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B. J. LEMPKE, Oude IJselstraat 12III, Amsterdam-Zuid 2 — Nederland

Additional note on the giant Elaterid, Oxynopterus mucronatus Ol., a predator on termites in Java

by

L. G. E. KALSHOVEN

Two pages of my thesis on the bionomics of *Neotermes tectonae* (1930) were devoted to this interesting predator, which was found to be an occasional enemy of the trunk-excavating termite in the teak forests of Central Java. As the text was written in Dutch and this section was recapitulated in 6 lines only in the English summary, a fuller resumé of its contents completed with details from the orginal field notes, may be given first.

Habits of larva. Young specimens were found in the nest cavities of *Neotermes,* some 6 m and more above the ground level in standing teak, as well as in rotten snags, rough bark and similar places on the trees. The flat wedge-like head, shining chitinous armour, and strong spinal projections of the apex enabled them to enter into very narrow holes and crevices. In the laboratory they could be fed on *Neotermes* specimens. When hungry they went in search for them entering into burrows and removing any obstacles with their jaws. They could grip the large *Neotermes* specimens in the abdomen or behind the head; in the latter case the victims were rapidly killed. First the juices were sucked from the body, then the extremities and membranes were masticated; finally only a part of the head capsule remained. It was no at all difficult for them to overmaster a *Neotermes* soldier, although the latter tried to attack the intruder; the click of the mandibles was clearly audible! The smallest specimens of the Elaterid in the *Neotermes* nests were 11—15 mm in length (probably the second larval stage?),

somewhat larger ones measured 19—23 mm (third stage?). Only one specimen had reached a length of 30 mm. When fed in the laboratory they soon grew too large to force their way into the tunnels anymore. This accounts for the fact that no specimens larger than 30 mm were found in the *Neotermes* nests. The larvae were sparsely covered with upright hairs, which were conspicuous only in small specimens where they were longer than half the breadth of the body.

When put in glass dishes filled with earth the larvae immediately burrowed into the soil. They appeared to take the subterranean termites supplied for food as greedily as they took *Neotermes,* waiting quietly until a victim had come within the reach of their opened jaws and then gripping it with a sudden jerk of the head. If several termites came near at the same time, they would crush them in rapid succession, consuming them afterwards.

Amount of food and growth. The larvae showed remarkable capacities for consuming termites. One specimen, originally measuring 19 mm in length, ate 1190 large *Neotermes* larvae in the first five months (23 a day at a maximum), growing to 40 mm in length in that time, and 3070 workers of *Microtermes* and *Macrotermes* in the next 9 months (55 specimens a day at a max.); it had grown to 50 mm when it died. Another specimen, measuring 12 mm, consumed 590 workers of *Microtermes* in the next 7 months, finishing some 70 individuals in a day; when it died it was 55 mm long but it had lost in length rather than gained during the last months. The larvae passed through some 8 to 9 moults in the course of a year. The width of the head capsule, originally 1—2 mm, was eventually 7 mm.

Identity. The author did not succeed in rearing any of the larvae from the *Neotermes* nests to the adult stage, although specimens were kept alive for as long as 14 months. However, the larvae appeared quite similar in habitus as well as in behaviour to a large Elaterid larva not uncommonly occurring in the soil in the same area measuring up to 70 mm in length (width of head capsule in the largest specimens 7 mm), also feeding on termites and well known to the Javanese villagers as 'ular wogan' (wogan worm). One of these latter larvae was reared to the adult stage in the field laboratory. The beetle was identified with *Oxynopterus mucronatus* Ol. (det. FLEUTIAUX). The larva from the teak trunks was provisionally mentioned as *Oxynopterus* sp.

Status as a predator. In several cases *Neotermes* colonies harbouring an *Oxynopterus* larva appeared to be undersized for their age. One colony was even found to be in a languishing condition. But others showed no signs of any harmful influence of the presence of the Elaterid larva. (Probably the larvae may work considerable havoc in young *Neotermes* colonies that still largely inhabit a rotten branch or snag and have not yet penetrated deeply into the sound wood of the main trunk.).

ADDITIONAL OBSERVATIONS.

Further remarks on identification. *Oxynopterus mucronatus* was originally described as a Javanese species. In old records a second species, *O. adouini* Hope, was listed as occurring in Java besides other islands. However, the extensive collecting activities in Java in more recent times — especially those of Mr C. L. DRESCHER — have yielded only the former species. As the larvae

from the teak trunks and from the soil resemble each other so closely in habitus and food preference, and as no other Elaterid attains such a large size in Java it may be assumed that the predator on *Neotermes* is identical with the one on the subterranean termites, that is with the not uncommon *Oxynopterus mucronatus*. This conclusion implies that the young larval stages may be passed high up in the tree trunks while at a more advanced stage the larvae live more exclusively in the soil.

The male beetles of the species, at once recognizable by their broad pectinate antennae, are 46—55 mm in length, the females 57—61 mm. Most specimens present in the musea in Bogor and the Netherlands were collected in the plains and hills, only a few in mountainous regions at 600—1000 m (Garut, Ambarawa, Magelang, slope of Mount Tengger). In the collection of the Zoological Museum at Amsterdam there is a male of 44 mm only, from Magelang, (800 m, leg. DRESCHER).

Oxynopterus audouini, which is represented by specimens from Sumatra in the Amsterdam and Leiden musea, is quite different from *mucronatus*, being still larger — one male measures 72 mm in length — and lacking the silky pubescence. Nothing is known about the habits of this species and some three others, all found in S.E. Asia.

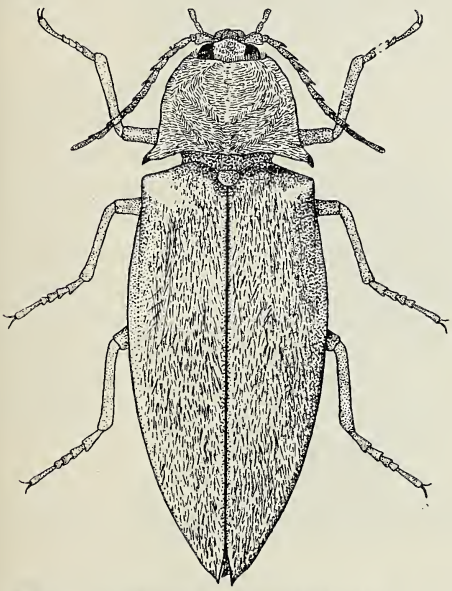

Fig. 1. *Oxynopterus mucronatus* Ol., ♀ beetle (natural size) (from KALSHOVEN 1930).

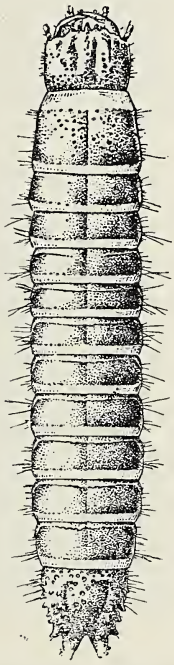

Fig. 2. *Oxynopterus* larva ex *Neotermes* nest. (× 3) (from KALSHOVEN 1930).

The genus *Oxynopterus* belongs to a small subfamily Oxynopterinae, comprising six genera (cf. FLEUTIAUX, 1947, Révision des Elaterides de l'Indochine Franç. *Notes d'entom. Chin.* 11 (8)).

Predatory habits in Elaterids. These are not unusual for various genera in the Orient. Several of them belong to the first 6 subfamilies listed in

the catalogues. So the predatory life may perhaps be looked upon as a primitive feature in these cases. FRIEDERICHS has been the first to call attention to these predators in the tropics and he gave a resumé of the subject a few years ago.[1]). The characteristic habitus of these larvae, given by the author — viz. the flattened body and robust appearance — agrees quite well with that of *Oxynopterus,* which genus has not been mentioned bij FRIEDERICHS[2]). So far, these predatory Elateriden kaum bekannt geworden sind — nur LEA nennt eine australische Art in the soil and in dead coconut trunks, and of various borers under the bark and heavily infested wood of dead trees. But none other than *Oxynopterus* has been recorded as an enemy of termites, as far as could be ascertained.

However, the author happened to find a reference to a possibly 'termitophilous' Elaterid in S.Africa, *Scaphoderus riehlii* Cand., in a paper by REICHENSPERGER, 1915[3]). One single specimen of the beetle had been collected by TRÄGÅRDH with the annotation "Zusammen mit Termiten im Bau; Natal, 5 Febr. '05, termitophil?". The species — the only representative of the subfamily Scaphoderinae — has several morphological characters unusual for Elaterids and looks like a Rhysopausside in some respects according to REICHENSPERGER, who added the remark: "When auch meines Wissens bisher termitophile oder myrmekophile Elateriden kaum bekannt geworden sind — nur LEA nennt eine australische Art als sicher termitophil ohne sie zu beschreiben — so glaube ich dennoch die vorliegende Art auf Grund ihrer Eigentümlichkeiten und Analogien als unbedingt termitophil ansprechen zu dürfen."

Fasting ability. After 1931, several more specimens of the large larvae found in the soil were occasionally brought to the laboratory in Bogor by Indonesian assistants and were kept in captivity for different periods of time. The protacted keeping of the larvae which had to be provided daily with a meal of termites to be dug from the soil, eventually led to periods of neglect. The larvae appeared to be none the worse for it. Therefore it was decided to investigate how long they could be kept alive without food, when confined in glass dishes filled with moist soil. A few escaped, probably having succeeded in erecting themselves against the glass wall and lifting the heavy lid with their wedge-shaped heads. In two cases the fasting larvae could be kept in observation, however, for a remarkable long time: one for 2½ years and one — originally

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[1]) FRIEDERICHS, K., 1951, Ueber karnivore Elateriden und ihre Bedeutung im Pflanzenschutz. *Zeits. f. ang. Entom.* 33 (1, 2): 168.

[2]) J. A. HYSLOP in his paper on 'The phylogeny of the Elateridae based on larval characters' *Ann. Entom. Soc. Amer.* 10 : 241, 1917) mentions dorso-ventrally depressed larvae, with the ninth abdominal segment emarginate posteriorly, as characteristic of the subfamily Pyrophorinae. His figure of the larva of an *Athous* sp. resembles the one here produced of the *Oxynopterus* larva in several respects. *Pyrophorus luminosus* is well-known as a predator of white grubs. HYSLOP does not mention carnivorous and phytophagous habits of the Elaterid larvae in his considerations about their phylogeny.

[3]) A. REICHENSPERGER, 1915, Myrmekophilen und Termitophilen aus Natal und Zululand gesammelt von Dr. I. TRÄGÅRDH. *Medd. Göteborgs Mus. Zool. Afdeln.* 5, 1915 (*Göt. Kungl. Vetens. o. Vitterh. Handl.* Fjärde följden 16 : 2).

measuring 75 mm in length — for as long as 3 years and 4½ months. [1]) Exuviae left after moulting were noticed 3 times in the former and 4 times in the latter specimen, with intervals of 6—11 months. The larvae ultimately succumbed without pupating. [2])

Pupal cell. Pupation takes place in a thick-walled clay cell in the soil.

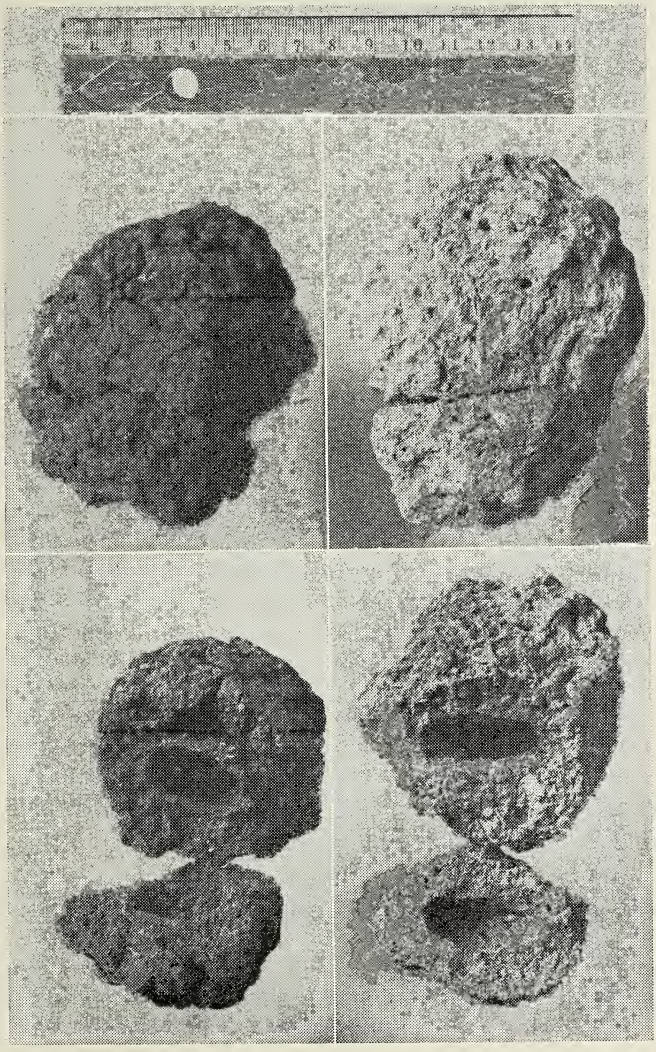

Fig. 3. Pupal cells of *Oxynopterus mucronatus*, constructed of black and yellow clay; outward appearance, and broken in two parts to show lumen.

[1]) This specimen was demonstrated at the 2nd meeting of the Ned. Ind. Entom. Vereen. held at Bogor on 27th April 1935, when it was still alive after 3 years of fasting. At the same occasion the two examples of the pupal cell (see next paragraph) were shown. (*Entom. Mededeel. N. I.* 1, 2 : 27, 1935).

[2]) Another Elaterid larva which can stand fasts and is a slow breeder is mentioned as a predator of the *Rhabdocnemis* borer in sugar-cane by Muir. (Cane borer beetle in Hawaii, 1916 : 81).

Two of such cells are pictured here, one made of black, the other of whitish material. Outwardly they have the appearance of rough lumps, as big as a fist. When broken up the shell is found to be 1—3 cm thick, leaving a flattened room in which the pupa lies well protected against predatory ants, shrews, etc. It has not been noticed how the beetles, when emerging, manage to break the cells.

One of the pupal chambers was found near a termite mound (*Macrotermes gilvus)* on the 30th of May. The beetle emerged on the 19th of October. It is not surprising that the pupal period (plus the pre- and post-pupal one) should take a long time in this slowly developing species.

Use as a medicine. The reason why the 'ular wogan' insect, is so well known among the villagers of the teak area in Mid Java is mainly to be sought in its alleged properties as a restorative medicine — 'obat kuat' in Malay — or aphrodisiac.[1]) The author was told at the time that well-to-do people were prepared to pay as much as 25 cents for one specimen which was equal to the price or a chicken large enough to be served at a rice meal for two persons in those off the road places.

Habits of adults. The swarming period of the beetles occurs in Mid Java in the months of September/October (the beginning of the wet season). Few beetles have ever been captured in August and in November. In West Java the main swarming season appears to occur one month earlier.

The beetles are attracted to the light. One evening several specimens were swarming together under a high pending electric lamp in a street in Bogor. This seems to point to a possible regulation of the date of emergence from the soil by some particular climatic factor.

Further observations needed. It would be interesting to know whether the Oxynopterus larva is able to feed on white grubs and other soil inhabiting insects and on earthworms. As regards its feeding on termites, it would make a nice experiment to investigate whether the *Coptotermes* species with their fighting form (soldier caste) secreting a sticky stoff, would yet be as helpless against the robberies of the big armoured larva as are the *Neotermes* and *Macrotermes* species, whose fighting forms, however well equipped with strong and sharp mandibles they may be, are not really a match even for young *Oxynopterus* larvae.

Additional observations on the habits of the beetles are also badly needed. It should be known for instance whether food is taken in the adult stage and where the eggs are deposited. It is quite conceivable that the eggs may be laid in rotten snags, humus-filled cavities or beneath epiphytes on the trees. This would give a more plausible explanation of the fact that very young larvae are found high up in the trees than is got by conjecturing that they made their way upwards through crevices in the bark and similar places.

Blaricum, Rotondeweg 2.

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[1]) According to kind information received from drs R. L. Mellema of the R. Institute f.t. Tropics, Amsterdam, the term 'wogan' might have been derived from an old Sanscrit word meaning 'food'.