

## Notes on the larval stages of some East African Hydrophilinae (Coleoptera: Hydrophilidae)

by

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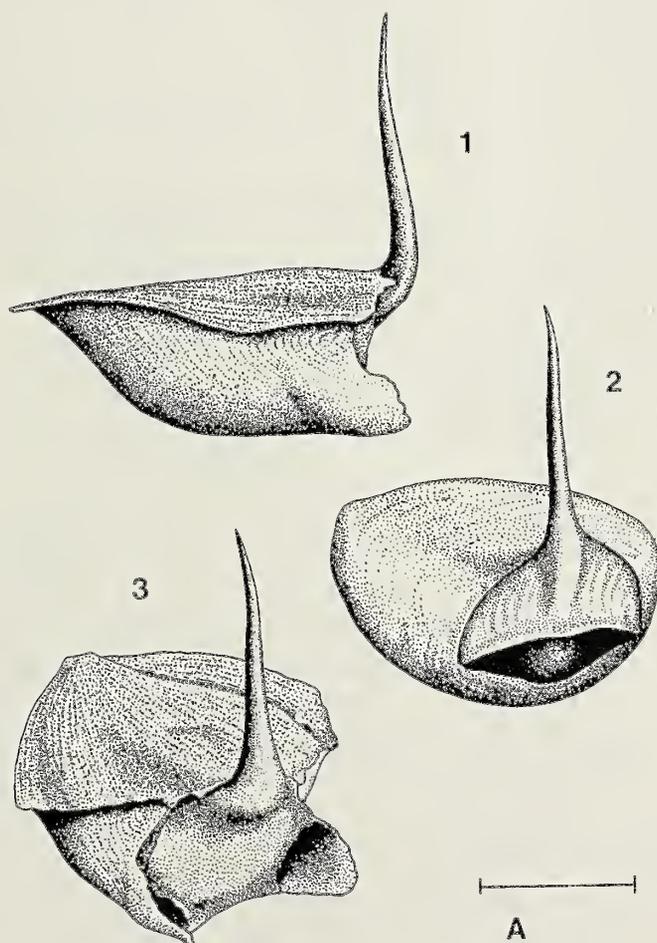
**ABSTRACT.** — The egg-case and larva of *Hydrophilus senegalensis* Castelnau are described and figured. They are compared with the egg-cases and larvae of *Hydrophilus piceus* (Linnaeus) from Europe and the North American *Hydrophilus triangularis* Say. The egg-case contained 74 larvae. The main morphological differences in the egg-cases of the three species are found in the extent of the vertical plate, the extension of the sides outside the vertical plate and the way by which the larvae leave the case. The absence or presence of swimming setae on the tibiae and femora are good characters for recognizing the larvae.

Further notes concern unidentified larvae of the genera *Amphiops* Erichson and *Neohydrophilus* d'Orchymont, which are diagnosed and figured.

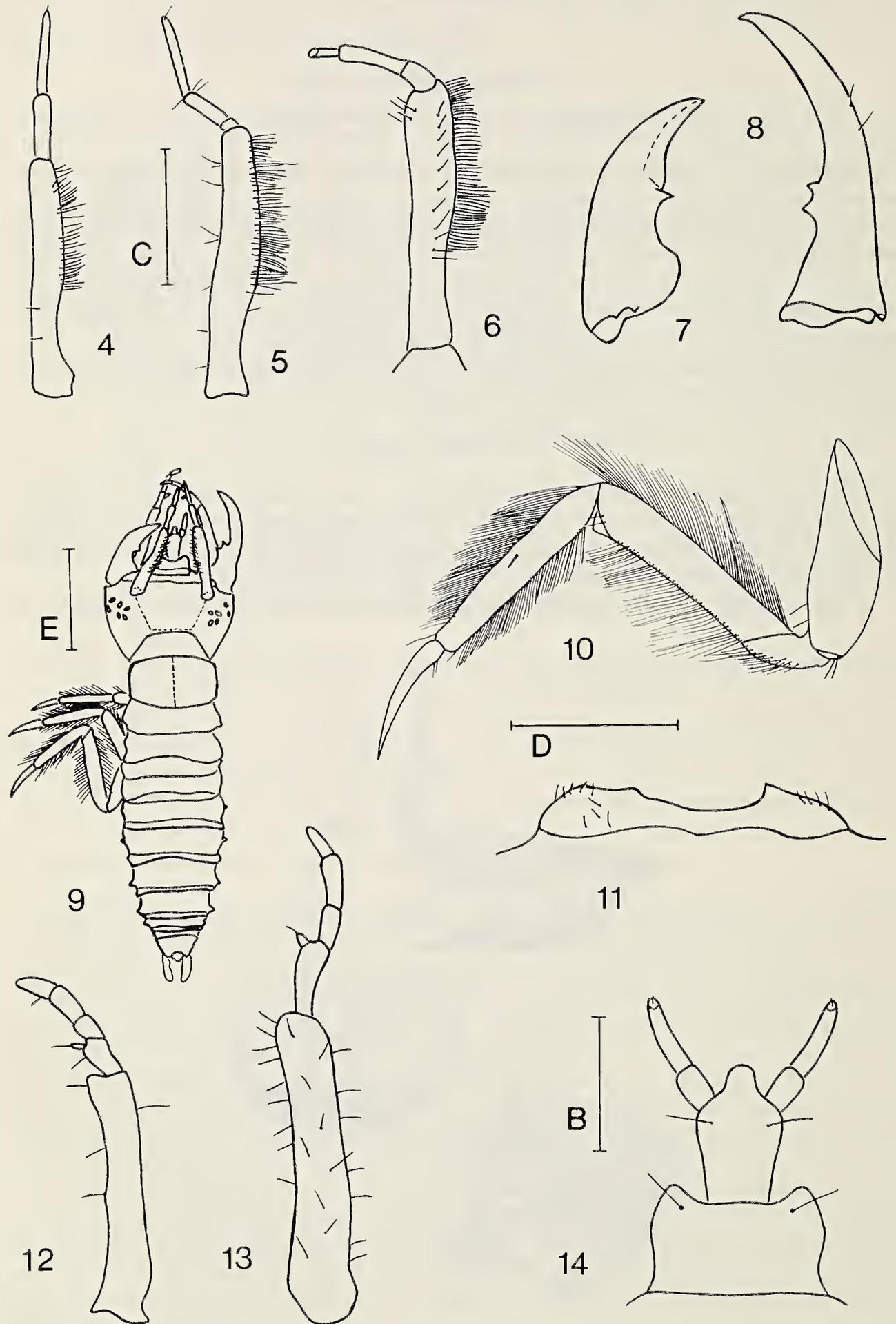
### INTRODUCTION

During November and December 1974 the author and mr. J. Krikken, curator of Coleoptera at the Rijksmuseum van Natuurlijke Historie, Leiden, made a trip to Kenya, East Africa, in order to collect beetles, mainly dung inhabiting Scarabaeidae and Hydrophilidae. Additionally adults as well as immature stages of aquatic Hydrophilidae were collected.

Usually it is hardly possible to distinguish between species within a Hydrophilid genus when



Figs. 1, 3, *Hydrophilus senegalensis*, 2, *Hydrophilus piceus*. 1-3, empty egg-case, 1, lateral view, 2-3, antero-lateral view. Figs. 1-3 drawn by R. van Assen. Scale-line A = 10 mm.



immature stages are concerned. In this paper the results of a comparative study of the immature stages of various species of the genus *Hydrophilus* O. F. Müller are given. The author thanks the Jan Joost Ter Pelkwijk Fonds for financial support. R. van Assen, taxidermist of the Museum voor het Onderwijs, made the drawings of the egg-cases. Prof. Dr. J. T. Wiebes and mr. J. Krikken critically read the manuscript. All material is preserved in alcohol, and is deposited in the Rijksmuseum van Natuurlijke Historie, Leiden.

*Hydrophilus senegalensis* Castelnau (figs. 1, 3, 4-5, 7-12, 14)

Material examined. — Two egg-cases, the one empty and another full of eggs. The empty egg-case contained 74 larvae, which gnawed their way out during the day after its collection and before its preservation in alcohol. The cases were collected together with adult beetles on 10.XII.1974 from an artificial waterhole in deciduous orthophyll savanna at Maungu Plains, 3° 33' S - 38° 47' E, Tsavo (E.) National Park, Kenya. They were floating between *Marsilea*-ferns in water of 30 cm depth. Another two larvae of 13 mm were collected in the same area, also from a waterhole on 28.XI.1974, 3° 33' S - 38° 51' E.

Egg-case (figs. 1, 3). — Colour greyish-white. It is spun of silk underneath a leaf of the fern *Marsilea*. The four leaflets of this fern are folded together by the adult beetle, thus forming a firm roof for the egg-case. The length of the case is 25 mm, the mast is 20 mm high. The vertical plate below the mast extends to the bottom of the case and it has a brownish colour. The full egg-case is closed, while in the empty case the larvae have gnawed their way out beside the vertical plate (fig. 3). The sides project outside the vertical plate.

Identification. — The egg-case is very easily distinguished from those of other species by the sides which project outside the vertical plate. The way by which the larvae leave the case (besides the vertical plate) is also different from other known species. For comparison the egg-case of *Hydrophilus piceus* (Linnaeus) is illustrated as well (fig. 2).

Discussion. — It is possible to differentiate the egg-cases of various species of this genus. The basic pattern may be similar, but the main difference is found in the way the females close the case after oviposition. The extent of the vertical plate varies a great deal. According to Wilson (1923) it is small in *Hydrophilus triangularis* Say, leaving a crescent-shaped opening beneath it, through which the larvae leave the case. In *Hydrophilus piceus*, however, the situation resembles that in *H. senegalensis*. The vertical plate extends downwards and reaches the bottom of the case, closing it completely. The larvae escape by gnawing a hole. Another feature in which *H. piceus* and *H. senegalensis* agree are the number of eggs, 60-70 in *H. piceus*, 74 in *H. senegalensis*. The egg-case of *H. triangularis* contains at least 100 eggs (Wilson, 1923).

Larva (figs. 4-5, 7-12, 14). Dorsal parts brownish-white; ventral parts whitish. Dorsal part of head with four slightly infuscated patches. Ultimate segment of antenna and labial palpus, segments 2-5 of maxilla and the clypeus brownish (specimens preserved in alcohol, some specimens were slide-mounted in Berlese-medium).

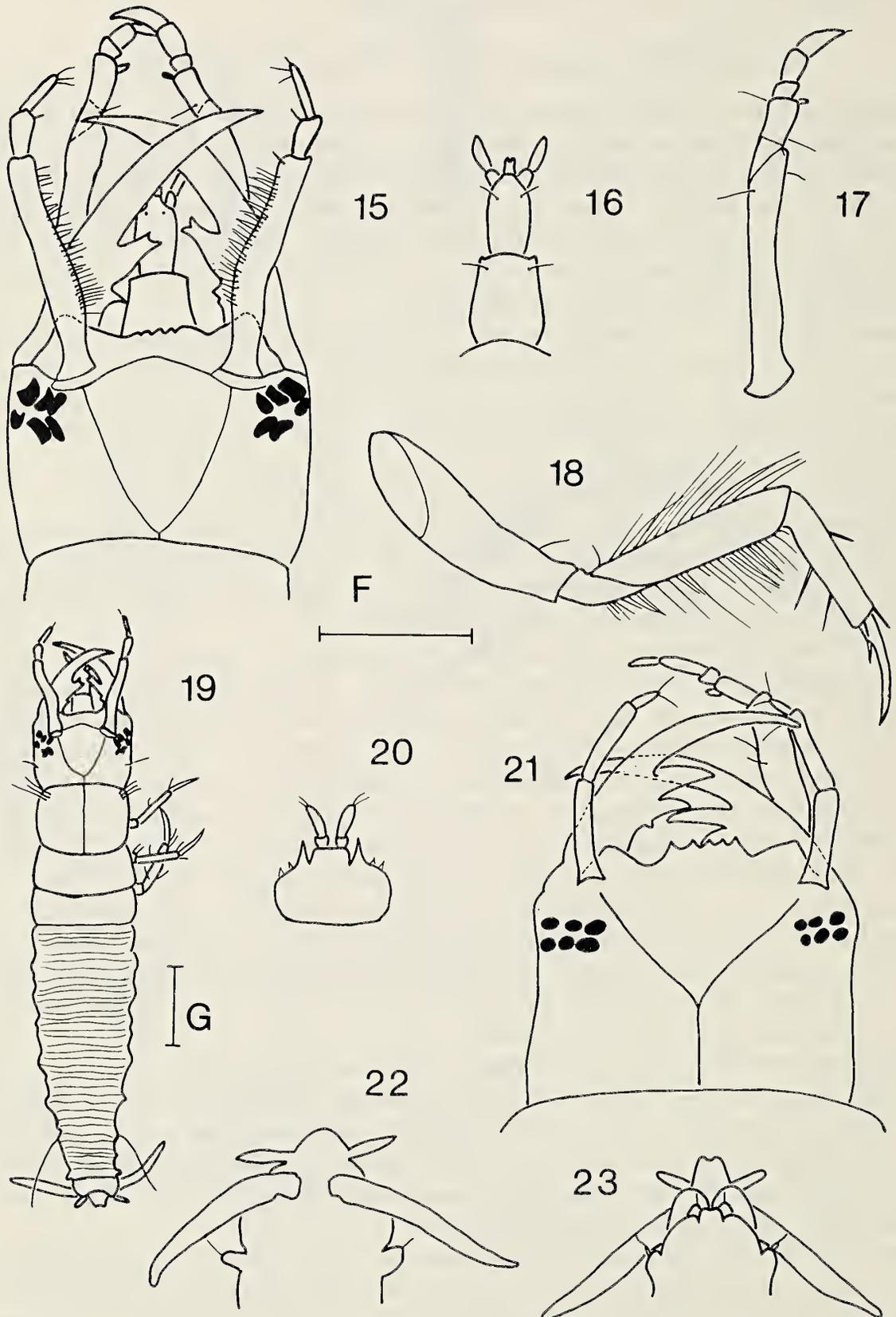
Body-length of 1st-day larva approximately 8 mm, maximum width 2.3 mm (at head-capsule); body-length of grown larva over 30 mm, maximum width 5.5 mm (at 3rd thoracic segment), width of head-capsule 3.8 mm. Body gradually narrowing caudad in 1st-day larva, in grown larva widest at 3rd thoracic segment. Dorsal aspect of head-capsule trapezoid in outline, widest at clypeal edge, the sides rounded and narrowing posteriad (1/w ratio 0.5); head-capsule flattened dorsoventrally, held in an upward position.

Clypeus (fig. 11) distinctly and completely separated from the frons (best seen in specimens

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Figs. 4-5, 7-12, 14, *Hydrophilus senegalensis*. 6, 13, *Hydrophilus triangularis*. 4-6, left antenna, dorsal view, 4, 1st-day larva, 5, grown larva. 7-8, mandibles, dorsal view. 9, habitus, 1st-day larva. 10, left median leg. 11, anterior border of frontoclypeus, dorsal view. 12-13, left maxilla, dorsal view. 14, labium, ventral view. Scale-line B = 0.5 mm to 14. Scale-line C = 1 mm to 5. Scale-line D = 1 mm to 4, 7-8, 10-12. Scale-line E = 2 mm to 9. Figs. 6, 13 after Wilson (1923), scale unknown.

kept in alcohol); anterior border slightly concave, symmetrical, anterolateral lobes projecting, a small paralateral lobe present. Epicranial sutures present but difficult to see, converging posteriad, in their last third parallel to the posterior cephalic border; coronal suture present but very short. Ocelli arranged in two oblique rows of three ocelli each, the lateral pair somewhat remote.



Figs. 15-19, 22-23, *Neohydrophilus* spec. 20-21, *Amphiops* spec. 15, head-capsule, dorsal view. 16, 20, labium, ventral view. 17, right maxilla, ventral view. 18, right hind leg, dorsal view. 19, habitus, dorsal view. 21, head-capsule, dorsal view, left maxilla omitted. 22-23, tracheal gills anal segment, 22, ventral view, 23, dorsal view. Scale-line F = 1 mm to Figs. 15-18, 20-23. Scale-line G = 1 mm to 19.

Antenna (figs. 4-5) three-segmented in 1st-day larva, in grown larva four-segmented. Antenna not projecting beyond segment 4 of maxilla. Shape of segment 1 bisinuate in 1st-day larva, more straight in grown larva, longer than ultimate segments taken together; the inner side of segment 1 densely covered with setae, the setae as long as its width. Ultimate segment slightly longer than penultimate.

Mandibles (figs. 7-8) asymmetrical; left mandible shorter and more robust than the right one, the inner side with one median tooth; right mandible more slender, the inner side with two teeth in its basal half. Teeth in 1st-day larva sharply pointed, in grown larva obtuse.

Maxilla (fig. 12) five-segmented, longer than any other cephalic appendage. Segment 1 twice as long as remaining segments taken together, its inner side with three setae, which are as long as the segmental width, one seta situated halfway the length of the segment, one near the apex and one in between.

Labium (fig. 14) with distinct submentum. Mentum twice as wide as long, with the sides rounded and the anterolateral lobes bluntly pointed; superior surface without any spines or setae, smooth. Prementum longer than wide, lateral sides diverging, width at base half the width of mentum; superior surface with two spines near base. Labial palpus as long as prementum, segment 2 twice as long as segment 1; ligula not separated from prementum by a suture, its length equal to segment 1 of labial palpus, the apex rounded.

Thoracic tergites each with a pair of sclerotized plates, their surface being largest in tergite 1, intermediate in tergite 2 and smallest in tergite 3; the plates being most distinct in grown larva.

Abdominal segments not sclerotized, their surface densely covered with villose setae; sides of each segment in 1st-day larva with a slightly projecting spiracle, the spiracles each with one long seta; in grown larva the spiracles are not visible from outside; tergite 8 sclerotized. Procerci, urogomphi and acrocerci present. Ventral anal appendages as long as segment 8.

Legs (fig. 10) well-developed, all having the same size, femora and tibiae visible from above, adapted for swimming; femora and tibiae flattened, their inner and outer sides with long swimming setae; tarsal claws weakly curved, approximately half as long as the corresponding tibia; trochanters distinct; coxae about  $2/3$  the length of corresponding femur, their superior surface grooved to receive the femur.

Identification. — *Hydrophilus senegalensis* is distinguished from the well-known larvae of *H. triangularis* and *H. piceus* by the inner and outer sides of tibiae and femora having long swimming setae; in *H. triangularis* the inner side of the femora lacks setae, in *H. piceus* the outer side of the tibiae has only short setae in its basal half.

Discussion. — Of four other species of the genus *Hydrophilus* O. F. Müller the larva is known, all non-african. Wilson (1923) described and figured in detail the life-history of the American species *H. triangularis*. The life-history of the European species *H. piceus* has been described by various authors, as well as that of *H. aterrimus* Eschscholtz. Finally Morioka (1955) described the larva of *H. acuminatus* Motschulsky from Japan. According to Böving & Henriksen (1938), larvae of *H. piceus* and *H. aterrimus* cannot be distinguished morphologically. The larva of *H. acuminatus* seems to be similar to that of *H. piceus*.

### *Amphiops* Erichson

#### *Amphiops* spec. larva (figs. 20-21)

Diagnosis. — Length 10 mm. Legs not visible from above.

Mentum (fig. 20) without ligula. Clypeus symmetrical, armed with five teeth. Mandibles symmetrical, each with three teeth. Upper surface of mentum with strong short spines in its front half. Abdominal segments laterally with short conical outgrowths.

Material examined. — One larva collected 8.XII.1974 from littoral vegetation in deciduous orthophyll savanna, 700 m above sealevel, at Mzima Springs, 2° 59' S - 38° 01' E, Tsavo (W.) National Park, Kenya.

*Neohydrophilus* d'Orchymont*Neohydrophilus* spec. larva (figs. 15-19, 22-23)

Diagnosis. — Length 8 mm. Headcapsule (fig. 15) quadrangular in dorsal view. Sides of mentum (fig. 16) straight, slightly converging, the upper surface smooth. Abdominal segments without lateral outgrowths (fig. 19).

Material examined. — Three larvae collected on 28.XI.1974 from a waterhole in deciduous orthophyll savanna, 700 m above sealevel, at Maungu Plains, 3° 33' S - 38° 51' E, Tsavo (E.) National Park, Kenya.

## REFERENCES

- Böving, A. G. & K. L. Henriksen, 1938. The developmental stages of the Danish Hydrophilidae (Insecta, Coleoptera). — *Vidensk. Meddr dansk naturh. Foren.* 102: 27-162, figs. 1-54.
- Morioka, A., 1955. Description of four Hydrophilid larvae from Japan (In Japanese). — *Shin-Konchu* 8 (10): 15-18, figs.
- Wilson, C. B., 1923. Life history of the Scavenger Water beetle, Hydrous (*Hydrophilus*) triangularis, and its economic relation to fish breeding. — *Bull. Bur. Fish., Wash.* 39: 9-38, 22 figs.

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PAREULYPE BERBERATA (DENIS & SCHIFFERMÜLLER) IN MIDDEN-LIMBURG (LEP., GEOMETRIDAE). Te Montfort ving ik in 1980 bij mijn woning van 15 mei tot 11 juni elf exemplaren van deze spanner; van 23 juli tot 7 augustus nog drie exemplaren van de tweede generatie, *P. berberata* is ook gevangen te Sint Joost (gem. Echt) en te Maasbracht. Franssen meldde één exemplaar van Melick (*Ent. Ber., Amst.* 40: 163).

In de Catalogus (en supplement) worden nog geen vindplaatsen uit Midden-Limburg vermeld.

*Berberis*, de voedselplant van de rups, is de laatste jaren veel aangeplant in plantsoentjes en tuinen.

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FLEAS: Proceedings of the international conference on fleas Ashton Wold/Peterborough/UK/21-25 June 1977; R. Traub & H. Starcke, eds, 1980. pp. X. 420. ISBN 90-6191-018-8. A. A. Balkema, P.O. Box 1675, Rotterdam. Prijs (gebonden, in Nederland excl. 4% BTW): f 95,—.

Dit keurig verzorgde boek omvat 37 bijdragen, die samen een breed spectrum vertonen van het onderzoek dat aan vlooien kan worden verricht. Het boek begint met een biografie van N. C. Rothschild, van de hand van zijn dochter Miriam (bij wie te huize de conferentie werd gehouden). Er is één taxonomisch artikel, naast een aantal over evolutie en zoögeografie. Door zijn omvang springt een artikel van Traub over zoögeografie en evolutie van vlooien, luizen en zoogdieren eruit. Medische aspecten krijgen natuurlijk rijkelijk de aandacht, naast een bonte rij bijdragen over fysiologie, morfologie, oecologie, faunistiek enz. Het is ondoenlijk om deze bijdragen afzonderlijk te refereren; ik heb de indruk dat „objectgebonden” symposia als deze nog heterogener zijn dan de meeste andere collectieve uitgaven en potentiële kopers zullen dit zeker als een bezwaar ervaren. Anderzijds hebben deze dieren zoveel interessante facetten dat er redenen genoeg zijn om dit boek van tijd tot tijd ter hand te nemen. — W. N. Ellis.

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AFDELING NOORD-HOLLAND EN UTRECHT. De afdeling zal dit seizoen nog bijeen komen op donderdag 14 januari en dinsdag 2 maart 1982 in het Instituut voor Taxonomische Zoölogie, afd. Entomologie, Plantage Middenlaan 64, Amsterdam, aanvang 20.00 uur.

B. Brugge, secretaris