FOSSIL BEETLES

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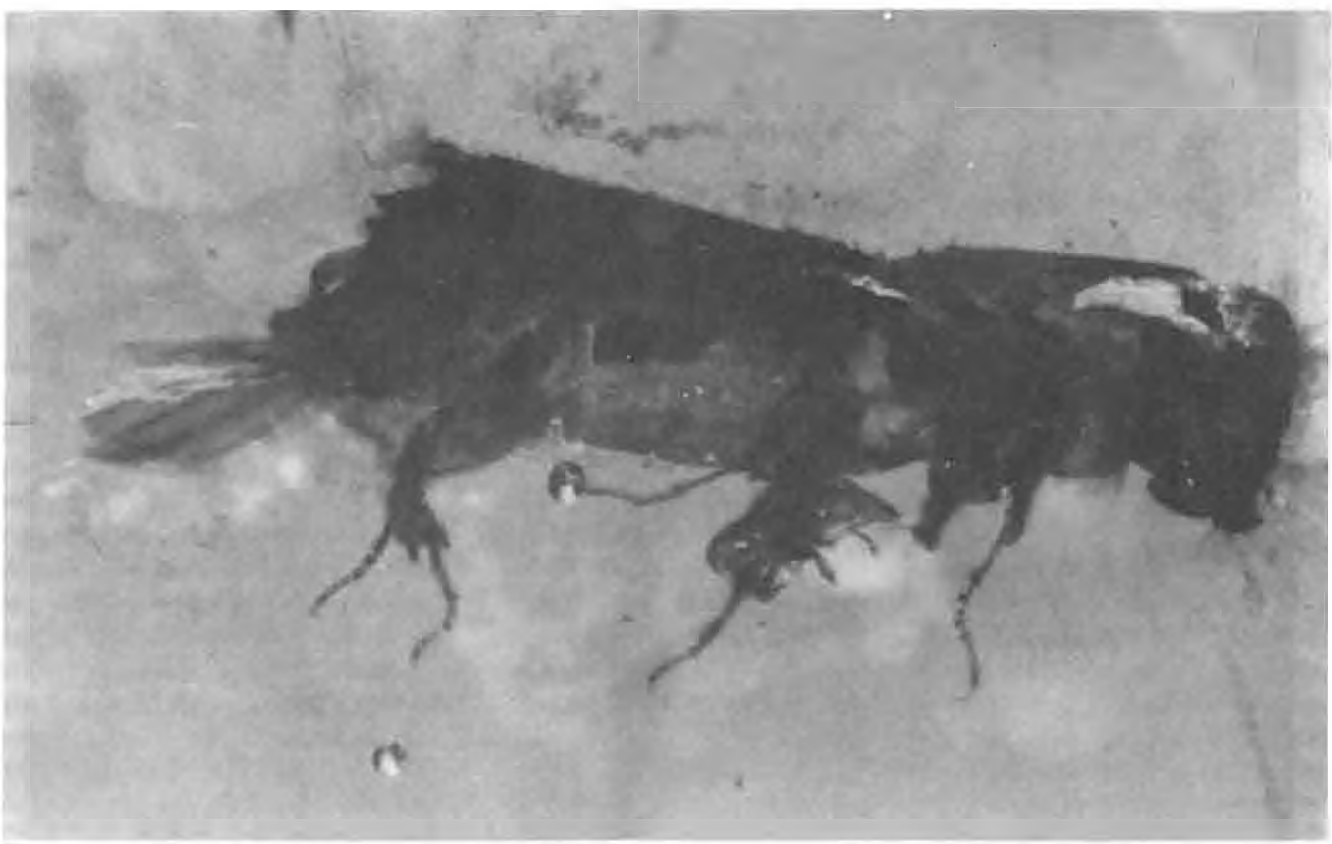
Entomology can be subdivided into several subdisciplines. Most of these are well-known, such as medical, veterinary, agricultural, taxonomic, physiological and ecological entomology. Less known, however, is paleoentomology or the study of fossil insects, and whenever this field of study is mentioned blank stares and bemused expressions arise.

In the insect world, beetles, scientifically known as Coleoptera, are the most commonly found in the fossil record. This presumably is due to the large number and wide variety of beetles found (over 1,250,000 species of living forms have been described from our planet, of which nearly one quarter are beetles), as well as their hard exoskeleton which enhanced the probabilities for fossilization.

Beetles have a reasonable pedigree in the geological time scale, as they were first recorded in the Permian Era (± 250 million years ago). They have thus outlived the last dinosaurs by about 60 million years and have a 50 million year head start on the mammals.

Despite their immense diversity, fossil beetles have received little study to date. The reason for the lack of interest is fairly clear. Insect remains are not particularly common in the fossil record, except in certain well-known localities in Canada, North America and Europe. The vast majority of fossil remains (except for the amber deposits) consist of compressed and sometimes carbonized impressions of fragments, or more rarely, whole insects. Morphological details are usually poorly preserved and colour patterns obscured or non-existent in most of these fossil arthropods. In addition, the phylogeny of many mid-Tertiary and older insect groups is poorly understood.



A well-preserved wood-boring beetle that was caught in a resin flow. Attached to one of the beetle's legs is an equally well-preserved mite.

American Museum (Natural History)

Beetle and other arthropod fragments extracted from sediment and stored in alcohol. At this stage identifications can be made to the generic level: a - c indicate the distinctive sculpture of some beetle elytra (= hardened fore-wings).

Geoscience Canada.

The formidable problems associated with the study of older insect remains are somewhat reduced when insects of the Quarternary (i.e. insects ± 1,8 million years old) are examined. The latter consist of the original structural parts; thus colour patterns, "hairs" and scales can be well preserved, even on specimens which date back two million years.

Almost any non-marine sediment containing organic debris is likely to preserve insect remains. The nature of the preservation depends upon the rapidity with which the organism was buried, the depth of burial, post-depositional changes in the sediment and the position of the modern water table in respect to the stratigraphic position of the site. Probably the two most important factors are oxidation of the organic layer and the degree of compression undergone by the sequence. Insect fragments are remarkably resilient to chemical attack, but they are relatively brittle, and stresses caused by overburden pressures or cyclic wetting and drying tend to fragment specimens to a point where they become almost unidentifiable.

In contrast with the above fossilization method whereby brittle insect fragments tend to be damaged, there is the process whereby the whole insect, even one that is soft-bodied, becomes preserved in a completely undamaged state. This process is known as amberization. In this process tree resin functions as an embalming medium. After a period of time, which may be millions of years, the resin undergoes physical and chemical changes resulting in the formation of amber, a very hard substance with a melting point of ± 600°F. Certain species of trees produce copious amounts of resinous sap. These flows can be quite rapid and extensive, engulfing organisms living on the bark of the trees. Slower flows act as traps for both crawling and flying insects not strong enough to free themselves from the sticky surface. Their struggles eventually cause them to become completely covered. Thereafter amberization sets in.

Other materials which are known to preserve insect remains include silts, organic pockets in fluvial deposits and peat bogs or swamps. Well preserved insects have also been found in tar seeps, wood rat middens, organic layers in permafrost of the Arctic and environments influenced by man such as hand-dug wells and ditches, refuse pits, grave sites and even granaries.

References:

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