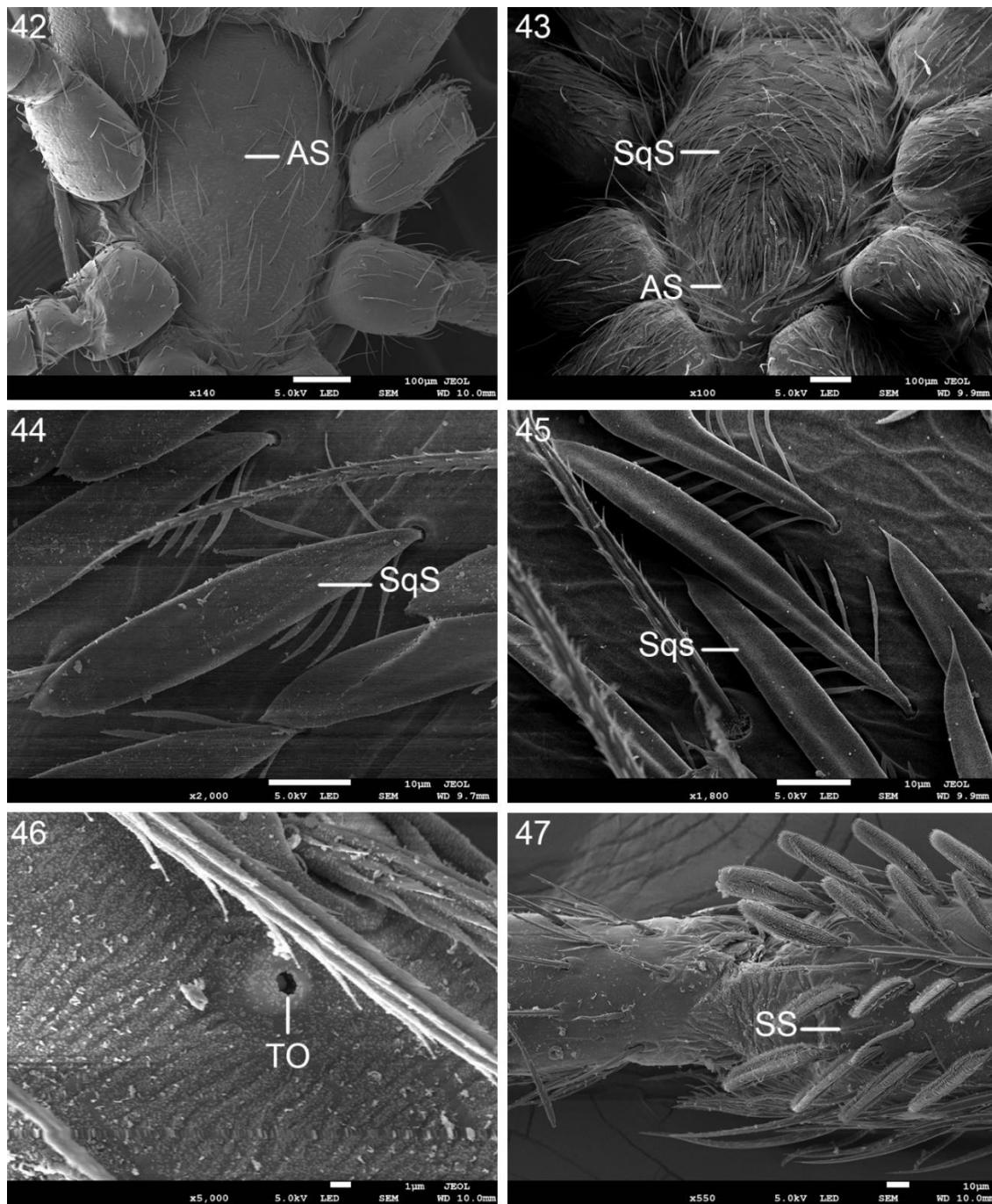
**Figs 20-29.** Stereomicroscope micrographs of the dorsal habitus of Afrotropical *Micaria* species: (20) *Micaria parvotibialis* sp. nov. male; (21) *M. plana* sp. nov. female, (22) male; (23) *M. quadrata* sp. nov. female; (24) *M. quinquemaculosa* sp. nov., female, (25) male; (26) *M. rivotosy* sp. nov. female; (27) *M. salta* sp. nov. male; (28) *M. scutellata* sp. nov. male; and (29) *M. tersissima* Simon, 1910 male. Scale: 1.0 mm.



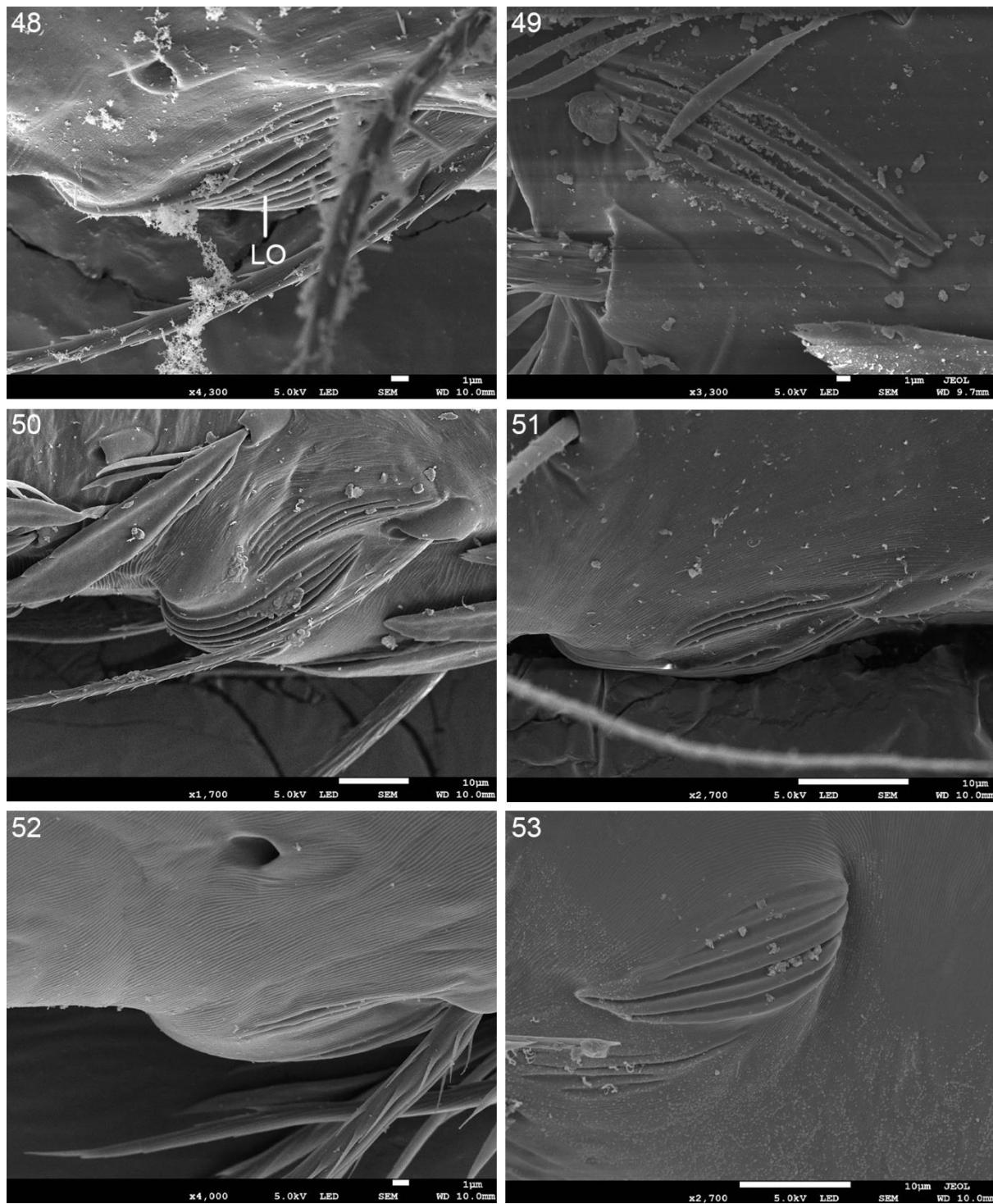
**Figs 30-35.** Scanning electron micrographs of *Micaria* carapace features: (30) *M. beaufortia* (Tucker, 1923) male squamose setae on carapace; (31) *M. felix* sp. nov. male squamose setae on carapace; (32) *M. felix* sp. nov. female carapace; (33) *M. beaufortia* female anterior view of eye region; (34) *M. beaufortia* male dorsal view of eye region; (35) *M. felix* sp. nov. dorsal view of eye region. Abbreviations: SqS—squamose setae.



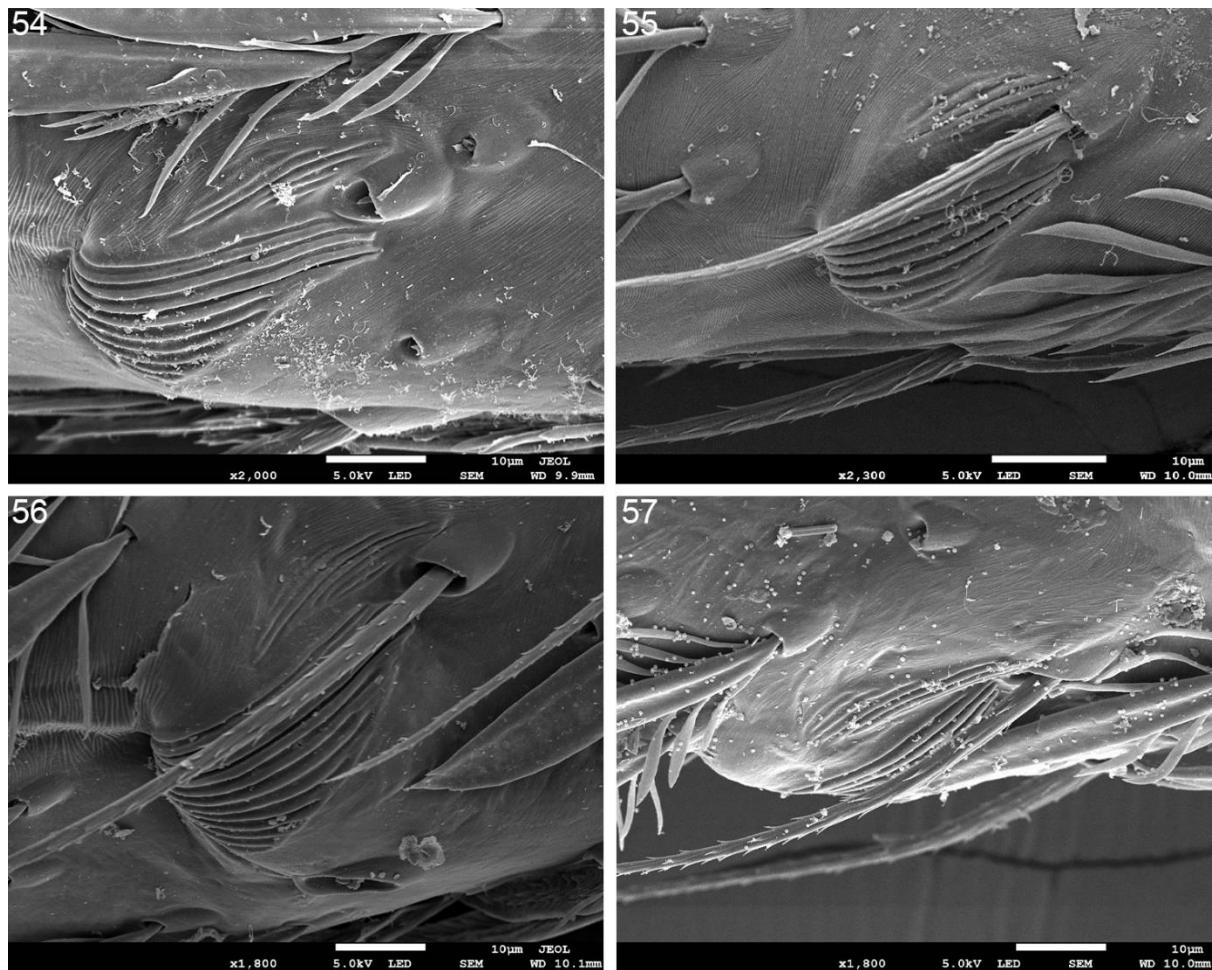
**Figs 36-41.** Scanning electron micrographs of cheliceral and endite features: (36) *M. beaufortia* (Tucker, 1923) female chelicerae (anterior view); (37) *M. felix* sp. nov. female chelicerae (ventral view); (38) plumose setae on chelicerae of female *M. felix* sp. nov.; (39) cheliceral teeth of *M. beaufortia* male; (40) endites of female *M. felix* sp. nov.; (41) serrula of male *M. beaufortia*. Abbreviations: En – endite, PIS – plumose setae, Pt – promarginal tooth, Rt – retromarginal tooth, Se – serrula.



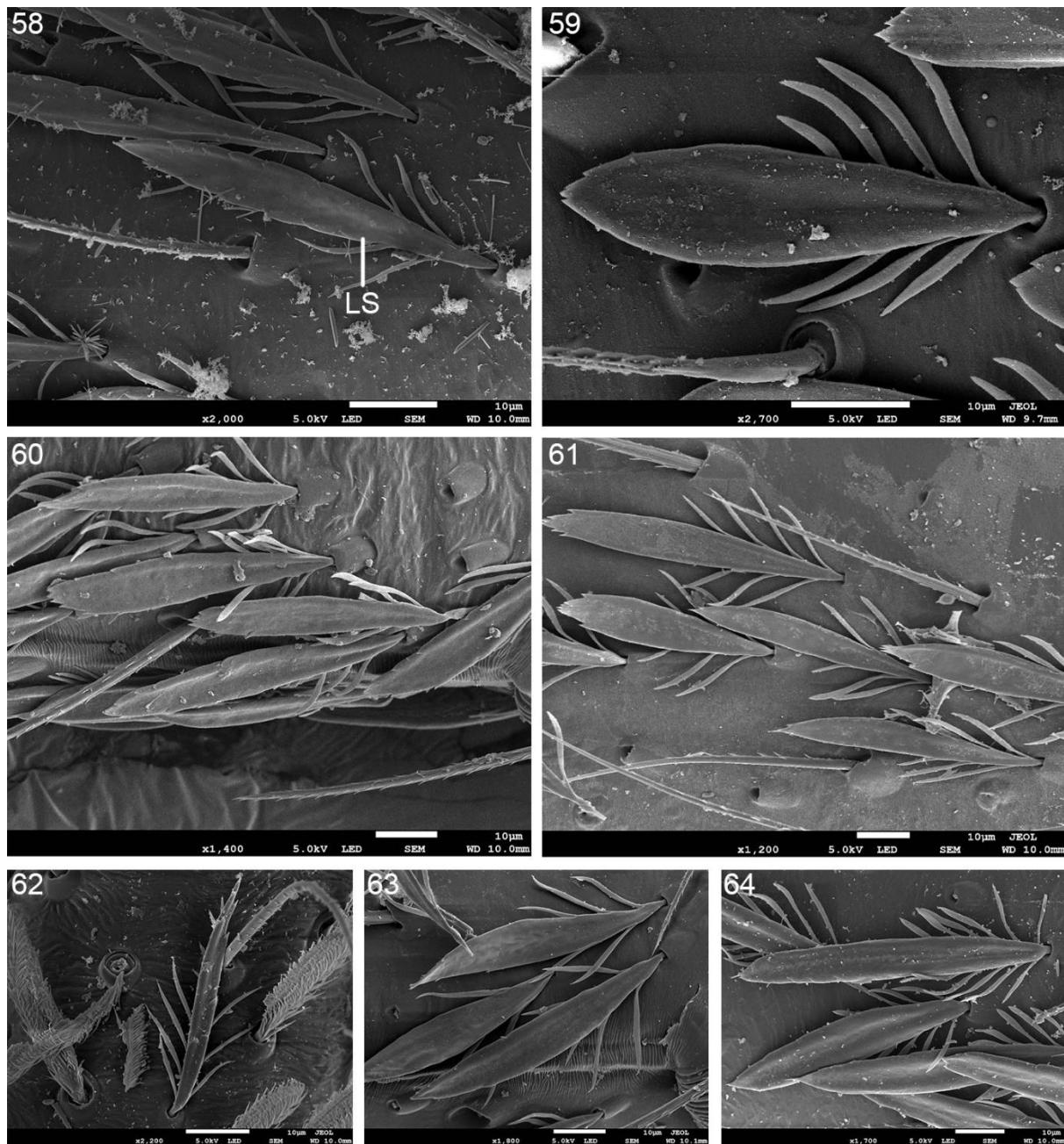
**Figs 42-47.** Scanning electron micrographs of *Micaria* sternum and leg features: (42) sternum of male *M. felix* sp. nov.; (43) sternum of female *M. beaufortia* (Tucker, 1923); (44) sternum squamose setae of male *M. beaufortia*; (45) sternum squamose setae of female *M. beaufortia*; (46) tarsal organ on distal dorsal surface of tarsus I of male *M. felix* sp. nov.; (47) slit sensilla on distal ventral surface of metatarsus I of female *M. fulgens* (Walckenaer, 1802). Abbreviations: AS – aculeate setae, SS – slit sensilla, SqS – squamose setae, TO – tarsal organ.



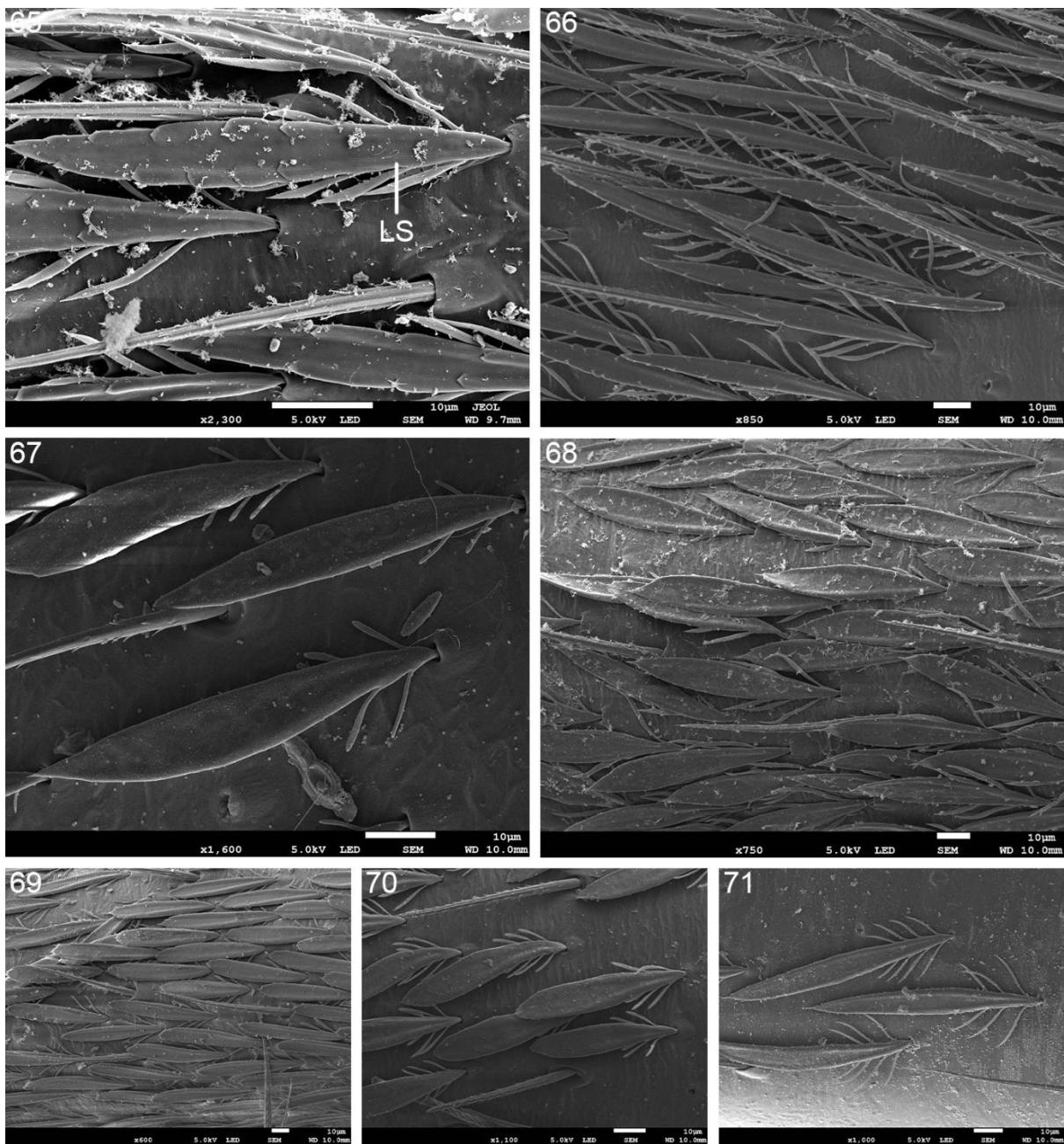
**Figs 47-52.** Scanning electron micrographs of the lyriform organs of *Micaria*: (48) *M. basaliducta* sp. nov. male patella I; (49) *M. beaufortia* (Tucker, 1923) female tarsus I; (50) *M. bispicula* sp. nov. patella I; (51) *M. chrysis* male patella I; (52) *M. durbana* sp. nov. female patella IV; (53) *M. felix* sp. nov. palpal patella. Abbreviations: LO - lyriform organ.



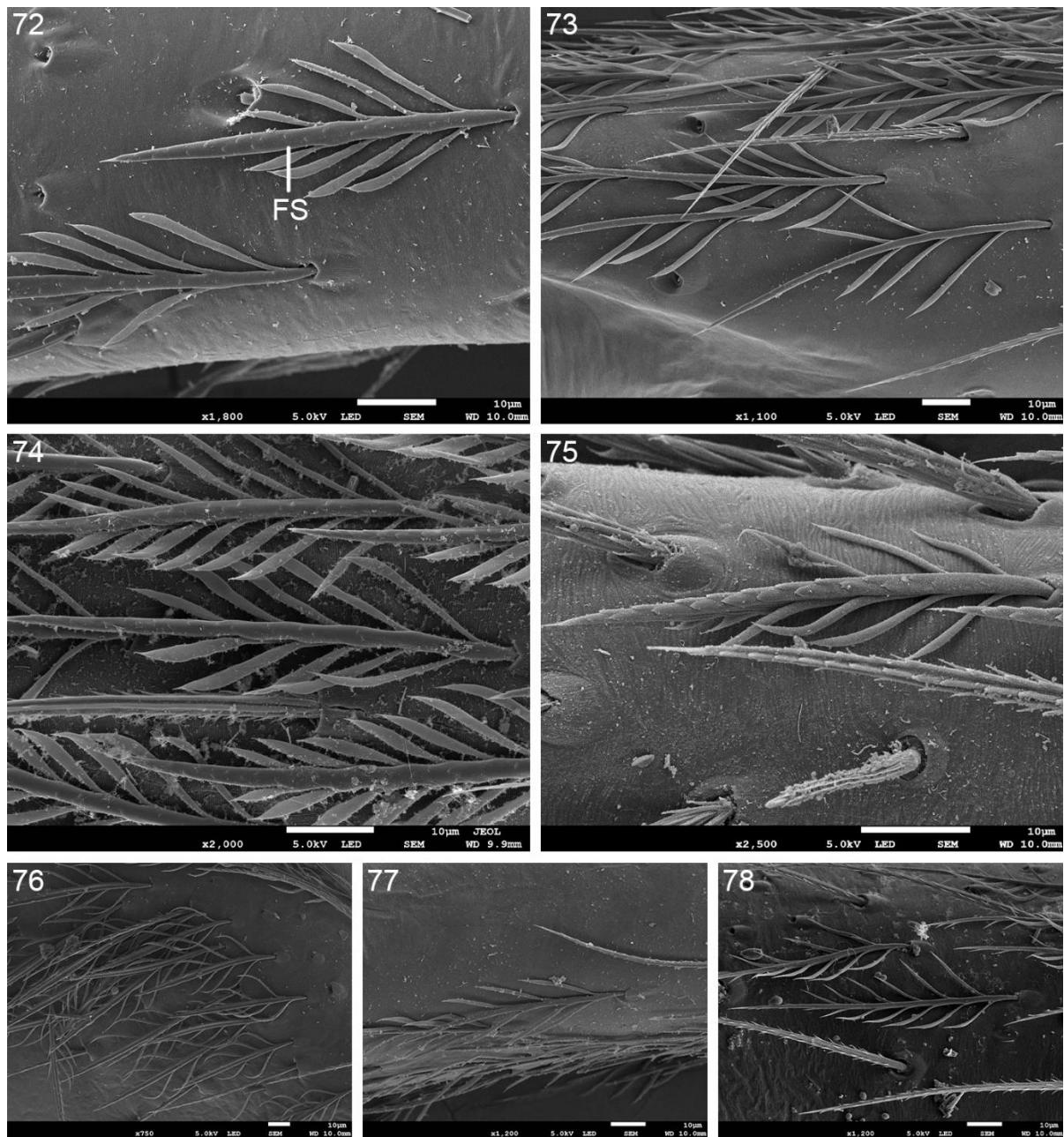
**Figs 54-57.** Scanning electron micrographs of the lyriform organs of *Micaria*: (54) *M. koingnaas* sp. nov. male patella I; (55) *M. scutellata* sp. nov. male patella IV; (56) *M. plana* sp. nov. male patella I; (57) *M. quadrata* sp. nov. female patella I.



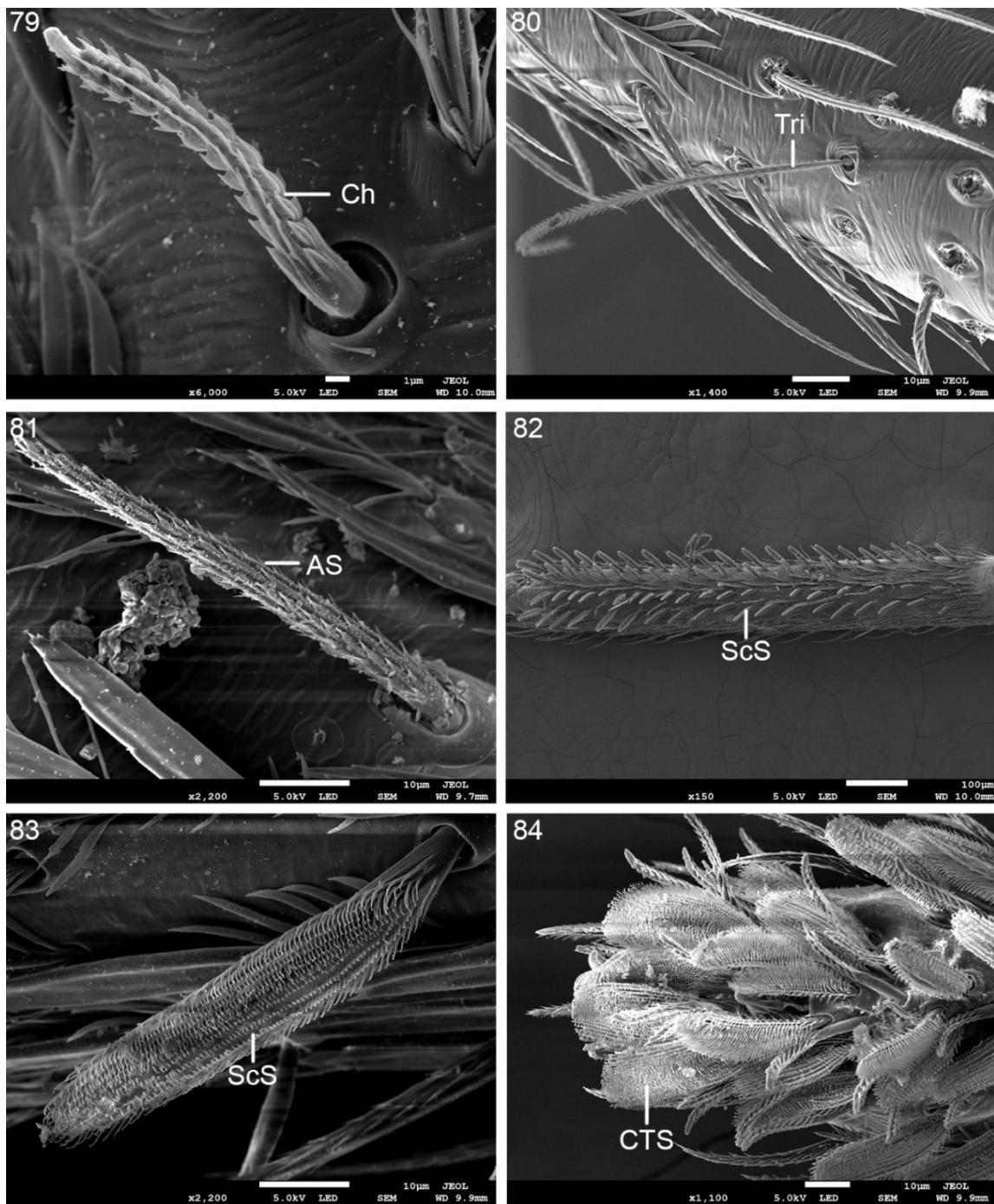
**Figs 58-64.** Scanning electron micrographs of the lanceolate setae of *Micaria*: (58) *M. basaliducta* sp. nov. male patella I; (59) *M. beaufortia* (Tucker, 1923) male palpal tibia; (60) *M. bispicula* sp. nov. male patella I; (61) *M. koingnaas* sp. nov. male femur I; (62) *M. parvotibialis* sp. nov. male tarsus IV; (63) *M. plana* sp. nov. male patella I; (64) *M. quadrata* sp. nov. female femur IV. Abbreviations: LS – lanceolate setae.



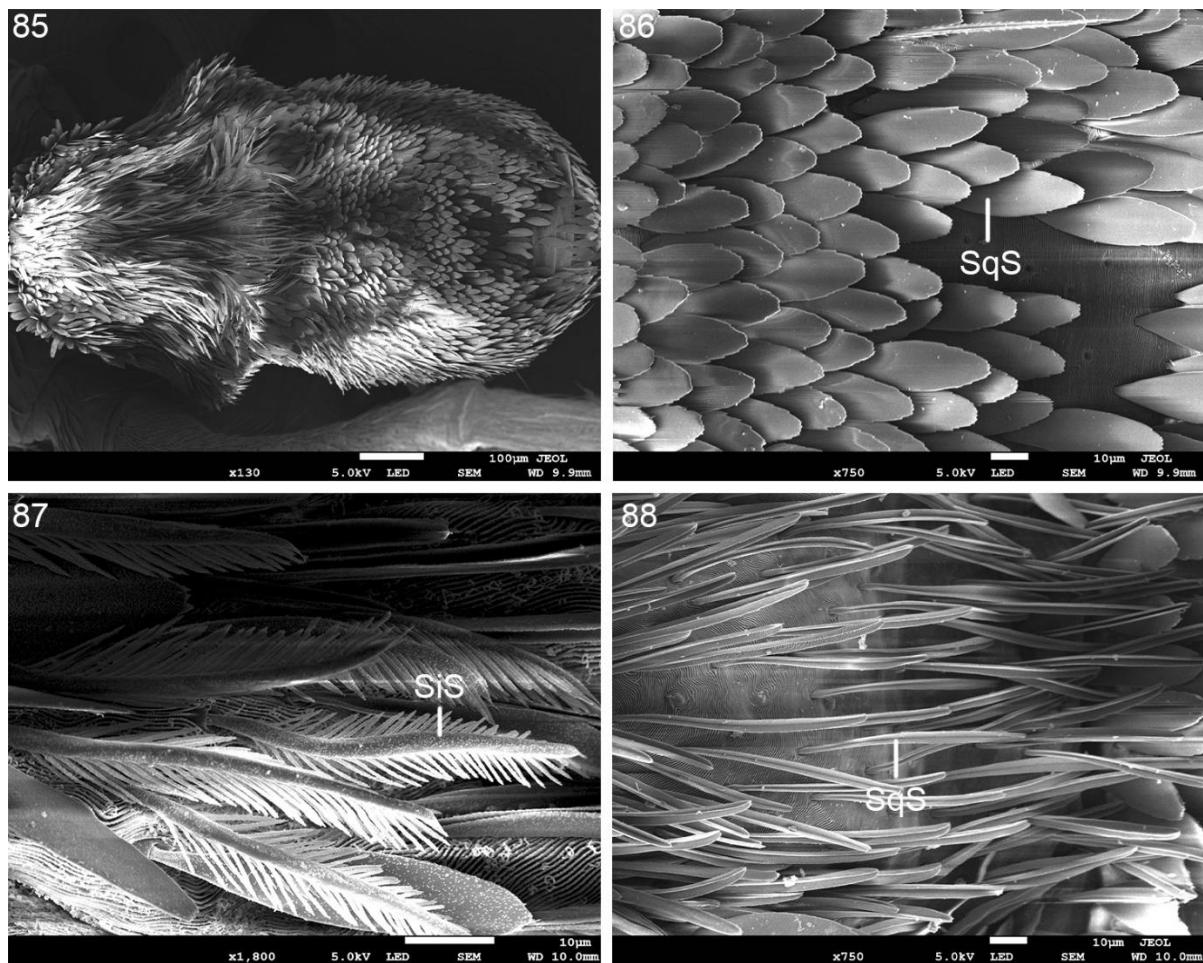
**Figs 65-71.** Scanning electron micrographs of lanceolate of *Micaria*: (65) *M. quinquemaculosa* sp. nov. male tarsus IV, (66) *M. constricta* Emerton, 1894 male patella IV; (67) *M. formicaria* (Sundevall, 1831) female femur I; (68) *M. fulgens* female femur IV; (69) *M. rossica* Thorell, 1875 female femur IV; (70) *M. sociabilis* Kulczyński, 1897 female femur I; (71) *M. coarctata* (Lucas, 1846) female femur IV. Abbreviations: LS – lanceolate setae.



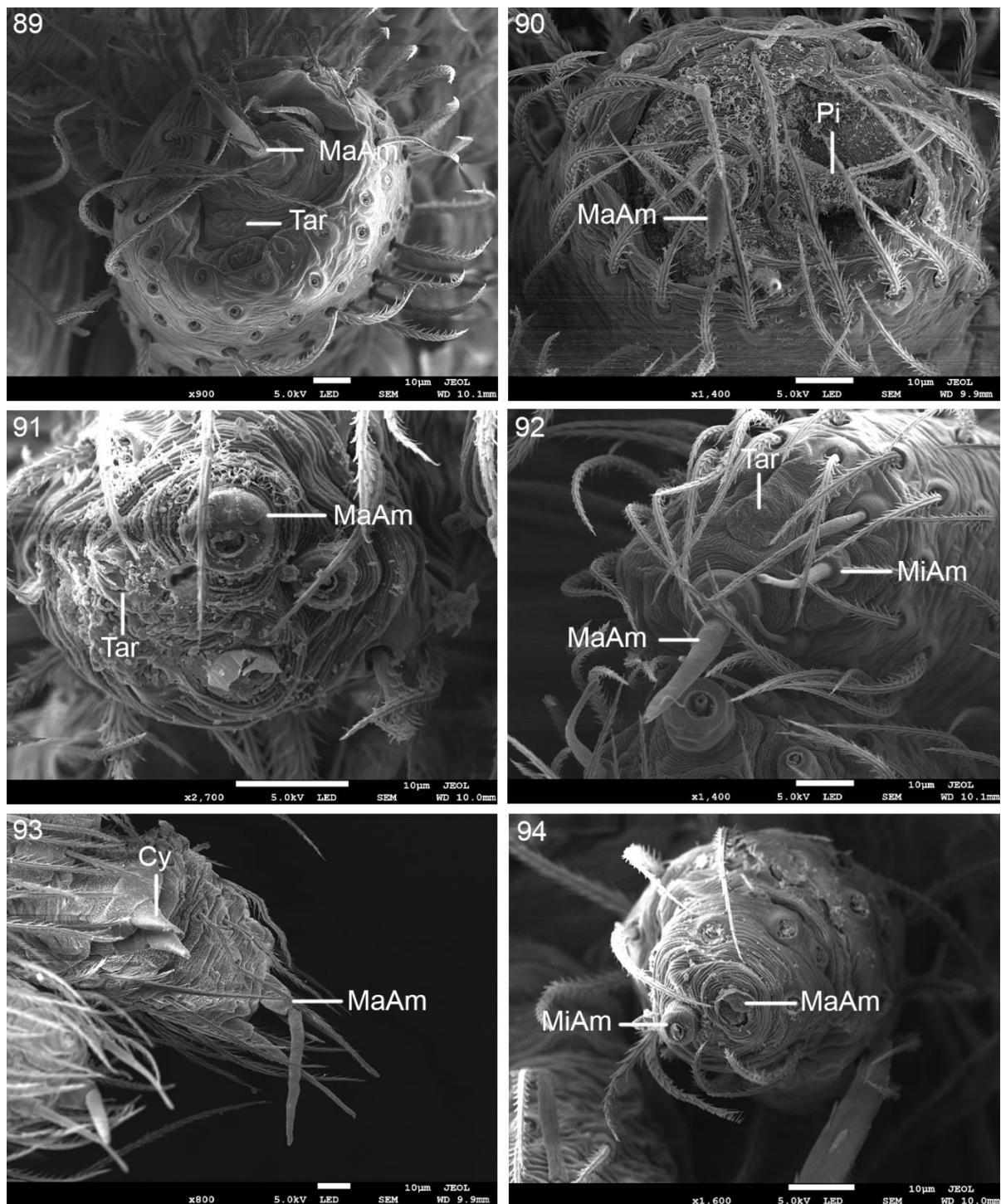
**Figs 72-78.** Scanning electron micrographs of the feathery setae of *Micaria*: (72) *M. chrysis* (Simon, 1910) male femur IV; (73) *M. durbana* sp. nov. female femur IV; (74) *M. felix* sp. nov. female tibia IV; (75) *M. scutellata* sp. nov. male tarsus I; (76) *M. subopaca* Westring, 1861 female femur I; (77) *M. dives* (Lucas, 1846) female femur IV; (78) *M. pulicaria* (Sundevall, 1831) female femur I. Abbreviations: FS – feathery setae.



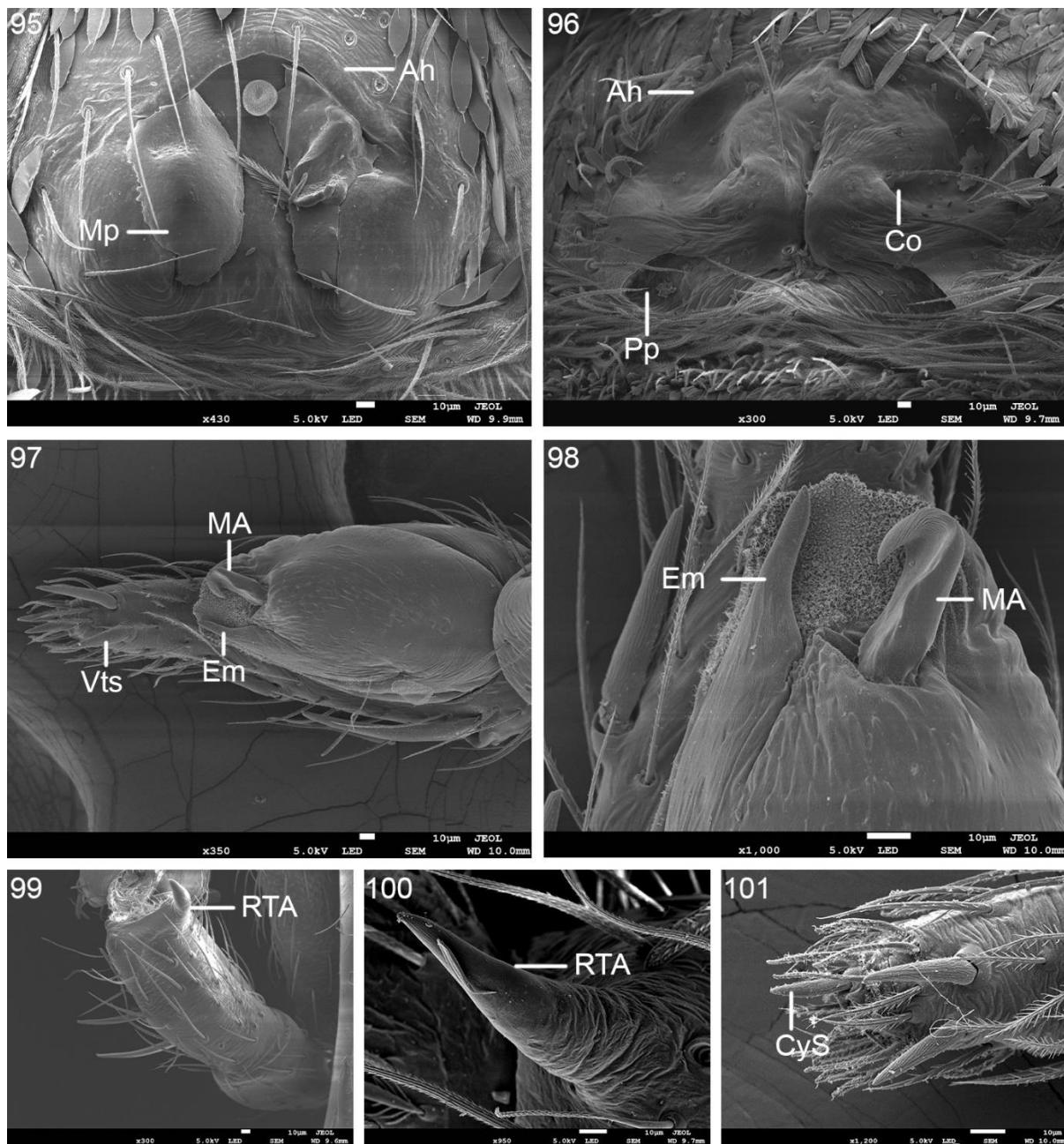
**Figs 79-84.** Scanning electron micrographs of leg setae of *Micaria*: (79) scopulate chemosensory setae on tarsus I of female *M. felix* sp. nov.; (80) trichobothrium on dorsal metatarsus I of female *M. felix* sp. nov.; (81) aculeate seta on femur I of male *M. beaufortia* (Tucker, 1923); (82) scopulate setae on metatarsus I of female *M. fulgens* (Walckenaer, 1802); (83) scopulate seta on tibia I of female *M. beaufortia*; (84) claw tuft setae on tarsus I of female *M. beaufortia*. Abbreviations: AS – aculeate setae, Ch – chemosensory setae, CTS – claw tuft setae, ScS – scopulate setae, Tri – trichobothrium.



**Figs 85-88.** Scanning electron micrographs of the abdominal setae of *Micaria*: (85) dorsal abdomen of female *M. felix* sp. nov.; (86) squamose setae on dorsal abdomen (posterior half) of female *M. felix* sp. nov.; (87) sicate setae on dorsal abdomen (anterior half) of male *M. scutellata* sp. nov.; (88) elongate squamose setae on dorsal abdomen (anterior half) of female *M. felix* sp. nov. Abbreviations: SiS – sicate setae, SqS – squamose setae.



**Figs 89-94.** Scanning electron micrographs of the spinnerets of *Micaria*: (89) ALS of male *M. beaufortia* (Tucker, 1923); (90) ALS of female *M. felix* sp. nov.; (91) PMS of male *M. felix* sp. nov.; (92) PMS of male *M. beaufortia*; (93) PLS of female *M. beaufortia*; (94) PLS of male *M. felix* sp. nov. Abbreviations: Cy – cylindrical gland spigot, MaAm – major ampullate gland spigot, MiAm – minor ampullate gland spigot, Pi – piriform gland spigot, Tar – tartipore.



**Figs 95-101.** Scanning electron micrographs of the genitalic structure of *Micaria*: (95) epigyne of *M. felix* sp. nov.; (96) epigyne of *M. beaufortia* (Tucker, 1923); (97) left palp of male *M. felix* sp. nov.; (98) left palp of male *M. felix* sp. nov.; (99) palpal tibia of male *M. felix* sp. nov.; (100) RTA of male *M. beaufortia*; (101) ventral cymbial tip of male *M. scutellata* sp. nov. Abbreviations: Ah – anterior hood, Co – copulatory opening, CyS – cymbial spine, Em – embolus, MA – median apophysis, Mp – mating plug, Pp – posterior pockets, RTA – retrolateral tibial apophysis, Vts – ventral terminal spine.

2.4.) Key to the *Micaria* species of the African part of the Afrotropical Region:

1.) Males.....	2
- Females.....	18
2.) Retrolateral tibial apophysis (RTA) absent (Figs 149, 155, 168, 180).....	3
- One or more RTAs present (e.g. Figs 105, 110, 120, 152, 180).....	5
3.) Palpal tibia more than 0.5 times cymbium length.....	4
- Palpal tibia less than 0.5 times cymbium length (Figs 154, 155).....	5
4.) Embolus curving retrolaterally; two ventral terminal spines confined to prolateral half of the cymbium; sperm duct curves as early as basal center of tegulum (Fig. 154).....	<i>M. parvotibialis</i> sp. nov.
- Embolus straight with only tip slightly tapered; sperm duct makes a $\frac{3}{4}$ circle following tegular ridge before ending at embolus base; two ventral terminal spines widely separated (Fig. 167).....	<i>M. quinquemaculosa</i> sp. nov.
5.) Embolus broad at its base, leaf-like, tapered to a short tip; median apophysis broad and facing ventrally; three ventral terminal spines in a transverse row with the middle spine lower than the lateral spines (Fig. 148).....	<i>M. laxa</i> sp. nov.
- Embolus thin and elongate, curving inwards towards the center; median apophysis thin, curving sharply inwards and downwards; characteristic “kink” in the lower retrolateral section of the sperm duct; three ventral terminal spines in a straight transverse row above the embolus (Fig. 179).....	<i>M. tersissima</i> Simon, 1910
6.) Two RTA's present (Fig. 120).....	<i>M. bispicula</i> sp. nov.
- One RTA present on palpal tibia.....	7
7.) RTA located on the apical ridge of the palpal tibia.....	10
- RTA located sub-apically (Figs 115, 143, 152).....	8
8.) RTA located at least midway on the palpal tibia (Fig. 152) . <i>M. medispina</i> sp. nov.	
- RTA located sub apically, no more than twice its length away from the apex.....	9
9.) Embolus large and curved laterally inwards with the tip almost perpendicular to the base; median apophysis large, broadest at base and small bent tip; three ventral terminal spines above embolus with retrolateral spine higher up than the rest; both	

- sexes with two large white spots on the abdomen (Figs 6, 7, 114, 115)..... *M. bimaculata* sp. nov.
- Embolus moderate in size with sharp elongate tip slanting inwards; median apophysis similar in size to embolus and thin; two ventral terminal spines above the embolus (Figs 142, 143)..... *M. koingnaas* sp. nov.
- 10.) RTA located on the dorsal margin of the palpal tibia..... 11
- RTA located on the retrolateral margin of the palpal tibia..... 12
- 11.) Median apophysis large and located centrally on the tegulum and slightly prolaterally; embolus elongate straight and slanting inwards; three ventral terminal spines present with two above the embolus and one small one retrolaterally; RTA small (Fig. 3, 104, 105)..... *M. basaliducta* sp. nov.
- Median apophysis located above the center towards the retrolateral margin of the tegulum, sharply curved inwards; embolus curved inwards, short with broadened base; two ventral terminal spines located above the embolus (Figs 5, 109, 110)..... *M. beaufortia* (Tucker, 1923)
- 12.) Tibia I with no ventral spines; embolus with short tip; median apophysis large; sperm duct with basal loop below the embolus (Figs 22, 157, 158)..... *M. plana* sp. nov.
- Tibia I with two prolateral ventral and two retrolateral ventral spines..... 13
- 13.) Basal loop of the sperm duct with a smaller and sharper bend, usually extending into the middle of the tegulum (Fig. 173)..... 14
- Basal loop of the sperm duct with a large bend, rather extending more or less straight up after the midpoint of the tegulum (Fig. 134)..... 15
- 14.) Median apophysis located off-centre retrolaterally; embolus with broad base and thin tip slanting towards the middle of the tegulum (Figs 27, 173, 174)..... *M. salta* sp. nov.
- Median apophysis large, thin and curved inwards, located centrally towards the apical margin of the tegulum; embolus elongate with moderately broad base, tip only slightly slanting inwards (Figs. 13, 134)..... *M. felix* sp. nov.
- 15.) Abdomen uniform in colour and with two small white spots close to the anterior margin (Fig. 9); embolus straight with a thin short tip; sperm duct ending

- in a slight curved tube; dark brown to black in colour (Figs 10, 123)..... *M. chrysia* (Simon, 1910)
- Abdomen divided into two parts by a median transverse constriction (usually light in colour) with anterior half sometimes lighter than the posterior half (Figs 11, 12)..... 16
- 16.) Scutum broad (in males only), covering most of the anterior half of the abdomen; embolus curved at tip (Figs 28, 176, 177)..... *M. scutellata* sp. nov.
- Scutum thin, only 1/3 the width of the abdomen..... 17
- 17.) Median apophysis thick (ventral view); sperm duct ending in a elongate open curve below the embolus; embolus with short tip; retrolateral spine on the cymbium present at the height of the tip of the embolus; light brown to yellow in colour (Fig. 12)..... *M. durbana* sp. nov.
- Median apophysis thin (ventral view); sperm duct ending in a short sharply curved tube well below the embolus base; embolus tip elongate; retrolateral spine on the cymbium present at the base of the embolus; brown to dark brown in colour (Figs 15, 139, 140)..... *M. gagnoa* sp. nov.
- 18.) Anterior hood of the epigyne divided into two parts (Figs 102, 103, 107, 108, 112, 113, 145, 146, 157, 158, 162, 163, 165)..... 19
- Anterior hood of the epigyne continuous (Figs 117, 118, 122, 123, 127, 128, 132, 133, 137, 138, 170, 171)..... 24
- 19.) Copulatory ducts with a short, secondary duct below the midpoint of the duct; copulatory ducts elongate and aligned parallel to each other up to the height of the anterior hood (Figs 2, 102, 103)..... *M. basaliducta* sp. nov.
- Copulatory ducts without any secondary ducts; other characters variable..... 20
- 20.) Copulatory ducts flattened right above the spermathecae and extending laterally to a tapered tip close to the spermathecae; anterior hood close the copulatory ducts; posterior pockets located centrally as two vertical sclerites (Figs 21, 157, 158)..... *M. plana* sp. nov.
- Copulatory ducts not tapered..... 21
- 21.) Anterior hood widely separated (Figs 112, 113, 162, 163)..... 23

- Anterior hood close to each other, separated by no more than half the length of one segment (Figs 102, 103, 107, 108, 145, 146, 157, 158, 165, 166).....22
- 22.) Copulatory ducts bifurcated and closely bent backwards over itself with apices not extending past the interior margin of the spermathecae; anterior hood almost touching in the middle (17, 145, 146)..... *M. latia* sp. nov.
- Copulatory ducts without any bifurcation and separated from the spermathecae; five spots present on the abdomen, three medially and 2 (may sometimes fade) anteriorly (Figs 25, 165, 166) ..... *M. quinquemaculosa* sp. nov.
- 23.) Posterior pockets located basal to the spermatheca as elongate laterally expanding structures with a inwards curve on the outer lateral ends; abdomen with a median white stripe and a white (sometimes dotted) longitudinal stripe from the median stripe towards the spinnerets (Figs 3, 4); anterior hoods curved (Figs 4, 107, 108)..... *M. beaufortia* (Tucker, 1923)
- Anterior hood elongated, curving around the copulatory openings; copulatory ducts square shaped posterior pockets elongate L-shaped and extends up to the copulatory openings (Figs 23, 162, 163)..... *M. quadrata* sp. nov.
- 24.) Anterior hood “wave-like” with middle section procurved and lateral section recurved; copulatory ducts short and thick with bifurcating apices (Figs 8, 117, 118)..... *M. bispicula* sp. nov.
- Anterior hood entirely recurved; copulatory ducts elongate.....25
- 25.) Abdomen with two small white spots anteriorly; black to dark brown in colour; moderately sized atrium, curved anterior hood that is slightly flattened in the middle, posterior pockets present centrally on the epigyne as two longitudinal sclerites (Fig. 10, 122, 123)..... *M. chrysis* (Simons, 1910)
- Abdomen pattern variable; anterior hood otherwise.....26
- 26.) Anterior hood strongly curved (Figs 122, 123, 132, 133, 137, 138).....27
- Anterior hood flattened, with only the tips curving slightly (Figs 127, 128, 170, 171).....28
- 27.) Atrium large; anterior hood elongate; spermathecae wider than they are high (Figs 14, 137, 138)..... *M. gagnoa* sp. nov.

- Atrium normal; anterior hood short; spermathecae higher than they are wide (Figs 132, 133)..... *M. felix* sp. nov.
- 28.) Anterior hood broad and elongate, extending well past the copulatory openings, close to the spermathecae; brown in colour (Figs 26, 170, 171)..... *M. rivenosy* sp. nov.
- Anterior hood normal, not extending a great distance past the copulatory openings; tips of the anterior hood curved sharply downwards; yellow to light brown in colour (Figs 11, 127, 128)..... *M. durbana* sp. nov.

## 2.5.) Taxonomy

### 2.5.1.) *Micaria basaliducta* sp. nov. (Figs 2-3, 48, 58, 102-105)

#### *Material examined*

Holotype ♀ together with 3 ♂ paratypes: SOUTH AFRICA. Western Cape: Beaufort West, Farm Eerste Water, Karoo, Area 2, Site 2, pitfall traps, 32°40.26'S; 22°56.1'E, leg. D.H. Jacobs, 6.XII.2007 (NCA 2008/4704).

Paratypes: SOUTH AFRICA. Western Cape: Beaufort West, Farm Kraanvogelfontein, Karoo, Area 2, Site 3, 32°32.4'S; 22°59.04'E, leg. D.H. Jacobs, 9.XII.2007, 4 ♂ (NCA 2008/4755).

#### *Etymology*

The species name is a combination of the Latin words *basali* (basal) and *ductus* (ducts), referring to the basal accessory glands on the copulatory ducts of the female.

#### *Diagnosis*

Females of this species can be distinguished from other Afrotropical *Micaria* in possessing a basal accessory gland on the copulatory duct close to the spermathecae. The copulatory duct is also elongate and extends above the anterior hood, with a curved

apex (Figs 102, 103). Similar species like *M. beaufortia* lack the secondary accessory glands and have a widely separated anterior hood. The males can be distinguished by having a large and ventrally facing median apophysis below the embolus, just off-centre on the tegulum. The embolus is also large and slanting inwards below four ventral terminal spines on the cymbium (Fig. 104).

*Female*

Female holotype from Farm Eerste Water, Beaufort West (NCA 2008/4704).

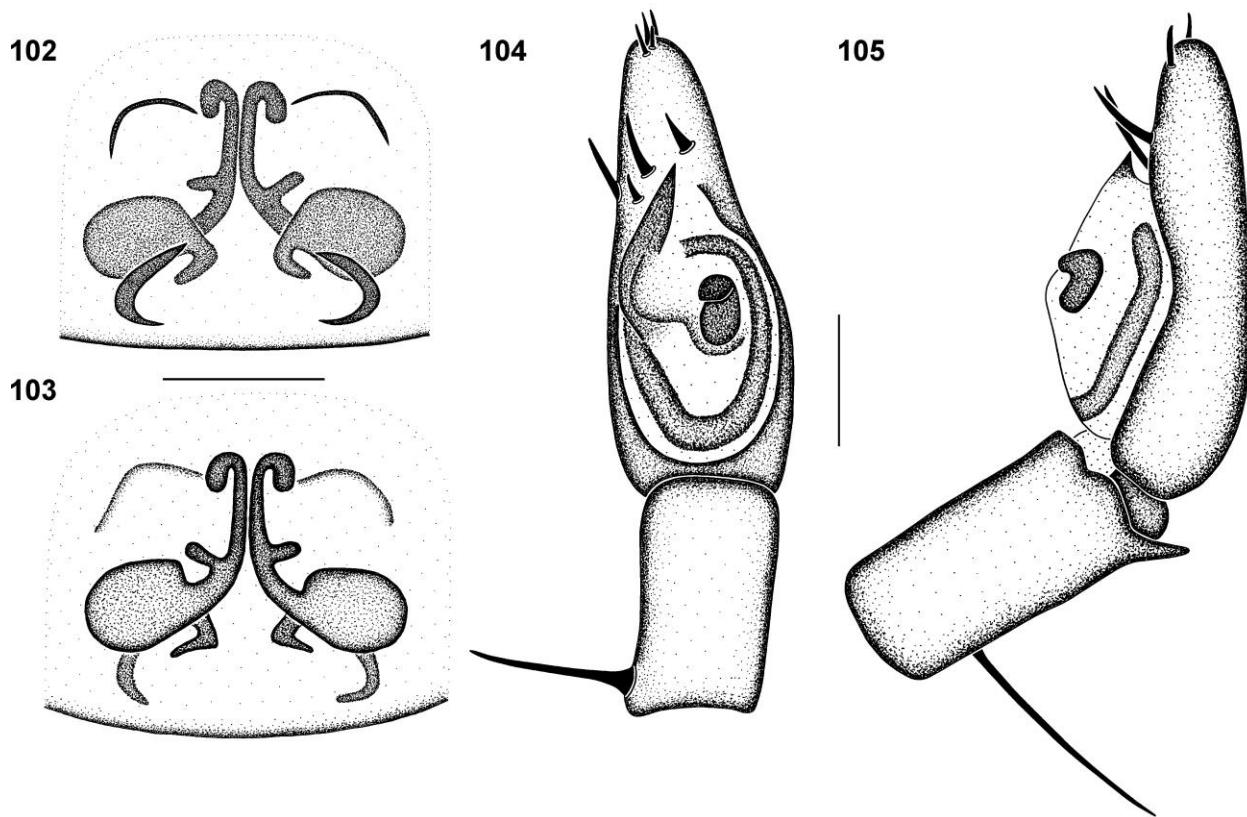
**Measurements:** TL 2.70, CL 0.95, CW 0.60, CL:CW 1.58:1, CLH 0.04, CLH:AME 0.83:1. Eyes: ALE 0.05, AME 0.05, PLE 0.07, PME 0.04, AME-AME 0.03, PME-PME 0.05, MOQAW 0.11, MOQPW 0.13, MOQL 0.14. SL 0.54, SW 0.43, AL 1.53, AW 1.00. **Leg measurements:** Palpal segment length: 0.24, 0.14, 0.14, 0.25. Leg I: 0.58, 0.28, 0.46, 0.33, 0.41. II: 0.53, 0.25, 0.44, 0.37, 0.43. III: 0.49, 0.24, 0.37, 0.40, 0.32. IV: 0.68, 0.27, 0.64, 0.67, 0.41. TL of legs (I-IV): 2.06, 2.02, 1.82, 2.67; leg formula: 4123.

**Colouration:** carapace and abdomen dark brown; sternum, endites, labium and chelicerae similar in colour to carapace; all legs with femora darker than rest of leg (Fig. 2). **Carapace:** decorated with squamose setae; smooth in texture; pattern indistinct; posterior margin mostly straight, with very shallow indentation in middle; fovea absent.

**Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; tuft of setae is present on tip; anterior margin of carapace narrowing slightly from coxa I; PER procurved in dorsal view, AER recurved in anterior view. **Endites:** oblique; constricted just above halfway; anterior margin flattened; cluster of setae present on inner-apical margin.

**Sternum:** shield-like; broadest between coxa I and II; posterior margin tapered with broad rounded tip behind coxa IV. **Legs:** femora of all legs laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 1pl, 1do, 1pl, 1pl, 1plv, 3vt. Leg I: 1do, 1pl. II: 1d. III: 1do, 1pl, 1vt, 2vt. IV: 1do, 1plv, 2vt, 1plv, 3vt. Legs with four rows of scopulate setae on metatarsi and tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern not visible; venter similar in colour to dorsum; sigilla not visible. **Epigynе:** in ventral view, anterior hood divided with curved sclerites; posterior pockets present beneath spermathecae;

copulatory opening located at apex of copulatory duct. In dorsal view, copulatory ducts elongate and extend medially, curved at apex; accessory glands present on basal third of copulatory duct; fertilisation ducts curved, present medially on spermathecae; spermathecae globular, slightly more elongate horizontally (Figs 102, 103).



**Figs 102-105.** Genitalic morphology of *Micaria basaliducta* sp. nov.: (102) female epigyne, ventral view; (103) same, dorsal view; (104) male palp, ventral view; (105) same, retrolateral view. Scale: 0.1 mm.

### Male

Male paratype from Farm Kraanvogelfontein, Beaufort West (NCA 2008/4755).

**Measurements:** TL 1.98, CL 0.90, CW 0.63, CL:CW 1.43:1, CLH 0.06, CLH:AME 1.4:1. Eyes: ALE 0.05, AME 0.04, PLE 0.06, PME 0.05, AME-AME 0.03, PME-PME 0.05, MOQAW 0.12, MOQPW 0.15, MOQL 0.15. SL 0.57, SW 0.40, AL 0.98, AW 0.64. **Leg measurements:** Palpal segment length: 0.27, 0.14, 0.14, 0.29. Leg I: 0.57, 0.30, 0.48,

0.38, 0.40. II: 0.56, 0.24, 0.41, 0.37, 0.37. III: 0.44, 0.21, 0.34, 0.37, 0.30. IV: 0.52, 0.21, 0.46, 0.51, 0.41. TL of legs (I-IV): 2.13, 1.95, 1.66, 2.11; leg formula: 1423.

**Colouration:** carapace and abdomen dark brown; sternum, endites, labium and chelicerae similar in colour to carapace; legs with femora slightly darkened (Fig. 3).

**Carapace:** decorated with squamose setae; smooth in texture; pattern indistinct; posterior margin rounded; anterior margin of carapace narrowing slightly from coxa I; fovea absent; PER procurved in dorsal view; AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; tuft of setae present on tip.

**Endites:** oblique; constricted just above halfway; anterior margin flattened; cluster of setae present on inner-apical margin. **Sternum:** shield-like; broadest between coxa I and II; posterior margin tapered broadly, rounded behind coxa IV. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin.

Leg macrosetae: Palps: 1pl, 1pl, 2plv, 2vt. Leg I: 1do, 1pl. II: 1d. III: 1do, 1plv, 2vt, 1pl, 1plv, 2vt. IV: 2do, 1plv, 2vt, 2plv, 2vt. Legs with four rows of scopulate setae on metatarsi and tarsi. **Abdomen:** cylindrical in shape; decorated with brachiate setae; dorsal pattern not visible, but white vertical stripe may be present antero-laterally; venter similar in colour to dorsum; sigilla not visible. **Palp:** RTA present on retrolateral margin; median apophysis present medially, below embolus with MA facing prolaterally; four ventral-terminal spines (three long and one short) present above tegulum; sperm duct present prolaterally on tegulum, curved basally; embolus moderately broad, elongate base; embolus slanted retrolaterally; cymbial tip extends approximately one-third of cymbium's length above tegulum (Figs 104, 105).

### *Distribution*

*M. basaliducta* sp. nov. is known from only one locality in South Africa (Beaufort West) and two localities in Namibia (Fig. 106).



**Fig. 106.** The distribution of *Micaria basaliducta* sp. nov. in the Afrotropical Region.

**2.5.2.) *Micaria beaufortia*** (Tucker, 1923) (Figs 4-5, 30, 33, 34, 36, 39, 41, 43, 44, 45, 49, 59, 81, 83, 84, 89, 92, 93, 96, 100, 107-110)

*Epikurtomma beaufortia* Tucker, 1923: 333, pl. 10, fig. 54 (♀)

*Micaria beaufortia* Murphy, 2007: 67, figs 550-551 (♀)

*Micaria beaufortia* Marusik & Omelko, 2017: 463, figs 1-20, 23-24, 26-29 (♀ ♂)

*Material examined*

Other material: BOTSWANA. *Kweneng District*: Thamaga, on rock, hand collecting, 24°43'S; 25°32'E, leg. R. Jocqué, 28.I.2003, 1 ♂ (MRAC 212746). Francistown, Selkirk Mine, Site 14, pitfall traps, 21.2897 °S; 27.7631 °E, leg. D.H. Jacob, 1-28.III.2008, 1 ♂ (NCA 2008/2891). ETHIOPIA. *Oromia Region*: Adama, 40 km East of Nazret (Adama), under stones, *Acacia/Commiphora* woodland, hand collecting, leg. A. Russell-Smith, 21.III.1986, 2 ♂ (MRAC 225604); Adama, Harbona, under rocks, hillside, hand collecting, 08°44'N; 39°33'E, leg. A. Russell-Smith, 2.VII.1986, 1 ♂ (MRAC 225605). *Shewa Region*: Langano Lake, *Cynodon* grassland, 1600 m a.s.l., 07°36'N; 38°43'E, leg. A. Russell-Smith, 21.VII.1986, 1 ♂ (MRAC 225571). LESOTHO. *Berea District*: Near Koali, Under rocks on hillside, 1800 m a.s.l., 29°15'S; 27°47'E, leg. J. van Niekerk, 8.I.2013, 1 ♂ (NCA 2013/2337); *Butha-Butha District*: Near Butha-Butha, under rocks, 1768 m a.s.l., 28°46.714'S; 26°16.262'E, leg. J. van Niekerk, 24.III.2014, 1 ♀ (NCA 2014/1129); Same locality, under rocks on mountainside, 1780 m a.s.l., 28°47'S; 28°15'E, leg. J. van Niekerk, 14.XII.2012, 3 ♀ (NCA 2013/2367), Same data, 1 ♂ (NCA 2013/2345); Valley near Butha-Buthe, under rocks, 2150 m a.s.l., 28°48'S; 28°16'E, leg. J. van Niekerk, 18.X.2012, 1 ♂ (NCA 2013/1861); *Leribe District*: Viewing Point near Seshutes airport, 2340 m a.s.l., 29°17.115'S; 28°32.939'E, leg. C. Haddad, 8.III.2003, ♂ 1 ♀ (NCA 2017/1483); *Quthing District*: Ha Lazaro, Under rocks on hillside, 2355 m a.s.l., 30°18.207'S; 28°07.872'E, leg. C. Haddad, 12.XI.2003, 1 ♀ (NCA 2018/28); *Tsaba-Tseka District*: Mohale Dam, Island 5, 2025 m a.s.l., 29°25.396'S; 28°05.903'E, leg. C. Haddad, 06.XII.2003, 2 ♂ (NCA 2017/1484). NAMIBIA. *Hardap Region*: Reutersbrunn, Diamond Area II, in salsola, SE

2414 Db, leg. E. Griffin, 6.IV.1986, 4 immatures (SMN). *Oshikoto Region*: Andoni, pitfall traps, 18°30'S; 16°45'E, 19.V-20.VI.1986, 6 immatures (SMN 39453); Etosha National Park, 18°31'S; 16°46'E, 27.III-18.IV.1988, 35 ♂ 8 ♀ 8 immature (SMN 40869); Andoni, South, hand collecting, 18°30'S; 16°45'E, leg. A. Russell-Smith, I.1997, 1 ♂ 1 ♀ (MRAC 215420); Fishers Pan, pitfall traps, 18°47'S; 16°55'E, leg. E. Griffin, 14.II-22.III.1987, 1 ♂ 1 immature (SMN 40135). *SOUTH AFRICA*. *Eastern Cape*: Fort Beaufort, Mpofu Nature Reserve, thorn field (transect 1) SLP2, 32°36.6'S; 26°36.00'E, leg. S.L. Peinke, 29.I.2009, 1 ♂ (NCA 2011/824); Grahamstown, 1820 Settlers Monument, damp grassland, hand collecting, 33°19.14'S; 26°31.14'E, leg. T. Russell-Smith, 23.IV.1977, 1 ♀ (NCA 2015/2872); Great Fish River NR, Andries Vosloo Kudu Reserve, Site 4, pitfall traps, 33°07.8'S; 26°39.00'E, leg. M. Wolmarans, 30.VII.2010, 1 ♀ (NCA 2011/911); Great Fish River NR, Farm Bucklands, on soil, M.B. 292, leg. M. Burger, 4.X.1993, laid 13 eggs in 11.VI.1976, 1 ♂ (NCA 96/62); Middelburg, associated with termites, hand collecting, leg. M. de Jager, 29.IX.1991, 1 ♀ (NCA 92/44). *Free State*: Amanzi Private Game Reserve Game Reserve, *Acacia karroo* woodlands, 28°35.785'S; 26°26.335'E, leg. V. Butler, 1-30.IX.2012, 1 ♂ (NCA 2013/3377); Same locality, Open grassland, 28°35.845'S; 26°26.280'E, leg. V. Butler, immature female, 2 ♂ (NCA 2013/3350); Same locality, *Acacia karroo* woodlands, 28°35.785'S; 26°26.335'E, 1-31.III.2013, 1 ♂ (NCA 2013/4287); Bethulie, Tussen-die-Riviere Nature Reserve, rocky hill, hand collecting, 30°17.4'S; 26°03.6'E, leg. L.N. Lotz & C. Haddad, 14.X.2008, 1 immature (NMBA 12702); Bloemfontein, Botanical Gardens, pitfall traps, 29°04.8'S; 26°06.00'E, leg. R. Poller & S. Otto, XII.2008, 1 ♂ (NMBA 11166); Bloemfontein district, Farm Deelhoek, under rocks, hand collecting, 28°50.295'S; 26°06.545'E, leg. C. Haddad, 21.X.2001, 1 ♂ (NCA 2017/1476); Bloemfontein, Roodewal, 5 Dryer Ln., under rocks next to dam, hand collecting, 29°06'17.3"S; 26°20'00.3"E, leg. R. Booyens, L. Whitehead, N. Smit, 15.XI.2018, 1 ♀ 1 immature (NCA 2020/85); Same locality, on ground, under rocks, with *Anoplelepis* ants, hand collecting, 29°06'17.3"S; 26°20'00.3"E, leg. R. Booyens, S. Pekár, E. Liznarova, O. Michálek, 27.XI.2018, 1 ♂ (NCA 2020/86); U.F.S. West Campus, *Trinervitermes trinervoides* termitaria and surrounding grassland, pitfall traps, 1425 m a.s.l., 29°06'S; 26°10'E, leg. C. Haddad & H. Badenhorst, 06-26.III.2019, 10 ♂ 4 ♀ (NCA 2019/845); Bloemfontein district, Farm Hopefield, Blue gum, leaf litter, 28°54.00'S;

26°13.8'E, leg. C. Haddad, 24.II.2002, 1 ♂ (NCA 2002/416); ground surface, hand collecting, 22.XII.2001, 1 ♂ 1 ♀ (NCA 2002/415); Bloemfontein, Langenhoven Park, on paving in garden, 1415 m a.s.l., 29°05.099'S; 26°09.569'E, leg. C. Haddad, 01.I.2003, ♂ 1 ♀ (NCA 2017/1485); Naval Hill, pitfall traps, 1440 m a.s.l., 29°03.6'S; 26°08.4'E, leg. L.N. Lotz, V.1990, 1 ♂ (NMBA 6186), Same locality, 1480 m a.s.l., 1 ♀ 1 immature (NMBA 6095), Same locality, 1440 m a.s.l., 1 ♂ (NMBA 6082); Naval Hill, Eastern Plateau, 1250 m a.s.l., leg. L.N. Lotz, II.1991, 5 ♂ (NMBA 7161); Same locality, X.1990, 1 ♂ 1 ♀ (NMBA 6955); Same locality, I.1991, 2 ♂ 1 ♀ (NMBA 7096); Same locality, III.1991, 1 ♂ (NMBA 7202); Naval Hill, Hangmanskloof, 1250 m a.s.l., VII.1990, 2 ♂ (NMBA 7036); Naval Hill, Hangmanskloof North, XI.1990, 1 ♂ (NMBA 6987); Naval Hill, Hangmanskloof South, 1250 m a.s.l., XII.1991, 7 ♂ 1 ♀ 1 immature (NMBA 7607); Same locality, II.1991, 6 ♂ 1 immature (NMBA 7145); Same locality, IX.1990, 7 ♂ (NMBA 6315); Same locality, pitfall traps, XI.1991, 1 ♂ 1 immature (NMBA 7539); Same locality, III.1991, 1 ♂ (NMBA 7185); Same locality, XI.1990, 3 ♂ (NMBA 6990); Same locality, I.1991, 9 ♂ 4 ♀ 2 immatures (NMBA 7080); Same locality, X.1990, 2 ♂ (NMBA 6944); Naval Hill, Observatory, 1250 m a.s.l., II.1991, 1 ♀ (NMBA 7164); Naval Hill, West Plateau, I.1991, 2 ♂ (NMBA 7109); Boshof, Elliesdal 1062, pitfall traps, 28°10.8'S; 25°18.6'E, leg. Entomol. Staff, IV-VIII.1987, 2 ♂ 1 ♀ (NMBA 1813); Brandfort, Amanzi Private Game Reserve, Acacia woodland, 1425 m a.s.l., 28°21.00'S; 26°15.00'E, leg. V. Butler & C. Haddad, 17.XII-1.I.2010-11, 2 ♂ (NMBA 15925); Florisbad, 1250 m a.s.l., 28°27.6'S; 26°03.00'E, leg. L.N. Lotz, 08.XII.1987, 1 ♀ (NMBA 16912); Same locality, 08-21.XII.1987, 1 ♀ (NMBA 8413); Same locality, 09-23.XI.1987, 1 ♂ (NMBA 4954); Same locality, 1 ♂ (NMBA 4939); Same locality, 1250 m a.s.l., 17.I-1.II.1988, 1 ♀ (NMBA 3724); Same locality, 8.XII.1987, 1 ♂ (NMBA 17096); Same locality, 5-19.I.1988, 1 ♀ (NMBA 3631); Same locality, 12-23.IX.1988, 1 ♂ (NMBA 8519); Same locality, 08.XII.1987, 1 ♂ (NMBA 17448); Same locality, 21.XII-5.I.1987-88, 1 ♀ (NMBA 8394); Same locality, 5.I.1988, 1 ♂ (NMBA 16913); Same locality, 8-21.XII.1987, 1 ♂ 1 immature (NMBA 3394); Same locality, 1 ♂ (NMBA 8376); Same locality, 1-15.II.1988, 1 ♂ (NMBA 8494); Krugersdrift dam, in canal, hand collecting, 28°25.2'S; 25°33.00'E, leg. Mus. Staff, 28.VIII.1985, 3 immatures (NMBA 9901); Same locality, SE 28 25 Dd, leg. C. Pieterse, 23.IV.1985, 1 immature (NMBA 169); Same locality, leg. Mus. Staff, 21.X.1985, 1 ♂ (NMBA 979), Same locality, 1 immature

(NMBA 982); Same locality, 28.VIII.1985, 1 ♀ (NMBA 891); Same locality, *Ziziphus* bushes, beating, leg. C. Pieterse, 18.IV.1985, 5 ♂ 1 ♀ (NMBA 165); Same locality, in canal, hand collecting, leg. Mus. Staff, 22.VIII.1985, 1 ♂ (NMBA 858); Fauresmith, Kalkfonteindam, in webs & on ground, 29°18.6'S; 25°09.6'E, leg. L.N. Lotz, 9.IV.2008, 2 immatures (NMBA 12099); Same locality, grassveld, pitfall traps, 10-14.IV.2008, 4 ♂ 4 ♀ (NMBA 12183); Same locality, Koppie, 14-18.IV.2008, 1 ♀ (NMBA 12205); Same locality, rocky hill, 8-11.IV.2008, 1 ♂ (NMBA 11988); Gariep Dam Nature Reserve, Nama karoo veld, pitfall traps, 1340 m a.s.l., 30°35'S; 25°32'E, leg. M. Morake & N. Tshabalala, 10.IV.2017, 1 ♂ (NCA 2019/910); Same data, sweeping, 1 ♀ (NCA 2019/926); Golden Gate, pitfall traps, SE 29 29 Aa, leg. Mus. Staff, V.1985, 1 ♂ (NMBA 765); Hennenman, 2 km South of Whites, Various, 28°00.6'S; 27°00.6'E, leg. L.N. Lotz, X.1993, 1 ♂ 1 immature (NMBA 6295); Hoopstad, Sandveld Nature Reserve, *Odontotermes* mound chimney, hand collecting, 27°51.00'S; 25°55.8'E, leg. C. Haddad, 25.X.2003, 1 ♂ (NCA 2002/529); grassland & shrubs, pitfall traps, 27°26.4'S; 25°07.6'E, leg. R. Fourie & A. Grobler, 2-30.X.2009, 2 ♂ (NMBA 14612); Swartsrus 1193, beating, 27°27.00'S; 25°18.00'E, leg. Mus. Staff, 24.X.1985, 1 ♀ (NMBA 991); Luckhof district, Farm Bankfontein, Koppie Site, under rocks, hand collecting, 30°03.396'S; 24°53.51'E, leg. C.R. Haddad, 3.IV.2018, 1 immature (NCA); Nama Karoo Veld, 30°04.918'S; 24°54.437'E, 8.IV.2018, 1 immature (NCA); 6.IV.2018, 1 ♂ (NCA 2018/22); riverbank, 30°04.433'S; 24°52.982'E, 5.IV.2018, 1 immature (NCA); leg. R. Boysen, 5.IV.2018, 1 immature (NCA); southern slope, under rocks, 30°04.405'S; 24°52.915'E, leg. C.R. Haddad, 3.IV.2018, 1 immature (NCA), 1 immature (NCA), 1 immature (NCA), 1 ♂ (NCA 2018/23); Vanderkloof Dam, 30°04.557'S; 24°52.204'E, leg. C. Haddad, 26.IV.2019, 1 ♂ (NCA 2019/410); Same locality, 30°04.4483'S; 24°53.0233'E, leg. C. Haddad, 27.III.2018, 2 ♀ (NCA 2019/409); Petrusburg, Petrusburg Rd., among *Arctotis* flowers, 29°10.8'S; 25°04.2'E, leg. Entomol. Staff, 20.VIII.1987, 1 ♀ (NMBA 1893); Theunissen, Erfenis Dam Nature reserve, site 4, gravel plain, pitfall traps, 28°18.00'S; 26°28.8'E, leg. R. Fourie & A. Grobler, 31.VIII-30.IX.2009, 1 ♀ (NMBA 14279); 30.IX-28.X.2009, 2 ♂ (NMBA 14339); Site 6, N shore of dam, near water, 31.VIII-30.XI.2009, 1 ♀ (NMBA 14260). **Gauteng:** Johannesburg, Klipriviersberg Nature Reserve (Site 4), Along hillside, between entrance & site 4, hand collecting, 26°16.998'S; 28°04.002'E, leg. Spider Club members, 13.I.2013,

1 ♂ (KNR0742); Midrand, Halfway House, crops, potatoes, 25°59.4'S; 28°07.8'E, leg. J. Finley, 2.IV.1989, 3 immatures (NCA 76/1105); Pretoria/Tshwane, Faerie Glenn Nature Reserve, leg. P. Webb, 26.IV.2014, 3 immatures (NCA 2014/2481); Knoppieslaagte, pitfall traps, 25°57.00'S; 27°58.2'E, leg. D. Uys, 19.III.1979, 2 ♂ 1 ♀ (NCA 2001/65); Rietondale Research Station, on soil, 25°44.4'S; 28°11.4'E, leg. A. v. d. Berg, 24.III.1998, 1 ♂ (NCA 2007/1317); Same locality, leg. J. Nkwana, 16.VI.1998, 1 ♂ 1 ♀ (NCA 2007/1319). *KwaZulu-Natal*: Ndumo Game Reserve, Mjanshi, Main Road, hand collecting, 26°54.222'S; 32°16.025'E, leg. C. Haddad, 10.II.2015, 1 ♀ (NCA 2015/1717); Pongola, Ngotche, Farm Vergeval, *Camponotus* ant mimic, 27°21.00'S; 31°36.6'E, leg. A.S. Dippenaar et al., 4.IV.1967, 1 ♀ (NCA 84/476); Sani Pass, pitfall traps, 1200 m a.s.l., 30°11.4'S; 30°24.4'E, leg. University of Pretoria Students, 28.I.2008, 1 ♀ (NCA 2011/855). *Limpopo*: Dendron, Farm Amsterdam, under stones, hand collecting, 23°22.2'S; 29°19.2'E, leg. A.S. Dippenaar et al., 19.IV.1967, 1 ♂ (NCA 84/477); Mopani, Ndengeza, pitfall traps, 23°18.534'S; 30°24.486'E, leg. E. Mauda, 14.VI.2014, with egg sac, 2 ♀ (NCA 2015/2474); Same data, 1 ♂ (NCA 2015/2475); Same data, 1 ♂ 2 ♀ (NCA 2015/2480); Same data, 1 ♂ (NCA 2015/2481); Same data, 2 ♀ (NCA 2015/2488); Same locality, pitfall traps, leg. E. Mauda, 9.VI.2014, 3 ♂ 1 ♀ (NCA 2015/2485), Same data, pitfall traps, 5 ♂ 3 ♀ (NCA 2015/2484); Same locality, pitfall traps, leg. E. Maude, 21.I.2015, 1 ♀ (NCA 2015/2473); Same locality, pitfall traps, leg. E. Maude, 26.I.2015, 2 ♂ 1 ♀ (NCA 2015/2477). *Mpumalanga*: Belfast, Kloof, leaf litter, leg. M. Filmer, 27.XII.1990, 1 immature (NCA 91/652); Carolina, Grootpan Farm 456JS, Site 1, 27 km NW Carolina, Strathrae Colliery EIA, sweeping, 1692 m a.s.l., 23°58.18'S; 29°55.44'E, leg. D.H. Jacobs, 13.II.2012, 3 ♂ (NCA 2013/5308); Grootpan Farm 564JS, 01F, 27 km NW of Carolina, Strathrae Colliery EIA, pitfall traps, 1689 m a.s.l., 25°54.18'S; 29°55.44'E, leg. D.H. Jacobs, 12.VI.2012, 1 ♀ (NCA 2012/4435); Dullstroom, Verloren Valei Nature Reserve, soil surface, hand collecting, 28°18.00'S; 30°06.9'E, leg. P. Webb, 23.XII.215, 1 ♀ (NCA 2015/2491); Kruger National Park, Skukuza Camp, leg. A. Leroy, 29.XI.2005, 1 ♀ (NCA 2007/1316); *Northern Cape*: Douglas, ca. 20 km east of Douglas on R357, On ground with *Anoplolepis custodiens* ant, 1035 m a.s.l., 28°59.358'S; 23°58.372'E, leg. C. Haddad, 21.IX.2001, 1 ♀ (NCA 2017/1477); Kathu, Farm Sacha, pitfall traps, 27°42.500'S; 22°57.967'E, 24-27.II.2003, 2 ♂ (NCA 2017/1478); Kuruman, 1 km S of

Kuruman, On ground with *Anoplolepis custodiens* ant, hand collecting, leg. C. Haddad, 1350 m a.s.l., 27°28.887'S; 23°26.624'E, leg. C. Haddad, 21.I.2004, 1 ♂ (NCA 2017/1479); Nieuwoudtville, Hantam National Botanical Garden, under stones, 31°22.2'S; 19°06.6'E, leg. T. Russell-Smith, 26.VIII.2008, 1 ♂ 1 immature (NCA 2015/2817); Prieska, Green Valley Nuts, Pistachio orchard, pitfall traps, 29°40.8'S; 22°44.4'E, leg. C. Haddad, 18.IX.2001, 3 ♂ 2 ♀ (NCA 2002/483); Same locality, leaf litter sifting, 29°40.8'S; 22°44.4'E, leg. C. Haddad, 28.V.2002, 1 immature (NCA 2002/486). *Western Cape*: Beaufort West, Karoo National Park, web in grass, hand collecting, leg. A. Leroy, 2.IV.1989, 1 immature (NCA 89/691); Cape Town, Devil's Peak slope, 33°57.00'S; 18°25.8'E, leg. F. Purcell, VII.1898, 1 immature (SAM 4283); Signal Hill, 33°54.6'S; 18°24.00'E, leg. W.F. Purcell, VIII.1898, 1 ♀ (SAM 4400); Same locality, leg. R.M. Lightfoot, VI.1897, 1 immature (SAM 3386); De Hoop Nature Reserve, back dune, leaf litter, leg. C. Haddad, 25.III.2005, 2 immatures (NCA 2005/569); Matjiesfontein, Farm Jagerskraal, open ground, pitfall traps, 33°13.802'S; 20°24.907'E, leg. Z. Mbo, 10.IX.2015 - 15.X.2015, 4 immatures (NCA 2016/2732); Prince Albert, Tierberg, old lands, 33°13.2'S; 22°01.8'E, leg. R. Dean, 14.VI.1988, 1 ♂ (NCA 91/1259). *ZIMBABWE*. *Matobo*: Rowallan Park, 20°25'S; 28°31'E, leg. M. FitzPatrick, VII.2005, Same data, 1 ♂ (NMZ/A15859), Same data, 1 ♂ 2 ♀ 4 immatures (NMZ/A15297), Same data, 1 ♀ (NMZ/A15297); Same locality, pitfall traps, leg. M. FitzPatrick, i.2005, 1 ♂ 4 ♀ 1 immature (NMZ/A15287); Same locality, pitfall traps, leg. M. FitzPatrick, 27.VII.2004, 1 ♂ (NMZ/A14870); Same locality, pitfall traps, leg. M. FitzPatrick, V.2005, 2 ♂ 1 immature (NMZ/A15465); Same locality, pitfall traps, leg. M. FitzPatrick, XI.2004, 1 ♂ 2 ♀ 2 immatures (NMZ/A15218); Same locality, pitfall traps, leg. M. FitzPatrick, XII.2004, 1 ♂ (NMZ/A15229); Same locality, pitfall traps, leg. M. FitzPatrick, XI.2005, 1 ♂ (NMZ/A16457); Same locality, pitfall traps, leg. M. FitzPatrick, III.2005, 6 ♂ 3 ♀ (NMZ/A15420); Same locality, pitfall traps, leg. M. FitzPatrick, IV.2005, 3 ♂ 4 ♀ (NMZ/A15452); Same locality, pitfall traps, leg. M. FitzPatrick, X.2004, 1 ♂ 1 ♀ 2 immatures (NMZ/A15107); Same locality, pitfall traps, leg. M. FitzPatrick, I.2006, 1 ♀ (NMZ/A16560).

## *Diagnosis*

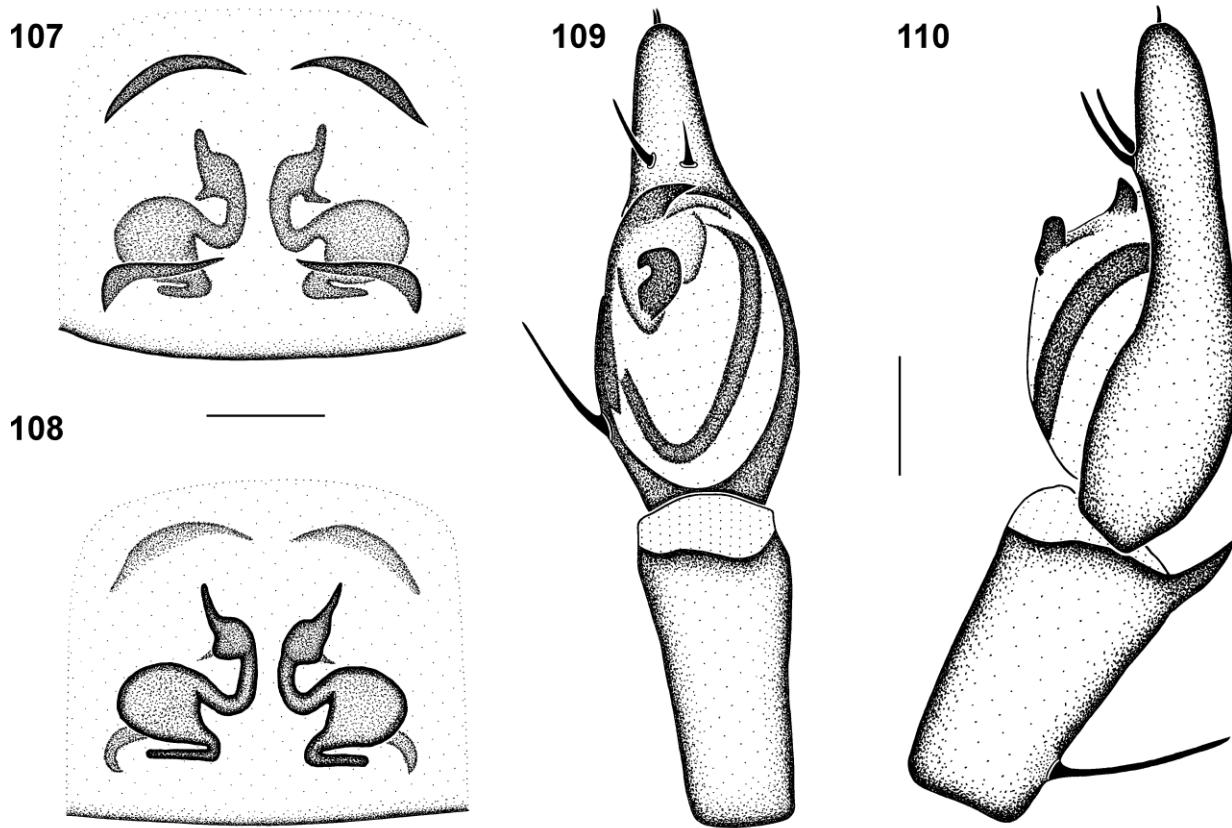
*Micaria beaufortia* can be distinguished from other Afrotropical *Micaria* in having a divided anterior hood (females), as well as posterior pockets basal to each of the spermathecae that are curved. Both sexes are large (4mm – 5mm) in comparison to other Afrotropical species and possess a white transverse median stripe with a perpendicular dotted or solid stripe extending towards the spinnerets.

## *Female*

Female from U.F.S. West Campus (NCA 2019/845). **Measurements:** TL 4.85, CL 1.85, CW 1.15, CL:CW 1.61:1, CLH 0.13, CLH:AME 2.06:1. Eyes: ALE 0.10, AME 0.06, PLE 0.08, PME 0.06, AME-AME 0.04, PME-PME 0.08, MOQAW 0.18, MOQPW 0.21, MOQL 0.20. SL 0.94, SW 0.73, AL 2.60, AW 1.80. **Leg measurements:** Palpal segment length: 0.54, 0.30, 0.35, 0.60. Leg I: 1.25, 0.56, 0.97, me 0.79, 0.86. II: 1.12, 0.57, 0.95, 0.78, 0.84. III: 1.11, 0.54, 0.86, 0.93, 0.80. IV: 1.80, 0.65, 1.40, 1.60, 0.93. TL of legs (I-IV): 4.43, 4.26, 4.24, 6.38; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown to black; sternum, endites, labium and chelicerae similar in colour to carapace; legs with femora slightly darkened (Fig. 4). **Carapace:** carapace smooth; decorated with squamose setae (Fig. 30), indistinct dark pattern radiating from the middle; two white lines present on posterior quarter; posterior margin with an indentation in the middle; anterior margin of the carapace narrowing from coxa I; fovea absent; AER recurved in anterior view (Fig. 33), PER procurved in dorsal view (Fig. 34). **Chelicerae:** decorated with plumose setae (Fig. 36). **Labium:** triangular in shape. **Endites:** oblique; constricted just above halfway; anterior margin flattened; cluster of setae present on inner-apical margin; serrula present (Fig. 41). **Sternum:** broadest between coxa I and II, tapered to rounded tip behind coxa IV; decorated with squamose setae (Figs 43, 44, 45). **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; all tarsi pseudo-segmented. Leg macrosetae: Palps: 1do, 1pl, 1do, 1pl, 1pl, 3plv, 1rlv, 4vt. Leg I: 1do, 1pl, 2plv, 1rlv, 1vt. II: 1do, 1pl, 2plv, 1rlv, 1vt. III: 1do, 1pl, 1rl, 2pl, 1rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. IV: 1do, 2pl, 2pl, 1rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. Legs

with four rows of scopulate setae on metatarsi and tarsi. **Abdomen:** cylindrical in shape; decorated with squamose seta; white setae forming a transverse dorsal stripe medially and longitudinally from midpoint of abdomen to spinnerets; venter similar in colour to dorsum; sigilla not visible. **Epigyne:** anterior hood divided; slightly angled; posterior pockets present posterior to spermathecae; copulatory opening located medially at bifurcation of copulatory ducts; spermathecae globular in shape. Copulatory duct originating from copulatory opening, extending posteriorly for short distance to anterior margin of spermathecae; fertilisation duct curved laterally, located basally on spermathecae; spermathecae globular (Figs 96, 107, 108).



**Figs 107-110.** Genital morphology of *Micaria beaufortia* (Tucker, 1923): (107) female epigyne, ventral view; (108) same, dorsal view; (109) male palp, ventral view; (110) same, retrolateral view. Scale: 0.1 mm.

*Male*

Male from Bloemfontein, South Africa (NCA 2019/845). **Measurements:** TL 3.65, CL 1.50, CW 0.95, CL:CW 1.58:1, CLH 0.14, CLH:AME 2.19:1. Eyes: ALE 0.07, AME 0.06, PLE 0.08, PME 0.05, AME-AME 0.03, PME-PME 0.07, MOQAW 0.15, MOQPW 0.19, MOQL 0.20. SL 0.78, SW 0.60, AL 1.90, AW 0.95. **Leg measurements:** Palpal segment length: 0.59, 0.29, 0.29, 0.54. Leg I: 1.21, 0.56, 0.97, 0.81, 0.83; II: 1.17, 0.51, 0.90, 0.79, 0.81. III: 1.10, 0.43, 0.86, 0.81, 0.71. IV: 1.65, 0.53, 1.28, 1.45, 1.00. TL of legs (I-IV): 4.38, 4.18, 3.91, 5.91; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown to black; sternum, endites, labium and chelicerae similar in colour to carapace; femora slightly darkened (Fig. 5). **Carapace:** smooth in texture; decorated with squamose setae; indistinct dark pattern radiating towards coxae; two white lines present on posterior quarter; posterior margin indented medially; anterior margin of carapace narrowed from coxa I; fovea absent; PER procurved in dorsal view; AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular, tapering to a rounded apex. **Endites:** slanting inwards towards chelicerae; constricted just above middle; anterior margin flattened; cluster of setae present on inner-apical margin. **Sternum:** shield-like; broadest between coxa I and II; truncated between coxa IV; decorated with brachiate and elongate barbed setae. **Legs:** femora laterally flattened, highest at base; leg I more pronounced in this fashion, rest of leg normal, thin; all tarsi pseudo-segmented. Leg macrosetae: Palps: 1do, 1pl, 1do, 1pl, 1pl, 1plv, 3vt. Leg I: 1do, 1pl, 2plv, 1rlv, 1vt. II: 1do, 1pl, 2plv, 1rlv, 1vt. III: 1do, 1pl, 1rl, 2pl, 1rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. IV: 1do, 2pl, 2pl, 1rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. Legs with four rows of scopulate setae on metatarsi and tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; white transverse median stripe located dorsally, formed by white setae; venter similar in colour to dorsum, white stripes sometimes present laterally towards anterior margin (Fig. 5); sigilla not visible. **Palp:** RTA present dorsally (Fig. 100); median apophysis present medially with slightly curved tip; sperm duct present on retrolateral surface tegulum; embolus broad at base, retrolaterally curved tip; cymbium tapered third of tegulum's length above bulb (Fig. 101).

### *Distribution*

The distribution of *M. beaufortia* is very widespread throughout South Africa and a few localities in Namibia, Zimbabwe and Ethiopia (Fig. 110).



**Fig. 111.** The distribution of *Micaria beaufortia* (Tucker, 1923) in the Afrotropical Region.

### **2.5.3.) *Micaria bimaculata* sp. nov.** (Figs 6-7, 112-115)

#### *Material examined*

Holotype ♀ together with 1 ♂ paratype: MAURITANIA. Nouakchott Region: Nouakchott, 31 km South of Nouachott, hand collecting, 18°04.862'N; 15°57.975'W, leg. F. Borgato, XI.1994 (CAS, CASENT 9078556).

#### *Etymology*

The name of this species is derived from the two Latin words “bi” (two) and “maculata” (spot) and refers to the two large white spots on the midline of the abdomen in both the males and females of this species.

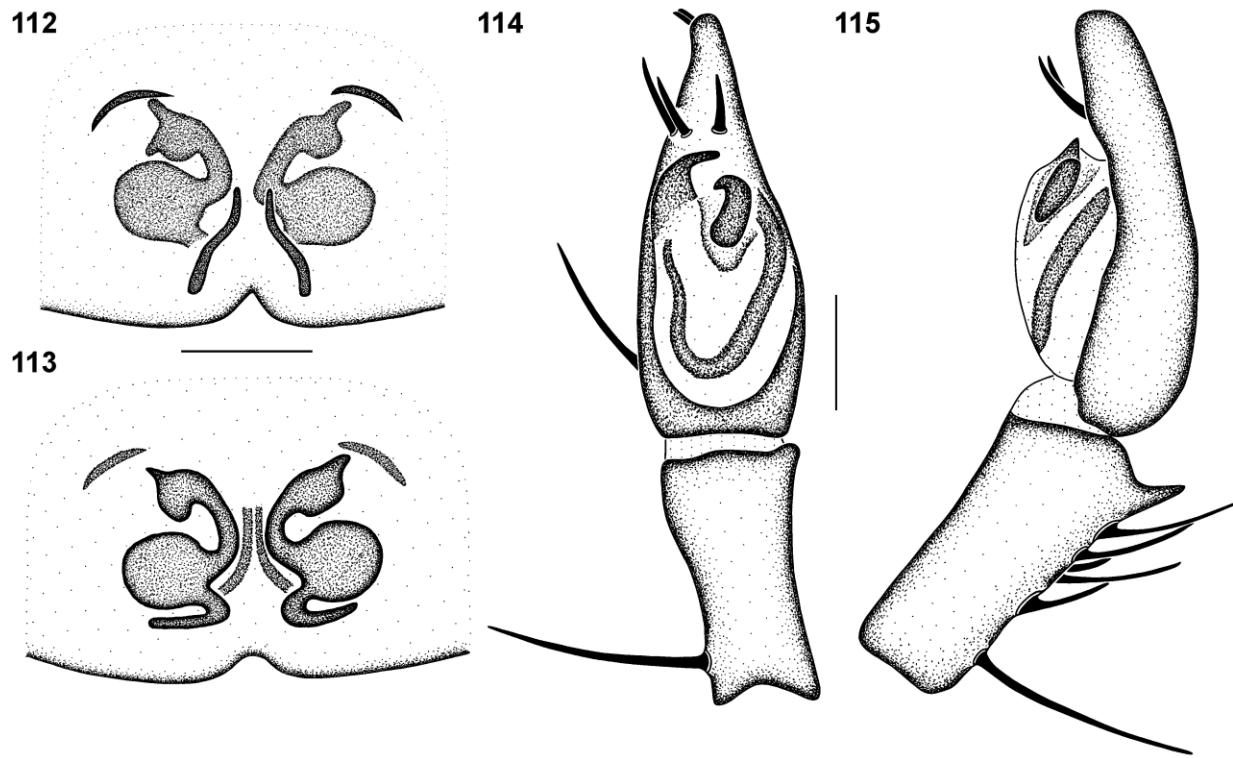
#### *Diagnosis*

*Micaria bimaculata* sp. nov. can be distinguished from other Afrotropical *Micaria* in bearing two large white spots on the abdomen in both sexes. Furthermore, the females can be recognised by the two short separated anterior hood sclerites and the posterior pockets that are located medially. The males can be recognised by their sharply bent embolus, with the tip point laterally inwards, as well as a sub-apical RTA on the retrolateral surface of the palpal tibia.

#### *Female*

Female holotype from Nouakchott (CASENT 9078556). **Measurements:** TL 3.75, CL 1.35, CW 0.95, CL:CW 1.42:1, CLH 0.10, CLH:AME 1.20:1. Eyes: ALE 0.06, AME 0.08, PLE 0.06, PME 0.06, AME-AME 0.04, PME-PME 0.07, MOQAW 0.18, MOQPW 0.19, MOQL 0.19. SL 0.78, SW 0.57, AL 2.15, AW 1.45. **Leg measurements:** Palpal segment length: 0.44, 0.19, 0.25, 0.43. Leg I: 0.97, 0.30, 0.49, 0.41, 0.64. II: 0.95, 0.29, 0.50, 0.40, 0.64. III: 0.87, 0.38, 0.65, 0.73, 0.59. IV: 1.40, 0.46, 0.98, 1.19, 0.87. TL of legs (I-IV): 2.81, 2.78, 3.22, 4.90; leg formula: 4312.

**Colouration:** carapace brown; abdomen brown on anterior half and dark brown on posterior half; legs uniform in colour (femora may be darker in live specimens); sternum, endites, labium and chelicerae similar in colour to carapace (Fig. 6). **Carapace:** smooth in texture; decorated with squamose setae; pattern faded but seems to be radiating from middle; posterior margin indented medially; anterior margin of carapace narrowing slightly from coxa I; PER procurved in dorsal view, AER recurved in anterior view; fovea absent. **Chelicerae:** decorated with plumose setae; apical margin slightly thickened. **Labium:** dark spots in posterior corners; triangular in shape; tuft of setae present on tip. **Endites:** slanting inwards, constricted just above halfway; cluster of setae present on inner-apical margin. **Sternum:** darkened ridges; shield-like; broadest between coxa I and II; posterior margin truncated between coxa IV. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of legs normal, thin. Leg macrosetae: Palps: 1do, 1pl, 1do, 1pl, 1pl, 2plv, 4vt. Leg I: I 1do, 1pl, 2plv, 2vt. II: 2do, 1pl, 1rl, 2plv, 2vt. III: 2do, 1pl, 1rl, 2pl, 1rl, 2plv, 1rlv, 2vt, 2pl, 1rl, 2plv, 2rlv, 5vt. IV: 2do, 2pl, 2rl, 2plv, 4vt, 1pl, 1rl, 2plv, 2rlv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern forming two large spots on transverse midline of abdomen (Fig. 6); venter similar in colour to dorsum; sigilla not visible. **Epigyne:** in ventral view, anterior hood divided, curved; posterior pockets medially between spermathecae; copulatory openings globular. In dorsal view, copulatory ducts present medially on inner apical margin of spermathecae; fertilisation ducts present on basal interior margin of spermathecae, curved laterally; spermathecae globular (Figs 112, 113).



**Figs 112-115.** Genitalic morphology of *Micaria bimaculata* sp. nov.: (112) female epigyne, ventral view; (113) female epigyne, dorsal view; (114) male palp, ventral view; (115) same, retrolateral view. Scale: 0.1 mm.

### Male

Male paratype from Nouakchott (CASENT 9078556). **Measurements:** TL 3.25, CL 1.45, CW 1.05, CL:CW 1.38:1, CLH 0.13, CLH:AME 1.65:1. Eyes: ALE 0.06, AME 0.08, PLE 0.06, PME 0.06, AME-AME 0.02, PME-PME 0.10, MOQAW 0.19, MOQPW 0.21, MOQL 0.22. SL 0.74, SW 0.59, AL 1.60, AW 1.10. **Leg measurements:** Palpal segment length: 0.49, 0.29, 0.30, 0.38. Leg I: 1.48, 0.49, 0.95, 0.81, 0.78. II: 1.13, 0.48, 0.81, 0.73, 0.78. III: 0.94, 0.44, 0.83, 0.92, 0.76. IV: 1.46, 0.46, 1.16, 1.19, 0.94. TL of legs (I-IV): 4.51, 3.93, 3.89, 5.21; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen brown on anterior half and dark brown on posterior half; femora darkened partially, rest of legs normal in colour; sternum, endites,

labium and chelicerae similar in colour to carapace (Fig. 7). **Carapace**: smooth in texture, decorated with squamose setae; pattern faded, but radiating from middle towards coxae, posterior margin similar to female; fovea absent; anterior margin of carapace narrowing slightly from coxa I; PER procurved in dorsal view, AER recurved in anterior view. **Chelicerae**: decorated with plumose setae; apical margin slightly thickened. **Labium**: dark spots in posterior corners; triangular in shape; tuft if setae present on tip. **Endites**: slanting inwards, constricted just above halfway; cluster of setae present on inner-apical margin; apical margin flattened; posterior margin bulbous. **Sternum**: darkened ridges; shield-like; broadest between coxa I and II; posterior margin narrowly truncated between coxa IV. **Legs**: femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg is normal, thin. Leg macrosetae: Palps: 1do, 1pl, 1do, 1pl, 1pl, 1plv, 4vt. Leg I: 1do, 1pl. II: 2do, 2pl, 2plv, 2vt. III: 2do, 2plv, 1rl, 2pl, 2rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2l, 1rl, 4vt. IV: 2do, 1rl, 2pl, 2rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen**: cylindrical in shape; decorated with squamose setae; dorsal pattern forming two large spots on transverse midline of abdomen (Fig. 7); venter similar in colour to dorsum; sigilla not visible. **Palp**: retrolateral tibial apophysis present dorsally; median apophysis present next to embolus; median apophysis broad, elongate, bending prolaterally, skewed diagonally; sperm duct present on retrolateral surface of tegulum, curved basally; sperm duct "S" shaped before ending at embolus; embolus broad at base, strongly curved retrolaterally, elongate tip; cymbium elongate, widest near middle; cymbial tip rounded, two small spines ventrally on tip; three ventral terminal spines above embolus (Figs 114, 115).

### *Distribution*

*Micaria bimaculata* sp. nov. is only known from the type locality (Fig. 116).



**Fig. 116.** The distribution of *Micaria bimaculata* sp. nov. in the Afrotropical Region.

2.5.4.) ***Micaria bispicula* sp. nov.** (Figs 8-9, 50, 60, 117-120)

*Material examined*

Holotype ♀: SOUTH AFRICA. *Western Cape*: Hermanus, Fisherhaven, leaf litter, leg. C. Haddad, 12.I.2008 (NCA 2008/453).

Paratypes: NAMIBIA. *Kunene Region*: Brandberg, Gravel plain, pitfall row 3, pitfall traps, 2120 m a.s.l., 21°10.5'S; 14°33.667'E, leg. K. Meaking/Raleigh International, 12.IV.2000, 1 ♂ (SMN 45032). SOUTH AFRICA. *Northern Cape*: Douglas, under rocks, hand collecting, 1025 m a.s.l., 29°04.266'S; 23°47.951'E, leg. C. Haddad, 2.IV.2001, 1 ♂ (NCA 2017/1482); Hay, Farm Rooipan, in the day, under rocks, hand collecting, 29°04.2'S; 23°04.8'E, leg. L.N. Lotz, 06.XII.2006, 1 ♀ (NMBA 10306). *Western Cape*: Buffels Bay, Cape of Good Hope, 34°11.4'S; 18°15.6'E, leg. C. Griswold, J. Doyen & T.M. Griswold, 25-29.X.1985, 1 ♂ (NMSA 22447); Cape Peninsula, Muizenberg, Dunes to the north, pitfall traps, 34°06'S; 18°27'E, leg. R. Legg, 01-15.XII.1991, 2 ♂ 1 ♀ 2 immature (MRAC 173647).

Other material: NAMIBIA. *Kunene Region*: Brandberg, Konigstein Farm, 22-day pitfall row, 2348 m a.s.l., 21°08.8'S; 14°34.283'E, leg. K. Meaking/Raleigh International, 17.V.2002, 1 ♂ (SMN 45021); Konigstein Pan, 2340 m a.s.l., 07.V.2000, 10 ♂ (SMN 45027); Same locality, 29.V.2000, 12 ♂ (SMN 45014); SOUTH AFRICA. *Northern Cape*: Kalahari Gemsbok Park, Twee Rivieren, pitfall traps, 26°15.6'S; 20°22.2'E, leg. E.A. Ueckermann & D. Keetch, 8-12.II.1987, 1 ♂ (NCA 87/531); Kathu, Farm Sacha, 27°42.500'S; 22°57.967'E, leg. C. Haddad, 24-27.II.2003, 1 ♂ (NCA 2017/1478); Prieska, Green Valley Nuts, Pistachio orchard, 29°40.8'S; 22°44.4'E, leg. C. Haddad, 18.IX.2001, 1 ♂ (NCA 2002/483). *Western Cape*: Anysberg Nature Reserve, under rocks, hand collecting, leg. C. Haddad & R. Lyle, 23.IX.2005, 2 ♂ (NCA 2007/3982); Same locality, leg. C. Haddad, 23.IX.2005, 1 ♂ (NCA 2007/3963); Beaufort West, Farm 77, Karoo, Area 4, Site 2, pitfall traps, 32°20.64'S; 23°21.24'E, leg. D.H. Jacobs, 12.XII.2007, 2 ♂ (NCA 2008/4699); Beaufort West, Farm Juriesfontein, Karoo, Area 3, Site 4, 32°31.8'S; 23°25.8'E, 11.XII.2007, 1 ♂ (NCA 2008/4701); Beaufort West, Farm Kraanvogelfontein,

Karoo, Area 2, Site 3, 32°32.4'S; 22°59.04'E, 9.XII.2007, 1 ♂ (NCA 2008/4755); Beaufort West, Farm Nuwejaarsfontein, Karoo, Area 3, Site 1, 32°57.00'S; 23°23.4'E, 2.XII.2007, 1 ♂ (NCA 2008/4703); Beaufort West, Farm Vaalkuil, Karoo, Area 1, Site 4, 32°48.84'S; 22°46.92'E, 6.XII.2007, 1 ♂ (NCA 2008/4700); Karoo National Park, Sandrivier, running on ground (LR624), hand collecting, leg. J. Leroy, 6.X.1989, 2 ♀ 2 immatures (NCA 91/700); Brand se Baai, NDC3, pitfall traps, leg. C. Lyons, 22.XI.2007, 1 ♀ (NCA 2008/1984); Cape Town, Bergvliet Flats, Diep Rivier, 34°03.00'S; 18°27.00'E, leg. W.F. Purcell, XII.1899, 1 ♂ (SAM 6236); Cederberg Wilderness Area, pitfall traps, 1-1298 m a.s.l., 32°20.82'S; 19°08.1'E, leg. E. Nortje & S. Kritzinger-Klopper, 1.III.2010, 1 ♂ (NCA 2012/5050); Cederberg, Nieuwoudt's Pass, 3-551 m a.s.l., 32°20.94'S; 19°00.36'E, 1.I.2009, 1 ♂ (NCA 2011/2693); Cederberg, Nieuwoudt's Pass, 3-344 m a.s.l., 32°20.28'S; 18°59.28'E, 01.X.2009, 1 ♂ (NCA 2011/2695); Cederberg, Nieuwoudt's Pass, 3-551 m a.s.l., 32°20.94'S; 19°00.36'E, 1 ♂ (NCA 2011/2694); Cederberg, Sawadee, 3-344m asl, 32°20.28'S; 18°59.28'E, 1 ♂ (NCA 2012/3549); Tierberg, leg. R. Dean, 14.IV.1998, 1 ♀ (NCA 91/1220); Victoria West, Melton Wold (83.5 km West of Victoria West), pitfall traps, 31°16.2'S; 22°27.00'E, leg. Entomol. Staff, III-VII.1989, 1 ♂ (NMBA 8619).

### *Etymology*

The species name is a combination of the Latin words *bi* (two) and *spicula* (spines). It refers to the two retrolateral tibial apophyses that are located on the dorsal side of the palpal tibia in the males of this species.

### *Diagnosis*

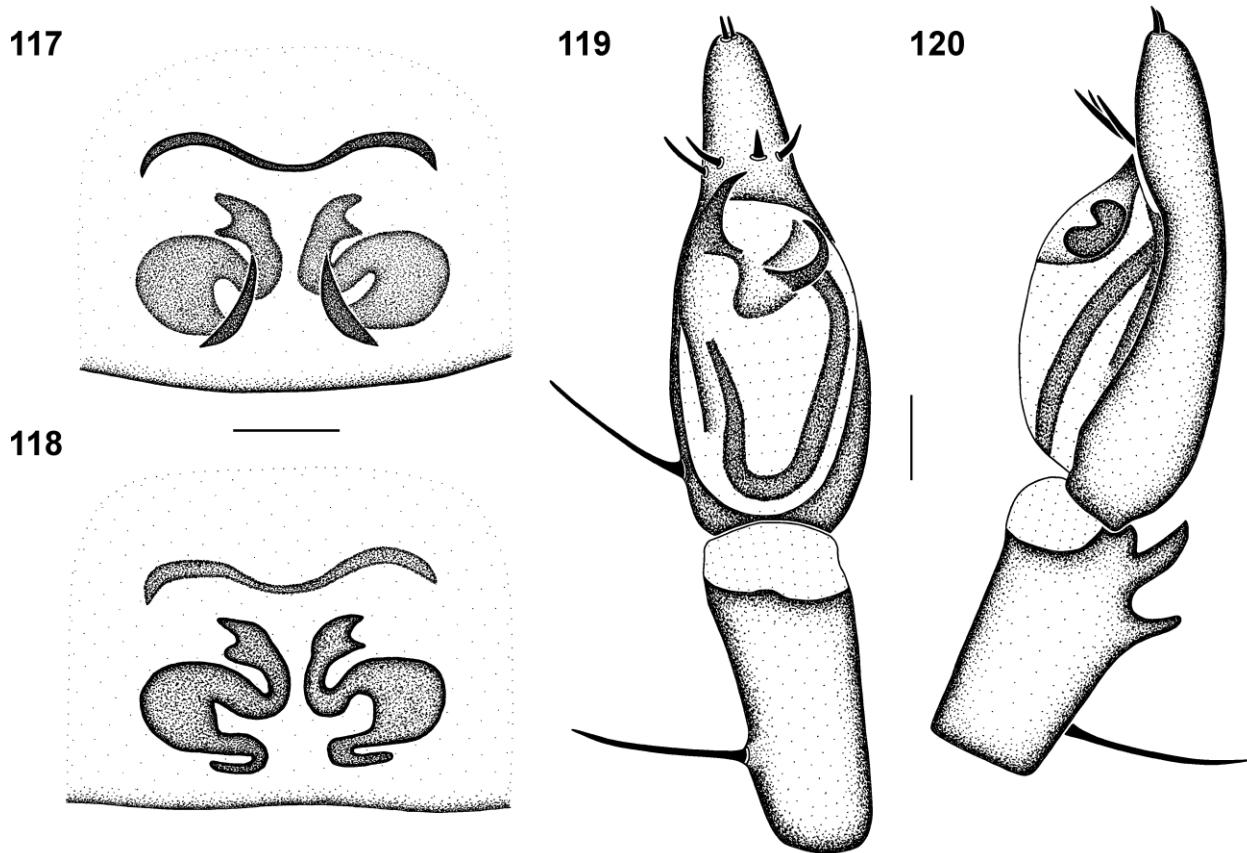
Females of this species can be distinguished from other Afrotropical species by having deeply notched copulatory openings, a continuous curved anterior hood, and shorter copulatory ducts. The males have two dorsal retrolateral tibial apophyses, located dorsally on the palpal tibia.

### *Female*

Female holotype from Fisherhaven (NCA 2008/453). **Measurements:** TL 3.65, CL 1.65, CW 0.95, CL:CW 1.74:1, CLH 0.14, CLH:AME 1.97:1. Eyes: ALE 0.06, AME 0.07, PLE 0.06, PME 0.06, AME-AME 0.02, PME-PME 0.07, MOQAW 0.16, MOQPW 0.20, MOQL 0.21. SL 0.86, SW 0.65, AL 2.10, AW 1.10. **Leg measurements:** Palpal segment length: 0.48, 0.26, 0.27, 0.48. Leg I: 0.86, 0.33, 0.62, 0.56, ta0.62. II: 1.10, 0.33, 0.76, 0.71, 0.78. III: 1.00, 0.46, 0.78, 0.76, 0.72. IV: 1.52, 0.51, 1.22, 1.37, 0.92. TL of legs (I-IV): 2.99, 3.68, 3.72, 5.54; leg formula: 4321.

**Colouration:** carapace dark brown; abdomen dark brown to black; sternum, labium, endites, and chelicerae similar in colour to carapace; legs I and II with femora darkened, legs III and IV uniform in colour (Fig. 8). **Carapace:** decorated with squamose setae; smooth in texture; pattern indistinct, radiating from middle towards coxae; two white lines present on posterior third of carapace; fovea absent; posterior margin indented medially; anterior margin of carapace narrowing from coxa I; PER procurved in dorsal view; AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; cluster of setae present on tip. **Endites:** oblique; constricted just above halfway; anterior margin rounded; cluster of setae present on inner-apical margin. **Sternum:** shield-like; broadest between coxa I and II; posterior margin tapered to point between coxa IV. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of legs normal, thin; all tarsi pseudo-segmented. Leg macrosetae: Palps: 1do, 5plv, 1pl, 1do, 1pl, 1rl, 2plv, 1rlv, 4vt. Leg I: 1do, 1pl, 2plv, 2vt. II: 1do, 2plv, 1rlv, 1vt. III: 1do, 1pl, 2pl, 1rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. IV: 1do, 2pl, 2rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern forming solid white transverse band medially on abdomen and longitudinal dotted perpendicular to former; venter similar in colour to dorsum, one lateral white stripe present anteriorly; sigilla not visible. **Epigyne:** in ventral view, anterior hood continuous, "M" shaped, generally recurved; posterior pockets present medially, crescent-shaped; copulatory opening bifurcated at tip. In dorsal view, copulatory duct briefly extends posteriorly, connecting to inner apical margin of spermathecae; fertilisation ducts present

on inner basal margin of spermathecae, curved laterally; spermathecae globular, with flattened interior margin (Figs 117, 118).



**Figs 117-120.** Genitalic morphology of *Micaria bispicula* sp. nov.: (117) female epigyne, ventral view; (118) same, dorsal view; (119) male palp, ventral view; (120) same, retrolateral view. Scale: 0.1 mm.

### Male

Male paratype from Douglas (NCA 2017/1482). **Measurements:** TL 4.15, CL 2.00, CW 1.18, CL:CW 1.70:1, CLH 0.16, CLH:AME 2.03:1. Eyes: ALE 0.08, AME 0.08, PLE 0.06, PME 0.05, AME-AME 0.04, PME-PME 0.10, MOQAW 0.19, MOQPW 0.23, MOQL 0.24. SL 0.90, SW 0.71, AL 2.25, AW 1.25. **Leg measurements:** Palpal segment length: 0.78, 0.41, 0.44, 0.60. Leg I: 1.70, 0.73, 1.52, 1.14, 1.10. II: 1.55, 0.65, 1.25, 1.03, 1.03. III:

1.40, 0.63, 1.18, 0.98, 0.83. IV: 2.03, 0.71, 1.64, 1.70, 1.15. TL of legs (I-IV): 6.19, 5.51, 5.02, 7.23; leg formula: 4123.

**Colouration:** carapace light brown; abdomen dark brown or black; sternum similar in colour to carapace; labium, endites and chelicerae slightly darker than carapace in preserved specimens; legs I and II with femora darkened, legs III and IV uniform in colour (Fig. 10). **Carapace:** decorated with squamose setae; smooth in texture; indistinct dark pattern radiating from middle towards coxae; posterior margin indented medially; anterior margin narrowing from coxa I; PER procurved in dorsal view; AER recurved in anterior view; eye region slightly elevated; fovea absent. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; cluster of setae present at tip. **Endites:** slanting inwards towards base of chelicerae; constricted just above halfway; anterior margin flattened; cluster of setae present on inner-apical margin. **Sternum:** shield-like; broadest between coxa I and II; posterior margin tapered to point between coxa IV. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; all tarsi pseudo-segmented; decorated with lanceolate setae. Leg macrosetae: Palps: 1do, 1pl, 1do, 1pl, 1pl, 4vt. Leg I: 1do, 1pl, 2plv. II: 1do, 2pl, 2plv, 1vt. III: 2do, 1pl, 1rl, 1do, 2pl, 2rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. IV: 2do, 2rl, 2pl, 2rl, 2plv, 2rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern similar to female, faded due to preservation; venter similar to female; sigilla not visible. **Palp:** two RTAs present pre-apically on retrolateral margin, second structure shorter than first; median apophysis present on anterior half of tegulum, "C" shaped, broadened basally; sperm duct present on retrolateral margin of tegulum embolus broadened basally, tip thin, curved retrolaterally; cymbium slightly narrower than apical margin of palpal tibia; widest at basal third tapering apically (Figs 119, 120).

### *Distribution*

The distribution of *M. bispicula* sp. nov. is confined to the more arid western parts of South Africa and southern Namibia (Fig. 121).



**Fig. 121.** The distribution of *Micaria bispicula* sp. nov. in the Afrotropical Region.

## 2.5.5.) *Micaria chrysis* (Simon, 1910) (Figs 10, 51, 72, 122-125)

*Micariolepis chrysis* Simon, 1910: 203 (♀)

### *Material examined*

### *Remarks*

The type material of *Micaria chrysis* from Port Nolloth was described as a female (Simon 1910), but the material was found to be an immature female, and thus there were no descriptions of their genital structures.

Holotype: SOUTH AFRICA. *Northern Cape*: Port Nolloth, Schultze 1115, leg. L. Schultze, IV.1905, 2 immatures (ZMB 28242 – examined).

Other material: CÔTE D'IVOIRE. *Bafing Region*: Touba, upland rice, pitfall traps, 09°43'N; 07°24'W, leg. A. Russell-Smith, 3.XI.1994, 1 ♂ 8 ♀ (MRAC 227257). *Marahoué Region*: Sassandra-Marahoué District, Bouaflé, 06°59'N; 05°39'W, leg. J. Everts, 2.III.1981, 1 ♂ 1 ♀ (MRAC 174034). ETHIOPIA. *Afar Region*: Melka Werer, Awash River, litter, *Acacia nilotica* woodland, hand collecting, 750 m a.s.l., 08°59'N; 40°10'E, leg. A. Russell-Smith, 9.IV.1986, 1 ♀ (MRAC 225651). *Shewa Region*: Addis Ababa, 8 km if Addis Ababa, beneath montane shrub, 2400 m a.s.l., 09°02'N; 38°42'E, 8.IV.1986, 1 ♂ (MRAC 225603); near ICLA compound, under stone in short grass, 20.VI.1983, 1 ♂ 3 ♀ 1 immature (MRAC 225566); 12 km East of Addis Ababa, in grass below Juniper tree, 21.VI.1987, 1 ♂ 1 ♀ 1 immature (MRAC 225648); 15 km East of Addis Ababa, under rock, stream valley, 2500 m a.s.l., 28.V.1988, 1 ♂ (MRAC 225645); Langano Lake, under stones, *Cynodon* grassland, 07°36'N; 38°43'E, 9.VI.1988, 1 ♂ (MRAC 225567); Langano Lake, Hotel, under stone, short *Cynodon* grassland, 1600mm, 16.X.1988, 1 ♂ (MRAC 225644). LESOTHO. *Butha-Butha District*: Near Butha-Butha, under rocks on mountainside, 1780 m a.s.l., 28°47'S; 28°15'E, leg. J. van Niekerk, 14.XII.2012, 1 ♀ (NCA 2013/2366); *Qacha's Nek District*: Qacha's Neck, Under rocks, 1865 m a.s.l., 30°06.155'S; 28°40.239'E, leg. C. Haddad, 9.XI.2003, 1 ♂ (NCA 2018/29); Sehlabathebe National Park, under rocks on mountainside, 2940 m a.s.l., 29°52'S; 28°58'E, leg. J. van Niekerk,

15.I.2013, 1 ♀ (NCA 2013/2375); Same locality, under rocks, sandstone mountain, 2500 m a.s.l., 29°53.095'S; 29°07.407'E, leg. C. Haddad, 9.XI.2003, 3 ♂ 1 ♀ (NCA 2018/24); *Quthing District*: Ha Lazaro, under rocks on hillside, hand collecting, 2355 m a.s.l., 30°18.207'S; 28°07.872'E, leg. C. Haddad, 12.XI.2003, 1 ♂ 1 ♀ (NCA 2018/27); Ha Limapa, under rocks, hand collecting, 2100 m a.s.l., 30°11.019'S; 28°16.727'E, leg. C. Haddad, 13.XI.2003, 2 ♀ (NCA 2018/30); Letšeng-la-Letsie, under rocks along lakeside, 2360 m a.s.l., 30°18.751'S; 28°09.806'E, 12.XI.2003, 2 ♂ 1 ♀ (NCA 2018/25); Near Ha Ratjeka, Under rocks, 30°09.989'S; 28°15.684'E, 12.XI.2004, 1 ♂ (NCA 2018/26); *Tsaba-Tseka District*: Mohale Dam, Island 1, under rocks, plateau, 2025 m a.s.l., 29°25.255'S; 28°05.985'E, leg. C. Haddad, 13.XII.2003, 1 ♀ (NCA 2017/1486); Mohale Dam, Island 2, Under rocks on hillside, 29°25.396'S; 28°05.903'E, leg. C. Haddad, 14.XII.2003, 1 ♀ (NCA 2017/1487); Mohale Dam, Island 3, 29°25.349'S; 28°06.253'E, leg. C. Haddad, 15.XII.2003, 2 ♀ (NCA 2017/1488); Mokhoabong Pass, under rocks, 2880 m a.s.l., 29°31.253'S; 28°20.239'E, leg. C. Haddad, 9.III.2003, ♂ 1 ♀ (NCA 2017/1481). *Inhambane*: Goruvo, Bartholomeu Dias Point, BD Lodge, mangroves, leaf litter, 5 m a.s.l., 21°09.6'S; 35°04.2'E, leg. C. Haddad, R. Lyle & R. Fourie, 10.XII.2007, 1 ♂ 1 immature (NMBA 11248); Morrungulo, Morrungulo Resort, dune forest, 12 m a.s.l., 23°08.4'S; 35°18.00'E, 6.XII.2007, 2 ♂ 2 ♀ (NMBA 11329). NAMIBIA. *Khomas Region*: Garib Ost 275, pitfall traps, SE 2317 BA, leg. E. Griffin, 13-20.XII.1988, 1 ♂ 1 immature (SMN 40971). *Kunene Region*: Hobatere, 3.2 km from gate, 19°19'S; 14°27', leg. E. Griffin, 07-17.V.1991, 1 ♀ (SMN 42616). *Omusati Region*: Skorpion Mine Site, Kaross, 19°21'S; 14°31'E, 5.VIII-13.IX.1987, 1 ♀ (SMN 40631); preservative traps, 5.VIII-15.IX.1987, 1 ♀ (SMN 40632). *Oshikoto Region*: Etosha National Park, Bloubokkiedraai, 18°50'S; 16°57'E, leg. E. Griffin, 28.III-30.IV.1988, 1 ♂ (SMN 40879). *Otjozondupa Region*: Otjiwarongo District, Otjiku 192, on sandy plain next to dry riverbed, 21°16'S; 16°49'E, leg. E. Marais, 16-29.XI.1988, 1 ♂ (SMN 42098). *Zambezi Region*: Kongola, Sidwa near Choy, 10 km S of Kongola, low grassy vegetation on floodplain of Kuando River, 17°50'S; 23°25'E, leg. R. Jocqué, 18-23.X.1987, 1 ♀ (MRAC 168537), 1 ♂ (MRAC 168539). SOUTH AFRICA. *Eastern Cape*: Graaff-Reinet, Asante Sana Game Reserve, Acacia thicket, stony ground, 2000 m a.s.l., 32°15.9'S; 24°16.89'E, leg. J. Midgley, 23.X.2010, 1 ♂ (NCA 2012/2366); Same locality, 1198 m a.s.l., 32°16.98'S; 24°58.26'E, leg. J. Midgley,

15.I.2011, 1 ♂ (NCA 2012/2364); Same locality, steep rocky slope, dense shrubs (50cm high) with little to no grass, 1798 m a.s.l., 32°16.38'S; 24°58.98'E, leg. J. Midgley, 23.X.2010, 1 ♂ (NCA 2012/2362); Same locality, Waterkloof, mixed grass (tussock & tall) & shrubs with scattered oubos, 1806 m a.s.l., 32°14.76'S; 24°56.46'E, leg. J. Midgley, 1 ♂ (NCA 2012/2341); Same locality, high altitude tussock grassland, very few shrubs, 2116 m a.s.l., 32°15.00'S; 24°55.98'E, leg. J. Midgley, 2 ♂ (NCA 2012/2339); Same locality, mixed grass (low mat forming & tall) & small trees, 1413 m a.s.l., 32°15.72'S; 24°57.12'E, leg. J. Midgley, 2 ♂ (NCA 2012/2844); Same locality, mixed grass (tussock & tall) & shrubs with scattered oubos, 1802 m a.s.l., 32°14.76'S; 24°56.46'E, leg. J. Midgley, 15.IV.2010, 1 immature (NCA 2012/2359); Same locality, mixed grass (low mat forming & tall) & small trees, 1415 m a.s.l., 32°15.72'S; 24°57.12'E, 23.X.2010, leg. J. Midgley, 1 ♂ (NCA 2012/2342); Same locality, mixed grass (tussock & tall) & shrubs with scattered oubos, 32°14.76'S; 24°56.46'E, leg. J. Midgley, 25.XI.2009, 1 ♂ (NCA 2012/2340); Same locality, Zuurkloof, 50% mixed shrub; 50% Tussock grass, 1798 m a.s.l., 32°15.54'S; 25°00.54'E, leg. J. Midgley, 23.X.2010, 1 ♂ (NCA 2012/2360); Same locality, High altitude tussock grassland, few shrubs, 2013 m a.s.l., 32°15.12'S; 25°0.42'E, leg. J. Midgley, 1 ♂ (NCA 2012/2361); Same locality, 50% mixed shrub; 50% tussock grass, 1801 m a.s.l., 32°15.54'S; 25°00.54'E, leg. J. Midgley, 1 ♂ (NCA 2012/2363); Jeffrey's Bay, Kabeljous, Garden, leaf litter, 34°00.413'S; 24°55.796'E, leg. C. Haddad, 08.I.2015, 1 ♂ (NCA 2015/1678); Same locality, coastal dune, base of grass tussocks, hand collecting, 34°00.513'S; 24°55.896'E, leg. C. Haddad & L. Wiese, 12.VII.2014, 1 ♀ (NCA 2014/1754), 10 m a.s.l., 2 ♂ (NCA 2014/1753). Free State: Amanzi Private Game Reserve, koppie, northern slope, pitfall traps, 28°35.405'S; 26°25.665'E, leg. V. Butler, 1-30.IX.2012, 1 ♂ (NCA 2013/3206); Same locality, plateau, 28°35.565'S; 26°25.550'E, leg. V. Butler, 1-31.VII.2013, 1 ♂ (NCA 2013/3728); Same locality, leg. V. Butler, 1-31.III.2013, 1 ♂ (NCA 2013/3526); Same locality, northern slope, 28°35.405'S; 26°25.665'E, leg. V. Butler, 1 ♀ (NCA 2013/3476); Same locality, leg. V. Butler, 1-31.X.2012, 1 ♂ (NCA 2014/1498); Same locality, plateau, 28°35.565'S; 26°25.550'E, leg. V. Butler, 1 ♂ (NCA 2014/1563); Same locality, *Acacia karroo* woodlands, 28°36.365'S; 26°25.030'E, leg. V. Butler, 1-30.IX.2012, 2 ♂ (NCA 2013/3114); Same locality, *Digitaria eriantha* grazing, 28°35.980'S; 26°24.935'E, leg. V. Butler, 2 ♂ (NCA 2013/3294); Same locality, Open

grassland, 28°35.845'S; 26°26.280'E, leg. V. Butler, 1 ♂ (NCA 2013/3349); Same locality, *Acacia karroo* woodlands, 28°35.785'S; 26°26.335'E, leg. V. Butler, 7 ♂ (NCA 2013/3376); Bloemfontein, Botanical Gardens, grassland, 29°01.8'S; 26°07.8'E, leg. C. Haddad, 21.IX-9.XII.2009, 1 ♂ (NMBA 15339); Oliewenhuis, Grant's Hill South, 1250 m a.s.l., 29°03.6'S; 26°07.8'E, L.N. Lotz, V.1991, 1 ♀ (NMBA 6461); Phuthaditjaba, Basotho Village, under rocks on hillside, hand collecting, 1840 m a.s.l., 28°29.316'S; 28°44.673'E, leg. C. Haddad & J. Neethling, 14.XI.2013, 1 ♀ (NCA 2014/188); Theunissen, Erfenis Dam Nature reserve, unburned site 3, pitfall traps, 28°18.00'S; 26°28.8'E, leg. C. Haddad, 22.XI-23.XII.2005, 1 ♀ (NMBA 17050); Same locality, *Acacia karroo* trees, R. Fourie & A. Grobler, 30.IX-28.X.2009, 3 ♂ 1 ♀ (NMBA 14394). *Gauteng*: Cullinan, 25°39.6'S; 28°30.6'E, leg. R. de Klerk, 6.VI.2000, 1 ♀ (NCA 2007/1318); Heidelberg, Suikerbosrand Nature Reserve, pitfall traps, 1700 m a.s.l., 26°27.6'S; 28°25.62'E, leg. P.S. Roos, 26.IV.2005, 1 ♀ (NCA 2010/2170). *KwaZulu-Natal*: Ithala Game Reserve, Reserve Offices, base of grass tussocks, hand collecting, 27°30.301'S; 31°12.105'E, leg. C. Haddad, 28.I.2014, 1 ♀ (NCA 2013/5068); Ndumo Game Reserve, Environmental Centre, *Acacia xanthophloea* forest, pitfall traps, 26°54.955'S; 32°18.376'E, leg. C. Haddad, V. Swart & A. Kirk-Spriggs, 27.XI-7.XII.2009, 1 ♀ (NCA 2013/547); Same locality, Near Dipini Hide, *Albizia-Euphorbia* thicket, 26°51.872'S; 32°15.146'E, leg. C. Haddad, V. Swart & A. Kirk-Spriggs, 28.XI-8.XII.2009, 1 ♂ (NCA 2013/470); Same locality, Ezikebheni, *Albizia-Euphorbia* thicket, 26°53.398'S; 32°18.671'E, leg. C. Haddad, V. Swart & A. Kirk-Spriggs, 28.XI-8.XII.2009, 2 ♂ (NCA 2013/492); Same locality, Nyamiti Pan, *Acacia xanthophloea* bark, hand collecting, 26°53.767'S; 32°16.557'E, leg. C. Haddad, 23.I.2006, 1 ♀ (NCA 2014/1204); Same locality, *Acacia xanthophloea* forest, pitfall traps, 26°53.675'S; 32°16.974'E, leg. C. Haddad, V. Swart & A. Kirk-Spriggs, 27.XI-7.XII.2009, 1 ♂ (NCA 2013/532); Newcastle, Moorfield Farm, montane grassland, pitfall traps, 1870 m a.s.l., 27°55.551'S; 29°42.495'E, 7.I.2016, 2 ♂ (NCA 2017/831); Sani Pass, 1800 m a.s.l., 29°40.8'S; 29°30.6'E, leg. University of Pretoria Students, 20.I.2008, 1 ♂ (NCA 2011/854); Same locality, 900 m a.s.l., 30°12.00'S; 30°24.00'E, leg. University of Pretoria Students, 22.I.2009, 1 ♂ (NCA 2011/922); Same locality, 2400 m a.s.l., 29°39.6'S; 29°30.6'E, leg. University of Pretoria Students, 1.X.2009, 1 ♂ (NCA 2011/751); Same locality, leg. University of Pretoria Students, 24.IX.2010, 1 ♂ (NCA 2011/919);

Same locality, 2100 m a.s.l., 29°37.2'S; 29°26.4'E, leg. University of Pretoria Students, 22.I.2009, 1 ♂ (NCA 2011/1682); Same locality, 29°37.2'S; 29°22.2'E, leg. University of Pretoria Students, 1.IX.2006, 1 immature (NCA 2008/1977), Same data, 1 ♂ (NCA 2008/1976); Tembe Elephant Park, Mahlasela Hide, Closed Woodland, hand collecting, 70 m a.s.l., 27°02.797'S; 32°26.898'E, leg. C. Haddad & R. Booyens, 28.III.2017, 1 ♂ (NCA 2017/1165); Same locality, pioneer grassland; base of grass, leg. C. Haddad, 9.I.2006, 1 ♀ (NCA 2007/3530); uKhahlamba Drakensberg Park, Royal National Park, dry grassland, 28°41.34'S; 28°56.7'E, leg. T. Russell-Smith, 24.IV.1977, 1 ♀ (NCA 2015/2922); Ulundi, Ophathe Game Reserve, overgrazed savanna, Winkler Traps, 560 m a.s.l., 28°22.14'S; 31°23.34'E, leg. C. Haddad, 3.X.2008, 2 ♂ (NCA 2008/4080); Same locality, Ophathe Riverbed, 50 traps 4 days, pitfall traps, 455 m a.s.l., 28°23.727'S; 31°23.643'E, leg. C. Haddad, S. Oliver & C. Hanekom, 30.IX-4.X.2008, 1 ♀ (NCA 2008/4252); Underberg, Sani-Pass, 3d, 2400 m a.s.l., 29°36.318'S; 29°18.984'E, leg. University of Pretoria Students, 1.I.2009, 2 ♂ 1 immature (NCA 2017/235). *Limpopo*: Makhado, Vyeboom village near Kruger National Park, 23°18.534'S; 30°24.486'E, leg. E. Mauda, 25.I.2015, 1 ♀ (NCA 2015/2490); Mopani, Ndengeza, 9.VI.2014, 1 ♂ 1 ♀ (NCA 2015/2483); Ndengeza, 14.VI.2014, 1 ♂ 1 ♀ (NCA 2015/2487); Lhuvhondo Nature Reserve, leg. M. v.d. Merwe, 29.VI.1997, 1 ♀ 1 immature (NCA 98/27); Vyeboom village near Kruger National Park, leg. E. Mauda, 22.IV.2014, 1 ♂ (NCA 2016/244). *Mpumalanga*: Delmas Farm, Rietvallei, sprayed maize, hand collecting, leg. M. v. Jaarsveld, 25.V.2005, 1 ♀ (NCA 2007/1324); Dullstroom, Verloren Valley Nature Reserve, pitfall traps, 25°19.86'S; 30°07.74'E, leg. L. Makaka, 7.II.2009, 1 ♂ (NCA 2009/5003); Marble Hall, Bt Cotton Survey, 24°57.6'S; 29°17.4'E, leg. M. Mellet, 3.IV.2002, 11 ♂ 10 ♀ (NCA 2004/1331); 15.IV.2003, 1 ♂ 1 ♀ 1 immature (NCA 2004/1218), 3 ♂ (NCA 2004/1287). *Northern Cape*: Kalahari Gemsbok Park, Twee Rivieren, 26°15.6'S; 20°22.2'E, leg. E.A. Ueckermann, 8-12.II.1987, 1 ♀ (NCA 87/479); Port Nolloth, Happy Valley Beach, hand collecting, 29°17.482'S; 16°52.647'E, leg. R. Booyens, 27.VII.2017, 1 ♀ (NCA 2017/1302). *Western Cape*: Jacobs Bay, coastal fynbos, leaf litter, 32°58.465'S; 17°53.422'E, leg. C. Haddad & R. Lyle, 2.X.2007, 1 ♀ (NCA 2008/408); Prieksa, Green Valley Nuts, base of grass tussocks, hand collecting, 29°34.924'S; 22°53.376'E, leg. C. Haddad, 28.I.2009, 1 ♀ (NCA 2009/1475). *Western Cape*: Anysberg

Nature Reserve, *Thamnochortus*, leg. C. Haddad & R. Lyle, 24.IX.2005, 2 ♂ 1 ♀ (NCA 2007/3751); Buffels Bay, Sand Dunes, 34°04.98'S; 22°58.02'E, leg. T. Russell-Smith, 12.VII.1978, 1 ♂ (NCA 2015/2828); Cederberg Wilderness Area, Aan Het Berg, pitfall traps, 2-258 m a.s.l., 32°16.62'S; 18°31.8'E, leg. E. Nortje & S. Kritzinger-Klopper, 6.X.2009, 1 ♀ (NCA 2012/711); Same locality, 3-258 m a.s.l., leg. E. Nortje & S. Kritzinger-Klopper, 1.III.2006, 1 ♂ 1 immature (NCA 2012/4916); Same locality, 3-680 m a.s.l., 32°24.00'S; 19°05.46'E, leg. E. Nortje & S. Kritzinger-Klopper, 1.III.2004, 1 ♂ (NCA 2012/5096); Same locality, 4-1366 m a.s.l., 32°26.1'S; 19°12.78'E, leg. E. Nortje & S. Kritzinger-Klopper, 1.X.2009, 1 ♀ (NCA 2012/4918); Same locality, leg. E. Nortje & S. Kritzinger-Klopper, 1.X.2010, 1 immature (NCA 2012/4917); Lambert's Bay, 4-4 m a.s.l., 32°10.92'S; 18°19.02'E, 6.X.2005, 1 ♀ (NCA 2012/3550); Same locality, 664 m a.s.l., 32°24.066'S, 19°05.428'E, leg. S. Kritzinger-Klopper, 1.III.2009, 1 ♂ (NCA 2011/914); De Hoop Nature Reserve, De Hoop Vlei, fynbos, hand collecting, 15 m a.s.l., 34°29'S; 20°25'E, leg. R. Booysen & A. de Smit, 8.IX.2017, 1 ♀ (NCA 2019/789); Same locality, Thamnochortu, leg. C. Haddad, 26.IX.2007, 2 ♀ (NCA 2007/3848); Same locality, back dune, leaf litter, 25.III.2005, 1 ♀ 6 immature (NCA 2005/569); Hermanus, Brekfisbaai, Silk retreats under limpet shells, under rocks at back of shore, intertidal zone, hand collecting, 0 m a.s.l., 34°25.323'S; 19°08.304'E, leg. C. Haddad, V. Hamilton-Atwell, S. Sebata, G. Edwards, R. Booysen, L. Whitehead, 25.I.2017, 1 ♀ (NCA 2019/411); Fisherhaven, On ground and in leaf litter, 34°21.433'S; 19°07.557'E, leg. C. Haddad, 28.XII.2014, 1 ♂ (NCA 2015/1746); Same locality, leaf litter, leg. C. Haddad, 28.X.2004, 1 ♀ (NCA 2006/796); Robertson, Noree Road, pitfall traps, 33°43.693'S, 19°47.533'E, leg. P. Addison & M. Addison, XII.2016, 2 ♂ 1 ♀ (NCA 2020/92); Same locality, 33°43.649'S, 19°43.527'E, leg. P. Addison & M. Addison, 1 ♀ (NCA 2020/93); Same locality, 33°43.674'S, 19°47.521'E, leg. P. Addison & M. Addison, 3 ♂ (NCA 2020/95); Same locality, 33°43.240'S, 19°47.209'E, leg. P. Addison & M. Addison, 1 ♀ (NCA 2020/97); Same locality, 33°43.737'S, 19°47.536'E, leg. P. Addison & M. Addison, 1 ♂ 1 ♀ (NCA 2020/94); Same locality, 33°43.984'S, 19°47.538'E, leg. P. Addison & M. Addison, 1 ♂ (NCA 2020/98); Same locality, 33°43.004'S, 19°47.271'E, leg. P. Addison & M. Addison, 1 ♀ (NCA 2020/96); Swartberg Pass, 33°18.6'S; 22°03'E, leg. J. Breytenbach, 4.XII.1978, 2 ♂ (NCA 97/751); Vredendal, Groot Fontein 105, under objects, hand collecting, 32°02.4'S;

18°23.4'E, leg. Entomol. Staff, 20.X.1987, 1 ♀ (NMBA 5454); Worcester, 33°39.00'S; 19°25.998'E, leg. H. van der Walt, 15.X.2015, 1 ♂ (NCA 2016/2780). TANZANIA. *Kilimanjaro Region*: Mkomazi National Park, Ibaya Camp, unburnt grassland, 04°00'S; 38°00'E, leg. A. Russell-Smith, 26.XI.1994, 3 ♂ 2 ♀ (MRAC 211337). *Mbeya Region*: Tukuyu, Ushirika area, Kayuki tea estate, evergreen forest, litter, 1200 m a.s.l., 09°25'S; 34°40'E, leg. R. Jocqué, 29.IX.1991, 1 ♂ (MRAC 173411).

### *Diagnosis*

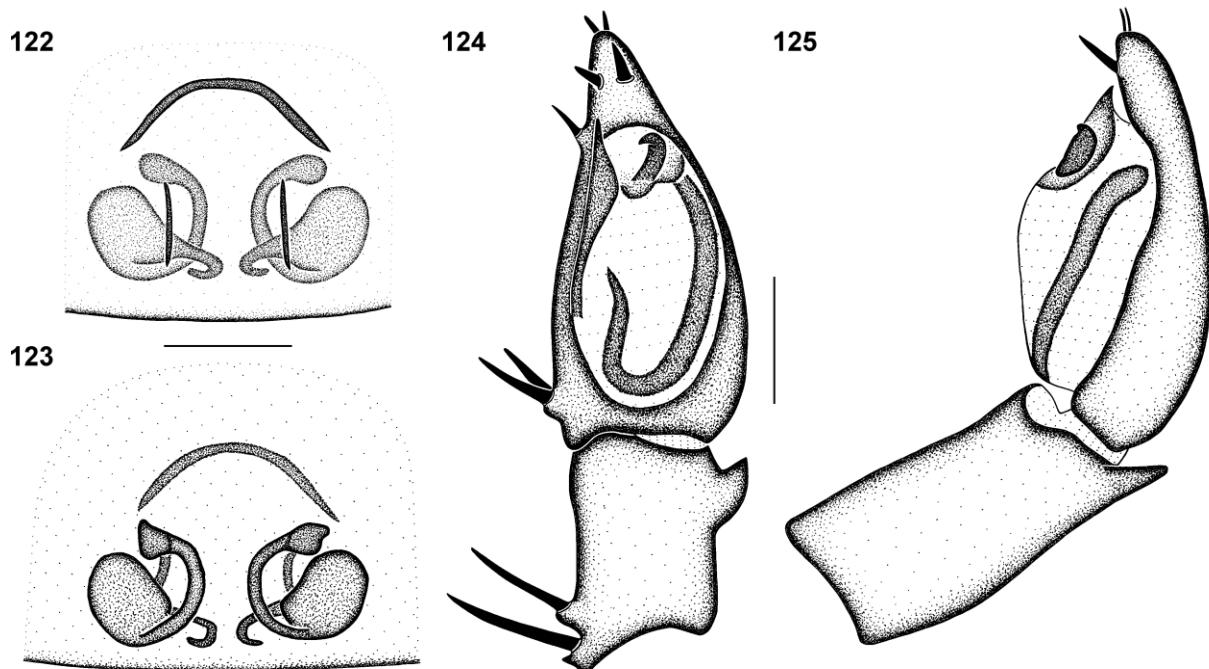
*Micaria chrysia* females can be distinguished from other Afrotropical *Micaria* such as *M. felix* sp. nov. in having a continuous anterior hood that is recurved and slightly flattened. Males have a slight constriction in the abdomen, but no visible colour differences between the anterior half and the posterior half as in the males of *M. felix*. Both sexes dark brown or black and iridescent colouration. Their abdomens have two small white spots close to the anterior margin, not present in *M. felix*.

### *Female*

Female from Ha Lazaro, Lesotho (NCA 2018/27). **Measurements:** TL 2.95, CL 1.10, CW 0.65, CL:CW 1.69:1, CLH 0.06, CLH:AME 1.58:1. Eyes: ALE 0.06, AME 0.04, PLE 0.05, PME 0.06, AME-AME 0.01, PME-PME 0.03, MOQAW 0.10, MOQPW 0.12, MOQAL 0.15. SL 0.62, SW 0.46, AL 1.68, AW 1.00. **Leg measurements:** Palpal segment length: 0.41, 0.22, 0.29, 0.32. Leg I: 0.70, 0.22, 0.51, 0.43, 0.51. II: 0.67, 0.27, 0.54, 0.49, 0.56. III: 0.56, 0.22, 0.40, 0.48, 0.40. IV: 0.90, 0.33, 0.78, 0.86, 0.57. TL of legs (I-IV): 2.37, 2.53, 2.06, 3.44; leg formula: 4213.

**Colouration** carapace and abdomen dark brown or black; legs I and II with basal half of femora darkened; legs III and IV uniform in colour; labium, endites and chelicerae similar in colour to carapace; sternum lighter than carapace (Fig. 10). **Carapace:** decorated with squamose setae; smooth in texture; shallow transverse depression present on posterior third of carapace; pattern visible, broad somewhat rectangular with radiating dark lines; posterior margin rounded; anterior margin narrowing moderately from coxa I; fovea absent; PER recurved in dorsal view; AER recurved in anterior view. **Chelicerae:**

decorated with plumose setae. **Labium**: triangular in shape, rounded at tip. **Endites**: slightly slanting inwards; constricted just above halfway; anterior margin rounded; cluster of setae present on inner-apical point. **Sternum**: shield-like; broadest between coxa I and II, tapering towards point between coxa IV. **Legs**: femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 5plv, 1pl, 1pl, 1plv, 2pl, 1plv, 2rlv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv, 1rlv. II: 1d. III: 1do, 2vt, 1plv, 1rlv, 4vt. IV: 2plv, 2rlv. Scopulate setae present on metatarsi and tarsi of legs I-IV, two rows on former and four on latter. **Abdomen**: cylindrical in shape; decorated with brachiate setae; dorsum with two small white spots roughly one-quarter of abdomen length from anterior ridge (may be faded in preserved specimens); sigilla not visible; venter similar in colour to dorsum. **Epigyne**: in ventral view, anterior hood continuous, moderately recurved; curve flattened medially; posterior pockets present medially, straight; copulatory opening bulbous. In dorsal view, copulatory ducts elongate, thin, curved laterally outwards, originating from base of spermathecae; fertilisation duct present medially, curved towards apex; spermathecae oval, longer than broad; interior apical ridge flattened and merged with apical ridge of fertilisation duct (Figs 122, 123).



**Figs 122-125.** Genitalic morphology of *Micaria chrysos* (Simon, 1910): (122) female epigyne, ventral view; (123) same, dorsal view; (124) male palp, ventral view; (125) same, retrolateral view. Scale: 0.1 mm.

#### Male

Male from Ha Lazaro, Lesotho (NCA 2018/27). **Measurements:** TL 2.65, CL 1.30, CW 0.80, CL:CW 1.63:1, CLH 0.08, CLH:AME 1.975:1. Eyes: ALE 0.04, AME 0.04, PLE 0.06, PME 0.06, AME-AME 0.01, PME-PME 0.05, MOQAW 0.11, MOQPW 0.14, MOQL 0.19. SL 0.65, SW 0.51, AL 1.25, AW 0.60. **Leg measurements:** Palpal segment length: 0.59, 0.35, 0.30, 0.37. Leg I: 0.88, 0.32, 0.62, 0.52, 0.57. II: 0.71, 0.29, 0.57, 0.50, 0.56. III: 0.57, 0.25, 0.44, 0.51, 0.40. IV: 0.90, 0.33, 0.73, 0.86, 0.55. TL of legs (I-IV): 2.91, 2.63, 2.17, 3.37; leg formula: 4123.

**Colouration:** carapace and abdomen dark brown or black; legs I and II with basal half of femora darkened; legs III and IV uniform in colour; sternum, labium, endites and chelicerae similar in colour to carapace. **Carapace:** decorated with squamose setae; smooth in texture; shallow transverse depression present on posterior third of carapace; markings visible medially, broad somewhat rectangular dark pattern with radiating dark lines; posterior margin rounded; anterior margin narrowing slightly from coxa I; fovea

absent; PER recurved (almost straight) in dorsal view; AER recurved in anterior view. **Chelicerae**: decorated with plumose setae. **Labium**: triangular in shape, rounded at tip between chelicerae. **Endites**: slightly slanting inwards; constricted just above halfway; anterior margin rounded; cluster of setae present on inner-apical margin. **Sternum**: broadest between coxa I and II, tapering to point between coxa IV; no brachiate setae present. **Legs**: femora of all legs laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with feathery setae (Fig. 67). Leg macrosetae: Palps: pa 1pl, 1pl, 1plv, 1pl, 2plv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv, 1rlv. II: ?. III: 1do, 2vt, 1plv, 1rlv, 4vt. Leg IV: 2plv, 2rlv. Scopulate setae present on metatarsi and tarsi of legs I-IV, two rows on former and four on latter segment. **Abdomen**: cylindrical in shape; decorated with squamose setae; no pattern visible; venter similar in colour to dorsum; sigilla present, white, crescent-shaped pits in transverse constriction. **Sternum**: shield-like; serrula present. **Palp**: RTA present on apex of tibia; median apophysis present medially, curved prolaterally; sperm duct present on retrolateral ventral surface of tegulum; embolus broadest at base, tip straight and thin; cymbium widest at basal third, tapered above tegulum (Figs 124, 125).

### *Distribution*

*Micaria chrysis* is widely distributed throughout southern Africa, with isolated records from West and East Africa (Fig. 126).



**Fig. 126.** The distribution of *Micaria chrysis* (Simon, 1910) in the Afrotropical Region.

## 2.5.6.) *Micaria durbana* sp. nov. (Figs 11-12, 52, 73, 127-130)

### *Material examined*

Holotype ♀ together with 1 ♂ paratype: SOUTH AFRICA. *KwaZulu-Natal*: Durban, Musgrave, shrubs and grasses in garden, hand collecting, 55 m a.s.l., 29°51.085'S; 31°00.052'E, leg. C. Haddad, 27.XII.2016 (NCA 2019/414).

Paratypes: SOUTH AFRICA. *KwaZulu-Natal*: Tembe Elephant Park, Viewing Tower, Base of grass tussocks, hand collecting, 27°02.225'S; 32°24.900'E, leg. C. Haddad, 13.II.2015, 1 ♂ (NCA 2020/82). ZAMBIA. *Southern Province*: Livingstone, Livingstone Airport nr runway, leaf litter, 17°47.998'S; 25°46.588'E, leg. C. Haddad, J. Parau & F. Jordaan, 1.XII.2006, 2 ♀ (NCA 2007/621).

### *Etymology*

The species name refers to the type locality, Durban in South Africa.

### *Diagnosis*

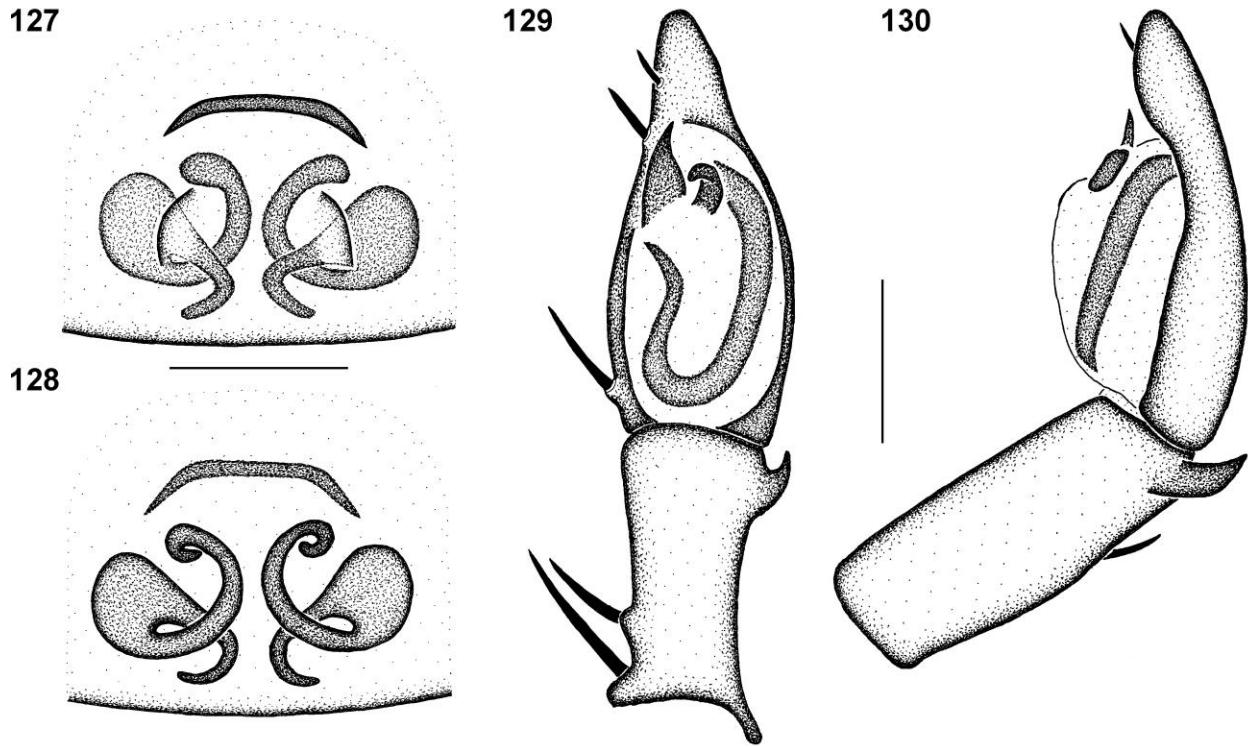
The genitalic structure of *M. durbana* sp. nov. females closely resemble that of *M. chrysis*, but they can be distinguished by having thicker copulatory ducts and a flattened anterior hood. The males can be recognised in having a large tapered embolus, twice the size of the MA and a sharp bend in the sperm duct just below the embolus. Their carapace is also slightly more elongate than the females'.

### *Female*

Female holotype from Musgrave, Durban (NCA 2019/414). **Measurements:** TL 2.35, CL 0.90, CW 0.55, CL:CW 1.63:1, CLH 0.05, CLH:AME 1.5:1. Eyes: ALE 0.04, AME 0.03, PLE 0.05, PME 0.05, AME-AME 0.01, PME-PME 0.03, MOQAW 0.09, MOQPW 0.13, MOQL 0.14. SL 0.54, SW 0.38, AL 1.20, AW 0.75. **Leg measurements:** Palpal segment length: 0.30, 0.18, 0.21 0.27. Leg I: 0.60, 0.27, 0.46, 0.41, 0.41. II: 0.54, 0.24, 0.38, 0.44,

0.41. III: 0.44, 0.21, 0.32, 0.38, 0.30. IV: 0.70, 0.27, 0.62, 0.64, 0.46. TL of legs (I-IV): 2.15, 2.01, 1.65, 2.69; leg formula: 4123.

**Colouration:** carapace dark brown and golden colour, with anterior half slightly darker; abdomen dark brown to black with interrupting patterns; femur I darkened on basal half, rest of leg uniform in colour; labium, endites and chelicerae similar in colour to carapace (Fig. 11). **Carapace:** smooth in texture; decorated with squamose setae; pattern visible medially, dark lines radiating towards eye region and carapace margins; fovea absent; posterior margin straight; anterior margin narrowing slightly from coxa I; PER recurved in dorsal view, AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape, cluster of setae present on tip. **Endites:** **oblique**; constricted slightly just above halfway; cluster of setae present on inner-apical margin; posterior margin rounded. **Sternum:** shield-like; lighter in colour than carapace; broadest between coxa I and II; posterior margin truncating between coxa IV; dark patches on some of lateral margins. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 1pl, 2pl, 1pl, 2plv, 2rlv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv, 1rlv. III: 2vt, 4vt. IV: 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern visible as transverse white band medially at constriction; longitudinal line is formed by scutum perpendicular to constriction (usually brown, but may appear lighter in older specimens) (Fig. 1); venter similar in colour to dorsum; sigilla not visible. **Epigyne:** in ventral view, anterior hood continuous, flattened; posterior pockets present medially, laterally curved apically; copulatory opening at curled apex. In dorsal view, copulatory ducts elongate, “C” shaped, curled at apex, close to each other; fertilisation ducts present medially, elongate, laterally curved; spermathecae bean-shaped; longer than broad (Figs 127-128).



**Figs 127-130.** Genitalic morphology of *Micaria durbana* sp. nov.: (127) female epigyne, ventral view; (128) same, dorsal view; (129) male palp, ventral view; (130) same, retrolateral view. Scale: 0.1 mm.

### Male

Male paratype from Tembe Elephant Park (NCA). **Measurements:** TL 2.05, CL 1.05, CW 0.60, CL:CW 1.75:1, CLH 0.06, CLH:AME 1.6:1. Eyes: ALE 0.05, AME 0.04, PLE 0.05, PME 0.06, AME-AME 0.01, PME-PME 0.03, MOQAW 0.10, MOQPW 0.12, MOQL 0.16. SL 0.56, SW 0.37, AL 0.95, AW 0.50. **Leg measurements:** Palpal segment length: 0.40, 0.21, 0.19, 0.29. Leg I: 0.65, 0.25, 0.48, 0.40, 0.49. II: 0.57, 0.22, 0.44, 0.38, 0.46. III: 0.49, 0.19, 0.38, 0.57, 0.37. IV: 0.84, 0.27, 0.67, 0.76, 0.56. TL of legs (I-IV): 2.27, 2.07, 2.00, 3.10; leg formula: 4123.

**Colouration:** carapace brown and golden colour with anterior half slightly darker; abdomen dark brown or black with interrupting patterns; femora I darkened on posterior half, leg III and IV uniform in colour; labium, endites and chelicerae similar in colour to carapace (Fig. 12). **Carapace:** smooth in texture; decorated with squamose setae;

pattern visible medially, dark lines radiating towards eye region and carapace margins from central dark patch; fovea absent; posterior margin straight; anterior margin narrowing slightly from coxa I; PER recurved in dorsal view, AER recurved in anterior view. **Chelicerae**: decorated with setae. **Labium**: triangular in shape; tuft of setae present on tip. **Endites: oblique**; constricted slightly just above halfway; cluster of setae present on inner-apical margin; posterior margin rounded. **Sternum**: shield-like; lighter in colour than carapace; broadest between coxa I and II; posterior margin truncating narrowly between coxa IV; dark patches on lateral margins. **Legs**: femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with feathery setae. Leg macrosetae: Palps: 1pl, 2pl, 1pl, 2plv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv, 1rlv. II: 2vt. III: 2vt, 4vt. IV: 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen**: cylindrical in shape; wrinkly in texture on anterior half; constricted medially and decorated with squamose setae; dorsal pattern forming transverse white band medially where constricted; longitudinal line scutum perpendicular to constriction (Fig. 12); venter similar in colour to dorsum; sigilla not visible. **Palp**: RTA present apically on retrolateral margin; median apophysis present next to embolus; median apophysis broad, curved and tapering; sperm duct present on retrolateral surface of tegulum; embolus broadest at base, tapered, elongate, curved retrolaterally; cymbium pear-shaped, broadest at basal third; cymbial tip broadly tapered; two small spines present on apex of cymbium; one ventral terminal spine above embolus (Figs 129, 130).

### *Distribution*

*Micaria durbana sp. nov.* is distributed on the eastern coast of South Africa, with an isolated recorded from Zambia (Fig. 131).



**Fig. 131.** The distribution of *M. durbana* sp. nov. in the Afrotropical Region.

**2.5.7.) *Micaria felix* sp. nov.** (Figs 13, 31, 32, 35, 37, 38, 40, 42, 46, 53, 74, 79, 85, 86, 88, 90, 91, 94, 95, 97-99, 132-135).

*Material examined*

Holotype ♀: SOUTH AFRICA. *Gauteng*: Pretoria/Tshwane, Rietondale Research Station, pitfall traps, leg. J. Nkwana, 16.VII.1998 (NCA 2007/1320).

Paratypes: CAMEROON. *North Province*: Faro Department, Faro Game Reserve, wooded savanna, pitfall traps, 08°24'N; 12°49'E, leg. R. Jocqué, R. Loosveldt, L. Baert & M. Alderweireldt, 04.V.2007, 1 ♂ (MRAC 221195). SOUTH AFRICA. *Free State*: Bloemfontein, Botanical Gardens, against NE slope of koppie, 29°04.8'S; 26°06.00'E, leg. L.N. Lotz, VII.2007, 1 ♂ (NMBA 10607). *Limpopo*: Mopani, Ndengeza, pitfall traps, 23°18.534'S; 30°24.486'E, leg. E. Mauda, 21.I.2015, 2 ♂ (NCA 2015/2478). ZIMBABWE. *Matobo*: Matobo National Park, Pomongwe, 20°32'S; 28°30'E, leg. M. FitzPatrick, XII.2004, 1 ♂ (NMZ/A15251). *Western Cape*: George, Outeniquastrand, in garden, hand collecting, leg. C. Haddad, 31.XII.2017, 5 ♂ (NCA 2019/407).

Other material: CAMEROON. *North Province*: Faro Department, Faro Game Reserve, gallery forest, pitfall traps, 08°24'N; 12°49'E, leg. R. Jocqué, R. Loosveldt, L. Baert & M. Alderweireldt, 5.V.2007, 1 ♂ (MRAC 221186). ETHIOPIA. *Oromia Region*: Yabelo, Dembala Watcho, in grass, dry *Acacia* bushland, hand collecting, 04°53'N; 38°05'E, leg. A. Russell-Smith, 10.X.1982, 1 ♂ (MRAC 225641). *Shewa Region*: Addis Alem, 10 km W of Addis Alem, under stones, in pasture, 09°02.828'N; 38°24.452'E, leg. A. Russel-Smith, 28.VI.1988, 1 ♂ (MRAC 225606). MALAWI. *Northern Region*: Rhumphi District, Nyika plateau, herbaceous vegetation with *Phillipia*, pitfall traps, 750 m a.s.l., 10°40'S; 33°50'E, leg. R. Jocqué, 6-18.XII.1981, 4 ♂ (MRAC 155746). MOZAMBIQUE. *Inhaca Island*: wetland, pitfall traps, 26°01'S; 32°54'E, leg. T. Steyn, 15-29.IX.1993, 1 ♂ (MRAC 209338); Same locality, 4-18.X.1993, 1 ♂ (MRAC 209071); Same locality, 5-15.III.1994, 1 ♂ 1 ♀; Same locality, 26°01'S; 32°54'E, 8-23.IV.1994, 4 ♂ 1 ♀ 1 immature (MRAC 209739); Same locality, 1 ♀ 1 ♂; 5-15.III.1994 (MRAC 209383); 28.V-19.VI.1994, 1 ♂ (MRAC 209724); Same locality, 25.VI-9.VII.1994, 1 ♂ 1 ♀ (MRAC 208988); Same locality,

10-24.I.1994, 1 ♂ (MRAC 209342); Same locality, 30.IV-14.V.1994, 1 ♀ (MRAC 209908); Same locality, 24.I-7.II.1994, 2 ♂ (MRAC 208959); Same locality, 14-28.V.1994, 1 ♂ 1 immature (MRAC 209807); Same locality, 23-30.IV.1994, 5 ♂ 1 ♀ (MRAC 209782), Same locality, 21.II-5.III.1994, 1 ♀ (MRAC 209447); Same locality, 3-24.IX.1994, 1 ♂ (MRAC 215930); Same locality, 13-27.XII.1993, 2 ♂ (MRAC 208972); Same locality, 9-23.VII.1994, 1 ♂ (MRAC 209212); Same locality, 15-29.XI.1993, 1 ♂ (MRAC 209334); Same locality, 20.VII-3.VIII.1994, 1 ♂ (MRAC 215955). NAMIBIA. *Erongo Region*: Rossing Mine Survey, E. camp pond, under stones near water, hand collecting, SE 2215 CA, leg. E. Griffin, 25.IX.1984, 1 immature (SMN 39045). *Karas Region*: Karasburg District, Karabib 327, pitfall traps, 28°33'S; 17°50'E, leg. E. Marais & J. Irish, 19.IX-4.X.1988, 1 immature (SMN); Keetmanshoop District, Khabus 146, 26°17'S; 18°14'E, leg. N. & G. Olivier, 23.VII-1.XII.1988, 1 immature (SMN); Same locality, 26°18'S; 18°13'E, leg. N. & G. Olivier, 1 immature (SMN); Mount Stormberg, 3 km NNE Stormberg, in leaf litter under dry bush, hand collecting, 28°12'S; 17°14'E, leg. E. Marais, 11.III.1990, 1 immature (SMN). *Kunene Region*: Omaruru District, Ugab River, 2 km W Brandberg West, sweeping, 20°58.0833'S; 14°06.06'E, 23.X.1998, 1 immature (SMN 44863). *Omusati Region*: Dorstland, pitfall traps, 18°46'S; 14°44'E, leg. E. Griffin, 24.III-26.IV.1988, 1 immature (SMN). *Oshikoto Region*: Etosha National Park, Kamaseb?, 19°04'S; 16°41'E, 8.VIII-14.IX.1987, 1 immature (SMN); Namutoni, Bloubokdraai, 18°50'S; 16°57'E, leg. E. Griffin, 10.VIII-14.IX.1987, 1 immature (SMN). SOUTH AFRICA. *Eastern Cape*: Graaff-Reinet, Asante Sana Game Reserve, Waterkloof, High altitude tussock grassland, few shrubs, 2166 m a.s.l., 32°15.00'S; 24°55.98'E, leg. J. Midgley, 25.XI.2009, 1 ♂ (NCA 2012/2338). *Free State*: Amanzi Private Game Reserve Game Reserve, *Vachellia karroo* woodland, 28°36.365'S; 26°25.030'E, leg. V. Butler, 30.IX-31.XI.2012, 1 ♂ (NCA 2017/1345); Bloemfontein, Free State National Botanical Gardens, leg. L.N. Lotz, XI.2008, 1 ♂ (NMBA 10942); Same locality, grassland, leg. C. Haddad, 9.XII-4.I.2009-10, 1 ♂ (NMBA 15021); Same locality, *Searsia lancea* and grassland, 1380 m a.s.l., 29°03'S; 26°12'E, leg. C. Haddad & L. Mosepe, 8.V-8.VI.2018, 7 ♂ (NCA 2018/1227); Bloemfontein, Farm Hopefield, on *Odontotermes* mound, hand collecting, 28°51.781'S; 26°09.750'E, leg. C. Haddad, 4.XI.2001, 1 ♂ (NCA 2017/1474); Same locality, under cattle dung pad, 22.XII.2001, 1 ♂ (NCA 2017/1475); Bloemfontein,

Langenhoven Park, 29°05.108'S, 26°09.565'E, on ground in garden with ants, hand collecting, leg. C. Haddad, 29.X.2017, 1 ♀ (NCA 2020/87); Same locality, on ground with ants, hand collecting, leg. C. Haddad, 19.II.2018, 1 ♀ (NCA 2020/89); De Brug, sweeping, 29°05.4'S; 26°00.00'E, leg. W. Kaiser, 22.IV.2004, 1 ♂ (NMBA 9398); Maselspoort, *Eucalyptus* bark, 2.II.2005, 1 ♀ (NCA 2008/2019); Same locality, Naval Hill, pitfall traps, 1480 m a.s.l., 29°03.6'S; 26°08.4'E, leg. L.N. Lotz, VI.1990, 1 ♂ 1 ♀ (NMBA 6118); Same locality, pitfall traps, leg. L.N. Lotz, V.1990, 1 ♀ (NMBA 6101); University of the Free State West Campus, *Trinervitermes trinervoides* termitaria and surrounding grassland, 1425 m a.s.l., 29°06'S; 26°10'E, leg. C. Haddad & H. Badenhorst, 3-26.III.2019, 1 ♂ (NCA 2019/853); Same locality, *Searsia lancea* and grassland, 1430 m a.s.l., leg. C. Haddad & L. Mosese, 10.V-11.VI.2018, Same data, 3 ♂ (NCA 2018/1195), Same data, 1 ♂ (NCA 2018/1203); Brandfort, Amanzi Private Game Reserve, pitfall traps, *Searsia burchelli* woodlands, 28°35.52'S; 26°25.32'E, leg. V. Butler, 31.I.2013, 1 ♂ (NCA 2013/3826); Florisbad, pitfall traps, 1250 m a.s.l., 28°27.6'S; 26°03.00'E, leg. L.N. Lotz, 8.XII.1987, 1 ♂ (NMBA 16911); Edenville, Farm Lusthoff, hand collecting, 27°55.00'S; 27°39.6'E, Dr. Karny, 3.VI.1967, 1 ♂ (NCA 84/483); Harrismith, Platberg Nature Reserve, montane grassland and plantation, 2036 m a.s.l., 28°16.843'S; 29°12.034'E, leg. H. Wood, C. Haddad & C. Griswold, 22.I.2011, 1 ♀ (CAS, CASENT 9037064); Heilbron, Vaal Dam, near Oranjeville, overgrazed grassland, pitfall traps, 26°36.00'S; 28°09.6'E, leg. R. Fourie & A. Grobler, 1.IX-1.X.2009, 1 ♂ (NMBA 15214); Same locality, leg. R. Fourie & A. Grobler, 1-29.X.2009, 1 ♂ (NMBA 15208); Hoopstad, Sandveld Nature Reserve, grasslands, 27°26.4'S; 25°7.6'E, 30.X-4.XII.2009, 1 ♂ (NMBA 15328); Theunissen, Erfenis Dam Nature Reserve, unburned site 3, pitfall traps, 28°18.00'S; 26°28.8'E, leg. C. Haddad, S. Otto & R. Poller, 1-30.IX.2006, 1 ♂ (NMBA 13808); Same locality, unburned site 1, 1 ♂ (NMBA 13699); Same locality, unburned site 3, 28.VII-1.XI.2006, 1 ♂ (NMBA 13667); Same locality, site 3. *Acacia karroo* trees, woodland, leg. R. Fourie & A. Grobler, 31.VIII-30.XI.2009, 6 ♂ (NMBA 14208); Same locality, leg. C. Haddad, S. Otto & R. Poller, 1-30.IX.2006, 1 ♂ (NMBA 13807); Same locality, unburned site 3, leg. R. Poller & S. Otto, 24.II-27.III.2006, 1 ♂ (NMBA 13318); Same locality, unburned site 2, leg. C. Haddad, S. Otto & R. Poller, 22.XI-23.XII.2005, 1 ♂ (NMBA 13849); Same locality, site 4, gravel plain, leg. R. Fourie & A. Grobler, 31.VIII-30.XI.2009, 1 ♂ (NMBA 14278); Same locality,

unburned site 1, C. Haddad, 22.XI-23.XII.2005, 1 ♂ (NMBA 13356); Winburg, Willem Pretorius Nature Reserve, grasslands, 28°10.2'S; 27°07.2'E, leg. R. Fourie & A. Grobler, 30.IX-28.X.2009, 1 ♂ (NMBA 14558); Same locality, grassland, leg. R. Fourie & A. Grobler 29.X-5.XII.2009, 1 ♂ (NMBA 15321). *Gauteng*: Pretoria/Tshwane, Groenkloof Nature Reserve, Site 1, 25°48.162'S; 28°12.756'E, leg. R. Lyle & P. Marais, 15.XI.2013, 2 ♂ (NCA 2017/184), Same data, 1 ♂ (NCA 2017/183); Rietondale Research Station, sunflower & canola fields, pitfall traps, 25°44.4'S; 28°11.4'E, leg. T. Bird, 15.X.1998, 2 ♂ (NCA 2002/1003), Same data, 4 ♂ 1 immature (NCA 2002/1004). *KwaZulu-Natal*: Howick, Umgeni Valley, dense vegetation near river, hand collecting, 29°28'S; 30°14'E, leg. M. Alderweireldt & R. Joqué, 18.VII.1990, 1 ♂ (MRAC 171688); Ndumo Game Reserve, Crocodile Farm, Pongola River Floodplain, *Acacia xanthophloea* bark, hand collecting, 26°54.426'S; 32°19.185'E, leg. C. Haddad, 24.I.2006, 1 ♀ (NCA 2014/1481); Same locality, Red Cliffs, hand collecting, 26°51.157'S; 32°12.364'E, leg. R. Booyens, 13.I.2019, 1 ♀ (NCA 2019/408); Ngome State Forest, pitfall traps, 27°49'S; 31°26'E, leg. M. van der Merwe, 1.XII.1992, 2 ♂ (NCA 94/474); Same locality, Patch 2 (grass); leg. M. van der Merwe, 1.I.1993, 1 ♂ (NCA 94/440); Pongola, Ngotche, Farm Vergeval, hand collecting, 27°21.00'S; 31°36.6'E, leg. Dr. Karny, 25.V.1967, 1 immature (NCA 84/482); Same locality, ant mimic, 26.VI.1967, 1 ♂ (NCA 84/481); Sani Pass, pitfall traps, 900 m a.s.l., 30°12.00'S; 30°24.00'E, leg. University of Pretoria Students, 20.I.2008, 1 ♂ (NCA 2011/853); Same locality, 1200 m a.s.l., 30°11.4'S; 30°24.4'E, 25.I.2006, 2 ♂ 1 immature (NCA 2011/856); Ulundi, Opathe Game Reserve, overgrazed savanna, 50 traps 4 days, 560 m a.s.l., 28°22.135'S; 31°23.363'E, leg. C. Haddad, 29.IX-03.X.2008, 1 ♂ (NCA 2008/4112); Umzinto, Vernon Crookes Nature Reserve, 30°09.6'S; 30°21.6'E, Schüle, 27.XI-17.XII.2001, 1 ♂ (NMBA 9721). *Limpopo*: Mopani, Ndengeza, NAT 02/B3, 23°18.534'S; 30°24.486'E, leg. E. Mauda, 14.VI.2014, 1 ♂ (NCA 2015/2486); Same data, pitfall traps, 23°18.534'S; 30°24.486'E, leg. E. Mauda, 14.VI.2014, 1 ♀ (NCA 2015/2481); Same locality, leg. E. Mauda, 21.I.2015, 2 ♂ (NCA 2015/2479); Same data, 1 ♂ (NCA 2015/2489); Same locality, leg. E. Mauda, 14.VI.2014, 1 ♂ (NCA 2015/2482); Same data, 1 ♂ (NCA 2015/2476); Vyeboom village, 23°8.634'S; 30°22.781'E, leg. E. Mauda, 25.I.2015, 1 ♂ (NCA 2016/214). *Mpumalanga*: Carolina, Grootpan Farm 493JS, 03F, 28 km WNW of Carolina, Strathrae Colliery EIA, 1664 m a.s.l., 25°57.72'S; 29°51.48'E, leg.

D.H. Jacobs, 12.IV.2012, 1 ♂ (NCA 2012/4373); Delmas, Farm Rietvallei, unsprayed maize, 26°4.8'S; 28.34.2'E, leg. M. v. Jaarsveld, 31.III.2005, 1 ♂ (NCA 2007/1322); PAL3024, unsprayed maize, 4.I.2005, 1 ♂ (NCA 2007/1315); Dullstroom, Roger Croall's Farm (biennial), R'3, pitfall traps, 25°31.02'S; 30°06.00'E, leg. L. Makaka, 29.XI.2009, 1 ♂ (NCA 2009/5248); Grootpan Farm 456JS, Strathrae Colliery EIA, Site 1, 27 km NW Carolina, sweeping, 1692 m a.s.l., 23°58.18'S; 29°55.44'E, leg. D.H. Jacobs, 13.II.2012, 1 ♂ (NCA 2013/5307); Kruger National Park, Rhenosterkoppies, 03 Cr, pitfall traps, 25°04.247'S; 31°36.865'E, leg. Graham Ellis, 6-9.VI.2007, 1 ♂ (NCA 2008/1898). *Western Cape*: Beaufort West, Farm 77, Karoo, Area 4, Site 2, 32°20.64'S; 23°21.24'E, leg. D.H. Jacobs, 12.XII.2007, 1 ♂ (NCA 2008/4699); Cape of Good Hope Nature Reserve, Olifantsbaai, dry riverbed, pitfall traps, 32°00'S; 22°00'E, leg. R. Jocqué, 10-24.I.1989, 1 ♂ (MRAC 169790); Cape Town, Bergvliet Flats, Diep Rivier, 34°03.00'S; 18°27.00'E, leg. W.F. Purcell, XII.1899, 1 immature (SAM 6149); Klein-Dassenberg Rd, Trinity Farms, hand collecting, 33°34.94'S; 18°36.08'E, leg. D. Ubick, 25-27.XII.2012, 1 ♀ (CAS, CASENT 9055493); Signal Hill, Under stones in Renosterveld, 33°55.08'S; 18°24.18'E, leg. T. Russell-Smith, 3.V.1976, 1 ♂ (NCA 2015/2893); George, Outeniquastrand, thicket, leaf litter & foliage, 34°02.754'S; 22°17.037'E, leg. C. Haddad, 7.I.2015, 1 ♂ (NCA 2015/1777); George, Groot-Brak, leaf litter in garden, 75 m a.s.l., 34°02.759'S; 22°17.039'E, leg. C. Haddad, 27.XII.2018, 1 ♂ (NCA 2020/90); Hermanus, Fisherhaven, sieving leaf litter, 10 m a.s.l., 34°24.434'S; 19°07.558'E, leg. C. Haddad, 19.III.2004, 1 ♀ (NCA 2017/1480); Sedgefield, Ruigtevlei, garden, hand collecting, 34°01'S; 22°52'E, leg. R.J. Dowsett, XII.1984, 1 ♂ (MRAC 166114); Stellenbosch, Weltevreden, Apple Orchards, leg. I. Rencken, 12.X.1992, 3 ♂ (NCA 96/182); Swartberg Nature Reserve, Swartberg Pass, Fynbos and riparian vegetation, hand collecting, 836 m a.s.l., 33°17.980'S; 22°03.015'E, leg. L. Almeida, C Griswold & T. Meikle, 22.X.2011, 1 ♀ (CAS, CASENT 9042372). *ZAMBIA*. *Southern Province*: Livingstone, Livingstone Airport nr runway, leaf litter, 17°49.075'S; 25°48.848'E, leg. C. Haddad, J. Parau & F. Jordaan, 1.XII.2006, 1 ♀ (NCA 2007/878). *ZIMBABWE*. *Harare*: Newlands, Walmer Drive, 4.3.9, pitfall traps, 3-551 m a.s.l., 17°48.41'S; 31°04.963'E, leg. M. Cumming, 4.XII.2002, 1 ♂ (NCA 2010/4800).

### *Etymology*

The species name is Latin for happy and refers to extremely “happy face” the female epigyne has when viewed upside-down.

### *Diagnosis*

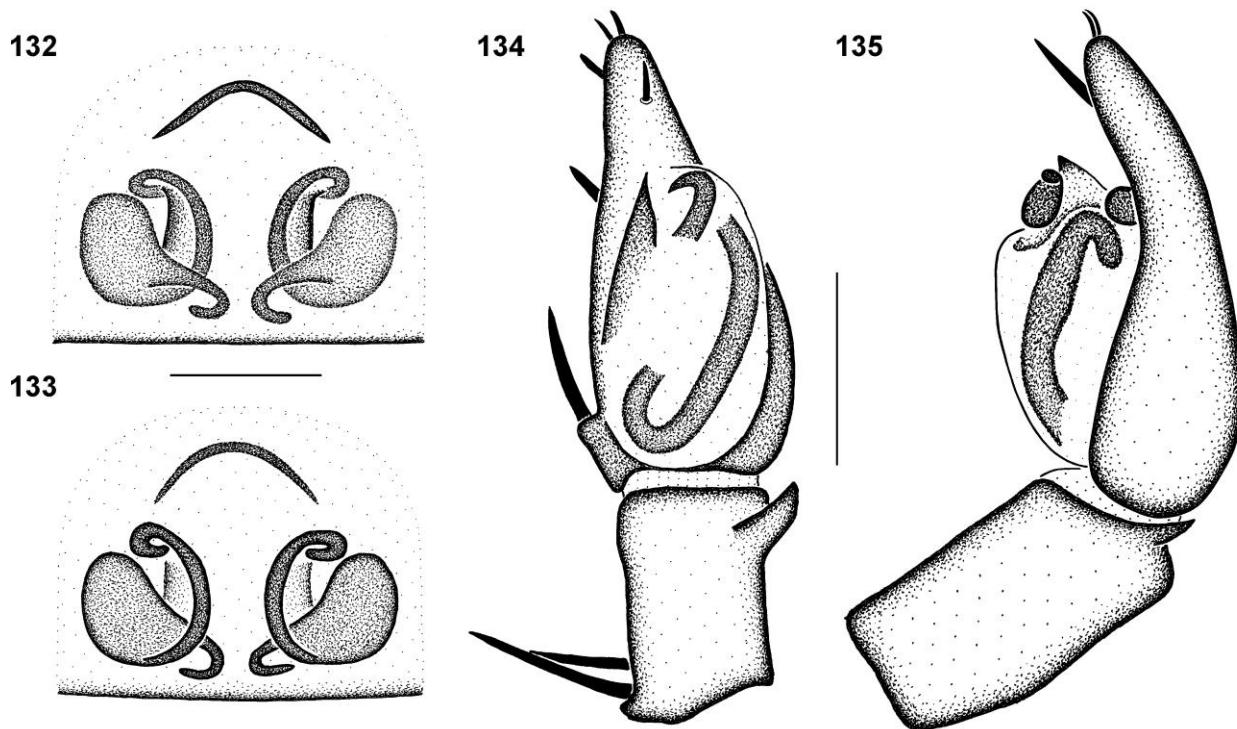
The female epigyna of this species differs from that of *M. chrysia* in that the anterior hood is much more curved in the middle, whereas that of the latter is longer and more flattened. The males of *M. felix sp. nov.* are distinguished from those of *M. chrysia* by their embolus slanting inwards, while straight in *M. chrysia*; the basal curvature in the sperm duct is smaller than that of *M. chrysia*; and the cymbial tip is longer than that of *M. chrysia*.

### *Female*

Female holotype from Rietondale Research Station (NCA 2007/1320). **Measurements:** TL 2.56, CL 1.20, CW 0.73, CL:CW 1.64:1, CLH 0.05, CLH:AME 1.25:1. Eyes: ALE 0.05, AME 0.04, PLE 0.05, PME 0.05, AME-AME 0.02, PME-PME 0.04, MOQAW 0.10, MOQPW 0.14, MOQL 0.19, SL 0.68, SW 0.48, AL 1.37, AW 0.80. **Leg measurements:** Palpal segment length: 0.38, 0.22, 0.24, t 0.32. Leg I: 0.70, 0.29, 0.54, 0.40, 0.56. II: 0.65, 0.29, 0.52, 0.49, 0.54. III: 0.49, 0.25, 0.43, 0.52, 0.43. IV: 0.95, 0.35, 0.79, 0.87, 0.63. TL of legs (I-IV): 2.49, 2.49, 2.12, 3.59; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown or black; legs I and II with basal two-thirds of femora darkened; sternum, endites, labium, and chelicerae similar in colour to carapace. **Carapace:** decorated with squamose setae (Fig. 31), smooth in texture; shallow transverse depression present on posterior third of carapace; pattern present medially as broad somewhat rectangular dark with radiating dark lines; posterior margin straight; fovea absent; anterior margin narrowing moderately from coxa I; PER recurved in dorsal view; AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; cluster of setae present on tip. **Endites:** oblique; constricted just above halfway; anterior margin round; cluster of setae present on inner-apical margin; serrula present. **Sternum:** broadest between coxa I and II; posterior margin broadly

rounded between coxa IV; decorated with aculeate setae (Fig. 42). **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with feathery setae. Leg macrosetae: Palps: 1pl, 2pl, 2pl, 1plv, 2rlv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv, 1rlv. II: 1d. III: 1do, 4vt, 1plv, 1rlv, 4vt. IV: 2vt. Scopulate setae present on metatarsi and tarsi of legs I-IV, two rows on former and four on latter. **Abdomen:** cylindrical in shape; decorated with squamose setae on posterior half and elongate squamose (Fig. 88), and branched sicate setae (Fig. 85, 87) on anterior half; constricted medially; no pattern visible on dorsum; anterior half of abdomen lighter in colour than posterior half; venter similar in colour to dorsum; sigilla not visible. **Epigyne:** in ventral view, anterior hood continuous, strongly recurved; copulatory opening at curved apex of copulatory duct. In dorsal view, copulatory ducts elongate, wide apart, "C" shaped, curled at apex; fertilisation duct elongate, originating from inner medial margin of spermathecae, curved laterally; spermathecae bean-shaped; longer than broad (Figs 95, 132, 133).



**Figs 132-135.** Genitalic morphology of *Micaria felix* sp. nov.: (132) female epigyne, ventral view; (133) same, dorsal view; (134) male palp, ventral view; (135) same, retrolateral view. Scale: 0.1 mm.

*Male*

Male paratype from Ndengeza, Mopani, Limpopo, South Africa (NCA 2015/2478).

**Measurements:** TL 2.13, CL 1.08, CW 0.61, CL:CW 1.77:1, CLH 0.05, CLH:AME 1.12:1.

Eyes: ALE 0.06, AME 0.04, PLE 0.05, PME 0.04, AME-AME 0.02, PME-PME 0.04,

MOQAW 0.10, MOQPW 0.12, MOQL 0.15. SL 0.57, SW 0.41, AL 0.95, AW 0.45. **Leg measurements:** Palpal segment length: 0.25, 0.21, 0.16, 0.33. Leg I: 0.65, 0.24, 0.54,

0.44, 0.55. II: 0.64, 0.25, 0.48, 0.48, 0.54. III: 0.52, 0.23, 0.43, 0.54, 0.44. IV: 0.84, 0.32,

0.79, 0.89, 0.63. TL of legs (I-IV): 2.42, 2.39, 2.16, 3.47; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown or black; endites, labium and

chelicerae similar in colour to carapace; sternum lighter than carapace; legs I and II with

femora darkened (Fig. 13). **Carapace:** decorated with squamose setae; smooth in

texture; shallow transverse depression present on posterior third of carapace; pattern

present medially, broad, somewhat rectangular dark with radiating dark lines over entire

carapace; posterior margin slightly round; anterior margin narrowing moderately from

coxa I; PER recurved in dorsal view; AER recurved in anterior view; fovea absent.

**Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; tuft of setae is

present at tip. **Endites:** oblique; constricted just above halfway; anterior margin round;

cluster of setae present on inner-apical margin. **Sternum:** shield-like; broadest between

coxa I and II; posterior margin tapering to point between coxa IV. **Legs:** femora laterally

flattened, highest at base; leg I more pronounced in this fashion; rest of leg normal, thin.

Leg macrosetae: Palps: 1pl, 1pl, 1plv, 2pl, 1plv, 2rlv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv,

1rlv. II: 1d. III: 1do, 4vt, 4vt. IV: 1vt, 2vt. Scopulate setae present on metatarsi and tarsi

of legs I-IV, two rows on former and four on latter segment. **Abdomen:** cylindrical in

shape; decorated with squamose setae on basal half and elongate sicate setae on

anterior half; constricted medially; no dorsal pattern visible; venter uniformly dark brown;

sigilla present, two white crescent-shaped pits in transverse constriction. **Palp:**

retrolateral tibial apophysis present on retrolateral margin; median apophysis present on

apical half next to embolus, curved prolaterally; sperm duct present on retrolateral surface

of tegulum, curved at base; embolus base broad, tip thin and short; cymbium pear-

shaped; widest at basal third, tapering to point apically with approximately one-quarter of cymbium exposed above tegulum (Figs 134, 135).

#### *Distribution*

*Micaria felix sp. nov.* is widespread throughout southern Africa, with isolated records from central and eastern Africa (Fig. 136).



**Fig. 136.** The distribution of *Micaria felix sp. nov.* in the Afrotropical Region.

## 2.5.8.) *Micaria gagnoa* sp. nov. (Figs 14-15, 137-140)

### *Material examined*

Holotype ♀, together with 1 ♀ and 5 ♂ paratypes: CÔTE D'IVOIRE. *Fromager Region*: Gagnoa, upland rice, pitfall traps, 06°34'N; 06°15'W, leg. A. Russell-Smith, 8.V.1995 (MRAC 227323).

Paratypes: MOZAMBIQUE. *Inhaca Island*: wetland, pitfall traps, 26°01'S; 32°54'E, leg. T. Steyn, 30.IV-14.V.1994, 1 ♀ (MRAC 209908). TANZANIA. *Kilimanjaro Region*: Mkomazi National Park, Ibaya Camp, unburnt grassland, hand collecting, 04°00'S; 38°00'E, leg. A. Russell-Smith, 26.XI.1994, 26 ♂ 5 ♀ (MRAC 211337).

### *Etymology*

This species name is a noun in apposition of the type locality.

### *Diagnosis*

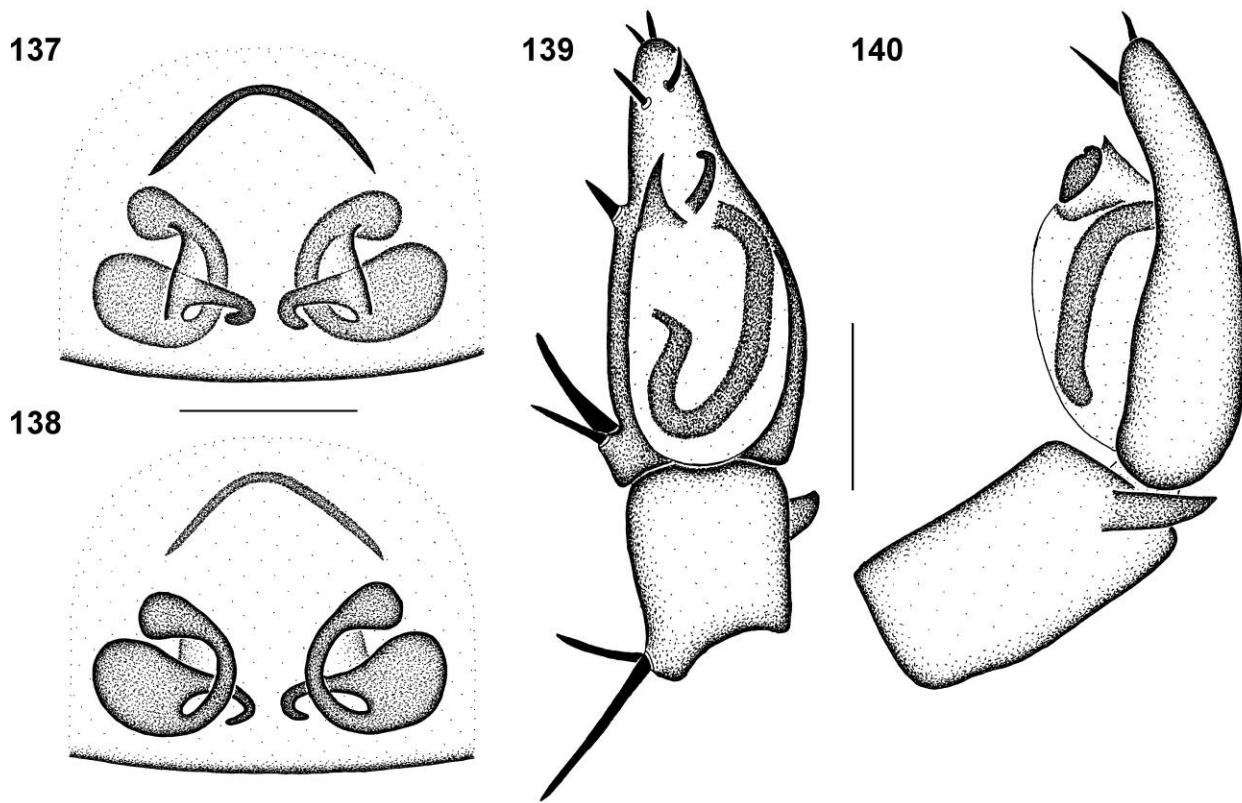
*Micaria gagnoa* sp. nov. very closely resembles *M. felix* sp. nov., but they can be distinguished by the females' anterior epigynal hood that is larger (in this case a larger atrium and longer) in *M. gagnoa* sp. nov. than that of *M. felix* sp. nov. Furthermore, the spermathecae of the former is horizontally flattened whereas the latter's is laterally flattened. The males are very difficult to distinguish due to the similarity of the palps and habitus, but *M. gagnoa* sp. nov. does have a smaller MA than *M. felix* sp. nov.

### *Female*

Female holotype from Gagnoa, Cote d'Ivoire (MRAC 227323). **Measurements:** TL 2.35, CL 0.95, CW 0.60, CL:CW 1.58:1, CLH 0.06, CLH:AME 1.6:1. Eyes: ALE 0.06, AME 0.04, PLE 0.05, PME 0.04, AME-AME 0.01, PME-PME 0.03, MOQAW 0.10, MOQPW 0.13, MOQL 0.14. SL 0.52, SW 0.38, AL 1.30, AW 0.80. **Leg measurements:** Palpal segment length: 0.33, 0.19, 0.22, 0.30. Leg I: 0.60, 0.25, 0.46, 0.38, 0.48. II: 0.53, 0.22, 0.46, 0.40,

0.48. III: 0.48, 0.21, 0.43, 0.35, 0.37. IV: 0.81, 0.29, 0.67, 0.73, 0.56. TL of legs (I-IV): 2.17, 2.09, 1.84, 3.06; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown; legs I and II with femora darkened on posterior half; other legs uniform in colour; endites, labium and chelicerae similar in colour to carapace (Fig. 14). **Carapace:** smooth in texture; transverse median depression present on posterior third; decorated with squamose setae; posterior half of carapace with dark triangular patches on lateral sides flanked by light brown radiating markings; dark brown stripes radiating outwards present on anterior half; posterior margin straight; fovea absent; anterior margin narrowing slightly from coxa I; PER recurved in dorsal view, AER recurved in anterior view. **Chelicerae:** decorated with short plumose setae. **Labium:** triangular in shape, truncating where chelicerae meet. **Endites:** broad; slanting inwards; constricted slightly just above halfway; flattened anterior margin with dark anterior ridge; cluster of setae present on inner-apical margin; posterior margin rounded. **Sternum:** shield-like; lighter in colour than carapace; broadest between coxa I and II; posterior margin tapering between coxa IV. **Legs:** femora of all legs laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 3plv, 1pl, 1pl, 1plv, 1pl, 2plv, 2rlv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv, 1rlv. III: 1pl, 1vt, 1plv, 1rlv, 4vt. IV: 1vt, 2vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern not visible in holotype; venter similar in colour to dorsum; sigilla not visible. **Epigyne:** in ventral view, anterior hood continuous, strongly recurved; large atrium; posterior pockets present medially, straight with laterally curved apices; copulatory openings at bulbous apices of copulatory ducts. In dorsal view, copulatory ducts elongate, "C" shaped, wide apart; fertilisation ducts extending medially, curved at apices; spermathecae globular; horizontally elongate; anterior margin of spermathecae flattened and aligned with fertilisation ducts (Figs 137, 138).



**Figs 137-140.** Genitalic morphology of *Micaria gagnoa* sp. nov.: (137) female epigyne, ventral view; (138) same, dorsal view; (139) male palp, ventral view; (140) same, retrolateral view. Scale: 0.1 mm.

### Male

Male paratype from Gagnoa, Cote d'Ivoire (MRAC 227323). **Measurements:** TL 2.25, CL 1.05, CW 0.60, CL:CW 1.75:1, CLH 0.06, CLH:AME 1.6:1. Eyes: ALE 0.06, AME 0.04, PLE 0.06, PME 0.04, AME-AME 0.01, PME-PME 0.05, MOQWA 0.10, MOQPW 0.14, MOQL 0.16. SL 0.56, SW 0.41, AL 1.10, AW 0.60. **Leg measurements:** Palpal segment length: 0.44, 0.22, 0.21, 0.30. Leg I: 0.65, 0.25, 0.48, 0.43, 0.46. II: 0.60, 0.22, 0.46, 0.44, 0.48. III: 0.52, 0.19, 0.40, 0.46, 0.37. IV: 0.68, 0.30, 0.68, 0.78, 0.56. TL of legs (I-IV): 2.27, 2.20, 1.94, 3.00; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown; legs I and II with femora darkened on basal half, other legs uniform in colour; endites, labium and chelicerae

similar in colour to carapace (Fig. 15). **Carapace**: smooth in texture; transverse median depression present on posterior third; decorated with squamose setae; posterior half of carapace with dark triangular patches on lateral sides flanked by light brown radiating markings; dark brown stripes radiating outwards on anterior half; posterior margin straight; fovea absent; anterior margin narrowing slightly from coxa I; PER recurved in dorsal view, AER recurved in anterior view. **Chelicerae**: decorated with short plumose setae. **Labium**: triangular in shape, tuft of setae present on tip. **Endites**: broad; slanting inwards; constricted slightly just above halfway; flattened anterior margin with dark anterior ridge; cluster of setae present on inner-apical margin; posterior margin rounded. **Sternum**: shield-like; lighter in colour than carapace with dark lateral margins; broadest between coxa I and II; posterior margin tapering between coxa IV. **Legs**: femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 3plv, 1pl, 1pl, 1plv, 1pl, 1plv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv, 1rlv. III: 1pl, 1vt, 1plv, 1rlv, 4vt. IV: 2vt, 2vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen**: cylindrical in shape; decorated with squamose setae; dorsal pattern visible as light transverse median line connecting to scutum; anterior half of abdomen slightly lighter brown than posterior half; venter similar in colour to dorsum; sigilla not visible. **Palp**: retrolateral tibial apophysis present on retrolateral margin; median apophysis present next to embolus, curved retrolaterally; sperm duct present on retrolateral margin of tegulum, curved at base, kink just before base of embolus; embolus thin and very slightly curved retrolaterally; cymbium widest at posterior third, tapering roughly quarter of cymbium's length above tegulum (Figs 139, 140).

### *Distribution*

*Micaria gagnoa* sp. nov. is known from isolated records in eastern and western Africa (Fig. 141).



**Fig. 141.** The distribution of *Micaria gagnoa* sp. nov. in the Afrotropical Region.

## 2.5.9.) *Micaria koingnaas* sp. nov. (Figs 16, 54, 61, 142-143)

### *Material examined*

Holotype ♂: together with 1 ♂ paratype: SOUTH AFRICA. *Northern Cape*: Koingnaas, hand collecting, 30°11.71'S; 17°17.461'E, leg. R. Boysen, Z. Mbo & R. Christiaan, 19.VII.2017, 2 ♂ (NCA 2017/1247).

Paratypes: SOUTH AFRICA. *Western Cape*: Strandfontein, hand collecting, 31°45.308'S; 18°13.552'E, leg. R. Boysen, 22.VII.2017, 2 ♂ (NCA 2017/1315).

### *Etymology*

The species name is a noun in apposition of the type locality of this species.

### *Diagnosis*

Males of this species can be distinguished from other Afrotropical species in having a long palpal tibia (as long as its palp) and a very sharp bend in the median apophysis. Female unknown.

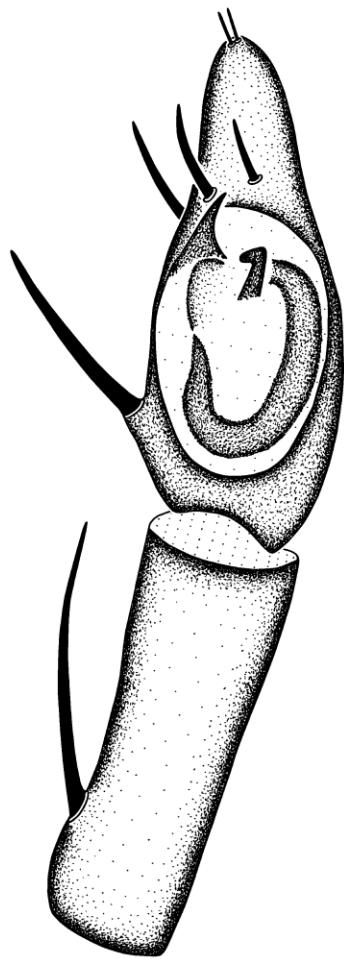
### *Male*

Male holotype from Koingnaas (NCA 2017/1247). **Measurements:** TL 2.65, CL 1.18, CW 0.68, CL:CW 1.74:1, CLH 0.06, CLH:AME 1.33:1. Eyes: ALE 0.05, AME 0.05, PLE 0.05, PME 0.04, AME-AME 0.03, PME-PME 0.06, MOQAW 0.13, MOQPW 0.15, MOQL 0.18. SL 0.62, SW 0.41, AL 1.40, AW 0.65. **Leg measurements:** Palpal segment length: 0.33, 0.16, 0.18, 0.31. Leg I: 0.78, 0.33, 0.62, 0.56, 0.56. II: 0.78, 0.32, 0.56, 0.54, 0.57. III: 0.62, 0.30, 0.56, 0.54, 0.48. IV: 0.98, 0.37, 0.75, 0.79, 0.62. TL of legs (I-IV): 2.85, 2.77, 2.50, 3.51; leg formula: 4123.

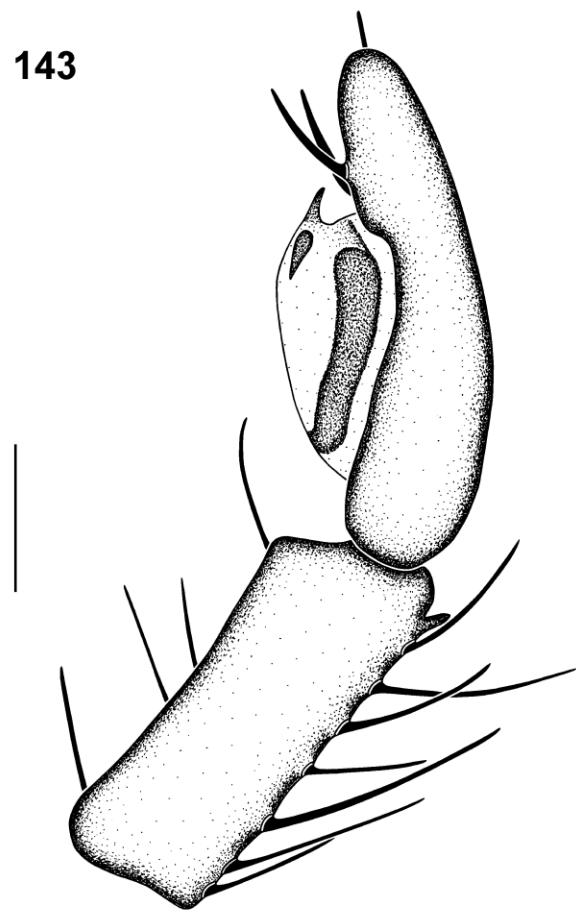
**Colouration:** carapace dark brown to black; femora darkened; sternum, chelicerae, endites and labium similar in colour to carapace (Fig. 16). **Carapace:** smooth in texture; fovea absent; decorated with squamose setae; posterior margin truncating; anterior margin narrowing slightly from coxa I; PER procurved in dorsal view, AER recurved in

anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; tuft of setae present at tip. **Endites:** oblique; cluster of setae present on inner-apical margin. **Sternum:** shield-like, broadest at coxa II; posterior margin tapered to point between coxa IV. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with lanceolate setae (Fig. 62). Leg macrosetae: Palps: 1do, 1pl, 1do, 1pl, 1pl, 1plv, 3vt. Leg I: 1do, 1pl. II: 1d. III: 1do, 1pl, 1rl, 1plv, 1vt, 1pl, 1rl, 1plv, 1rlv, 4vt. IV: 1do, 1pl, 1rl, 2plv, 2vt, 1plv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern not visible; venter similar in colour to dorsum; sigilla not visible. **Palp:** retrolateral tibial apophysis present re-apically on dorsal margin, small; median apophysis present medially, elongate, curved at tip; sperm duct present on retrolateral surface of tegulum, curved at base of tegulum; embolus broadest at base, tip thin and elongate, skewed retrolaterally; cymbium widest at midline; tapering slightly towards apex and round at tip, two small spines present on tip of cymbium, three ventral terminal spines present above embolus (Figs 142, 143).

142



143



Figs 142-143. Genitalic morphology of *Micaria koingnaas* sp. nov.: (142) male palp, ventral view; (143) same, retrolateral view. Scale: 0.1 mm.

### *Distribution*

*Micaria koingnaas sp. nov.* is known from the western part of South Africa (Fig. 144).



**Fig. 144.** The distribution of *Micaria koingnaas sp. nov.* in the Afrotropical Region.

## 2.5.10.) *Micaria latia* sp. nov. (Figs 17, 145-146)

### *Material examined*

Holotype ♀: SOUTH AFRICA. *Northern Cape*: Tswalu Kalahari Reserve, BI33, hand collecting, leg. R. Jocqué, 12.II.2006 (NCA 2013/2466).

Paratypes: NAMIBIA. *Kunene Region*: Brandberg, Konigstein Pan, 22 day pitfall row, pitfall traps, 2340 m a.s.l., 21°08.8'S; 14°34.283'E, leg. K. Meaking/Raleigh International, 7.V.2000, 4 ♀ (SMN 45027); Same data, 29.V.2000, 15 ♀ (SMN 45014).

### *Etymology*

The species name is Latin for wide, which refers to the widely separated copulatory ducts and spermathecae.

### *Diagnosis*

The females of this species can be distinguished from *Micaria beaufortia* females by having globular spermathecae (dorsal view), elongate fertilisation ducts and widely spaced copulatory ducts. Male unknown.

### *Remarks*

Female holotype has a few legs missing; however, the genital structure is well intact and can be used for species identification.

### *Female*

Female holotype from Tswala Kalahari Game Reserve (NCA 2013/2466).

**Measurements:** TL 3.40, CL 1.55, CW 0.95, CL:CW 1.63:1, CLH 0.14, CLH:AME 2.54:1.

Eyes: ALE 0.08, AME 0.06, PLE 0.04, PME 0.06, AME-AME 0.04, PME-PME 0.05,

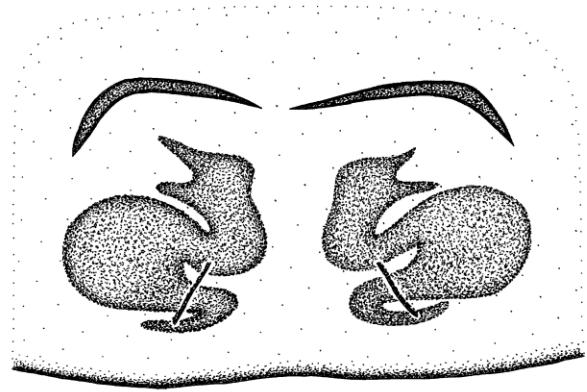
MOQAW 0.16, MOQPW 0.21, MOQL 0.22. SL 0.80, SW 0.59, AL 1.85, AW 1.16. **Leg measurements:** Palpal segment length: 0.48, 0.25, 0.32, 0.48. Leg I: ?. II: 1.10, 0.51,

0.92, 0.79, 0.73. III: 1.10, 0.51, 0.87, 0.92, 0.71. IV: 1.75, 0.57, 1.42, 1.51, 0.71. TL of

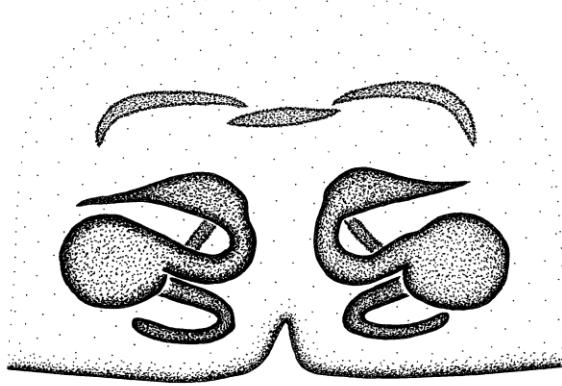
legs (I-IV): ?, 4.05, 4.11, 5.96; leg formula: very likely 4123.

**Colouration:** carapace light brown (colour faded); abdomen dark brown; sternum, endites, labium and chelicerae appear darker than carapace; femora slightly darker, other legs uniform in colour (Fig. 17). **Carapace:** decorated with squamose setae; smooth in texture; pattern not visible due to preservation; posterior margin indented medially; fovea absent; anterior margin narrowing moderately from coxa I; PER procurved in dorsal view; AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape, cluster of setae present on tip. **Endites:** oblique; constricted just above halfway; anterior margin rounded; cluster of setae present on inner-apical margin. **Sternum:** shield-like; broadest between coxa I and II; posterior margin tapered to point between coxa IV. **Legs:** femora of all legs laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; all tarsi pseudo-segmented. Leg macrosetae: Palpal segment length: 1do, 1pl, 1do, 1pl, 1rl, 2plv, 1rlv, 4vt. II: 1do, 2plv, 1vt. III: 1do, 1pl, 1rl, 2pl, 1rl, 1plv, 1rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. IV: 1do, 2pl, 2rl, 2plv, 1rl, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern appears broken, white transverse band medially, longitudinal stripe perpendicular to transverse stripe; venter similar in colour to dorsum; two white stripes present latero-ventrally; sigilla not visible. **Epigyne:** in ventral view, anterior hood divided, flattened; posterior pockets present medially, diagonal; copulatory openings bifurcated. In dorsal view, copulatory ducts thick, short, curved, bifurcated apically, obliquely attached to inner anterior margin of spermathecae; fertilisation ducts projecting basally from interior margin of spermathecae, curved; spermathecae globular (Figs 145, 146).

145



146



Figs 145-146. Genitalic morphology of *Micaria latia* sp. nov.: (145) female epigyne, ventral view; (146) same, dorsal view.

### *Distribution*

*Micaria latia* sp. nov. is only known from northern part of South Africa and central Namibia (Fig. 147).



**Fig. 147.** The distribution of *Micaria latia* sp. nov. in the Afrotropical Region.

## 2.5.11.) *Micaria laxa* sp. nov. (Figs 18, 148-149)

### *Material examined*

Holotype ♂: SOUTH AFRICA. Eastern Cape: Graaff-Reinet, Asante Sana Game Reserve, *Acacia* thicket, stony ground (T1S5c), pitfall traps, 1202 m a.s.l., 32°16.98'S; 24°58.32'E, leg. J. Midgley, 28.VII.2010 (NCA 2012/2365).

### *Etymology*

The species name is translated from the Latin word “laxa” (broad), referring to the very broad base of the embolus in the males of this species.

### *Diagnosis*

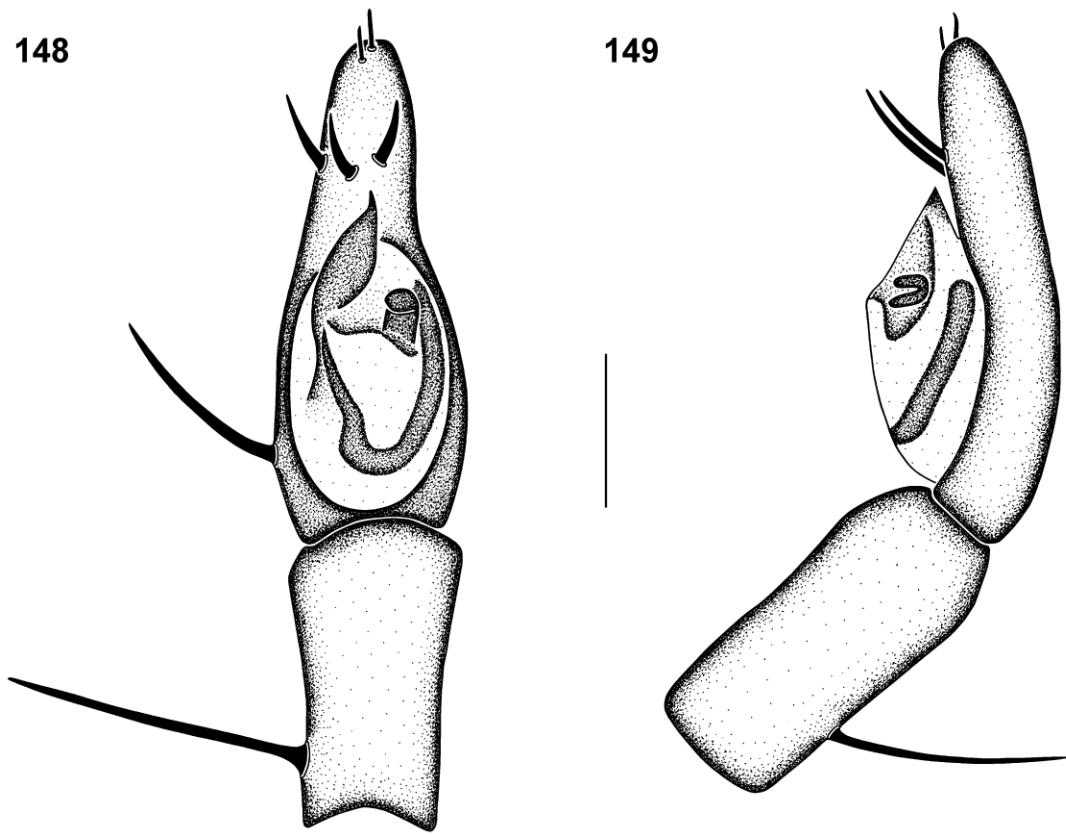
This species can be distinguished from other Afrotropical *Micaria* by the combination of the following: a lack of a RTA, a small diversion in the sperm duct, and a broad leaf-like embolus. Female unknown.

### *Male*

Male holotype from Asante Sana Game Reserve (2012/2365). **Measurements:** TL 3.05, CL 1.45, CW 1.55, CL:CW 0.94:1, CLH 0.08, CLH:AME 1.23:1. Eyes: ALE 0.07, AME 0.06, PLE 0.06, PME 0.05, AME-AME 0.02, PME-PME 0.06, MOQAW 0.14, MOQPW 0.17, MOQL 0.18. SL 0.73, SW 0.52, AL 1.49, AW 0.98. **Leg measurements:** Palpal segment length: 0.48, 0.18, 0.25, 0.37. Leg I: 1.06, 0.48, 0.87, 0.70, 0.65. II: 0.87, 0.40, 0.68, 0.62, 0.60. III: ?. IV: 1.10, 0.41, 0.91, 1.08, 0.64. TL of legs (I-IV): 3.76, 3.17, ?, 4.14; leg formula: most likely 4123.

**Col著ation:** carapace dark brown colour; black abdomen; femora darkened; sternum, chelicerae, endites and labium similar in colour to carapace (Fig. 18). **Carapace:** smooth in texture; decorated with squamose setae; faded, dark pattern radiating medially; posterior margin straight; fovea absent. **Chelicerae:** decorated with plumose setae; anterior margin narrowing slightly from coxa I; PER procurved in dorsal view, AER

recurved in anterior view. **Labium**: triangular in shape; tuft of setae present on tip. **Endites**: oblique; cluster of setae present on inner-apical margin. **Sternum**: shield-like, broadest between coxa I and II, tapered to point between coxa IV. **Legs**: femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. **Abdomen**: cylindrical in shape; decorated with squamose setae; dorsal pattern not visible; venter similar in colour to dorsum; sigilla not visible. Leg macrosetae: Palps: 2do, 1pl, 2do, 1pl, 1pl, 1pl, 1plv, 3vt. I: 1do, 1pl. II: 1d. III: ?. IV: 1do, 1rl, 2pl, 2rl, 2plv, 1rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Palp**: retrolateral tibial apophysis absent; median apophysis present, offset medially, curved; sperm duct present on retrolateral surface of tegulum, kink present after basal curve; embolus broad at base, skewed retrolaterally, tip small, thin and curved anteriorly; cymbium elongate, pear-shaped, widest near basal third; two small spines on tip of cymbium; three ventral terminal spines present above embolus (Figs 148, 149).



**Figs 148-149.** Genitalic morphology of *Micaria laxa* sp. nov.: (148) male palp, ventral view; (149) same, retrolateral view. Scale: 0.1 mm.

*Distribution*

*Micaria laxa* sp. nov. is only known from the type locality (Fig. 150).



**Fig. 150.** The distribution of *Micaria laxa* sp. nov. in the Afrotropical Region.

## 2.5.12.) *Micaria medispina* sp. nov. (Figs 19, 151-152)

### *Material examined*

Holotype ♂: SOUTH AFRICA. *Eastern Cape*: Fort Brown, Kwandwe Private Game Reserve, Farm Hermanuskraal, on soil, M.B. 316, pitfall traps, 33°08.75'S; 26°31.505'E, leg. M. Burger, 3.XII.1993 (NCA 96/71).

### *Etymology*

The species name is a combination of the Latin words “media” (middle) and “spina” (spine) that refer to the retrolateral tibial apophysis that is located in the middle of the palpal tibia in males.

### *Diagnosis*

Males of *Micaria medispina* sp. nov. can be distinguished from other Afrotropical *Micaria* by possessing an RTA that is located in the middle of the tibial palp on the dorsal surface. The embolus of this species is enlarged and slanted retrolaterally. Female unknown.

### *Remarks*

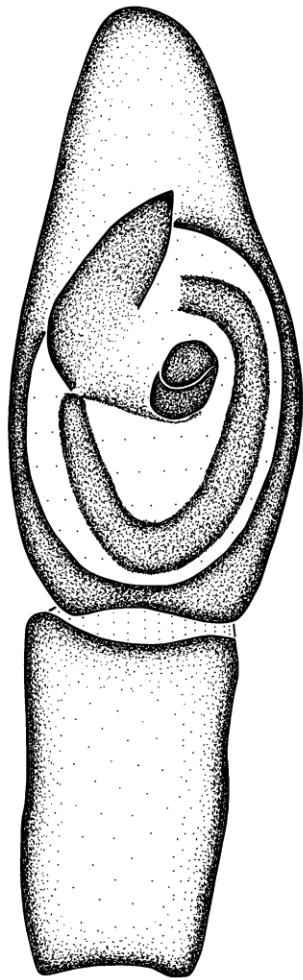
Holotype damaged, with abdomen severed from the prosoma. However, the palp structure is intact and could still be used for identification.

### *Male*

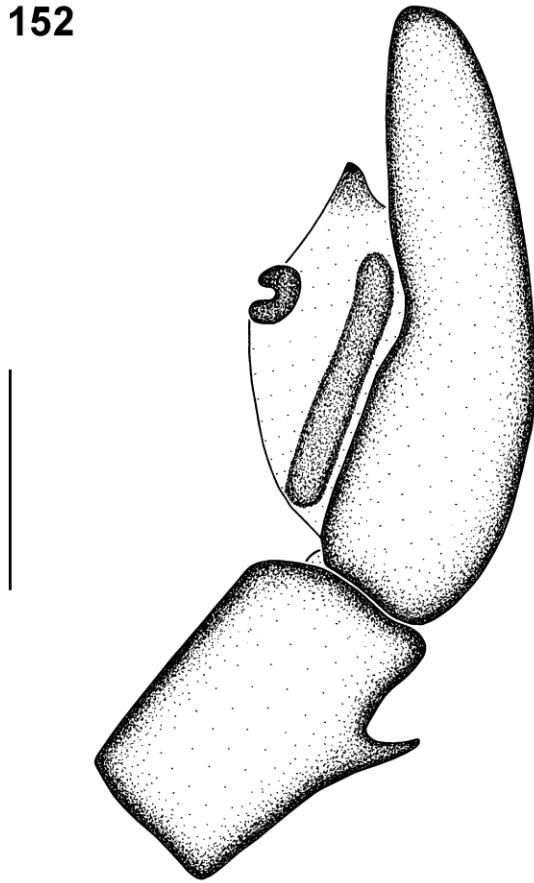
Male holotype from Farm Hermanus, Fort Brown (NCA 96/71). **Measurements:** TL 2.40, CL 1.13, CW 0.65, CL:CW 1.74:1, CLH 0.07, CLH:AME 1.92:1. Eyes: ALE 0.05, AME 0.04, PLE 0.06, PME 0.05, AME-AME 0.02, PME-PME 0.05, MOQAW 0.13, MOQPW 0.14, MOQL 0.16. SL 0.64, SW 0.38, AL 1.10, AW 0.42. **Leg measurements:** Palpal segment length: 0.35, 0.13, 0.16, 0.33. Leg I: 0.79, 0.32, 0.60, 0.49, 0.57. II: 0.71, 0.30, 0.57, 0.50, 0.56. III: 0.62, 0.30, 0.54, 0.49, 0.46. IV: 0.91, 0.33, 0.81, 0.88, 0.56. TL of legs (I-IV): 2.77, 2.64, 2.41, 3.49; leg formula: 4123.

**Colouration:** presumably dark brown or black (holotype's colouration faded); chelicerae similar to carapace; abdomen black, no pattern visible; leg I and II femora darkened (Fig. 19). **Carapace:** darkened ridges; smooth in texture; decorated with squamose setae; fovea absent.; median dark pattern radiating outwards; anterior margin narrowing moderately from coxa I; PER very slightly procurved in dorsal view; AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape, tuft of setae present at tip. **Endites:** oblique; slightly constricted medially; cluster of setae present on inner-apical margin; darkened in colour. **Sternum:** slightly lighter in colour than carapace, shield-like, broadest between coxa I and II; posterior margin narrowly truncated between coxa IV. **Legs:** femora laterally flattened, highest at base; leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 1do, 1do, 1pl, 1pl. Leg I: 1do, 1pl. II: 1do, 1pl. III: 1do, 1pl, 2vt. IV: 1do, 2vt. Scopulate setae not visible. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern not visible; venter similar in colour to dorsum; sigilla not visible. **Palp:** retrolateral tibial apophysis present medially on dorsal surface; median apophysis present medially, curved ventrally, broad; sperm duct present on retrolateral surface of tegulum, curved; embolus broad, tapered; embolus slanted retrolaterally; cymbium broad at tip, widest at basal third (Figs 151, 152).

151



152



Figs 151-152. Genitalic morphology of *Micaria medispina* sp. nov.: (151) male palp, ventral view; (152) same, retrolateral view. Scale: 0.1 mm.

### *Distribution*

*Micaria medispina* sp. nov. is only known from the type locality (Fig. 153).



**Fig. 153.** The distribution of *Micaria medispina* sp. nov. in the Afrotropical Region.

## 2.5.13.) *Micaria parvotibialis* sp. nov. (Figs 20, 62, 154-155)

### *Material examined*

Holotype ♂: SENEGAL. *Saint Louis Region*: Richard Toll, 5-10 km East of Richard Toll, semi-arid thorn bush, hand collecting, 16°20'N; 15°30'W, leg. J. Everts, IX.1989 (MRAC 172110).

Paratypes: SENEGAL. *Saint Louis Region*: Richard Toll, 5-10 km East of Richard Toll, semi-arid thorn bush, hand collecting, 16°20'N; 15°30'W, leg. J. Everts, VIII.1989, 2 ♂ (MRAC 172100), with 1 non-type immature.

### *Etymology*

The species name is derived from the Latin words *parvus* (short) and *tibialis* (tibia). The name refers to the very short palpal tibia of the male, which is approximately half the length of the cymbium.

### *Diagnosis*

The males of this species can be distinguished from other larger Afrotropical *Micaria* in having a very short tibia, a small inward slanting MA, the absence of an RTA and a shorter curvature in the sperm duct. The females of this species are unknown.

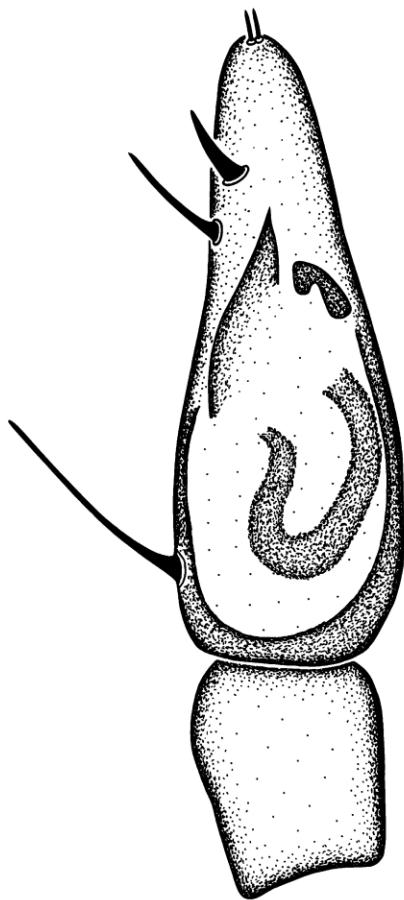
### *Male*

Male holotype from Richard Toll, Senegal (MRAC 172110). **Measurements:** TL 2.50, CL 1.10, CW 0.70, CL:CW 1.57:1, CLH 0.06, CLH:AME 1.14:1. Eyes: ALE 0.05, AME 0.06, PLE 0.06, PME 0.06, AME-AME 0.03, PME-PME 0.06, MOQAW 0.14, MOQPW 0.17, MOQL 0.18. SL 0.56, SW 0.41, AL 1.85, AW 0.65. **Leg measurements:** Palpal segment length: 0.30, 0.16, 0.14, 0.29. Leg I: 0.67, 0.29, 0.58, 0.46, 0.46. II: 0.64, 0.27, 0.54, ?, ?. III: 0.54, 0.25, 0.43, 0.46, 0.38. IV: 0.62, 0.30, 0.65, 0.65, 0.44. TL of legs (I-IV): 2.46, 1.45, 2.06, 2.66; leg formula: possibly 4123.

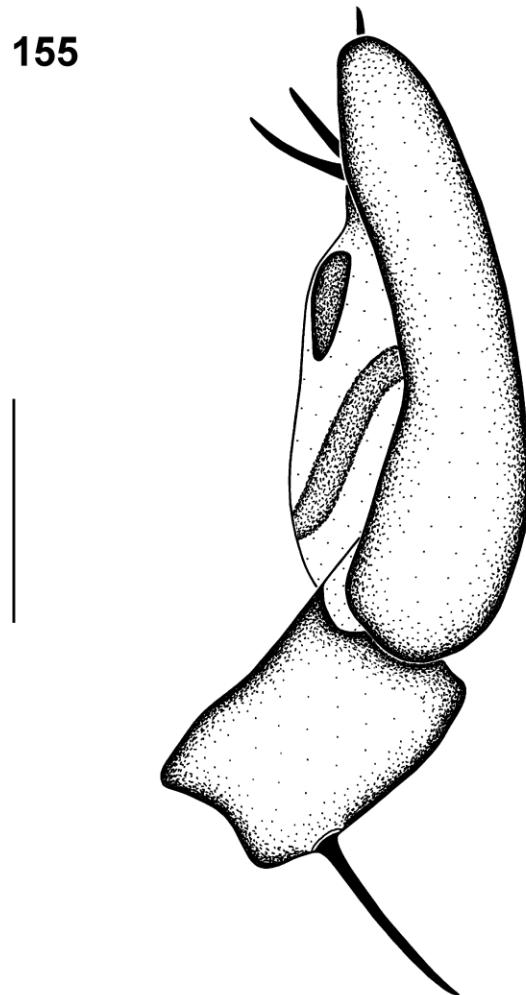
**Colouration:** carapace dark brown; abdomen dark brown or black; femora darkened; sternum, endites, labium, and chelicerae similar in colour to carapace (Fig. 20).

**Carapace:** smooth in texture; decorated with squamose setae; pattern faded, radiating from middle; posterior margin rounded; anterior margin narrowing slightly from coxa I; PER procurved in dorsal view, AER straight in anterior view; fovea absent. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; cluster of setae present on tip. **Endites:** oblique; serrula present. **Sternum:** shield-like; broadest between coxa I and II; posterior margin narrowly truncating between coxa IV; few long, aculeate setae present. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with lanceolate setae (Fig. 63). Leg macrosetae: Palps: 1pl, 1do, 1pl, 1pl, 1plv, 3vt. Leg I: 1do, 1pl. II: 1d. III: 1do, 1pl, 1pl, 1plv, 1rlv, 2vt, 1plv, 1rlv, 4vt. IV: 1do, 1rl, 1plv, 2vt, 2plv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern not visible; venter similar in colour to dorsum; sigilla not visible. **Palp:** retrolateral tibial apophysis absent; median apophysis present, small, thin, offset from embolus; sperm duct present on retrolateral surface of tegulum, curved at midpoint of tegulum, kink at end of duct; cymbium elongate, widest at basal third; apex of cymbium half its length above tegulum; two small spines at cymbial tip; two ventral terminal spines prolaterally above embolus (Figs 154, 155).

154



155



Figs 154-155. Genitalic morphology of *Micaria parvotibialis* sp. nov.: (154) male palp, ventral view; (155) same, retrolateral view. Scale: 0.1 mm.

### *Distribution*

*Micaria parvotibialis* sp. nov. is only known from its type locality (Fig. 156).



**Fig. 156.** The distribution of *Micaria parvotibialis* sp. nov. in the Afrotropical Region.

## 2.5.14.) *Micaria plana* sp. nov. (Figs 21, 22, 56, 63, 157-160)

### *Material examined*

Holotype ♀: ETHIOPIA. *Shewa Region*: Addis Alem, 10 km W of Addis Alem, under stones, in pasture, hand collecting, 09°02.828'N; 38°24.452'E, leg. A. Russell-Smith, 28.VI.1988 (MRAC 225606).

Paratypes: ETHIOPIA. *Shewa Region*: Between Debre Berhan & Ankober, under stones near stream, hand collecting, 09°41'N; 39°42'E, leg. A. Russell-Smith, 27.IV.1983, 4 ♂ (MRAC 225570).

### *Etymology*

The species name is taken from the Latin word “plana” (flat), referring to the flattened and laterally extending copulatory ducts of the females.

### *Diagnosis*

Females of this species can be recognised by the atypical structure of their copulatory ducts, in that they are laterally extending and tapered at the tip, opposed to the tubular structure of other *Micaria* species. The males of this species typically have a short (approximately half the size of the MA) embolus that is thick. The MA is large and curves inwards.

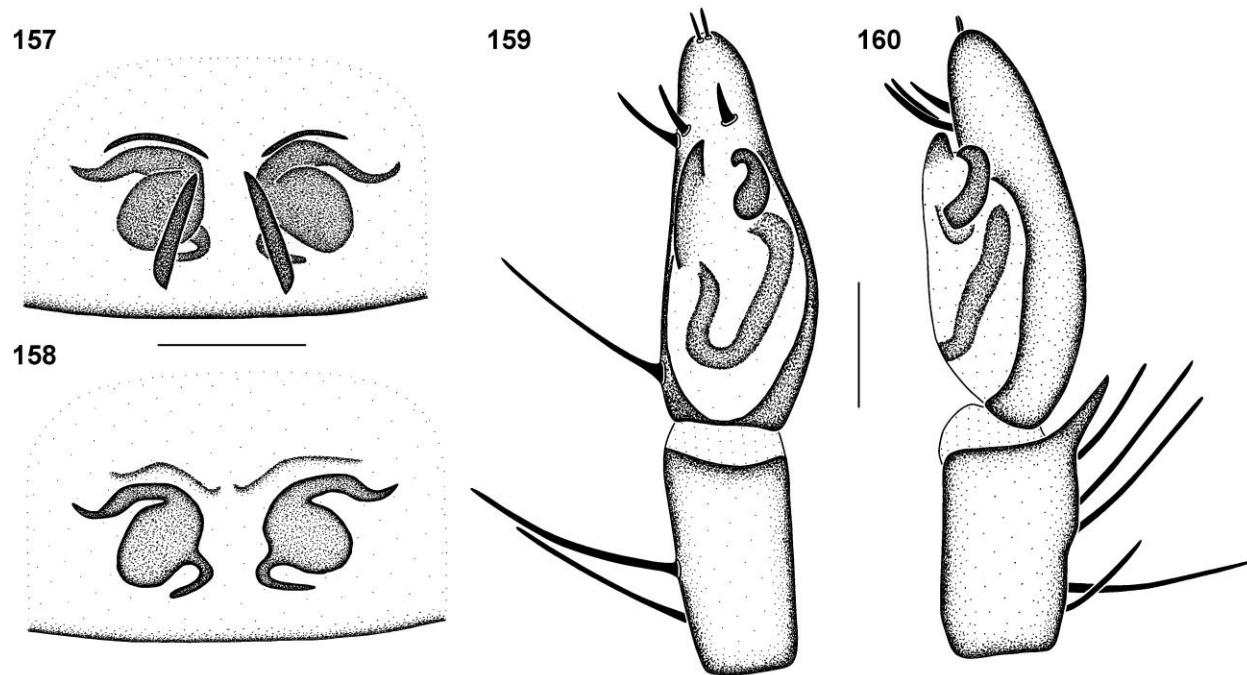
### *Female*

Female holotype from Addis Alem, Ethiopia (MRAC 225606). **Measurements:** TL 2.45, CL 1.03, CW 0.68, CL:CW 1.52:1, CLH 0.08, CLH:AME 1.65:1. Eyes: ALE 0.06, AME 0.05, PLE 0.05, PME 0.04, AME-AME 0.02, PME-PME 0.04, MOQAW 0.11, MOQPW 0.13, MOQL 0.16. SL 0.64, SW 0.49, AL 1.25, AW 0.80. **Leg measurements:** Palpal segment length: 0.29, 0.18, 0.16, 0.24. Leg I: 0.64, 0.30, 0.46, 0.37, 0.46. II: 0.59, 0.30, 0.41, 0.35, 0.43. III: 0.48, 0.27, 0.33, 0.38, 0.34. IV: 0.73, 0.33, 0.56, 0.59, 0.42. TL of legs (I-IV): 2.23, 2.08, 1.80, 2.63; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown or black; femora darkened; sternum, endites, labium, and chelicerae similar in colour to carapace (Figs 21).

**Carapace:** smooth in texture; decorated with squamose setae; dark pattern present medially, radiating; posterior margin indented medially; fovea absent; anterior margin narrowing slightly from coxa I; PER procurved in dorsal view, AER slightly recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape, truncating where chelicerae meet. **Endites:** slanting inwards. **Sternum:** shield-like; broadest between coxa I and II; posterior margin truncating behind coxa IV; decorated with aculeate setae. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 1pl, 1do, 1pl, 1pl, 2plv, 1rlv, 3vt. Leg I: 1do, 1pl. II: 1d. III: 1do, 1plv, 2plv, 2rlv, 4vt. IV: 1do, 1plv, 2vt, 2plv, 3vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi.

**Abdomen:** cylindrical in shape; decorated with squamose setae; two white spots dorsally near anterior margin, white median transverse line broken into three smaller transverse stripes (Fig. 21); venter similar in colour to dorsum; sigilla not visible. **Epigyne:** in ventral view, anterior hood divided, recurved; posterior pockets present medially, straight; copulatory openings at tip of copulatory ducts. In dorsal view, copulatory duct projecting laterally outwards from anterior margin of spermathecae, curved, tapered; fertilisation duct curved laterally outwards; spermathecae globular (Figs 157, 158).



**Figs 157-160.** Genitalic morphology of *Micaria plana* sp. nov.: (157) female epigyne, ventral view; (158) same, dorsal view; (159) male palp, ventral view; (160) same, retrolateral view. Scale: 0.1 mm.

### Male

Male holotype collected between Debre Berhan and Ankober, Ethiopia (MRAC 225570).

**Measurements:** TL 2.65, CL 1.10, CW 0.80, CL:CW 1.38:1, CLH 0.08, CLH:AME 1.41:1.

Eyes: ALE 0.06, AME 0.06, PLE 0.06, PME 0.05, AME-AME 0.02, PME-PME 0.04,

MOQAW 0.13, MOQPW 0.14, MOQL 0.16. SL 0.67, SW 0.49, AL 1.40, AW 0.26. **Leg measurements:**

Palpal segment length: 0.36, 0.19, 0.12, 0.30. Leg I: 0.81, 0.40, 0.68, 0.52, 0.51. II: 0.64, 0.33, 0.49, 0.41, 0.46. III: 0.52, 0.27, 0.37, 0.41, 0.37. IV: 0.75, 0.35, 0.57, 0.65, 0.46. TL of legs (I-IV): 2.92, 2.33, 1.94, 2.78; leg formula: 1423.

**Colouration:** carapace dark brown; black abdomen; femora darkened; sternum, endites, labium and chelicerae similar in colour to carapace (Fig. 22). **Carapace:** smooth in texture; decorated with squamose setae; broad somewhat rectangular dark marking medially, radiating dark lines project from it; posterior margin straight; fovea absent; anterior margin narrowing slightly from coxa I; PER procurved in dorsal view, AER

recurved in anterior view. **Chelicerae**: decorated with plumose setae. **Labium**: triangular in shape; cluster of setae present on tip. **Endites**: oblique; constricted just above halfway; posterior margin rounded. **Sternum**: shield-like; broadest between coxa I and II; posterior margin tapering behind coxa IV. **Legs**: femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with lanceolate setae (Fig. 64). Leg macrosetae: Palps: 1do, 1pl, 1do, 1pl, 1pl, 1plv. Leg I: 1do, 1pl. II: 1do, 1plv, 2vt. III: 1do, 1pl, 1plv, 2vt, 2plv, 2rlv, 4vt. IV: 1do, 1plv, 2vt, 2plv, 1rlv, 3vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen**: cylindrical in shape; decorated with squamose setae; two white spots dorsally near anterior margin, broken transverse line medially (Fig. 21); venter similar in colour to dorsum; sigilla not visible. **Palp**: retrolateral tibial apophysis present apically on dorsal surface; median apophysis present, large, next to embolus, broad basally; sperm duct present on retrolateral surface of tegulum, curved medially, slightly above base of tegulum; embolus base elongate, tip short, straight; cymbium elongate, pear-shaped and widest near basal third; two short spines present on tip of cymbium; three elongate ventral terminal spines present above embolus (Figs 159, 160).

### *Distribution*

The distribution of *Micaria plana* sp. nov. is only known from two localities in Ethiopia and the Western Cape, South Africa (Fig. 161).



**Fig. 161.** The distribution of *Micaria plana* sp. nov. in the Afrotropical Region.

## 2.5.15.) *Micaria quadrata* sp. nov. (Figs 23, 57, 63, 162-163)

### *Material examined*

Holotype ♀: ETHIOPIA. *Oromia Region*: Ziway, Abernossa Ranch, hill, grass tussocks in *Acacia* woodland, hand collecting, 07°45'N; 38°40'E, leg. A. Russell-Smith, 17.VI.1982 (MRAC 225569).

Paratypes: ETHIOPIA. *Afar Region*: Awash, Awash National Park, Ras Hotel (Rift Valley), heap of cut grass, hand collecting, 1000 m a.s.l., 08°59'N; 40°10'E, leg. A. Russell-Smith, 6.X.1988, 1 ♀ (MRAC 225568). *Oromia Region*: Welenchiti, Metehara, under stones, *Acacia/Commiphora* woodland, 08°43'N; 39°25'E, 21.III.1986, 2 ♀ (MRAC 225643).

### *Etymology*

The species name is Latin for “square”. This refers to the right angles the copulatory ducts form in the female of this species.

### *Diagnosis*

This species can be distinguished from other Afrotropical *Micaria*, in having opened copulatory ducts that form two perpendicular bends, as well as an anterior hood that is divided into two angular sclerites located diagonally from the copulatory openings. This species’ CLH to AME ratio is 2.5:1, which is much higher than any other Afrotropical species. Males unknown.

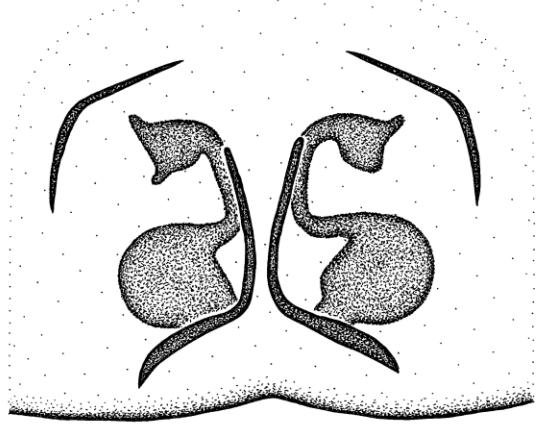
### *Female*

Female holotype from Abernossa Ranch (MRAC 225569). **Measurements:** TL 3.90, CL 1.65, CW 1.05, CL:CW 1.57:1, CLH 0.16, CLH:AME: 2.5:1. Eyes: ALE 0.08, AME 0.06, PLE 0.08, PME 0.06, AME-AME 0.05, PME-PME 0.08, MOQAW 0.18, MOQPW 0.21, MOQL 0.21. SL 0.87, SW 0.59, AL 2.05, AW 1.45. **Leg measurements:** Palpal segment length: 0.33, 0.25, 0.52, 0.59. Leg I: 1.16, 0.51, 0.87, 0.71, 0.86. II: 1.06, 0.48, 0.87, 0.73,

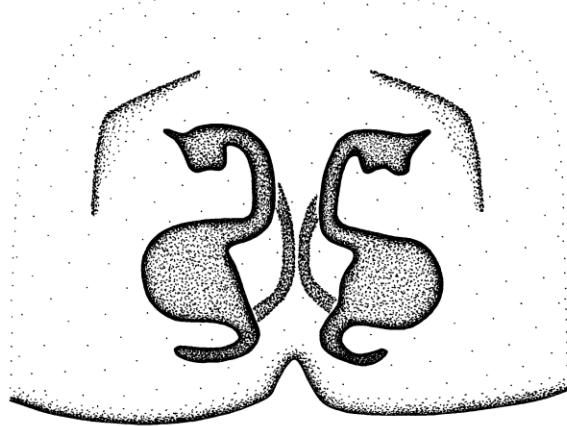
0.84. III: 1.00, 0.49, 0.81, 0.89, 0.73. IV: 1.65, 0.56, 1.27, 1.65, 1.00. TL of legs (I-IV): 4.11, 3.98, 3.92, 6.13; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown on posterior half and light brown on anterior half; femora darkened; sternum, endites, labium and chelicerae similar in colour to carapace (Fig. 23). **Carapace:** smooth in texture; decorated with squamose setae; radiating dark lines from middle of carapace; two white stripes one-quarter from posterior margin; posterior margin straight; fovea absent; anterior margin narrowing slightly from coxa I; PER procurved in dorsal view, AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape, truncated; cluster of setae present on tip. **Endites:** **oblique**; constricted just above halfway; posterior margin rounded. **Sternum:** shield-like; broadest between coxa I and II; posterior margin tapered to rounded tip before coxa IV; decorated with aculeate and squamose setae. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with lanceolate setae (Fig. 65). Leg macrosetae: Palps: 1do, 1pl, 1do, 1pl, 1pl, 2plv, 1rlv, 4vt. Leg I: 1do, 1pl, 2plv, 1rlv. II: 1do, 1pl, 1plv. III: 1do, 1pl, 1pl, 1rl, 2plv, 1rlv, 2vt, 1pl, 2lv, 1rl, 2vt. IV: 1do, 2pl, 2rl, 1plv, 1rlv, 2vt, 1pl, 1rl, 2plv, 2rlv, 3vt. Legs I-II with two rows of scopulate setae on metatarsi and four rows on tarsi; legs III-IV with scopulate setae only on tarsi. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal transverse solid line medially, longitudinal dotted line perpendicular to solid line extending towards spinnerets; two white stripes on antero-lateral margin; venter slightly lighter than dorsum; faint white broad stripe medially; sigilla not visible. **Epigyne:** in ventral view, anterior hood divided, curved; posterior pockets present medially, parallel, elongate, L-shaped; copulatory openings at bifurcated tip. In dorsal view, copulatory ducts elongate with right-angles as curves, bracket-like, extending above spermathecae; fertilisation ducts curved laterally outwards, projecting basally from spermathecae; spermathecae globular, with interior apical margin flattened (Figs 162, 163).

162



163



Figs 162-163. Genitalic morphology of *Micaria quadrata* sp. nov.: (162) female epigyne, ventral view; (163) same, dorsal view. Scale: 0.1 mm.

### *Distribution*

*Micaria quadrata* sp. nov. is only known from central Ethiopia (Fig. 164).



**Fig. 164.** The distribution of *Micaria quadrata* sp. nov. in the Afrotropical Region.

**2.5.16.) *Micaria quinquemaculosa* sp. nov. (Figs 24-25, 65, 165-168)**

*Material examined*

Holotype ♀ together with 1 ♂ paratype and 3 non-type immatures: NAMIBIA. *Erongo Region*: Karibib, Navachab Gold Mine, in storage facility, pitfall traps, 21°57.00'S; 15°45.00'E, leg. M. Rental, 1.XII.2008, (NCA 2009/2618).

Paratypes: NAMIBIA. *Erongo Region*: Karibib, Navachab Gold Mine, in storage facility, pitfall traps, 21°57.00'S; 15°45.00'E, leg. M. Rental, 1.XII.2008, 2 ♂ (NCA 2009/2616); Ugab River, Ugab River mouth, 21°12'S; 13°36'E, leg. B.H. Lamoral, 17.II.1969, 1 ♂ 2 ♀ 1 immature (NMSA 18853); 17.II.1969, Same locality, leg. B.H. Lamoral, 18.II.1969, 1 ♀ 1 immature (NMSA 18854). *Karas Region*: Keetmanshoop District, Khabus 146, on sandy plain next to dry riverbed, pitfall traps, 26°18'S; 18°13'E, leg. N. & G. Olivier, 14-30.IV-VI.1988, 4 ♂ (SMN 42206); Luderitz, Diaz Point Beach, Coastal dune hummock, pitfall traps, 26°37'S; 15°05'E, leg. E. Marais, 13-26.XI.1993, 1 immature (SMN); Skorpion Mine Site, rocky hillside, hand collecting, 27°48.675'S; 16°36.06'E, leg. E. Griffin, 25.VI.1997, 1 ♀ (SMN 43732). SOUTH AFRICA. *Free State*: Brandfort, Florisbad, pitfall traps, 28°27.6'S; 26°03.00'E, leg. L.N. Lotz, 21.XII-I.1987, 2 ♂ 1 ♀ (NMBA 16924). *Northern Cape*: Port Nolloth, 545 Perlemoen Street, under shrub (sea orache?), hand collecting, 29°14.4797'S; 16°51.9643'E, leg. R. Booyens & L. Whitehead, 26.IV.2019, 1 ♀ (NCA 2019/413).

Other material: NAMIBIA. *Erongo Region*: Karibib, Navachab Gold Mine, in storage facility, pitfall traps, 21°57.00'S; 15°45.00'E, leg. M. Rental, 1.XII.2008, 6 ♂ 7 immature 11 immature (NCA 2009/2617). *Karas Region*: Keetmanshoop District, Khabus 146, on sandy plain next to dry riverbed, pitfall traps, 26°18'S; 18°13'E, leg. N. & G. Olivier, 14.III-14.IV.1988, 4 ♂ (SMN 42013); Richtersveld Transfrontier Park, Hobas 374, in river to treed area, SE 2717 DA, leg. E. Griffin, 16-28.X.1984, 1 ♂ (SMN 39855). (NMSA) SOUTH AFRICA. *Free State*: Bloemfontein, Naval Hill, Observatory, pitfall traps, 29°03.6'S; 26°08.4'E, leg. L.N. Lotz, X.1990, 1 ♂ (NMBA 6951); Brandfort, Florisbad, 1250 m a.s.l., 28°27.6'S; 26°03.00'E, 8-21.XII.1987, 3 ♂ (NMBA 8339); Same locality, leg. L.N. Lotz,

21.XII-5.I.1987-88, 2 ♂ 1 immature (NMBA 8365); Same locality, leg. L.N. Lotz, 31.X-XI.1988, 1 ♂ (NMBA 8783); Same locality, leg. L.N. Lotz, 9-23.XI.1987, 1 ♂ (NMBA 4945); Same locality, leg. L.N. Lotz, 1-15.II.1988, 1 ♂ (NMBA 3769); Same locality, leg. L.N. Lotz, 12-23.IX.1988, 1 ♂ (NMBA 4589); Same locality, leg. L.N. Lotz, 8-21.XII.1987, 1 ♀ (NMBA 3394); Same locality, leg. L.N. Lotz, 5-19.I.1987, 1 ♂ (NMBA 3632); Same locality, leg. L.N. Lotz, 8.XII.1987, 1 ♂ (NMBA 17447); Same locality, leg. L.N. Lotz, 21.XII-I.1987, 1 immature (NMBA 16871); Same locality, leg. L.N. Lotz, 19-23.XI.1987, 1 ♀ (NMBA 8456); Same locality, leg. L.N. Lotz, 23.XI-XII.1987, 1 ♂ (NMBA 17418); Same locality, leg. L.N. Lotz, 23-8.XI-XII.1987, 2 ♂ (NMBA 3211). Northern Cape: Carnavon, Kleinfourieskolk 10, under calcrete stones, hand collecting, 30°05.4'S; 22°06.00'E, leg. L.N. Lotz, 25.X.1990, 1 ♂ (NMBA 5194); Hondeklipbaai, LKC105, pitfall traps, leg. C. Haddad, 18.XI.2007, 1 ♀ (NCA 2008/1983); Cape Town, Salt River, leg. W.F. Purcell & F. Purcell, 23.IV.1896, 1 ♂ 2 ♀ (SAM 3398).

### *Etymology*

The species name is derived from its Latin name *quince-maculosa*, meaning five-spotted. This refers to the five spots on this species' abdomen, two anterior and three on the midline.

### *Diagnosis*

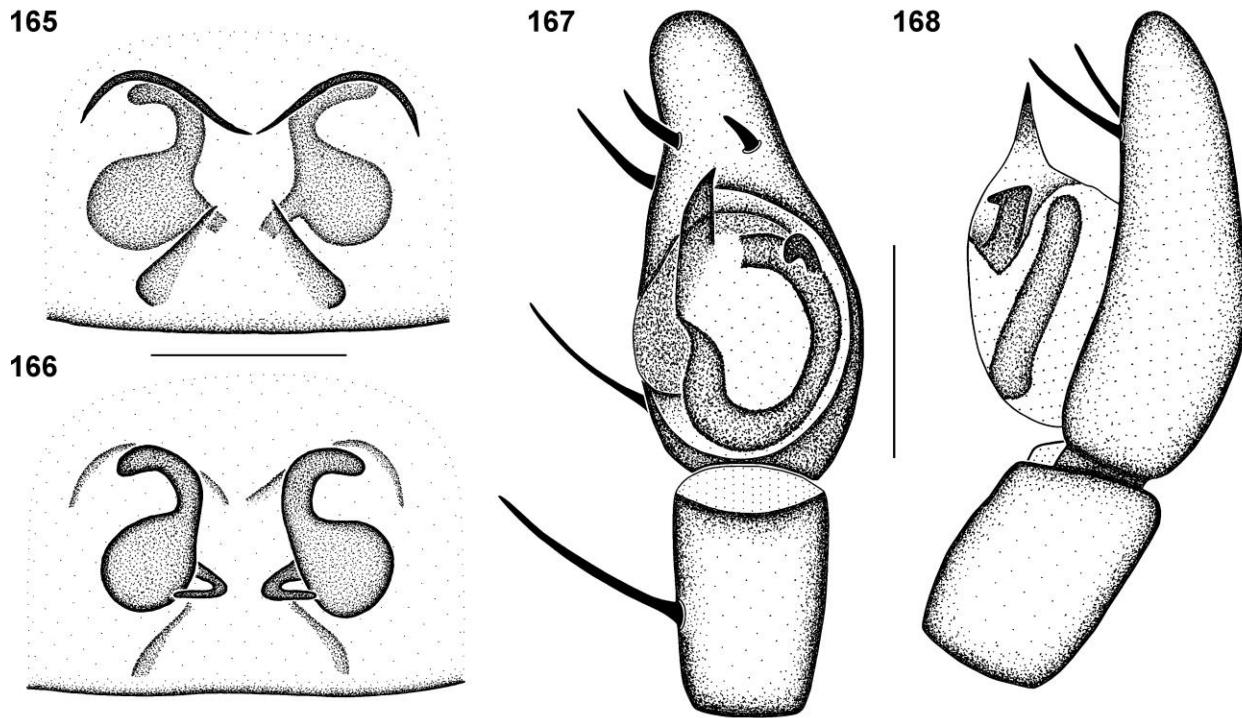
Females of this species can be distinguished from other Afrotropical *Micaria* by the short, dorsally projecting copulatory ducts that curve outwards and a divided anterior hood that almost touches in the middle (may be very close). Males can be recognized by having a very circular sperm duct and an elongate and broad embolus. The cymbial tip in this species is also very broad.

### *Female*

Female holotype from Navachab Gold Mine (NCA 2009/2618). **Measurements:** TL 2.25, CL 0.98, CW 0.63, CL:CW 1.56:1, CLH 0.06, CLH:AME 1.17:1. Eyes: ALE 0.05, AME 0.05, PLE 0.06, PME 0.04, AME-AME 0.02, PME-PME 0.05, MOQAW 0.12, MOQPW

0.14, MOQL 0.15. SL 0.59, SW 0.44, AL 1.25, AW 0.89. **Leg measurements:** Palpal segment length: 0.18, 0.16, 0.16, 0.25. Leg I: 0.57, 0.30, 0.43, 0.39, 0.39. II: 0.49, 0.27, 0.41, 0.38, 0.35. III: 0.46, 0.25, 0.33, 0.38, 0.40. IV: 0.73, 0.29, 0.53, 0.59, 0.38. TL of legs (I-IV): 2.08, 1.90, 1.82, 2.52; leg formula: 4123.

**Colouration:** carapace and abdomen dark brown to black; sternum, endites, labium and chelicerae similar in colour to carapace; legs I and II with femora darkened, legs III and IV uniform in colour (Figs 23, 24). **Carapace:** decorated with squamose setae; smooth in texture; dorsal pattern indistinct; posterior margin indented medially; fovea absent; anterior margin of carapace narrowing slightly from coxa; PER procurved in dorsal view, AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape, cluster of setae present on tip. **Endites:** oblique; constricted just above halfway; anterior margin straight; cluster of setae present on inner-apical margin. **Sternum:** shield-like; broadest between coxa I and II; posterior margin tapered to rounded point behind coxa IV. **Legs:** femora of all legs laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with lanceolate setae (Fig. 66). Leg macrosetae: Palps: 1do, 5plv, 1pl, 1do, 1pl, 2pl, 1plv, 2vt. Leg I: 1d. II: 1do, 4vt. III: 1do, 1pl, 1plv, 1vt, 1plv, 3vt. IV: 1do, 1plv, 1vt, 1plv, 1rlv, 4vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape; sigilla absent; decorated with squamose setae; two white spots dorsally near anterior margin, white broken transverse line medially, two more stripes antero-laterally (can be seen from side); venter similar in colour to dorsum. **Epigyne:** in ventral view, anterior hood divided, nearly touching, recurved; posterior pockets present baso-medially; copulatory opening present at tip of copulatory duct. In dorsal view, copulatory ducts short, thick, projecting above spermathecae laterally; fertilisation ducts projecting medially, curved laterally outwards; spermathecae globular (Figs 165, 166).



**Figs 165-168.** Genitalic morphology of *Micaria quinquemaculosa* sp. nov.: (165) female epigyne, ventral view; (166) same, dorsal view; (167) male palp, ventral view; (168) same, retrolateral view. Scale: 0.1 mm.

### Male

Male paratype from Navachab Gold Mine (NCA 2009/2616). **Measurements:** TL 1.85, CL 0.85, CW 0.55, CL:CW 1.54:1, CLH 0.05, CLH:AME 1:1. Eyes: ALE 0.04, AME 0.05, PLE 0.04, PME 0.04, AME-AME 0.02, PME-PME 0.02, MOQAW 0.10, MOQPW 0.11, MOQL 0.15. SL 0.50, SW 0.35, AL 0.91, AW 0.54. **Leg measurements:** Palpal segment length: 0.19, 0.13, 0.11, 0.24. Leg I: 0.49, 0.27, 0.43, 0.38, 0.41. II: 0.51, 0.24, 0.41, 0.37, 0.38. III: 0.40, 0.22, 0.37, 0.38, 0.32. IV: 0.56, 0.25, 0.56, 0.59, 0.41. TL of legs (I-IV): 1.98, 1.92, 1.69, 2.37; leg formula: 4123.

**Colouration:** carapace dark brown; abdomen dark brown to black; sternum, endites, labium and chelicerae similar in colour; legs I and II with femora darkened, other legs uniform in colour (Fig. 25). **Carapace:** decorated with squamose setae; smooth in texture; indistinct dark pattern radiating from middle; posterior margin indented medially; fovea

absent; anterior margin narrowing slightly from coxa I; PER procurved in dorsal view; AER recurved in anterior view. **Chelicerae**: decorated with plumose setae. **Labium**: triangular in shape, cluster of setae present on tip. **Endites**: oblique; constricted just above halfway; anterior margin rounded; cluster of setae present on inner-apical margin. **Sternum**: shield-like; broadest between coxa I and II; posterior margin tapering to broad rounded point behind coxa IV. **Legs**: femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 1do, 5plv, 1pl, 1do, 1pl, 1pl, 3vt. Leg I: 1do, 1pl. II: 1do, 1pl, 4vt. III: 1do, 1pl, 1plv, 1vt, 1plv, 3vt. IV: 1do, 1plv, 2vt, 2plv, 3vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen**: decorated with squamose setae; slightly constricted medially; dorsal pattern not visible; venter similar in colour to dorsum; sigilla not visible. **Palp**: retrolateral tibial apophysis absent; median apophysis small; retrolaterally offset from embolus, curved; sperm duct present on retrolateral surface of tegulum, curved; embolus base elongate, tip straight and tapered; cymbium widest at basal third, tapering apically (Figs 167, 168).

*Distribution*

*Micaria quinquemaculosa* sp. nov. is known from isolated records in Namibia (Fig. 169).



**Fig. 169.** The distribution of *Micaria quinquemaculosa* sp. nov. in the Afrotropical Region.

## 2.5.17.) *Micaria rivonosy* sp. nov. (Figs 26, 170-171)

### *Material examined*

Holotype ♀: MADAGASCAR. *Toamasina*: SF Tampolo, 10 km NNE Fenoarivonosy Atn., litter sifting, littoral forest, leaf litter, 10 m a.s.l., 17°17'S; 49°26'E, leg. B.L. Fischer, 4.IV.1997 (CAS, CASENT 9078551).

### *Etymology*

The species name is derived from the type locality and is a word from one of the native languages: “rivo” refers to Fenoarivo and “nosy” is from the Malagasy word *nosy*, which means island.

### *Diagnosis*

*Micaria rivonosy* sp. nov. females can be distinguished from other Afrotropical *Micaria*, such as *M. chrysis*, in having a broad, weakly recurved anterior hood, thus giving the appearance of a smaller atrium. The copulatory ducts are closer to each other as well. Lastly, the abdomen's dorsal pattern (formed by the longitudinal scutum and the transverse light brown band) forms an upside-down “T” and as a result three dark brown quadrants. This differs from *M. durbana*, where the posterior half of the abdomen is much lighter in colour than the anterior half. Male unknown.

### *Female*

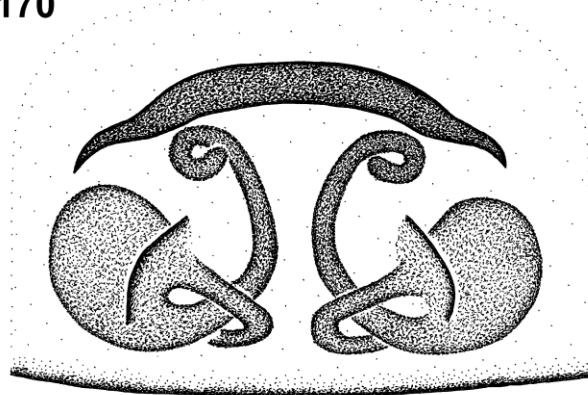
Female holotype from Fenoarivonosy, Madagascar (CAS, CASENT 9078551).

**Measurements:** TL 2.50, CL 1.13, CW 0.68, CL:CW 1.66:1, CLH 0.05, CLH:AME 1.2:1, MOQAW 0.09, MOQPW 0.13, MOQL 0.16. Eyes: ALE 0.04, AME 0.04, PLE 0.06, PME 0.05, AME-AME 0.01, PME-PME 0.03. SL 0.64, SW 0.40, AL 1.38, AW 0.68. **Leg measurements:**

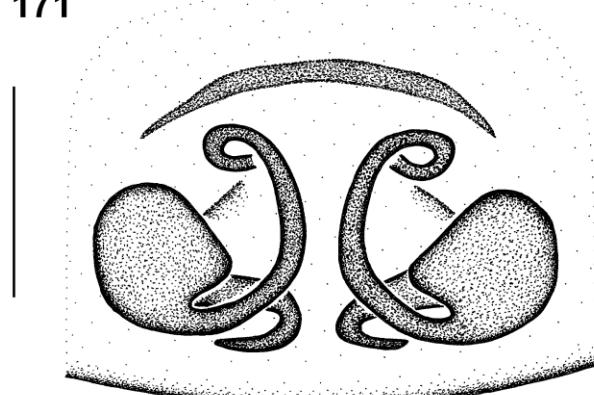
Palpal segment length: 0.75, 0.23, 0.25, 0.29. Leg I: 0.76, 0.32, 0.56, 0.51, 0.48. II: 0.68, 0.30, 0.55, 0.55, 0.51. III: 0.51, 0.25, 0.41, 0.52, 0.35. IV: 0.87, 0.35, 0.75, 0.78, 0.44. TL of legs (I-IV): 2.63, 2.59, 2.04, 3.19; leg formula: 4123.

**Colouration** carapace dark brown; abdomen dark brown to black; legs with femur I darkened up to two-thirds, rest of leg light in colour; legs II-IV uniform in colour; endites, labium and chelicerae similar in colour to carapace (Fig. 26). **Carapace:** smooth in texture; decorated with squamose setae; broad, somewhat rectangular dark pattern medially with radiating dark lines; fovea absent; posterior margin straight; anterior margin narrowing slightly from coxa I; PER recurved in dorsal view, AER recurved in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape; row of transverse setae present near tip. **Endites:** slanting inwards, constricted just above halfway; cluster of setae present on inner-apical margin. **Sternum:** light brown to yellow in colour; shield-like; broadest between coxa I and II; posterior margin tapering towards point behind coxa IV. **Legs:** femora of all legs laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 1pl, 2pl, 1pl, 1plv, 2rlv, 3vt. Leg I: 1pl, 2plv, 2rlv, 1plv, 1rlv. II: 1d. III: 1do, 1pl, 1plv, 1vt, 3vt. IV: 1do, 1plv, 1pl, 1plv, 2vt. Legs I-IV with two rows of scopulate setae on metatarsi and four rows on tarsi. **Abdomen:** cylindrical in shape, wrinkly in texture on anterior half; constricted medially and decorated with squamose setae; dorsal transverse white band present medially; longitudinal line is formed by scutum perpendicular to former; venter similar in colour to dorsum; sigilla not visible. **Epigyne:** in ventral view, anterior hood continuous, weakly recurved; posterior pockets present medially, curved. In dorsal view, copulatory ducts elongate, thin, curled at apex, close to each other; copulatory openings at curled apex; fertilisation duct projecting from median interior margin of spermathecae, elongate, curved; spermathecae globular, anterior apical margin flattened, merging with anterior ridge of fertilisation duct (Figs 170, 171).

170



171



**Figs 170-171.** Genitalic morphology of *Micaria rivenosy* sp. nov.: (170) female epigyne, ventral view; (171) same, dorsal view. Scale: 0.1 mm.

### *Distribution*

*Micaria rivotony sp. nov.* is only known from the type locality, with this species only recorded so far from Madagascar (Fig. 172).



**Fig. 172.** The distribution of *Micaria rivotony sp. nov.* in the Afrotropical Region.

## 2.5.18.) *Micaria salta* sp. nov. (Figs 27, 173-174)

### *Material examined*

Holotype ♂: SOUTH AFRICA. KwaZulu-Natal: Sani Pass, pitfall traps, 1200 m a.s.l., 30°11.4'S; 30°24.4'E, leg. University of Pretoria Students, 20.I.2008 (NCA 2011/857).

### *Etymology*

The species name is derived from the Latin word “salta” (mountain pass), referring the Sani Pass sampling transect where it was collected.

### *Diagnosis*

The males of this species can be distinguished from other Afrotropical *Micaria* in having a very curved loop at the base of the tegulum, more so than in other species. The males of similar species, such as *M. gagnoa* sp. nov., have a larger gap in the loop and the RTA is subapical, whereas that of *M. salta* sp. nov. is on the apical ridge of the palpal tibia.

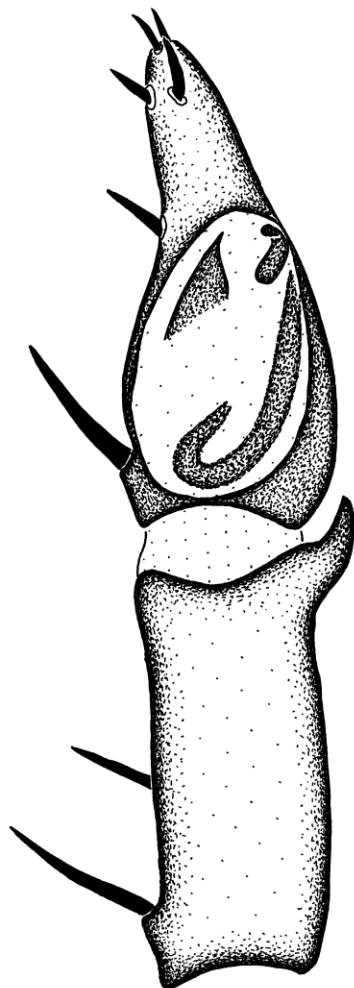
### *Male*

Male holotype from Sani Pass, South Africa. (NCA 2011/857). **Measurements:** TL 3.25, CL 1.50, CW 0.83, CL:CW 1.81:1, CLH 0.10, CLH:AME 1.70:1. Eyes: ALE 0.06, AME 0.06, PLE 0.06, PME 0.05, AME-AME 0.01, PME-PME 0.05, MOQAW 0.13, MOQPW 0.16, MOQL 0.20. SL 0.71, SW 0.49, AL 1.50, AW 0.95. **Leg measurements:** Palpal segment length: 0.68, 0.22, 0.21, 0.31. Leg I: 0.97, 0.37, 0.78, 0.70, 0.71. II: 0.84, 0.33, 0.70, 0.71, 0.71. III: 0.76, 0.30, 0.57, 0.71, 0.52. IV: 1.29, 0.41, 1.05, 1.18, 0.83. TL of legs (I-IV): 3.53, 3.29, 2.86, 4.76; leg formula: 4123.

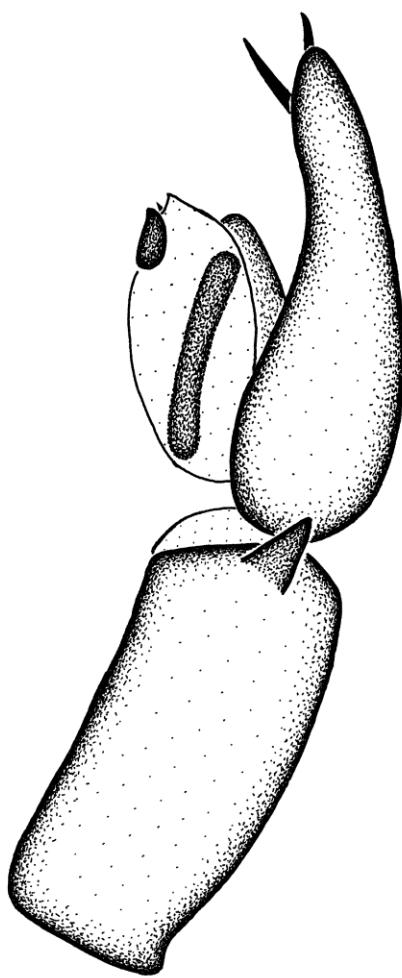
**Colouration:** carapace brown; abdomen dark brown; legs femur I darkened basally; legs II-IV uniform in colour; sternum, endites, labium and chelicerae similar in colour to carapace (Fig. 27). **Carapace:** smooth in texture; slight transverse median depression present on posterior third; decorated with squamose setae; broad rectangular dark

pattern resent medially with radiating dark lines; posterior margin straight; fovea absent; anterior margin narrowing slightly from coxa I; PER recurved in dorsal view, AER recurred in anterior view. **Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape, rounded at tip accompanied by cluster of setae. **Endites:** oblique; anterior margin straight; cluster of setae present on inner-apical margin; very thin black anterior margin. **Sternum:** shield-like; broadest between coxa I and II; posterior margin tapered between coxa IV; decorated with aculeate setae. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 1pl, 1pl, 1plv, 1pl, 2plv, 2vt. Leg I: 1do, 1pl, 2plv, 2rlv, 1plv, 1rlv. II: 1d. III: 1pl, 1rlv, 1vt, 1plv, 1rlv, 4vt. IV: 1plv, 2vt, 2plv, 2rlv, 4vt. Scopulate setae on tarsi and metatarsi of leg I-II, and on tarsi of Leg III-IV. **Abdomen:** cylindrical in shape; decorated with squamose setae; dorsal pattern not visible (abdomen damaged in holotype), but with brown scutum connecting to median constriction; white lateral stripes may also be present; venter lighter than dorsum; sigilla not visible. **Palp:** retrolateral tibial apophysis present on retrolateral surface; median apophysis similar in size to embolus, curved prolaterally; sperm duct present on retrolateral surface of tegulum, curved sharply at median basal margin of tegulum; embolus straight, slanted retrolaterally; cymbium thin above tegulum; two small, slightly thickened spines present at tip; two large spines present pre-apically on cymbium (Fig. 173, 174).

173



174



Figs 173-174. Genitalic morphology of *Micaria salta* sp. nov.: (173) male palp, ventral view; (174) same, retrolateral view. Scale: 0.1 mm.

*Distribution*

*Micaria salta sp. nov.* is only known from its type locality (Fig. 175).



**Fig. 175.** The distribution of *Micaria salta sp. nov.* in the Afrotropical Region.

## 2.5.19.) *Micaria scutellata* sp. nov. (Figs 28, 55, 75, 87, 101, 176-177)

### *Material examined*

Holotype ♂ together with 1 ♂ paratype. SOUTH AFRICA. *KwaZulu-Natal*: Ndumo Game Reserve, Nyamiti Pan, base of trees, under logs, hand collecting, 26°53.767'S; 32°16.557'E, leg. C. Haddad & R. Booysen, 7.XII.2018 (NCA 2020/83).

Paratypes: SOUTH AFRICA. *KwaZulu-Natal*: iSimangaliso Wetlands Park, Mission Rocks picnic site, base of grass tussocks, coastal forest, hand collecting, 28°15.879'S; 32°28.922'E, 90 m a.s.l., leg. C. Haddad, 29.XI.2015, 1 ♂ (NCA 2020/84).

### *Etymology*

The species name is combination of the derived Latin word “lata” (broad) and scutum, referring to the broad scutum of the ♂ that cover most of the anterior half of the abdomen.

### *Diagnosis*

The males of this species are easily recognized by their enlarged scutum. Furthermore, anterior margin of the carapace of *M. scutellata* sp. nov. is rounded (Fig. 27), whereas that of *M. felix* sp. nov. is truncated (Fig. 12). The palpal structures of the two species are very similar, but the distal retrolateral spine's position in *M. scutellata* is closer to the cymbial tip. These features coupled with the longer basal retrolateral dorsal spine on the palp would justify *M. scutellata* being a separate species. The females are still unknown.

### *Male*

Male holotype from Nyamiti Pan, Ndumo Game Reserve, South Africa. **Measurements:** TL 2.13, CL 1.13, CW 0.88, CL:CW 1.28:1, CLH 0.06, CLH:AME 1.5:1. Eye diameters and interdistances: ALE 0.48, AME 0.04, PLE 0.04, PME 0.03, AME-AME 0.02, PME-PME 0.04, MOQAW 0.10, MOQPW 0.13, MOQL 0.18. SL 0.57, SW 0.30, AL 0.87, AW 0.44. **Leg measurements:** Palpal segment length: 0.40, 0.22, 0.21, 0.30. Leg I: 0.65,

0.24, 0.56, 0.46, 0.51. II: 0.73, 0.24, 0.49, 0.49, 0.52. III: 0.56, 0.22, 0.43, 0.51, 0.44. IV: 0.98, 0.30, 0.81, 0.84, 0.56. TL of legs (I-IV): 2.42, 2.47, 2.16, 3.49; leg formula: 4213.

**Colouration:** carapace dark brown; abdomen dark brown on posterior half and light brown on anterior half; leg I and II with femora darkened on basal half, legs III-IV uniform in colour; endites, labium and chelicerae similar in colour to carapace (Fig. 28).

**Carapace:** smooth in texture; decorated with squamose setae; radiating dark lines present medially; posterior margin straight; fovea absent; anterior margin narrowing slightly from first coxa; PER slightly recurved in dorsal view, AER recurved in anterior view.

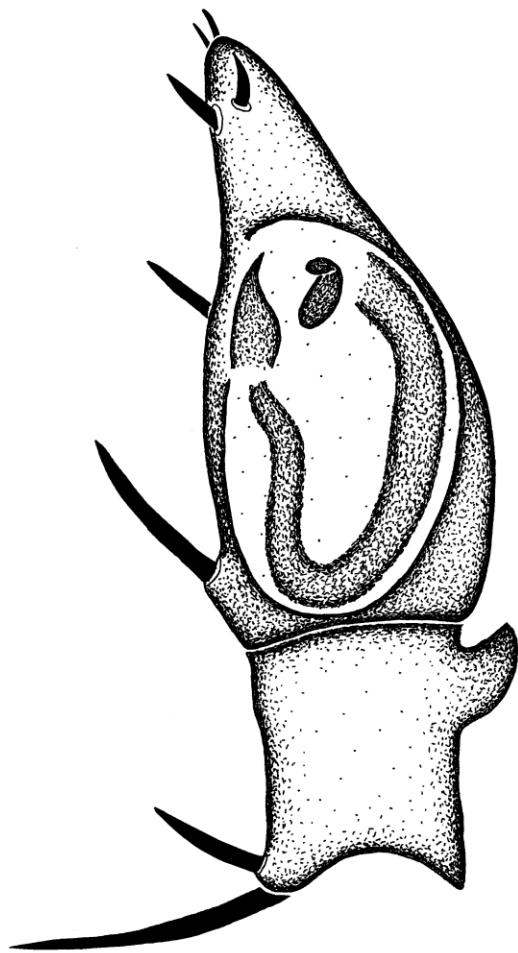
**Chelicerae:** decorated with plumose setae. **Labium:** triangular in shape, rounded at tip, accompanied by cluster of setae. **Endites:** **oblique**; anterior margin rounded; cluster of setae present on inner-apical margin; anterior margin darkened. **Sternum:**

shield-like; lighter than carapace; dark patches on lateral edges; broadest between coxa I and II; posterior margin tapered behind coxa IV; decorated with scattered long aculeate setae. **Legs:** femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin; decorated with feathery setae (Fig. 75). **Abdomen:**

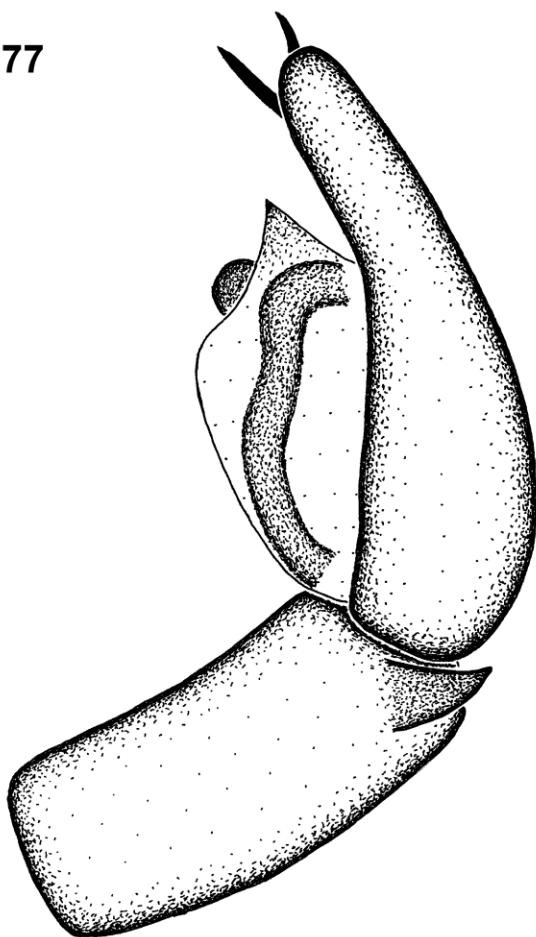
cylindrical in shape; decorated with squamose setae; large scutum present, very broad covering three-quarters of abdomen width; faint white median line just below scutum; lateral white stripes present on anterior half of abdomen; venter lighter than dorsum with no markings visible; sigilla not visible. Leg macrosetae: Palps: 1pl, 1pl, 1plv, 1pl, 2plv, 2vt. Leg I: 1pl, 2plv, 2rlv, 1plv, 1rlv. II: 1d. IV: 2vt, 2vt. Scopulate setae on tarsi and metatarsi of legs I-II, and only on tarsi of legs III-IV. **Palp:**

retrolateral tibial apophysis present on retrolateral surface; median apophysis present next to embolus, thin, elongate, curved prolaterally; sperm duct present on retrolateral surface of tegulum, curved close to basal margin of tegulum; embolus broad at base, tip tapered and slightly curved; cymbium pear-shaped, broadest at basal third; two small spines present on tip of cymbium; two large ventral terminal spines distally near tip (Figs 176, 177).

176



177



Figs 176-177. Genitalic morphology of *Micaria scutellata* sp. nov.: (176) male palp, ventral view; (177) same, retrolateral view. Scale: 0.1 mm.

### *Distribution*

*Micaria scutellata* sp. nov. is only known from its type locality (Fig. 178).



**Fig. 178.** The distribution of *Micaria scutellata* sp. nov. in the Afrotropical Region.

## 2.5.20.) *Micaria tersissima* Simon, 1910 (Figs 29, 179-180)

*Micaria tersissima* Simon, 1910: 203 (♂)

### *Material examined*

Holotype ♂: SOUTH AFRICA. Northern Cape: Komaggas, leg. L. Schultze, VII.1904 (ZMB 28241 – examined).

Other material: SOUTH AFRICA. Northern Cape: Komaggas, under rocks, hand collecting, 29°40.0003'S; 17°35.4157'E, leg. R. Booyens, L. Whitehead, R. Christiaan & Z. Mbo, 25.IV.2019, 1 ♂ (NCA 2019/412).

### *Diagnosis*

*Micaria tersissima* can be distinguished from other Afrotropical *Micaria* in having dark brown legs and carapace and a black abdomen with two white spots medially. Anterior margin of abdomen is truncated and legs III and IV have a white longitudinal median stripe. The sperm duct in the males have a characteristic kink in the retrolateral basal section of the duct and three elongate spines above the embolus. Females are still unknown.

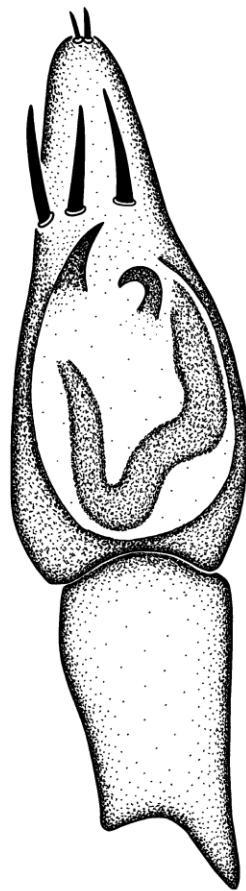
### *Male*

Male from Komaggas (NCA 2019/412). **Measurements:** TL 3.10, CL 1.45, CW 0.95, CL:CW 1.53:1, CLH 0.10, CLH:AME 2.38:1. Eyes: ALE 0.05, AME 0.04, PLE 0.04, PME 0.04, AME-AME 0.04, PME-PME 0.07, MOQAW 0.14, MOQPW 0.16, MOQL 0.21. SL 0.76, SW 0.56, AL1.55, AW 0.90. **Leg measurements:** Palpal segment length: 0.48, 0.24, 0.25, 0.40. Leg I: 1.05, 0.46, 0.89, 0.78, 0.70. II: 0.92, 0.41, 0.73, 0.64, 0.70. III: 0.83, 0.33, 0.68, 0.71, 0.54. IV: 1.29, 0.44, 0.98, 1.19, 0.65. TL of legs (I-IV): 3.88, 3.40, 3.09, 4.55; leg formula: 4123.

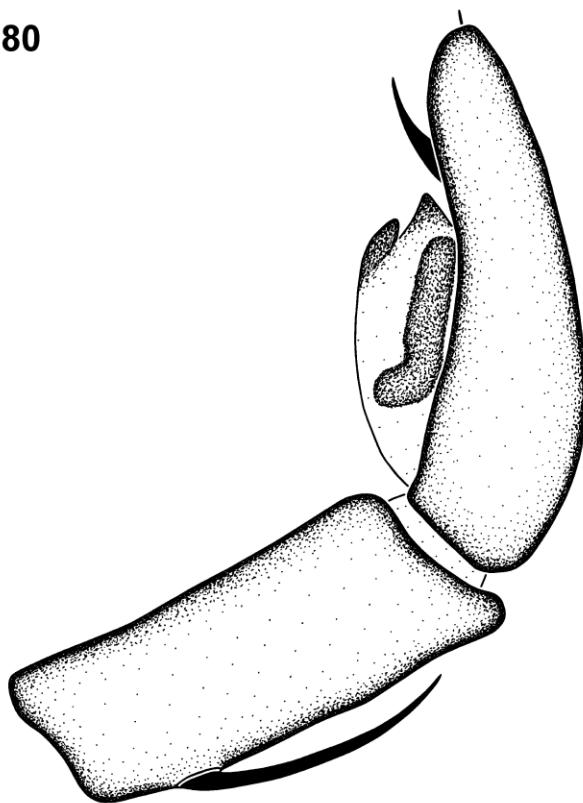
**Colouration:** carapace and abdomen dark brown or black; legs I and II with femora darkened; legs III and IV uniform in colour; sternum, labium, endites and chelicerae

similar in colour to carapace (Fig. 29). **Carapace**: smooth in texture; decorated with squamose setae; broad somewhat rectangular dark pattern present medially with radiating dark lines; posterior margin wide and straight; fovea absent; anterior margin narrowing slightly from coxa I; PER procurred in dorsal view, AER recurved in anterior view. **Chelicerae**: decorated with plumose setae. **Labium**: triangular in shape, rounded at tip, cluster of setae present apically. **Endites**: **oblique**; anterior margin rounded; cluster of setae present on inner-apical margin; black anterior margin. **Sternum**: shield-like; broadest between coxa I and II; posterior margin tapered behind coxa IV; decorated with aculeate setae. **Legs**: femora laterally flattened, highest at base, leg I more pronounced in this fashion; rest of leg normal, thin. Leg macrosetae: Palps: 1do, 1do, 1pl, 1pl, 2plv, 2vt. Leg I: 1do, 1pl. II: 1do, 1pl. III: 1do, 1pl, 1rl, 1pl, 1plv, 2vt, 1plv, 1rlv, 4vt. IV: 1do, 2plv, 2vt, 1pl, 2plv, 1rlv, 4vt. Scopulate setae on tarsi of legs I-IV. **Abdomen**: cylindrical in shape; decorated with squamose setae; truncated anteriorly; two small spots visible on midline dorsally, small white spot present just above spinnerets; venter similar in colour to dorsum; sigilla not visible. **Palp**: retrolateral tibial apophysis absent; median apophysis present, curved prolaterally, thin; sperm duct present on retrolateral surface of tegulum, kink in retrolateral basal portion of sperm duct; embolus tip thin, slanted retrolaterally; cymbium pear-shaped; two small spines present on tip of cymbium; three long ventral terminal spines present above embolus (Figs 179, 180).

179



180



**Figs 179-180.** Genitalic morphology of *Micaria tersissima* Simon, 1910: (179) male palp, ventral view; (180) same, retrolateral view. Scale 0.1 mm.

### *Distribution*

*Micaria tersissima* is only known from its type locality (Fig. 181).



**Fig. 181.** The distribution of *Micaria tersissima* Simon, 1910 in the Afrotropical Region.

## 2.6.) Discussion

This study added 17 new species to the Afrotropical Region, several of them are entirely new to their regions, such as the first *Micaria* species described from East Africa, West Africa and Madagascar. In South Africa, *Micaria* specimens have been collected throughout almost all of the provinces, except the North Western Province that lacks sampling. In terms of the Afrotropical Region, large gaps exist between the southern African countries and Ethiopia; west African countries such as Angola, Gabon, Nigeria, Guinea, Niger and Mali, to name a few. Similarly, nothing is known about the distribution of *Micaria* in the Democratic Republic of the Congo (DRC), Chad, Sudan, Kenya and Somalia. Nevertheless, Mauritania, Senegal, Ethiopia, Côte d'Ivoire, Cameroon, and Mozambique have yielded new species.

In terms of the habitat, representatives of *Micaria* were found in several biomes including fynbos, savanna, grassland, Nama Karoo and Succulent Karoo. These habitats were spread out through biodiversity hotspots such as the Cape Floristic region, Maputaland-Pondoland-Albany, and Succulent Karoo in South Africa; the Horn of Africa that includes Ethiopia and the Madagascar Islands. Their microhabitats typically included shelter and foraging within leaf litter as well as underneath rocks and logs. Some individuals were found underneath bushes close to the intertidal zones and beneath shrubs on the dunes, where they feed on small insects such as Collembola and hemipteran nymphs. The latter *Micaria* were usually associated with *Lepisiota* (Formicinae) ants, while several of the larger species were associated with *Anoplolepis custodiens* F. Smith, 1858 (Formicinae) ants.

In conclusion, 17 new species have been described, but it is very possible there are more to be discovered in the gaps present in central, western and eastern Africa.

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# CHAPTER 3: SYSTEMATICS OF

## *MICARIA*

### 3.1.) Introduction

The systematics of *Micaria* Westring, 1851 has been very poorly studied to date. This created a gap in the knowledge we have on Afrotropical *Micaria* and how to properly delineate species. Due to the limited information regarding their systematics, their phylogenetic relationships are poorly resolved. Platnick & Shadab (1988) revised the Nearctic species and provided a cladogram that explored the relationships between 12 species, as did Wunderlich (1980) for 26 Palearctic species. Ramirez (2014)'s morphological analysis of gnaphosids placed *Micaria* basal to Gnaphosidae, with the closest relative being Trochanteriidae. Similar results were obtained by Wheeler *et al.* (2017)'s molecular analysis on dionychan spiders, placing *Micaria* sister to Trochanteriidae and basal to the subfamily Molycriinae (Prodidomidae). Furthermore, Azevedo *et al.* (2018)'s cladistical analysis showed that *Micaria* may be more closely related to Ammoxenidae and yet still basal to Gnaphosidae. Bosmans & Blick (2000) described the genus *Arboricaria* (now a junior synonym of *Micaria*) and included *M. subopaca* Westring, 1861 therein. Mikhailov (2016) described one new species of *Arboricaria*. Nevertheless, none of these papers included a systemic revision of the genus and these were only morphological studies.

The first phylogeny, based on public DNA barcoding data (COI gene), was produced by Breitling (2017) for some of the Nearctic and Palearctic *Micaria*, including *M. subopaca*, which confirmed the placement of *Arboricaria* within *Micaria*, and confirming the species groups proposed by Platnick & Shadab (1988).

With respect to the Afrotropical species, at that point in time, none of the three described species had been evaluated morphologically or genetically. Until now, very little information on the taxonomy of Afrotropical *Micaria* was known. This study tried to

address this problem by sequencing as many Afrotopical species as possible to include in a phylogenetic analysis in comparison to the currently known American and European species.

### 3.2.) Materials and Methods

#### *Sequence Preparation*

In preparation for genetic analyses, the specimens were preserved in 96% ethanol and photographs of their habitus were taken for record keeping and submission to Barcode of Life Data Systems (BOLD). Two legs of each specimen were removed with sterile forceps and preserved in absolute ethanol within a 2 ml plastic tube. These samples were packed into a 96-well plate and sent to the Canadian Centre for DNA Barcoding (CCDB) for barcoding analyses using the cytochrome C oxidase subunit I (COI) gene region.

DNA extraction protocols were followed as described in the documents provided at: [http://ccdb.ca/site/wpcontent/uploads/2016/09/CCDB\\_DNA\\_Extraction.pdf](http://ccdb.ca/site/wpcontent/uploads/2016/09/CCDB_DNA_Extraction.pdf). Sequencing and clean-up processes were followed at the CCDB using the protocol provided at [http://ccdb.ca/site/wp-content/uploads/2016/09/CCDB\\_Sequencing.pdf](http://ccdb.ca/site/wp-content/uploads/2016/09/CCDB_Sequencing.pdf).

In combination with the 19 newly sequenced material (Table 1), 202 DNA sequences of extra-regional *Micaria* (Table 2), were downloaded in fasta format from BOLD and Genbank (<https://www.ncbi.nlm.nih.gov/>) respectively, and were aligned using Mega X (Kumar *et al.* 2018). Two ambiguous sequences (not shown in table) were removed from the analyses to avoid inaccuracies. Sequences were formatted using Sequence Matrix (Vaidya *et al.* 2011). Analyses were conducted using the computer software emulated on a High-Performance Computing (HPC) cluster hosted by the San Diego Supercomputer Centre via the CIPRES Science gateway (Miller *et al.* 2010).

#### *Phylogenetic analyses*

Bayesian inference analyses were performed using MrBayes 3.2.7 Parallel version (Ronquist & Huelsenbeck 2003; Altekar *et al.* 2004). The analysis consisted of four simultaneous runs (nruns=4) and six simultaneous Markov Chain Monte Carlo (MCMC) chains that were set to 12 000 000 generations and a temperature of 0.07. Samples were

taken every 5000 generations and printed every 1000 generations. A good posterior probability distribution was determined by checking whether the Potential Scale Reduction Factor (PSRF) values were close to 1.0.

Furthermore, codon partitions for the COI region were determined using PartitionFinder2 (Lanfear *et al.* 2016) and the results were included in the MrBayes data block. Molecular partition parameters were unlinked using the following commands: unlink statefreq=(all), revmat=(all), shape=(all), pinvar=(all) and tratio=(all). Due to this analysis being run on an HPC cluster, the command “set usebeagle=yes” was used to decrease the time taken to do the analysis. Finally, the trees and MCMC runs were summarised using the “sumt” and “sump” commands and 25% of the burnin was discarded. A majority rule consensus tree was produced using the “contype=allcompat” command.

RaxML (Stamatakis 2014) was used to infer a maximum likelihood phylogeny using a GTR substitution model. The final ML optimisation likelihood was -6028.3466. The analysis was replicated with 1000 bootstraps. The final tree was visualised using FigTree (Rambaut 2014).

### 3.3.) Results

#### *Genetic barcoding results (COI-region)*

The legs of 32 (Table 1) *Micaria* specimens representing 21 species were submitted to the CCDB for DNA barcoding, of which a total of 19 specimens representing 14 species were successfully barcoded. Successful sequences were uploaded to the Barcoding of Life Data Systems (BOLD) in the SPIZA project. This project aims to produce DNA barcodes for all the South African arachnids. The remaining 13 specimens that were unsuccessful were not included and discussed in the final phylogenetic analyses but may be sequenced in the future. Sequences were not successful because some specimens have been stored for a very long time (Miller *et al.* 2013) and the sampling methods used, such as pitfall trapping, could have damaged the DNA. All the phylogenetic analyses included *Drassodes lophognathus* Purcell, 1907 (Gnaphosidae) as an outgroup.

**Table 1.** A list of the successful DNA barcoding sequences used for the phylogenetic analyses.

BOLD Process ID	Depository Number	Species	Sex	Locality
SPIZA286-19	NCA 2019.407	<i>Micaria felix</i> sp. nov.	Male	George, Western Cape Province, South Africa
SPIZA287-19	NCA 2019.408	<i>Micaria felix</i> sp. nov.	Female	Ndumo, KwaZulu-Natal, South Africa
SPIZA289-19	NCA 2019.409	<i>Micaria beaufortia</i> (Tucker, 1923)	Female	Bankfontein Farm, Luckhof District, Free State, South Africa
SPIZA290-19	NCA 2019.410	<i>Micaria beaufortia</i> (Tucker, 1923)	Male	Bankfontein Farm, Luckhof District, Free State, South Africa
SPIZA296-19	NCA 2008.4704	<i>Micaria basaliducta</i> sp. nov.	Male	Beaufort West, Western Cape Province, South Africa
SPIZA297-19	NCA 2017.1315	<i>Micaria koingnaas</i> sp. nov	Male	Strandfontein, Western Cape Province, South Africa
SPIZA302-19	NCA 2019.411	<i>Micaria chrysis</i> (Simon, 1910)	Female	Hermanus, Western Cape Province, South Africa
SPIZA307-19	NCA 2017.1302	<i>Micaria chrysis</i> (Simon, 1910)	Female	Port Nolloth, Northern Cape Province, South Africa
SPIZA308-19	NCA 2019.412	<i>Micaria tersissima</i> Simo, 1910	Male	Komaggas, Northern Cape Province, South Africa
SPIZA309-19	NCA 2019.413	<i>Micaria quinquemaculosa</i> sp. nov.	Female	Port Nolloth, Northern Cape Province, South Africa
SPIZA310-19	NCA 2017.1247	<i>Micaria koingnaas</i> sp. nov.	Male	Koingnaas, Northern Cape Province, South Africa
SPIZA311-19	NCA 2019.414	<i>Micaria durbana</i> sp. nov.	Male	Durban, KwaZulu-Natal, South Africa
SPIZA312-19	NCA 2019.414	<i>Micaria durbana</i> sp. nov.	Female	Durban, KwaZulu-Natal, South Africa
SPIZA313-19	UFS AR041	<i>Micaria constricta</i> Emerton, 1894	Male	Arapho and Roosevelt National Forests, Colorado, United States of America
SPIZA314-19	UFS AR042	<i>Micaria rossica</i> Thorell, 1875	Male	Arapho and Roosevelt National Forests, Colorado, United States of America
SPIZA315-19	UFS AR042	<i>Micaria rossica</i> Thorell, 1875	Female	Arapho and Roosevelt National Forests, Colorado, United States of America
SPIZA319-19	UFS AR044	<i>Micaria sociabilis</i> Kulczynski 1897	Female	Lednice, Czech Republic
SPIZA321-19	UFS AR045	<i>Micaria subopaca</i> Westring, 1861	Female	Lednice, Czech Republic
SPIZA326-19	UFS AR049	<i>Micaria formicaria</i> (Sundevall, 1831)	Female	Mohelno, Czech Republic

**Table 2.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

Species	GenBank Accession Nr	BOLD ID	Distribution
<i>Drassodes lophognathus</i>		GMSAD008	Holarctic
<i>Micaria aenea</i>	KC502597	AEDNA150	Holarctic
<i>Micaria aenea</i>	HQ920280	ALBSP177	Holarctic
<i>Micaria aenea</i>	KP648563	ALBSP314	Holarctic
<i>Micaria aenea</i>	KP654101	ARBCM1198	Holarctic
<i>Micaria aenea</i>	GU683178	BBCAN197	Holarctic
<i>Micaria aenea</i>	GU683465	BBCAN666	Holarctic
<i>Micaria aenea</i>	GU683462	BBCAN669	Holarctic
<i>Micaria aenea</i>	KM840003	BBCNP398	Holarctic
<i>Micaria aenea</i>	KP647943	BBCNP673	Holarctic
<i>Micaria aenea</i>	MG047454	BCBSP1373	Holarctic
<i>Micaria aenea</i>	MG048085	BCBSP1395	Holarctic
<i>Micaria aenea</i>	MG044752	BCBSP1396	Holarctic
<i>Micaria aenea</i>	MG045265	BCBSP1398	Holarctic
<i>Micaria aenea</i>	MG042739	BCBSP994	Holarctic
<i>Micaria aenea</i>	MF814192	CBHSP124	Holarctic
<i>Micaria aenea</i>	MF809576	CNKLF4609	Holarctic
<i>Micaria aenea</i>	KY268359	GBBSP1411	Holarctic
<i>Micaria aenea</i>	MG043233	KLUSP089	Holarctic
<i>Micaria aenea</i>	MG045714	MPPSP063	Holarctic
<i>Micaria aenea</i>	MG049307	MPPSP081	Holarctic
<i>Micaria aenea</i>	MG048638	MPPSP141	Holarctic

**Table 2 cont.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

<i>Micaria aenea</i>	MG049426	MPPSP325	Holarctic
<i>Micaria aenea</i>	MG048558	MPPSP326	Holarctic
<i>Micaria aenea</i>	MG045688	MPPSP327	Holarctic
<i>Micaria aenea</i>	MG042949	MPPSP487	Holarctic
<i>Micaria aenea</i>	GU683781	SPICH157	Holarctic
<i>Micaria aenea</i>	GU683778	SPICH187	Holarctic
<i>Micaria aenea</i>	GU683946	SPICH220	Holarctic
<i>Micaria aenea</i>	KX039258	SPSLO200	Holarctic
<i>Micaria aenea</i>	KU875474	UAMIC1580	Holarctic
<i>Micaria aenea</i>	KU875475	UAMIC1587	Holarctic
<i>Micaria alpina</i>	KC502598	AEDNA129	Holarctic, Neotropical
<i>Micaria alpina</i>	KF368267	KKCHE231	Holarctic, Neotropical
<i>Micaria alpina</i>	GU684496	SPICH990	Holarctic, Neotropical
<i>Micaria COI</i>	MG512020	CNGRF420	Nearctic
<i>Micaria constricta</i>	KC502602	AEDNA102	Holarctic
<i>Micaria constricta</i>	KC502600	AEDNA108	Holarctic
<i>Micaria constricta</i>	KC502599	AEDNA145	Holarctic
<i>Micaria constricta</i>	KC502601	AEDNA151	Holarctic
<i>Micaria constricta</i>	MG047633	BMAPA701	Holarctic
<i>Micaria constricta</i>	MG047235	DWCSP037	Holarctic
<i>Micaria constricta</i>	HQ569250	JSYKA555	Holarctic
<i>Micaria constricta</i>	GU683690	KKCHE1001	Holarctic
<i>Micaria constricta</i>	GU683725	KKCHE1041	Holarctic

**Table 2.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

<i>Micaria constricta</i>	GU683724	KKCHE1042	Holarctic
<i>Micaria constricta</i>	KF368271	KKCHE232	Holarctic
<i>Micaria constricta</i>	KF368272	KKCHE603	Holarctic
<i>Micaria constricta</i>	KF368284	KKCHE604	Holarctic
<i>Micaria constricta</i>	KF368276	KKCHE615	Holarctic
<i>Micaria constricta</i>	KF368288	KKCHE616	Holarctic
<i>Micaria constricta</i>	KF368282	KKCHE627	Holarctic
<i>Micaria constricta</i>	KF368278	KKCHE674	Holarctic
<i>Micaria constricta</i>	KF368283	KKCHE675	Holarctic
<i>Micaria constricta</i>	MG043076	KKCHE687	Holarctic
<i>Micaria constricta</i>	KF368286	KKCHE713	Holarctic
<i>Micaria constricta</i>	KF368274	KKCHE789	Holarctic
<i>Micaria constricta</i>	KF368281	KKCHE794	Holarctic
<i>Micaria constricta</i>	KF368287	KKCHE798	Holarctic
<i>Micaria constricta</i>	KF368291	KKCHE799	Holarctic
<i>Micaria constricta</i>	KF368269	KKCHE813	Holarctic
<i>Micaria constricta</i>	KF368289	KKCHE819	Holarctic
<i>Micaria constricta</i>	KF368273	KKCHE824	Holarctic
<i>Micaria constricta</i>	GU683662	KKCHE961	Holarctic
<i>Micaria constricta</i>	GU683665	KKCHE963	Holarctic
<i>Micaria constricta</i>	GU683664	KKCHE965	Holarctic
<i>Micaria constricta</i>	HM862436	KKCHE966	Holarctic
<i>Micaria constricta</i>	GU683666	KKCHE968	Holarctic

**Table 2.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

<i>Micaria constricta</i>	GU683670	KKCHE969	Holarctic
<i>Micaria constricta</i>	MG045966	MPPSP058	Holarctic
<i>Micaria constricta</i>	MG043309	MPPSP060	Holarctic
<i>Micaria constricta</i>	GU683833	SPICH059	Holarctic
<i>Micaria constricta</i>	GU683905	SPICH062	Holarctic
<i>Micaria constricta</i>	GU683776	SPICH102	Holarctic
<i>Micaria constricta</i>	GU683777	SPICH142	Holarctic
<i>Micaria constricta</i>	GU683779	SPICH143	Holarctic
<i>Micaria constricta</i>	GU683945	SPICH219	Holarctic
<i>Micaria constricta</i>	KF368270	SPIRU1196	Holarctic
<i>Micaria constricta</i>	KF368280	SPIRU1241	Holarctic
<i>Micaria constricta</i>	KF368279	SPIRU1248	Holarctic
<i>Micaria constricta</i>	KF368277	SPIRU1268	Holarctic
<i>Micaria constricta</i>	MG048843	SPIRU1269	Holarctic
<i>Micaria constricta</i>	KF368268	SPIRU1313	Holarctic
<i>Micaria constricta</i>	KF368290	SPIRU1368	Holarctic
<i>Micaria constricta</i>	KF368275	SPIRU1369	Holarctic
<i>Micaria constricta</i>	HQ580756	SPRMA122	Holarctic
<i>Micaria constricta</i>	HQ580808	SPRMA194	Holarctic
<i>Micaria constricta</i>	KM840687	SSWLF2932	Holarctic
<i>Micaria constricta</i>	KF368285	TWSC220	Holarctic
<i>Micaria dives</i>	JN817228	GBCH11043	Palearctic
<i>Micaria elizabethae</i>	HM376105	ERSPI341	Nearctic, Neotropical

**Table 2.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

<i>Micaria elizabethae</i>	KP647474	RBINA4372	Nearctic, Neotropical
<i>Micaria foxi</i>	KP652338	ARBCM106	Nearctic, Neotropical
<i>Micaria foxi</i>	KP651906	ARBCM108	Nearctic, Neotropical
<i>Micaria foxi</i>	KP646563	ARBCM1214	Nearctic, Neotropical
<i>Micaria foxi</i>	KP649919	BBCNP694	Nearctic, Neotropical
<i>Micaria foxi</i>		BBUSE2696	Nearctic, Neotropical
<i>Micaria foxi</i>		BBUSE457	Nearctic, Neotropical
<i>Micaria foxi</i>		BBUSE787	Nearctic, Neotropical
<i>Micaria foxi</i>		BBUSE794	Nearctic, Neotropical
<i>Micaria foxi</i>	JN309654	SPICA1858	Nearctic, Neotropical
<i>Micaria foxi</i>	JF887091	SPRMA624	Nearctic, Neotropical
<i>Micaria foxi</i>	JF887092	SPRMA625	Nearctic, Neotropical
<i>Micaria foxi</i>	KP647725	SPRMA825	Nearctic, Neotropical
<i>Micaria foxi</i>	KP650704	SPRMA826	Nearctic, Neotropical
<i>Micaria foxi</i>	MF809163	SSGLA4807	Nearctic, Neotropical
<i>Micaria foxi</i>	KM828544	SSJAB2244	Nearctic, Neotropical
<i>Micaria gertschi</i>	MG049303	ARONW970	Nearctic, Neotropical
<i>Micaria gertschi</i>	MG045509	ARONW977	Nearctic, Neotropical
<i>Micaria gertschi</i>	KP653656	BBCNP674	Nearctic, Neotropical
<i>Micaria gertschi</i>	MF816511	CNGSB4255	Nearctic, Neotropical
<i>Micaria longipes</i>		BBUSE541	Nearctic
<i>Micaria longipes</i>	JN308571	PPELE372	Nearctic
<i>Micaria pulicaria</i>	KC502603	AEDNA099	Nearctic

**Table 2.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

<i>Micaria pulicaria</i>	KM832040	BBCNP079	Nearctic
<i>Micaria pulicaria</i>	KM833925	BBCNP083	Nearctic
<i>Micaria pulicaria</i>	KM828198	BBCNP089	Nearctic
<i>Micaria pulicaria</i>	KM829241	BBCNP095	Nearctic
<i>Micaria pulicaria</i>	KM830292	BBCNP406	Nearctic
<i>Micaria pulicaria</i>	MG046551	BCBSP1353	Nearctic
<i>Micaria pulicaria</i>	MG044890	BCBSP1371	Nearctic
<i>Micaria pulicaria</i>	MG511365	CBHSP005	Nearctic
<i>Micaria pulicaria</i>	MF812118	CBHSP074	Nearctic
<i>Micaria pulicaria</i>	MF809319	CBHSP075	Nearctic
<i>Micaria pulicaria</i>	KP647739	CNGBB534	Nearctic
<i>Micaria pulicaria</i>	KP654086	CNGBI1547	Nearctic
<i>Micaria pulicaria</i>	KP651997	CNGBI1551	Nearctic
<i>Micaria pulicaria</i>	KP652000	CNGBI1554	Nearctic
<i>Micaria pulicaria</i>	KP647392	CNGBJ1682	Nearctic
<i>Micaria pulicaria</i>	KP657409	CNGBJ1684	Nearctic
<i>Micaria pulicaria</i>	KP647304	CNGBJ1702	Nearctic
<i>Micaria pulicaria</i>	MF810288	CNSID1703	Nearctic
<i>Micaria pulicaria</i>	MF815885	ELKSP088	Nearctic
<i>Micaria pulicaria</i>	KX537427	FBARB230	Nearctic
<i>Micaria pulicaria</i>	KX537201	FBARB372	Nearctic
<i>Micaria pulicaria</i>	MF811264	FUNSP070	Nearctic
<i>Micaria pulicaria</i>	MF809191	FUNSP428	Nearctic

**Table 2.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

<i>Micaria pulicaria</i>	KY269478	GBBSP235	Nearctic
<i>Micaria pulicaria</i>	KY268341	GBBSP277	Nearctic
<i>Micaria pulicaria</i>	KP657063	KKCHE235	Nearctic
<i>Micaria pulicaria</i>	KF368295	KKCHE628	Nearctic
<i>Micaria pulicaria</i>	KF368293	KKCHE640	Nearctic
<i>Micaria pulicaria</i>	KF368294	KKCHE663	Nearctic
<i>Micaria pulicaria</i>	KF368292	KKCHE823	Nearctic
<i>Micaria pulicaria</i>	MG043281	KLPSP471	Nearctic
<i>Micaria pulicaria</i>	MF809520	KOUSP104	Nearctic
<i>Micaria pulicaria</i>	MF810062	KOUSP629	Nearctic
<i>Micaria pulicaria</i>	MG046783	MPPSP020	Nearctic
<i>Micaria pulicaria</i>	MG046668	MPPSP322	Nearctic
<i>Micaria pulicaria</i>	MG047907	MPPSP464	Nearctic
<i>Micaria pulicaria</i>	MG046502	MPPSP486	Nearctic
<i>Micaria pulicaria</i>		NLARA167	Nearctic
<i>Micaria pulicaria</i>	KT619250	RRSPI271	Nearctic
<i>Micaria pulicaria</i>	KT620900	RRSPI384	Nearctic
<i>Micaria pulicaria</i>		SMNKA074	Nearctic
<i>Micaria pulicaria</i>		SMNKA206	Nearctic
<i>Micaria pulicaria</i>	JF884638	SPICA1086	Nearctic
<i>Micaria pulicaria</i>	JF885140	SPICA1561	Nearctic
<i>Micaria pulicaria</i>	JF885345	SPICA1765	Nearctic
<i>Micaria pulicaria</i>	JF885350	SPICA1771	Nearctic

**Table 2.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

<i>Micaria pulicaria</i>	JN309801	SPICA2011	Nearctic
<i>Micaria pulicaria</i>	JF885506	SPICA305	Nearctic
<i>Micaria pulicaria</i>	JF885719	SPICA532	Nearctic
<i>Micaria pulicaria</i>	GU683944	SPICH215	Nearctic
<i>Micaria pulicaria</i>	GU683941	SPICH216	Nearctic
<i>Micaria pulicaria</i>	GU683942	SPICH217	Nearctic
<i>Micaria pulicaria</i>	GU683943	SPICH218	Nearctic
<i>Micaria pulicaria</i>	HM417000	SPINO092	Nearctic
<i>Micaria pulicaria</i>	KX039259	SPSLO293	Nearctic
<i>Micaria pulicaria</i>	KP645839	SSFDA2680	Nearctic
<i>Micaria pulicaria</i>	MF815772	SSGBC3516	Nearctic
<i>Micaria pulicaria</i>	KM825512	SSJAE5583	Nearctic
<i>Micaria pulicaria</i>	KM830329	SSPAC10083	Nearctic
<i>Micaria pulicaria</i>	KM839136	SSPAC10979	Nearctic
<i>Micaria pulicaria</i>	KM827168	SSWLD2595	Nearctic
<i>Micaria pulicaria</i>	KM833802	SSWLF2194	Nearctic
<i>Micaria pulicaria</i>	KM831821	SSWLF3329	Nearctic
<i>Micaria pulicaria</i>	KM836507	SSWLF3330	Nearctic
<i>Micaria pulicaria</i>	KU875477	UAMIC1538	Nearctic
<i>Micaria pulicaria</i>	KU875476	UAMIC1557	Nearctic
<i>Micaria rossica</i>		UAMIC1537	Nearctic, Neotropical
<i>Micaria rossica</i>		UAMIC1581	Nearctic, Neotropical
<i>Micaria</i> sp.	KY017737	GBMIN117069	Palearctic

**Table 2.** All extra-regional DNA sequences used for the molecular phylogenetic analyses with their respective accession numbers.

<i>Micaria</i> sp.	MK154470	MAMTS231	Indomalayan
<i>Micaria subopaca</i>	KX537482	FBARB496	Palearctic
<i>Micaria subopaca</i>	KY269129	GBBSP1396	Palearctic
<i>Micaria tripunctata</i>	KP645590	BBCNP3059	Holarctic
<i>Micaria tripunctata</i>	MF814956	KLUSP294	Holarctic
<i>Micaria tripunctata</i>	MF808607	KLUSP303	Holarctic
<i>Micaria tripunctata</i>	MF810739	KLUSP304	Holarctic
<i>Micaria tripunctata</i>	MF810822	KLUSP307	Holarctic
<i>Micaria tripunctata</i>	MF809104	KLUSP370	Holarctic
<i>Micaria tripunctata</i>	MF812610	KLUSP378	Holarctic
<i>Micaria tripunctata</i>	MF815403	SSKUA8179	Holarctic
<i>Micaria tripunctata</i>	MF814249	SSKUA8184	Holarctic
<i>Micaria tripunctata</i>	KU875478	UAMIC1603	Holarctic
<i>Micaria utahna</i>		BBUSE572	Neotropical
<i>Micaria utahna</i>		NGSFT1097	Neotropical
<i>Micaria utahna</i>		NGSFT1098	Neotropical

### *Molecular phylogenetic analysis*

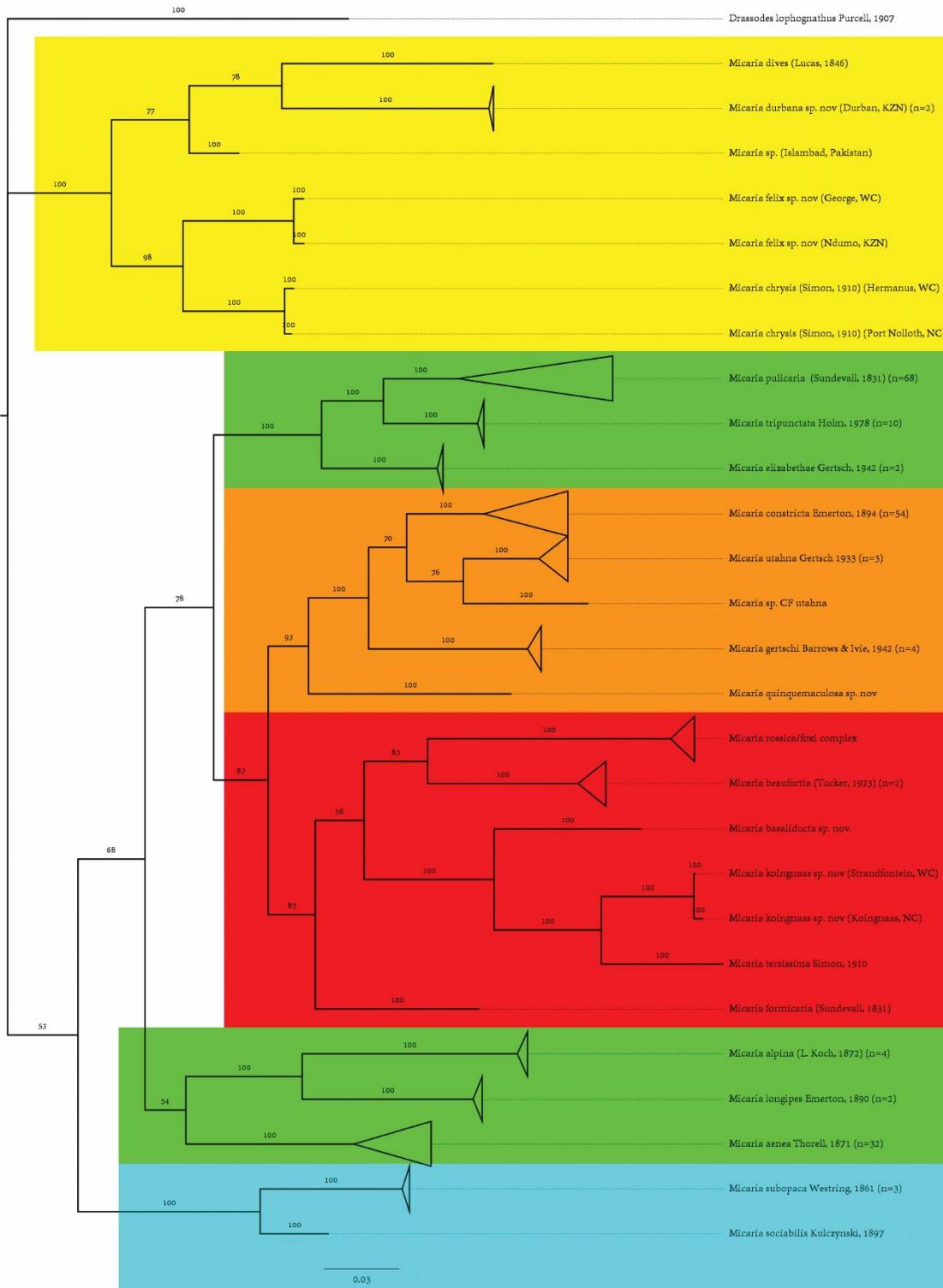
The Bayesian inference (BI) (12 000 000 generations) (Fig. 1) and the maximum likelihood analysis (ML) (1000 bootstraps) (Fig. 2) recovered six major clades of *Micaria* to create a robust representation of the Afrotropical *Micaria* and 14 extra-regional species. The type species, *Micaria fulgens* (Walckenaer, 1802) has not yet been sequenced. This creates a problem because to be able to accurately define what is and what is not *Micaria* one would need to include the type species in a molecular analysis. This would aid in decision-making with regards to the status of *Micaria* within Gnaphosidae, as well as

*Arboricaria* being a junior synonym to *Micaria*. Similarly, the possibility of several genera within *Micaria*, as suggested Breitling (2017), can be thoroughly looked into with the inclusion of the Afrotropical species in such an examination.

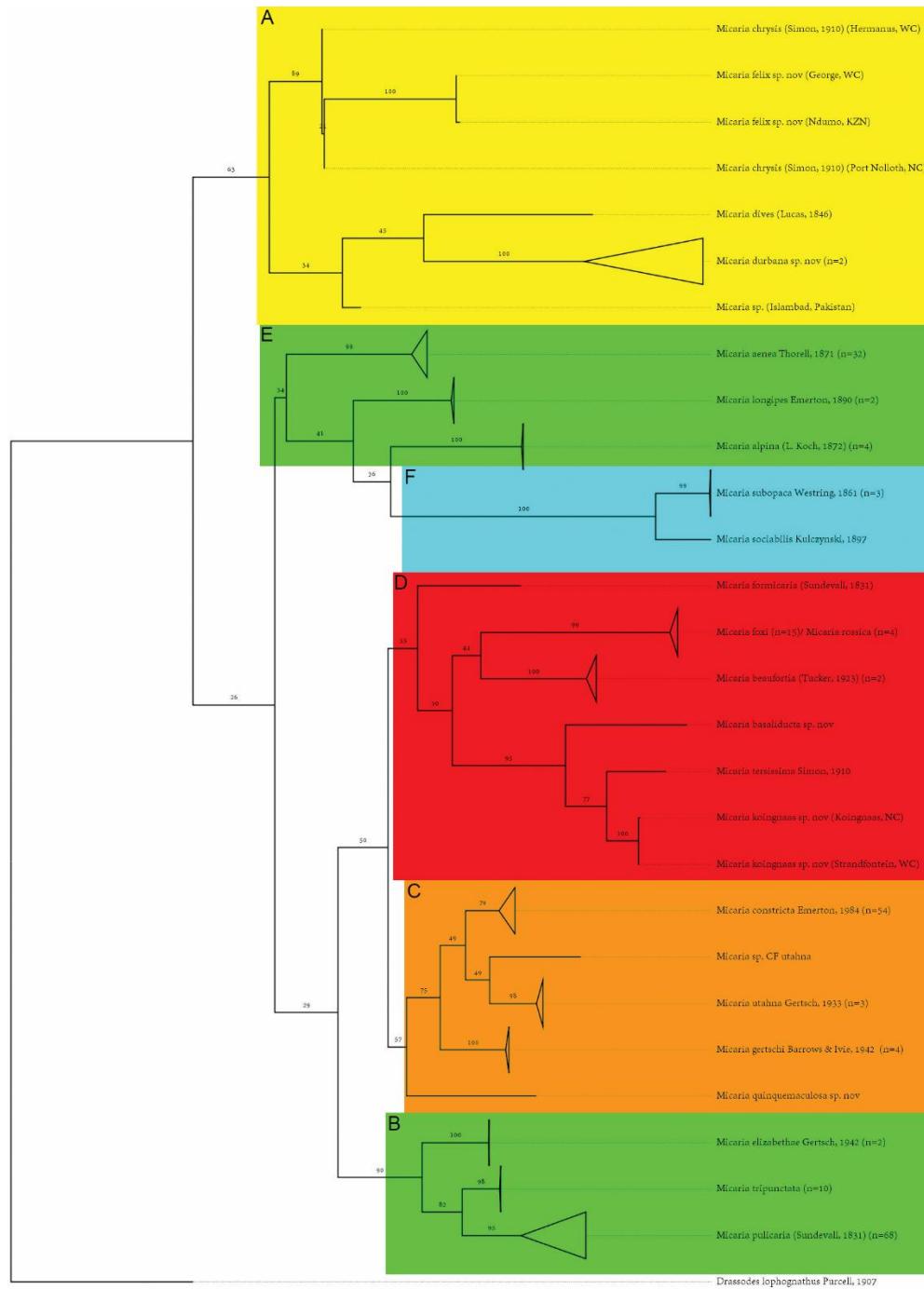
Interestingly, two larger clades of *Micaria* were recovered in the BI analysis with respect to *D. lophognathus*. Following the species group definitions of Platnick & Shadab, (1988). The first clade incorporates only the *dives* group (clade A in Fig. 1), and the second clade encompasses the *pulicaria*, *subopaca* and *formicaria* groups (clades B-F in Fig. 1). These larger clades have distinctive morphological features that can be used to separate them, for example, the former clade has four large spines on the ventral surface of tibia I (Figs 3, 5), combined with the partially darkened femur I. The latter usually have entirely darkened femora and only three smaller ventral spines on the tibia I (Figs 4, 6), with one or two ventral terminal spines.

Furthermore, the specimens of *M. felix* **sp. nov.** from Ndumo Game Reserve (KwaZulu-Natal, South Africa) and George (Western Cape Province, South Africa), localities separated by more than 1200 km, were confirmed to be conspecific, as there was very little genetic variation between them. A similar conclusion can be made for *M. chrysos* (Simon, 1910) from Hermanus (Western Cape Province, South Africa) and *M. chrysos* (Simon, 1910) from Port Nolloth (Norther Cape Province, South Africa), separated by 800 km.

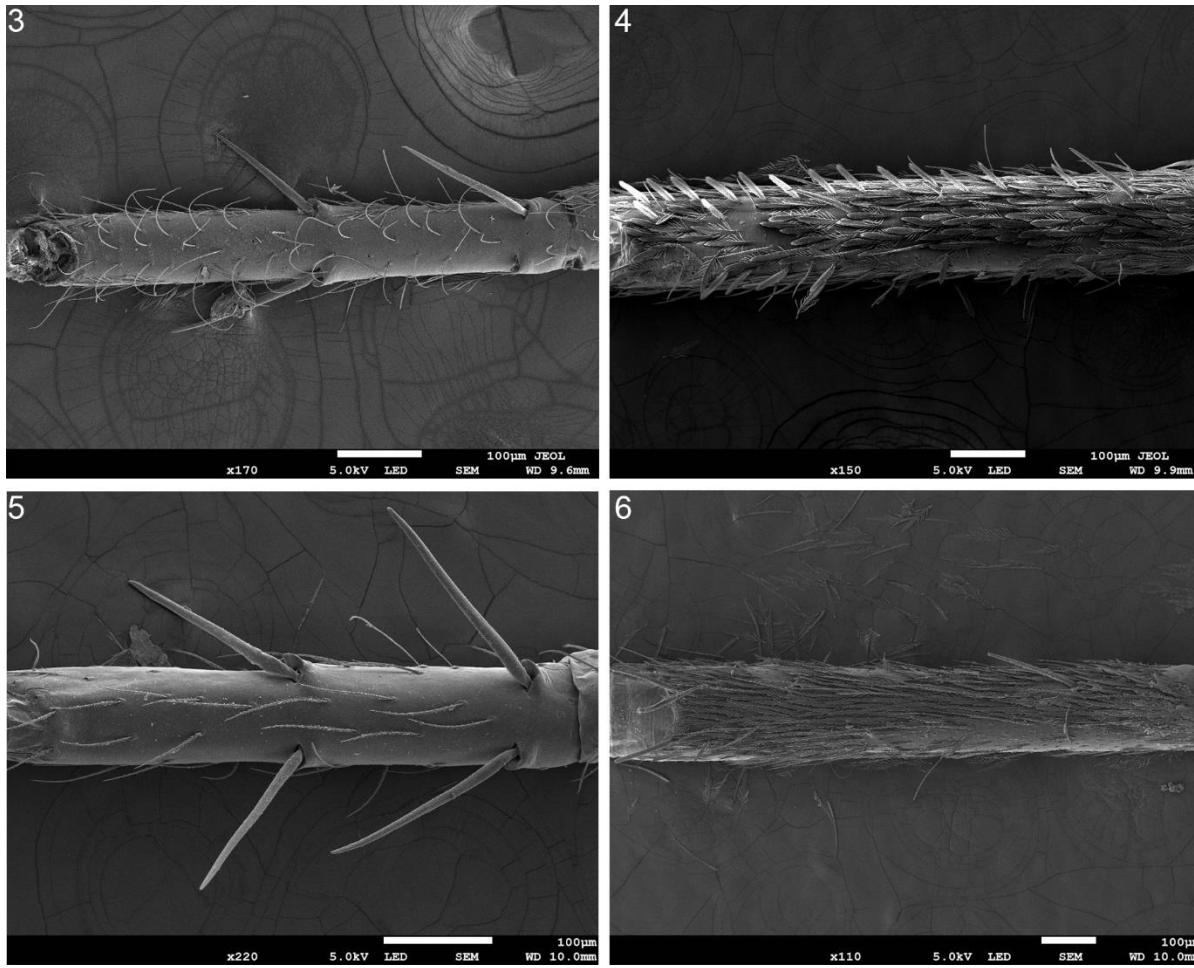
Four of the Afrotropical species were grouped together within the *formicaria* species group, with *M. formicaria* (Sundevall, 1831) as the sister species to the Afrotropical fauna. Each of these groups will be discussed in more detail.



**Fig. 1.** A phylogram obtained using a Bayesian inference analysis (MrBayes) based on the COI gene region to show the relationships between the Afrotropical *Micaria* and extraregional *Micaria* species. Coloured clades: **(A)** *dives* group; **(B, C, E)** *pulicaria* group; **(D)** *formicaria* group; **(F)** *subopaca* group. Branch support measured as bipartition posterior probability percentage (% bpp).



**Fig. 2.** A phylogram obtained using a maximum likelihood analysis (RaxML) based on the COI gene region to show the relationships between the Afrotropical *Micaria* and foreign *Micaria* species. **(A)** *dives* group; **(B, C, E)** *pulicaria* group; **(D)** *formicaria* group; **(F)** *subopaca* group. Branch support measured as percentage bootstrap support (% BS).



**Figs 3-6.** Scanning electron microscope images of the spine and setal variation on tibia I of: (3) *Micaria felix* sp. nov. male (*dives* group), (4) *M. beaufortia* (Tucker, 1923) female (Clade D), (5) *M. dives* (Lucas, 1846) female (*dives* group) and (6) *M. constricta* Emerton, 1984 female (*pulicaria* group).

Here a breakdown of each group is provided:

i.) The *dives* group recovered in the BI analysis is monophyletic and contains *M. dives* (Lucas, 1846), *M. chrysos* (Simon, 1910), *M. durbanensis* sp. nov. and *M. felix* sp. nov. They are characterised by their very iridescent colouration, even more so than the *pulicaria* and *subopaca* groups. The ML analysis follows a similar topology with regards to the relationships between *M. dives* and *M. durbanensis*.

ii.) The *pulicaria* group *sensu stricto* is split into three smaller clades, making it polyphyletic. The largest clade (clade C) with the most support (100% bipartition posterior probability support (bpp) for BI/ 90% bootstrap support (BS) for ML) contains *M. pulicaria* (Sundvall, 1831), *M. tripunctata* Holm, 1978 and *M. elizabethae* Gertsch, 1942. The distribution of clade C is confined to North America and Europe, Canada and Russia respectively. The second group (clade E), with 93% bpp/ 57% BS, contains *M. constricta* Emerton, 1984, *M. utahna* Gertsch, 1933 (USA) and *M. gertschi* Barrows & Ivie, 1942 (USA and Canada), one unknown species from Le Touquet, France that is sister to *M. utahna*, and finally *M. quinquemaculosa* sp. nov. (South Africa). The third group (Clade B) has much less support (53% bpp/ 34% BS) and contains only three species, *M. aenea* Thorell, 1871 (North America, Russia, Europe), *M. longipes* Emerton, 1890 (North America) and *M. alpina* (L. Koch, 1872) (USA, Canada, Europe) in the BI analysis and five in the ML analysis, with the addition of *M. subopaca* and *M. sociabilis* Kulczynski, 1897. The latter two species were recovered as a separate clade in the BI analysis.

iii.) The *formicaria* species group was nested within the larger *pulicaria* clade only sister to the second *pulicaria* grouping of *M. constricta* and others (clade D). The *formicaria* group included *M. beaufortia*, which was recovered sister to the *M. foxi* Gertsch, 1933/ *M. rossica* Thorell, 1875 complex. Furthermore, *M. koingnaas* sp. nov. and *M. tersissima* Simon, 1910 recovered as sister species, with *M. basaliducta* sp. nov. basal to them. In both analyses, *M. formicaria* recovered basal to the *rossica* grouping, and *M. koingnaas* the most terminal representative.

### 3.4.) Discussion

The phylogenetic analyses used in this study were the first including Afrotropical representatives of *Micaria*. Although only the COI barcoding data is available for Afrotropical species of *Micaria*, it provides a foundation to work from and determine the relationships between the species in the Afrotropical and other regions. Two major groups were distinguished in the BI analyses (Fig. 1). In the ML analysis, *Micaria*, *sensu lato*, recovered monophyletic (Fig. 2).

The *pulicaria* group *sensu lato* would recover as monophyletic with moderate to low support (68% bpp/ 26% BS) if it were to include all three of the *pulicaria* groupings, as well as the *formicaria* group. The uncertainty of the placement of the *formicaria* group within the *pulicaria* group may be due to the lack of genetic data from other related species, and they may potentially form a clade on their own. This clade does not have good bootstrap support (35%) in the ML analysis and so does some of the relationships within the clade, such as the placement of *M. formicaria* (Sundevall, 1831) sister to the *M. beaufortia* (Tucker, 1923) and *M. basaliducta* **sp. nov.** groupings (30% bpp for the latter group). Preliminary analyses of the male genitalia of the *formicaria* group show a difference in general genital morphology from the *pulicaria* group. Unfortunately, the females of *M. tersissima* Simon, 1910 and *M. koingnaas* are still unknown and could provide important insights regarding their morphology. One exception is *M. basaliducta* **sp. nov.**, in which the female's copulatory ducts do possess an accessory gland similar to those of the *pulicaria* group.

In conclusion, the data obtained here can be used in more comprehensive analyses, and the inclusion of more genes to accurately delineate species and determine species boundaries would provide the necessary data to determine whether *Micaria* should be split into more genera. Novel barcode sequence data has been generated for the three currently described *Micaria* species from the Afrotropical region, as well as several new species, which will aid in their future identification.

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# CHAPTER 4: BIOLOGY, BEHAVIOUR AND MYRMECOMORPHY OF *MICARIA*, WITH EMPHASIS ON THE AFROTROPICAL SPECIES

## 4.1.) *Introduction*

### *General Biology*

The majority of gnaphosid species in the world are terrestrial ground-living spiders, including *Micaria* Westring, 1851 (Cowels 2018; Muster & Michalik 2020). Rare exceptions include the now synonymised *Arboricaria* Bosmans, 2000 group that are all arboreal species (Bosmans & Blick 2000). These spiders typically forage by running around sensing for prey and have been known to feed on ants and other spiders (Wolff *et al.* 2017). Within this family, only two genera are known to be associated with ants, *Callilepis* Westring, 1874 that resembles and feeds on ants (Michálek *et al.* 2019) and *Micaria* that mimic ants (Cushing 1997, 2012). The genus *Micaria* contains small to medium sized spiders that are usually associated with ants (Dippenaar-Schoeman 2014).

### *Sexual biology*

Little is known about the sexual behaviour of *Micaria*, but Sentenská & Pekár (2013, 2014) studied the sexual behaviour of *M. sociabilis* Kulczynski, 1897. They found that *M. sociabilis* displays reversed sexual cannibalism during periods of low prey availability and high mate availability. This behaviour was linked to generation overlapping, where younger males encounter older females from the previous generation and act more aggressively towards them. Furthermore, Sentenská *et al.* (2015) observed that the male proceeds to copulate with a female by approaching her anteriorly and mounting her prosoma, before finally inserting his palp into her copulatory opening.

*Micaria* males all produce mating plugs to avoid sperm competition from other males, but they are not alone in this process. Sentenská *et al.* (2015) showed that female *M. sociabilis* may be in control of the mating process, that she may determine when the mating session is finished, and whether the plug would persist. In *M. beaufortia* (Tucker, 1923) (see Marusik & Omelko 2017: fig. 12 for partial plug), a mating plug usually covers the entire atrium, blocking both copulatory ducts, as in *M. sociabilis*. In *M. felix* sp. nov., the plug may be small and may only cover a single copulatory opening (Chapter 3: Fig. 40).

### *Feeding and natural prey*

The diet of *Micaria* typically includes insects that are equal to or shorter than the spider's prosoma length. This range includes Collembola, *Drosophila* fruit flies, small hemipterans and small hymenopterans (excluding Formicidae) (Sentenská & Pekár 2014).

### *Aims*

In this chapter, notes from personal observations, literature and experiments will be provided regarding their microhabitat preferences, mimetic relationships, mating plug occurrence and feeding biology.

#### 4.2.) Materials and methods

##### *Specimen collection*

Live *Micaria beaufortia* specimens were collected in a grassland field on a plot in Roodewal, Bloemfontein, South Africa (29°06'17.3"S; 26°20'00.4"E). A combination of at least 20 females, subadult females, sub adult males or males were collected for the feeding trials. Other arthropods within the immediate vicinity were collected by hand and pitfall traps to determine what prey may be available in the area. The traps consisted of 250 ml plastic containers filled with ethane-diol and were placed level with the ground. Sorting and identification were done at the University of the Free State, Bloemfontein, South Africa with a stereomicroscope. *Micaria* specimens were collected in glass vials and kept hydrated with moist cotton wool. Furthermore, possible prey items included

*Collembola* (Entomobryidae), *Odontotermes* Holmgren, 1912 termites (Blattodea: Termitidae), *Anoplolepis custodiens* F. Smith, 1858 (Hymenoptera: Formicidae) minor worker ants, and Cicadellidae and Cercopidae (Hemiptera).

#### *Experimental setup*

The spiders were measured (prosoma length) and placed in marked Petri dishes (9 cm diameter) with a piece of wet cotton for hydration and left for three days to acclimatise to their new environment. Each spider was fed one random prey item and the time taken to attack it (attack latency) and the time to paralysis (the time it took for the prey to stop moving) were recorded. After five days each spider was again fed a random prey item; this process was repeated another two times for each spider. Each prey item was measured from the front of the tip of the head to the tip of the abdomen. Spiders were left to feed after trials were done.

#### *Statistical analyses*

Unpaired t-tests were performed in Microsoft Excel on the prey items to determine if there were any significant differences in the prey acceptance between the groups of prey.

### 4.3.) Results

#### *Microhabitat associations – anecdotal observations*

The microhabitat associations of Afrotropical *Micaria* species were observed in various climatic regions with a few constants, such as the ant model and good hiding places such as leaf litter, stones, fallen logs or even grass poll. The microhabitat associations, however, differed slightly between smaller species, such as *M. chrysia* (Simon, 1910), *M. felix* sp. nov. and *M. quinquemaculosa* sp. nov., and larger species, such as *M. beaufortia* and *M. tersissima* Simon, 1910.

It is not unlikely to find these smaller species underneath logs and large stones that have not been tampered with where a small elongate dome-like silk retreat is made where the spider may rest, provided the ant model is present. In the case of *M. quinquemaculosa*, very high densities (30+) individuals were observed underneath sea orache plants in Port

Nolloth, alongside very high densities of *Monomorium* (Formicidae: Myrmecinae) ants. These concentrated populations were very few and far between, at least in this species and microhabitat. Similarly, in *M. felix* from Ndumo Game Reserve in northern KwaZulu-Natal, South Africa, the spiders were most commonly found in grasses along walls, underneath old logs and at the bases of *Vachellia xanthophloea* trees next to the Nyamiti Pan, where high densities of *Monomorium* (Myrmecinae) ants were also encountered.

In larger species, the microhabitat may include open sandy areas with scattered rocks. However, *M. beaufortia* has been found in grass tussocks, in very high densities in disturbed rocky areas, but rarely in leaf litter (juveniles). They are usually only found in microhabitats where *A. custodiens* ants occur. In the case of *M. tersissima*, individuals were only collected in very dry rocky areas. They were mostly inactive when sampled during the day (i.e. resting in their silk retreats), most likely due to the very high ambient temperatures. No active ants were observed in the area at the time of the collection or underneath the rocks they were found.

### *Mimicry*

Little is known about the mimetic relationships of the Afrotropical fauna. From personal observations in the field the following assumptions are made for five of the *Micaria* species from South Africa:

*Micaria beaufortia* (Fig. 1) is very likely to be a mimic of *A. custodiens* (Fig. 2), as they have only been found in the company or close to these ants. These spiders have similar morphology to the ants, such as the reddish colouration on the prosoma and legs, like that of the head and thorax of the ants; thin elongate legs; and an iridescent grey abdomen with a transverse white band and no median constriction in the abdomen. They are also very active during the mornings and late afternoons, as are their models.

Little information regarding the model of *M. chrysos* is available in collections, but a single female was collected from the type locality (Port Nolloth, Northern Cape, South Africa) alongside *Crematogaster* (Myrmecinae) ants. From the opposite side of town approximately 7 km North along the coastline, *M. quinquemaculosa* (Fig. 3) was found

alongside representatives of *Crematogaster*, *Lepisiota* (Formicinae) and *Monomorium* (Myrmecinae).

The potential model(s) of *M. tersissima* (Fig. 4) remains unknown. New material was collected on a mountain range near the town of Komaggas (Northern Cape, South Africa), but during mid-day no ants were active, and the spiders were hiding underneath the rocks. *Micaria felix* (Fig. 5) is very likely to be a mimic of representatives of *Monomorium* (Myrmecinae) ants (Fig. 6). They are typically dark brown or black in colour (like the ants), with purple and green iridescent bodies. Their abdomens have median constrictions to imitate the node-like first and second metasomal segments of the ants. The femora of leg I are only partially darkened. This character is not very distinct in the ants, but present.

*Monomorium* and *Lepisiota* (Formicinae) (Fig. 7) ants were thought to be the most likely candidates for the models of *M. quinquemaculosa* and *M. chrysosoma* respectively. The only genus that was consistently present in the bushes where the former was found, was *Monomorium*. Members of the latter genus is most likely the potential model for both species. These species overlap in distribution and have similar morphology, such as the slightly broadened abdomen, black and light contrast on legs and they are both shiny. Similarly, representatives of *Lepisiota* was also found in Outeniquastrand, Groot-Brak, Western Cape, South Africa, with *M. chrysosoma*.

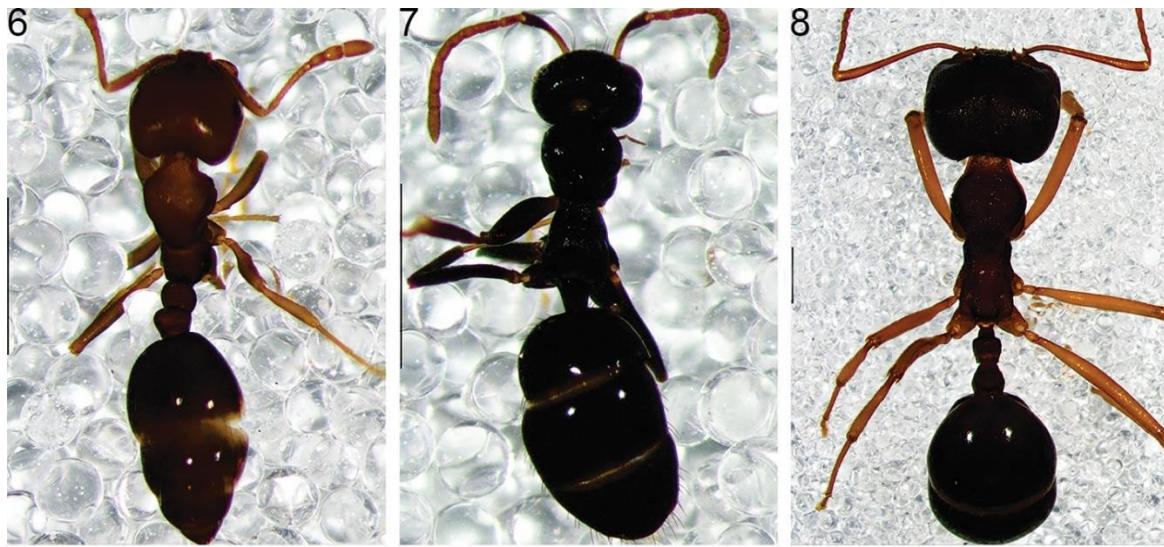
With regards to the models of *M. tersissima*, the pitfall traps yielded several ants that were generally in low abundance, and the only possible model from these samples would be representatives of *Messor* (Myrmecinae) (Fig. 8). However, individuals of this genus were large, at least 10 mm in total body length and were not present close to the spiders. In terms of morphology, *M. tersissima* males were overall dark brown with a black abdomen with two small white spots medially. These characters do not correspond very well with ant's morphology and may indicate a case of inaccurate mimicry in this species of *Micaria*.



**Figs 1-4.** Habitus photographs of (1) *Micaria beaufortia* (Tucker, 1923) female and its model (2) *Anoplolepis custodiens* F. Smith, 1858, (3) *M. quinquemaculosa* sp. nov. female and (4) *M. tersissima* Simon, 1910 male. (Photo credits: Ruan Boysen).



**Fig. 5.** A photograph of a male *Micaria felix* sp. nov. from Ndumo Game Reserve, KwaZulu-Natal, South Africa. Photo credit: Ondřej Michálek.



**Figs 6-8.** Photographs of the possible ant models for the Afrotropical *Micaria*. (6) *Monomorium* sp. from Ndumo Game Reserve (KwaZulu-Natal, South Africa), (7) *Lepisiota* sp. from Outeniquastrand, Western Cape Province, South Africa, (8) *Messor* sp. from Komaggas (Northern Cape Province, South Africa).

### Mating plugs

In personal observations, the count of full plugs in *Micaria* are much higher than in partial plug counts (Table 1). This could possibly indicate that the plugs are always full and partial plugs may be caused by damage, an interrupted mating that caused a male to withdraw and escape, or even other males trying to get it out.

**Table 1.** The total occurrences of mating plugs in three species of Afrotropical *Micaria* from personal observations.

<i>Micaria</i> species	Total females examined	Full mating plug	Partial mating plug (left)	Partial mating plug (right)
<i>Micaria chrysis</i> (Simon, 1910)	86	15	2	0
<i>Micaria felix</i> sp. nov.	17	1	0	0
<i>Micaria bispicula</i> sp. nov.	6	1	0	0

## Predation biology

During this study, 20 *Micaria beaufortia* individuals (3 females, 3 subadult females, 3 adult males and 11 subadult males) were fed various prey types to determine what they would feed on. In paired feeding trials, *Micaria beaufortia* accepted springtails and plant hoppers significantly more than ants or termites (Table 2).

**Table 2. Results of unpaired t-tests**, indicating the prey preferences of female and subadult female *Micaria beaufortia* (Tucker, 1923) in laboratory feeding experiments. \* indicates a significant difference ( $p<0.05$ ).

Prey comparison	p-value	t-value	Significance
Collembola vs Blattodea	0.0071	2.845285956	Significant
Collembola vs Hemiptera	0.7566	-0.312147237	Not significant
Collembola vs Hymenoptera	0.0010	3.559026084	Significant
Blattodea vs Hemiptera	0.0027	-3.210153384	Significant
Blattodea vs Hymenoptera	0.3236	1	Not significant
Hemiptera vs Hymenoptera	0.0003	3.942772444	Significant

The number of individuals accepted by the spiders differed between orders. Collembola (40%, N=20) and Hemiptera (Cicadellidae and a single Cercopidae) (45%, N=20) were successfully captured and consumed by the spiders. These predatory-prey ration varied between 0.66 – 1.4. Only one termite (5%, N=20) was accepted. To test whether the spiders would feed on their models, they were provided with *Anoplolepis custodiens* F. Smith, 1858 minor workers that were 2.5 – 4.5 mm in length. The spiders actively avoided the ants and quickly ran away as soon as they made contact, resulting in no ants being captured.

The relative abundance of natural prey recorded from the semi-disturbed habitat *M. beaufortia* was collected in (Table 3) showed that Collembola had the highest abundance (84.78 %, N=4310), followed by Hymenoptera (14.34 %, N=4310), which mostly included

the spider's ant model, *A. custodiens*, along with other small Formicinae, Myrmecinae and Bethylidae. The abundances of the other arthropods were much lower.

**Table 3.** The absolute abundance of natural prey in pitfall traps in a semi-disturbed environment over three days.

Order	Quantity	Percentage
Collembola	3654	84.78
Hymenoptera	618	14.34
Diptera	14	0.32
Araneae	9	0.21
Coleoptera	7	0.16
Orthoptera	3	0.07
Hemiptera	2	0.05
Solifugae	1	0.02
Trombidiformes	1	0.02
Zygentoma	1	0.02

#### 4.4) Discussion

In the cases *M. chrysia* and *M. quinquemaculosa* it was difficult to assess as there were two to three species of ants present in the leaf litter. Furthermore, these spiders do not seem like very accurate mimics of the models proposed as they have the general colour with pattern correlations on the legs but that is all. The iridescence of these spiders may play a role in their mimicry, maybe with regards to the perception of ultraviolet light (UV) of their predators or possibly in a mating context. Interestingly, *M. beaufortia* is much less iridescent (at least to the human eye) than the smaller, litter-dwelling, species such as *M. felix*, *M. durbana sp. nov.*, *M. chrysia* and *M. quinquemaculosa*.

The ecology of Afrotropical *Micaria* is not very well studied. This study has provided the first information regarding their mimetic relationships, general habitat and their feeding habits.

In the case of *Micaria beaufortia*, the spiders have been observed to be generalist predators and that their diet does not include their models. Smaller insects such as Collembola and small hemipterans such as juvenile cicadellids were most frequently fed on. These insects can be very abundant in leaf litter and under rocks and would provide a stable food source for both the adults and the juveniles. In laboratory conditions, the

spiders rarely fed on *Odontotermes* termites, but in grasslands these insects are usually underground during the day and not active on the surface and will be the least likely prey to be encountered in a natural setting. Their ant models were very aggressive, and the spiders avoided them as much as possible. In laboratory experiments the hunting strategy of these spiders were observed. The spiders would run around the Petri dish, and once a prey item is encountered, i.e. when they touched the prey with their tarsi, the spider would then decide whether to attack and eat it, or not. All prey items were bitten behind the head while sucking out their bodily fluids.

In conclusion, this study has provided some short notes on the feeding habits, mimetic relationships and habitat preferences of Afrotropical *Micaria*. This information could aid in determining the function of their iridescent colouration, their relationships with their models and how they survive in very dry environments such as in Komaggas, Northern Cape, South Africa, the type locality for *M. tersissima*.

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# CHAPTER 5: CONCLUDING REMARKS

This study provides the first revision of *Micaria* Westring, 1851 for the Afrotropical Region adding 17 new species to the list. The adult female and male *Micaria chrysis* (Simon, 1910) has been described for the first time, as well as the first *Micaria* record for the Madagascar island, *M. rivoносy sp. nov.* The new species are spread through the African continent in isolated records up to Mauritania. There are large gaps that exist in Central, eastern and western Africa and would require more sampling to discover the dispersal patterns of these spiders. This would also open fields of research on their population genetics to determine whether there is gene flow between closely related populations and whether there may be complexes of species (or genera) present.

Novel DNA barcoding data is provided for all the Afrotropical species and a few extra-regional species that were included in this study. This data proved very useful in determining the phylogenetic relationships between the Afrotropical *Micaria* and showed *Micaria sensu lato* to be monophyletic at least in one analysis. However, much more data is needed from other countries' species, including the type species *M. fulgens* (Walckenaer, 1802) to truly resolve the monophyly of *Micaria* as a whole.

Short notes on their biology, mimetic relationships and myrmecomorphy were provided to add to the existing knowledge we have on these aspects. More comprehensive behavioural and ecological studies are required to better understand these small creatures, especially in the Afrotropical Region, as no literature on their ecology is available. The habitat preferences of these spiders extended throughout several biodiversity hotspots, including the Maputoland-Pondoland-Albany hotspot and the Cape Floristic Region in South Africa. More data from these hotspots should be gathered to determine the red listing status of these spiders.

In conclusion, this study was successful in achieving the objective it has laid out and hopefully new research would stem from this study on *Micaria* as they are fascinating spiders with potentially very useful information to contribute towards the fields of inference lighting and mimicry.