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Observations on the acarofauna of fish aquariums IV : A new *Trimalaconothrus*, *T. aquatilis* sp. n. (Malaconothridae, Oribatida) from an aquarium containing Angel Fishes

by Alex FAIN, Luc LAMBRECHTS & Georges WAUTHY

Summary

A new oribatid mite, *Trimalaconothrus aquatilis* sp. n. (Malaconothridae) is described from an aquarium containing Angel Fishes (*Pterophyllum altum*) in Antwerp. It was mixed with numerous specimens of *Trimalaconothrus maniculatus* FAIN & LAMBRECHTS, 1987 also described from aquariums in Antwerp. Two tritonymphs of *Trimalaconothrus* sp. were found attached on the gills of one of these fishes which died from a bacterial disease.
Key-words : Acari, *Trimalaconothrus*, aquariums.

Résumé

Une nouvelle espèce d'Oribate, *Trimalaconothrus aquatilis* n. sp. (Malaconothridae) est décrite. Les spécimens proviennent d'un aquarium contenant des poissons exotiques, *Pterophyllum altum*, à Anvers. Cet aquarium renfermait également une autre espèce d'Oribate, *Trimalaconothrus maniculatus* FAIN & LAMBRECHTS, 1987, décrite précédemment et originaire d'un aquarium de la même ville. Deux tritonymphes d'un *Trimalaconothrus* sp. furent trouvées sur les branchies d'un des poissons mort d'une infection cutanée de nature bactérienne.
Mots-clefs : Acari, *Trimalaconothrus*, aquariums.

Introduction

To date, four species of aquatic oribatids have been found in aquariums in Antwerp, and one of these appear to be harmful for fishes. These species are as follows : (1) *Hydronothrus aquariorum* FAIN & LAMBRECHTS, 1987a (Trhypochthoniidae); (2) *Hydrozetes lemnae* (COGGI, 1899) (Hydrozetidae); (3) *Trimalaconothrus maniculatus* FAIN & LAMBRECHTS, 1987b (Malaconothridae); (4) *Trimalaconothrus aquatilis* sp. n. (Malaconothridae).
The new species we describe was found mixed with another species of the same genus (*T. maniculatus*), in an aquarium containing several Angel Fishes, *Pterophyllum altum*, originating from Venezuela.
One of these fishes died from a skin infection caused by an enterobacterium. Two mites (tritonymphs) were found attached to the gills of this fish, and many other mites were observed on the bottom of the aquarium. These mites belonged to two different species of *Trimalaconothrus* : one was *T. maniculatus* FAIN & LAMBRECHTS, 1987, and the second was the new species.
Numerous immature stages were also found in the aquarium in question. The adult forms are easy to separate from each other mainly by a different pattern of dorsal cuticle. Indeed, in the new species, the cuticle shows numerous pits which are absent in the other species. Because the immatures of both species do not show pits, their identification is thereby quite difficult.

Trimalaconothrus aquatilis spec. nov.

ADULT (Figs 1-10)

Colour yellowish. Holotype 567 µm long and 300 µm wide (this value refers to the greatest width registered at the level of the notogaster). Length and width in five paratypes : 560 µm x 303 µm; 570 µm x 312 µm; 582 µm x 307 µm; 600 µm x 315 µm; 615 µm x 330 µm.
Tegument with a thin granular cerotegument and a finely punctate cuticle showing very small rounded pits (diameter 2.5 µm to 3.5 µm) which are distinctly separated from each other (3 µm to 6 µm). These pits are confined to the notogaster.

Prodorsum

Cuticle with an indistinct pattern in its posterior part (Fig. 1). At each side, a slightly sclerotized S-shaped ridge is present. There is a well-developed, lateral angulation between legs I and II.
Rostral setae (*ro*) pectinate in their basal half; they are 50 µm long (47 µm to 55 µm in four paratypes), and 26 µm apart (23 µm to 27 µm in paratypes).
Lamellar setae (*la*) slightly pectinate, 70 µm long (67 µm to 72 µm in paratypes), and 57 µm apart (57 µm to 60 µm in paratypes). Interlamellar setae (*in*) smooth; 110 µm long (90 µm to 105 µm in paratypes), and 90 µm apart (96 µm to 93 µm in four paratypes). Exobothridial setae, short and very thin.
Distances : *la* - *ro*, 28 µm to 30 µm; *la* - *in*, 102 µm to 105 µm (holotype and paratypes).

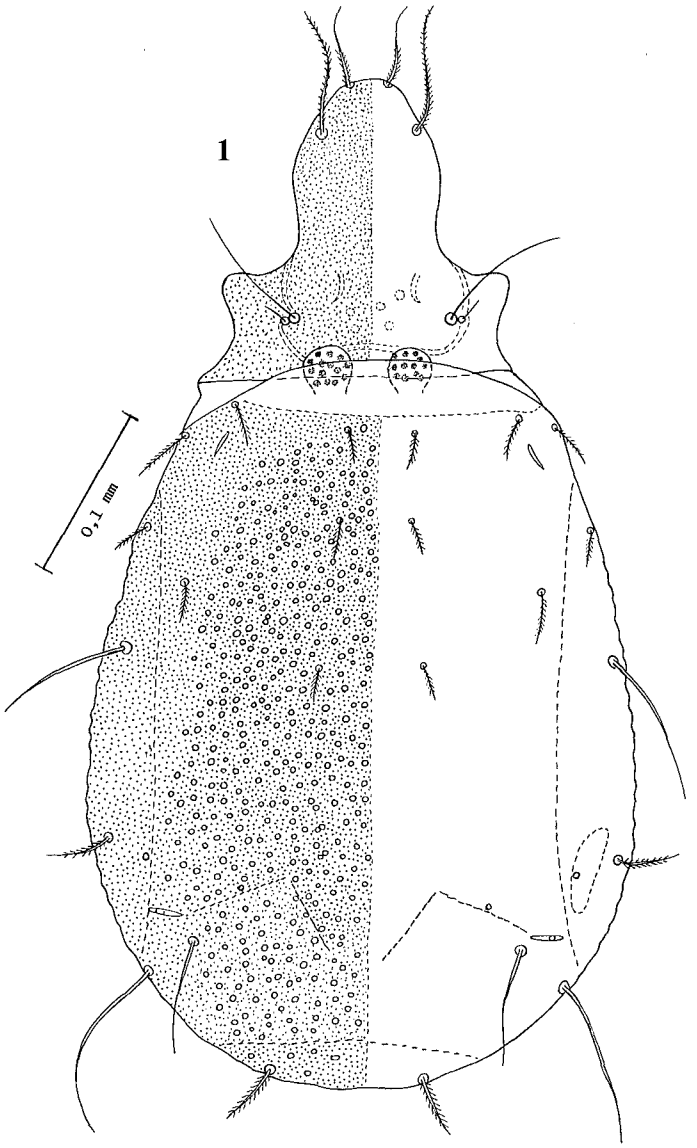


Fig. 1. Trimalaconothrus aquatilis *sp. n. Adult in dorsal view.*

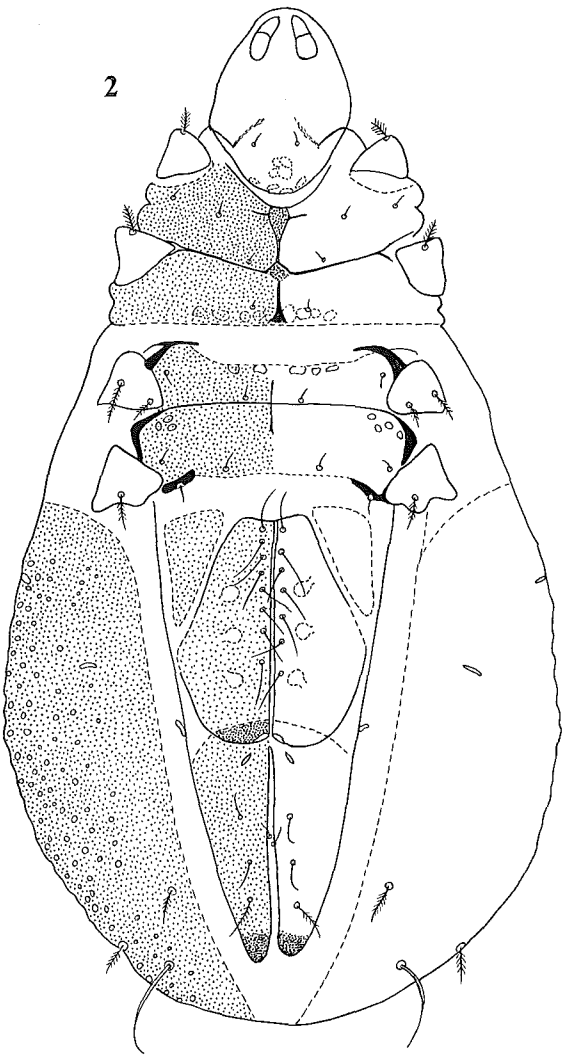


Fig. 2. Trimalaconothrus aquatilis *sp. n. Adult in ventral view.*

Notogaster

Distinctly pitted in its median part and laterally up to a line joining the lyrifissures *ia* and *ip*. Outside of this line, the cuticle is devoid of pits. A pair of rounded organs filled with reddish-brown conspicuous granules is observed under the cuticle, in front of setae *c1* (racemiform organs, see below).
Most dorsal setae are pectinate and 20 µm to 30 µm long. Setae *e2*, *h1* and *h2*, smooth, and 80-90 µm long (*e2* and *h1*) or 120-130 µm long (*h2*).
Oil glands with small apertures situated inside of setae *f2*.

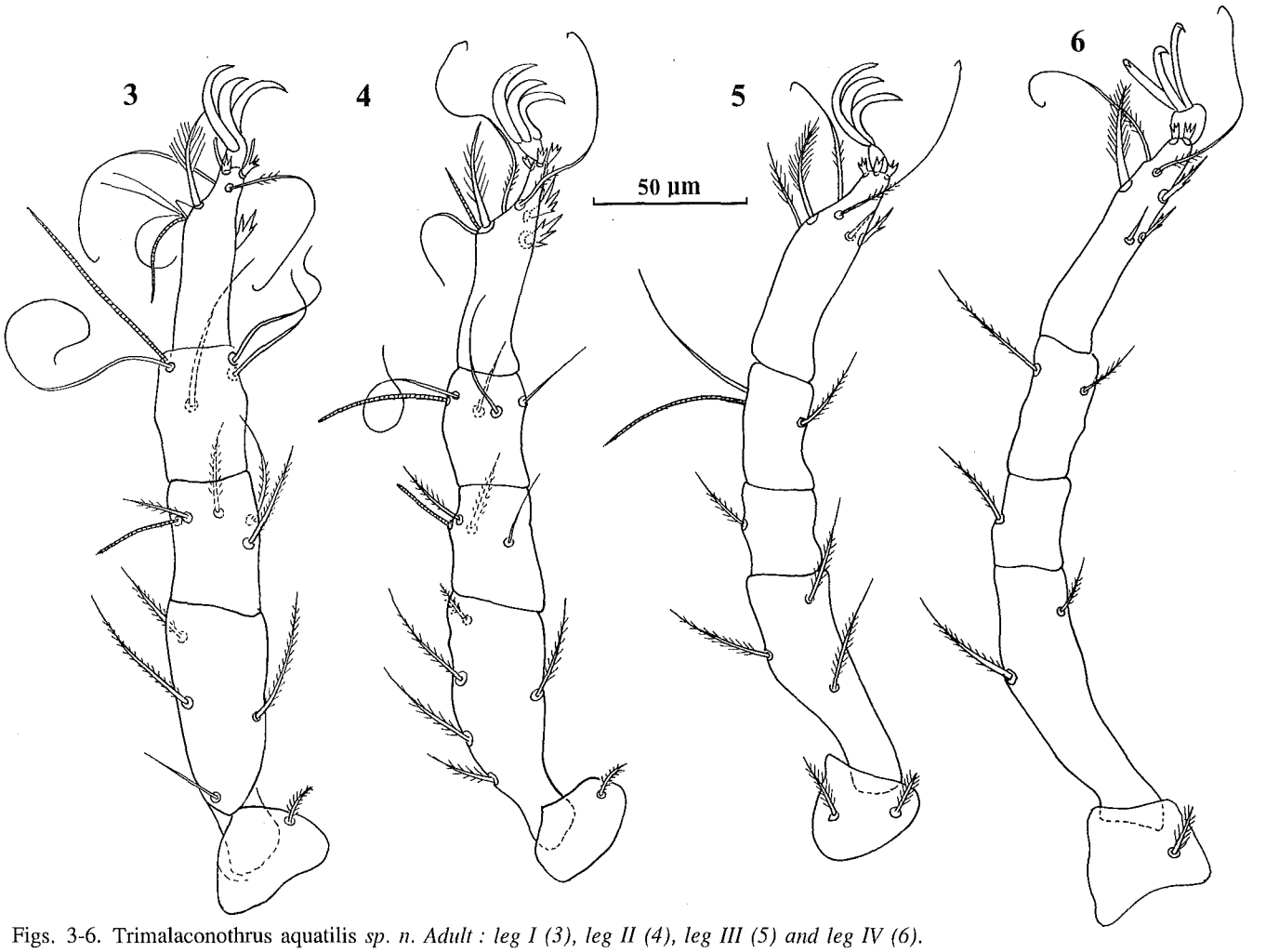
Ventral region

Cuticle pitted only in lateral parts (Fig. 2). Genital shields shorter (120 µm) than the adanal ones (130 µm). Note that the length of adanal shields includes the anterior part recovered by the genital shields.

The greatest, anterior part of adanal shields more strongly sclerotized than the rest of the shield; but, the sclerotized aspect is partly caused by the overlapping of both the shields (adanal and genital).
Epimeral setae : 3-1-2-3. These setae are thin and short. There are eight pairs (8 + 7 in some paratypes) of genital setae (25-30 µm long), one pair of anal setae and three pairs of adanal setae which are longer. The setae *ps3* and *h3* are pectinate whereas the *ps2* are smooth.

Legs

Tarsi tridactyle. In all the legs (Figs 3-6), the median claw is thicker and shorter than the lateral ones. In tarsus I, the median claw is 22 µm long, and the lateral claws are 24 µm long (measured in straight line). In tarsus IV, the values are 24 µm and around 28 µm, respectively. The dorsal surface of claws is very slightly barbed.
Length of tarsi I-IV (in paratypes) : 65 µm, 66 µm,



Figs. 3-6. Trimalaconothrus aquatilis *sp. n. Adult : leg I (3), leg II (4), leg III (5) and leg IV (6).*

70 µm and 87 µm, respectively.

Tarsus I, with the following setae (they are all located in the apical half of the segment; Figs 7,8) : (1) *ft'* thick, bipectinate and strongly attenuated apically; (2) *ft"* very thin, smooth and much shorter than *ft'*; (3) *tc"* and *tc'* long, with a few barbs in their basal third, and with a curved apex; (4) ventral setae *a'* and *s* strongly indentate and supporting fingerlike projections, one with seven, the other with five teeth; (5) setae *u'* and *u"* at the apex of the tarsus, in the form of two thick dentate spines; (6) dorsodistal, proral setae *p'* and *p"* cylindrical, with enlarged bases. There are three solenidia, *omega1* being thicker and slightly longer than *omega2* and *omega3*. Famulus spine-like.

Tarsus II (Fig. 9) differs from tarsus I : (1) by longer and more strongly indentate spines *s* and *a'*; (2) by the presence of only one solenidion; (3) by the presence of four indentate spines at its apex, i.e. (*u*) and (*p*) (note that the proral setae *p* are slightly denticulate).

Tarsus IV (Fig. 10) with seta *ft"* as *ft'* in tarsus I. The setae *tc'* and *tc"* are long, slightly inequal and barbed in their basal third or half. The setae (*pv*) are thin, shortly barbed spines; and, their relative position is variable. Moreover, the apex of the segment shows four indentate spines, i.e. the setae (*p*) and (*u*); and, the seta *s* is present.

Number of setae in legs I-IV (solenidia and famulus excluded; see Figs 3-6) : tarsi (10-10-10-10); tibiae (4-4-2-2); genua (4-3-1-1); femora (4-5-3-2); trochanters (1-1-2-1).

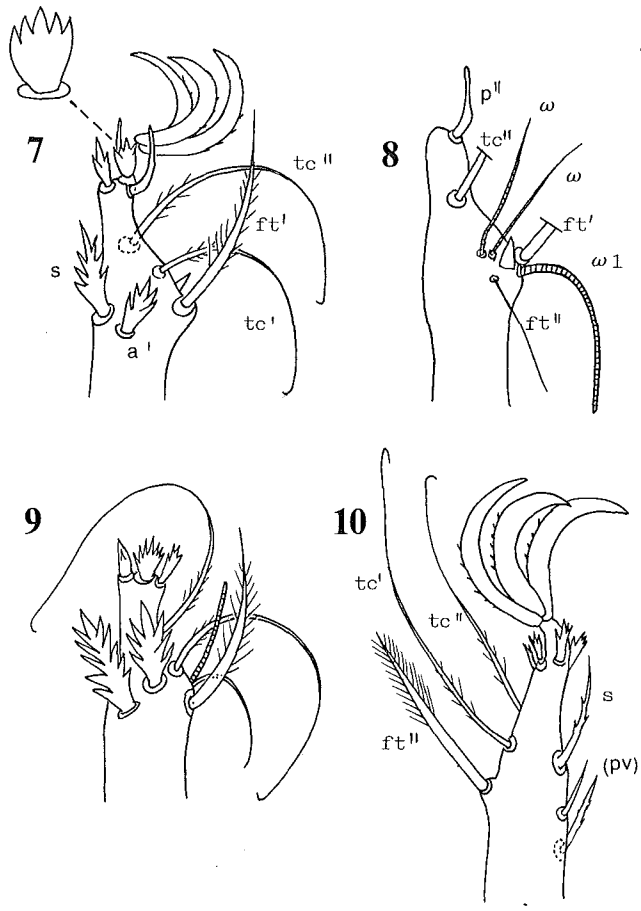
LARVIPARITY IN *TRIMALACONOTHRUS AQUATILIS*

Among the 25 paratypes of our collection, 11 specimens were females containing one or, more rarely, two completely developed larvae (in two females). No eggs or remnants of egg shells were observed within the body of these specimens.

Note that, as all the other species of *Trimalaconothrus* (see e.g. GRANDJEAN, 1941; NORTON & PALMER, in press), *T. aquatilis* is parthenogenetic.

RACEMIFORM ORGANS

COOREMAN (1941) was the first author who has drawn our attention to these organs in oribatids. In his description of *Trimalaconothrus intermedius* in 1941 (regarded at the present as a synonym of *T. novus* SELLNICK, 1921), COOREMAN described these organs as follows : "Entre les sensillus



Figs. 7-10. Trimalaconothrus aquatilis *sp. n. Adult : apical half of tarsi I (7 and 8), II (9) and IV (10).*

se trouvent deux grandes taches pigmentées circulaires formées de gros blocs de pigment pourpre foncé, situés immédiatement en dessous de la chitine de revêtement. La plupart des éclaircissants comme l'acide lactique dissolvent ce pigment".

GRANDJEAN (1962, 1965, 1966) found again these structures in several genera (*Trimalaconothrus*, *Chamobates*, *Hermannia*, *Allogalumna*, *Erogalumna*, *Centroribates* and *Dicatozetes*). This author called these structures "racemiform organs" (from the latin *racemosus*, i.e. bunch of grapes).

BERNINI (1984) found the organs in several other genera or species of oribatid mites (e.g. *Eupelops*, *Peloptulus*, *Minunthozetes*, *Platyliodes*, *Cultroribula*, *Caleremaeus*, *Licneremaeus*, *Sphaerozetes*, *Punctoribates*, *Mycobates*), and suggested that the "proventricular organs" mentioned by MICHAEL (1884) in *Liodes theleproctus*, *Steganacarus magnus*, *Damaeus geniculatus* and *Conoppia palmicincta*, and the "ghiandole proventricolari" *sensu* BERLESE (1896) are these organs.

More recently, FAIN & LAMBRECHTS (1987a, b) recorded these organs from a new species of *Hydronothrus*, and from *Trimalaconothrus maniculatus* FAIN & LAMBRECHTS, 1987.

The exact function of these organs is still unknown. GRANDJEAN (1962) suggested that the organs could have a visual function. According to BERNINI (1984), they are more likely involved with the alimentary physiology. In sections of *T. novus*, ALBERTI (*in litt.*) "found dense concentrations of granules in extensions of the ventricular region of the intestine. These granules are intracellular and, because they contain $CaCO_3$ shown histochemically, they probably have the same function as the lime glands in earthworms. However, these granules are very close to the brain and this might improve photo-sensivity by refraction/casting shadow".

Material

Holotype adult from the bottom of an aquarium containing Angel fishes, *Pterophyllum altum* ("Maanvis" in Flemish), and deposited in the Institut royal des Sciences naturelles de Belgique, Bruxelles.

Paratypes : 25 adults, from the same aquarium. One adult paratype in the British Museum (Nat. Hist). Note that these specimens were mixed with numerous specimens of *Trimalaconothrus maniculatus*.

In the same aquarium, two tritonymphs from one of these species were found on the gills of an Angel fish which died from a bacterial skin disease. This aquarium contained also numerous immatures (larvae, protonymphs, deutonymphs and tritonymphs) of *Trimalaconothrus* sp. which could belong either to *Trimalaconothrus maniculatus* or to the new species. Until now, we were unable to separate them at the specific level.

Remarks

As in *T. novus* SELLNICK, 1921, the new species shows a pitted aspect of the cuticle upon the dorsal and ventral parts of notogaster. Nevertheless, the redescription of *T. novus* by KNÜLLE (1957) and the examination of specimens found in Belgium allow both the species to be differentiated using the following characteristics : (1) cuticular pits absent in the lateral parts of dorsum, and in the paraxial half of ventrolateral shields (in *T. novus*, the pits are present over the whole surface of dorsal and ventrolateral shields); (2) a prodorsum relatively narrower; (3) rostral and lamellar setae partly or completely pectinate (they are smooth in *T. novus*); (4) lamellar setae much more apart (57 µm) than the rostral ones (26 µm) (in *T. novus*, the rostral setae are more apart than the lamellar ones); (5) interlamellar setae much shorter than the prodorsum (in *T. novus*, these setae are as long or longer than the prodorsum); (6) setae *ft'* in legs I and II, and *ft"* in legs III and IV bipectinate (they are almost smooth in *T. novus*); (7) setae *ft"* in legs I and II very thin and shorter than *ft'* (in *T. novus*, *ft"* is thick and as long as *ft'*); (8) setae *a'* and *s* in tarsi I and II with finger-like projections (with short teeth in *T. novus*); (9) apical and ventral spines shown by tarsi III and IV much thinner.

However, the new species is by most characters very close to *T. maniculatus* FAIN & LAMBRECHTS, 1987; and, *T.*

aquatilis differs from the latter : (1) by the presence of cuticular pits; (2) by a greater number of genital setae; (3) by a distinct pectinate aspect in most dorsal setae of the notogaster (in *T. maniculatus*, some dorsal setae show short barbs).
A more complete study on the morphology and development of *T. aquatilis* is in preparation.

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