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A NEW AQUATIC ORIBATID MITE FROM WESTERN AUSTRALIA
(ACARI: CRYPTOSTIGMATA: AMERONOTHRIDAE)

BY John A. WALLWORK

SUMMARY: A new aquatic oribatid mite, Chudalupia meridionalis n. gen., n. sp. is described from temporary gravel pools in Western Australia, and its systematic position within the family Ameronothridae (sensu WEIGMANN and SCHULTE) is discussed. It is suggested that it possesses some features indicative of a distant relationship with Aquanothrus montanus Engelbrecht which occurs in similar biotopes. The discovery of this new genus supports the idea that the concept of the family Ameronothridae should be widened to include not only Ameronothrus, Chudalupia and Aquanothrus, but also the genera presently included in the family Podacaridae.

RESUME: L'auteur décrit un Oribate nouveau, Chudalupia meridionalis n. gen., n. sp., d'Australie de l'ouest. Cette espèce habite les petits lacs de l'eau douce qui s'accumulent, en manière temporaire, en haut sur la colline Mt. Chudalup. L'auteur fait une comparaison avec les autres genres de la famille Ameronothridae (sensu WEIGMANN and SCHULTE). Il y a plusieurs caractères communs avec Aquanothrus Engelbrecht de l'Afrique du Sud qui indiquent, probablement, des ancêtres communs, mais éloignés, aux deux genres. Aquanothrus et Chudalupia se trouvent dans des biotopes semblables. La découverte de ce genre nouveau est très intéressante parce qu'il comble une lacune systématique. Il soutient l'idée, proposée par WEIGMANN et SCHULTE, de l'unification de Chudalupia, Ameronothrus, Aquanothrus et des genres podacarides dans une seule famille, qui s'appelle les Ameronothridae.

INTRODUCTION

WEIGMANN and SCHULTE (1977) have argued that the concept of the family Ameronothridae should be broadened to include genera which have, hitherto, been assigned to the Podacaridae, and also the genus Aquanothrus which Engelbrecht (1975) placed in a separate family, Aquanothridae. To support their arguments, these authors drew attention to the fact that advances in knowledge concerning these ameronothroid genera have filled in many gaps, to the extent that their groupings into three monophyletic families are no longer justified.

This view receives further support from the discovery of a new ameronothroid mite in limnological samples collected from temporary, freshwater gravel pools in Western Australia. This mite, which was collected by Dr IAN BAYLY of Monash University, cannot be assigned to any of the existing ameronothroid genera and

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it is described below under the name *Chudalupia meridionalis* n. gen., n. sp. A diagnosis of the genus and a discussion of its systematic position are given after the description of the type species.

**Material**

Many specimens are present in the collections; these are mainly adults, but some juveniles were also examined. The material was originally fixed in formalin and subsequently transferred to Koenike's fluid. As a consequence, the specimens are rather brittle and tend to break up (particularly the legs) when mounted in Hoyer's solution.

**Description**

*Chudalupia meridionalis* n. gen. n. sp.

**Measurements**

- Holotype (male): length: 456.5 μm, width: 247.5 μm
- Paratypes (male): avr. length: 481.2 μm (range: 478.5 μm-484.0 μm), avr. width: 258.5 μm (range: 253.0 μm-264.0 μm)
- (female): avr. length: 511.5 μm (range: 495.0 μm-539.0 μm), avr. width: 293.7 μm (range: 286.0 μm-302.5 μm)

**Description of holotype**

Body covered with a thick, dark-brown cerotegument which is coarsely granular (Fig. 1-3) over the notogaster and much of the prodorsum and ventral plate. Anterolaterally on the prodorsum, the cerotegument has a folded or wrinkled microsculpture.

**Prodorsum**: Rostral setae spiniform, divergent, shorter than their mutual distance but slightly longer than lamellar and interlamellar setae (Fig. 1). Lamellar setae inserted close together at the apex of a pair of convergent lamellar thickenings. The latter terminate anteriorly close together and in this region the cerotegument is folded transversely to give the appearance of a translamellar connexion. A more distinct translamellar ridge joins the two lamellae more posteriorly, and the interlamellar triangle so formed has a cerotegumental covering which is coarsely granular resembling that covering the exobothridial and notogastral regions. Posterior to this translamellar ridge, there is a pair of convergent thickenings, running from the bothridial region antero-medially. Interlamellar setae are inserted on these ridges and, in the holotype, each seta is situated in a cup-like depression or pit. The bothridia are large, with strongly-developed walls and aperture directed anterolaterally. The sensillus has a strong stem which curves laterad out of the bothridium, and a jet-black spherical head which is very conspicuous. The head is not smoothly rounded, but has a slightly roughened appearance. Postero-lateral to each bothridium is a short exobothridial seta; this is inserted on the lateral margin of the prodorsum immediately above the insertion of leg II and is very difficult to see in dorsal view.

**Notogaster**: The dorso-sejugal arch is complete and forms a broadly thickened, uninterrupted anterior notogastral margin (Fig. 1). An ovoid/rectangular lenticulus is present mid-dorsally immediately behind this margin. In side pro-
FIG. 1-2: *Chudalupia meridionalis* n. gen., n. sp. Adult. 1) Dorsal view; 2) Ventral view.

- ro: rostral setae;
- la: lamellar setae;
- in: interlamellar setae;
- ex: exobothridial setae;
- ss: sensillus;
- da, dm, dp, la, lm, lp, h_{1-3}: notogastral setae;
- len: lenticulus;
- ia, im, ips, ip: notogastral fissures;
- gla: aperture of lateral abdominal gland;
- 1a-c, 2a, 3a-b, 4a-b: coxisternal setae;
- ag: aggenital setae;
- ad_{1-3}: adanal setae;
- disc: discidium;
- iad: adanal fissure.

FIG. 3: *Chudalupia meridionalis* n. gen., n. sp. Notogaster, adult, lateral view (notations as in FIGS. 1-2).

FIG. 4: *Chudalupia meridionalis* n. gen., n. sp. Tarsus I, adult, antiaxial view (notations after Grandjean’s scheme).
file (Fig. 3) this dorso-sejugal region is flat, but posterior to this the notogastral surface is thrown into five broad, longitudinal folds, namely a median flanked on each side by a pair of lateral folds (Fig. 1 and 3). Fourteen pairs of short, spiniform notogastral setae, identified and located as shown in Fig. 1 and 3. The posterior notogastral setae are impossible to see clearly in dorsal view, but when the notogaster is viewed laterally (Fig. 3) their disposition can be noted. There is some doubt about the identity of the most posterior seta; it could belong to the ps or h series and it has been assigned to the latter as h₁ because of its superior position. The pattern of notogastral chaetotaxy is then characterised by the absence of setae ps₄, i.e. it is bideficient. Attention may also be drawn to the variable position of seta lp. On the left side in the holotype, this seta is inserted immediately anterior to seta h₃, whereas on the right side it is displaced medially and is inserted on the outer contour of the more median of the two lateral notogastral folds.

Fissures ia, im, ips and ip are distinct (Fig. 1 and 3) as is the aperture of the lateral abdominal gland.

Coxisternal region: Cerotegument covering this region is devoid of microsculpture. Apodemata II, the ventro-sejugal and III are well developed but do not meet in the mid-line; apodemata IV lacking (Fig. 2). All coxisternal setae short and spiniform, similar in form to the dorsal setae; coxisternal setal formula (3-1-2-2), with seta 4b displaced anteriorly into field III. Coxisternal seta 4c is lacking. A short, blunt discidium is present between the insertions of legs III and IV (Fig. 2), but pedotecta are lacking.

Genito-anal region: Genital aperture large, each genital plate with a median row of six short, spiniform setae. A single pair of auge-nital setae, similar in form to the other ventral setae, is located off the postero-lateral angle of the genital aperture. Anal aperture is also large, each plate with two medially inserted setae. Three pairs of adanal setae are similarly short; setae ad₃ inserted lateral to the anal field; setae ad₂ and ad₁ post-anal in position. The adanal fissure is a narrow slit situated just off the antero-lateral angle of the anal aperture and aligned parallel to the rim of this aperture.

Legs: All tarsi are tridactylous and heterodactyle. The slender lateral claws are finely serrate on their upper (convex) edge. The chaetotaxy of the legs shows no special features; the tarsal setal formula I-IV is (16-13-13-12); the setation of tarsus I is shown in Fig. 4. On this tarsus, solenidion ω₁ is associated with, but not coupled to, seta f′', and is slightly shorter and more baculiform than ω₂. On tarsus II, solenidion ω₁ is free-standing and approximately the same length and form as the baculiform ω₂. Iteral setae are present on tarsus IV.

Tritonymph (Fig. 5 and 6).

Length: 473.0 μm; width: 302.5 μm.

The cuticle covering the hysterosoma is strongly pleated and a granular cerotegument is also present; granules are irregular in shape and size although they tend to be more uniform over the prodorsum.

Prodorsal and hysterosomal setae are short and spiniform, as in the adult. Lamellar setae inserted medially to a pair of sigmoid-shaped lamellar folds. Interlamellar setae inserted medially to the bothridia. Sensillus as in the adult.

There are fourteen pairs of hysterosomal setae and the notation applied to these (Fig. 5) follows that used for the notogastral setae of the adult.

Ventral setae are short and spiniform. Coxisternal setal formula: (3-1-2-2). In the specimen selected for drawing there are five short genital setae on one plate, four on the other; five pairs are typical.

All legs are monodactylous; chaetotaxy was not studied.
**Locality.**

The material was collected from shallow (about 3 cm deep) granite rock pools near the summit of Mt. Chudalup, 15 km south of Northcliffe, Western Australia (35°46' S, 116°05' E), by Dr. IAN BAYLY of Monash University. The type series is deposited in the British Museum (Natural History).

**Chudalupia** n. gen.

The following combination of characters will serve to define this new genus:

1. The tarsi are tridactylous.
2. The notogastral chaetotaxy of at least the adult and tritonymph is bideficient (i.e. 14 pairs of notogastral setae).
3. A lenticulus is present.
4. The dorso-sejugal arch is complete.
5. Sensillus is well developed in all stages.
6. Pedotecta are lacking.
7. Iteral setae are present on tarsus IV.
8. Coxisternal setal formula is (3-1-2-2).
9. Nymphs have a strongly pleated integument ('Nymphes plissées', sensu GRANDJEAN, 1953), but lack porose scerites.
DISCUSSION

Prior to the revision by Weigmann and Schulte (1977), the family Ameronothridae was generally considered to comprise the single genus *Ameronothrus*, the Podacaridae consisted of the genera *Podacarus, Alaskozetes, Halozetes, Antarctica* and *Pseudantarcticola*, while Engelbrecht (1975) created the family *Aquanothridae* to accommodate the single genus *Aquanothrus*. Weigmann and Schulte (loc. cit.) reviewed the diagnostic features of all of these genera and concluded that there was no 'decided gap' between the genera or groups of genera which would validate their placement into three distinct families. According to these authors, the pleated integument covering the hysterosoma in the immature stages is the most fundamental character which unites all of these genera into a single family, the Ameronothridae. According to this criterion, *Chudalupia* also belongs in this family.

Several of the generic characters listed above deserve further comment since they illustrate a further bridging of the 'gap' between ameronothroid genera. Firstly, although the bideficient character of the notogastral chaetotaxy is very unusual, it also occurs in some *Halozetes* species and in some individuals of the *Aquanothrus montanus* populations studied by Engelbrecht (loc. cit.). In *Aquanothrus*, as in *Chudalupia*, the missing setae belong to the ps series. In contrast, bideficiency in *Halozetes* is associated with the loss of the anterior setae $c_3$. Again, a lenticulus is present both in *Aquanothrus* and *Chudalupia*; a feature lacking in all of the other ameronothroid genera. However, in *Aquanothrus* the dorso-sejugal arch is incomplete, as it is in *Ameronothrus, Pseudantarcticola* and some *Halozetes* species, whereas this arch is complete in *Chudalupia*, as it is also in *Podacarus* and *Alaskozetes*. Both of these last-named genera, on the other hand, show coxisternal neotrichy or a (3-1-2-3) formula, in contrast to the (3-1-2-2) formula shown by *Chudalupia* (and also by *Ameronothrus* and *Aquanothrus*). The presence of iteral setae on tarsus IV in *Chudalupia* is also worthy of mention since the only other ameronothroid genus to retain these setae is *Ameronothrus*. Most species in the genus *Ameronothrus* lack pedotecta, a condition which they share with *Aquanothrus* and *Chudalupia*.

The similarities between *Chudalupia* and *Aquanothrus* (pattern of notogastral deficiency, coxisternal setal formula, presence of lenticulus, absence of pedotecta) are of considerable interest since the species on which these genera are based occur in remarkably similar, but geographically remote, habitats. *Aquanothrus montanus* is reported from the soil at the bottom of temporary 'natural aquaria' on the tops of two mountains in South Africa. It maintains a sub-aquatic existence when the pools are filled, crawling on the bottom, and it also survives in dry soil in dried up aquaria; it does not swim, apparently. According to Dr. Bayly (pers. comm.), 'Mt. Chudalup is more properly described as a granite hill, with an altitude of 185 m above sea level, which rises distinctly above the surrounding coastal plain. The pools are of a temporary nature, usually occurring in the winter from about May to September. They usually have a thin deposit of black organic detritus on the bottom, and it is with this that *Chudalupia meridionalis* appears to be associated'. Dr. Bayly further remarks that there is 'an interesting parallel between the distribution of *Aquanothrus* and *Chudalupia* and the primitive genus *Archaeochlus* Brundin (Diptera : Chironomidae). The latter is known from granite rock pools in Western Australia which are closely similar to those yielding *Chudalupia* and from temporary running waters on the Drakensberg Escarpment on the border of Basutoland and South Africa'.

The differences between *Chudalupia* and *Aquanothrus* are sufficient, however, to maintain
their separate identity as the generic level. These differences include those of leg chaetotaxy, form of the sensillus and the number of anal setae, in addition to those mentioned above. It also appears that some, at least, of the similarities between the two genera involve apomorphous (i.e. derived) characters which may have evolved independently in the two by virtue of their similar modes of life. Such apomorphous characters include the absence of pedotecta, notogastral bideficiency and the reduced coxisternal setal formula.

On the other hand, if it is accepted that the presence of a lenticulus is a plesiomorphous character (i.e. one from which a transformation starts in a monophyletic group (Hennig, 1950; Weigmann and Schulte, 1977)), then it may be argued that Chudalupia and Aquanothrus could be descendants of a common ancestral stock. Such a stock possibly existed on Gondwanaland and became divided as the continents drifted apart. Geographical isolation would then result in the evolutionary divergence of South African and Australian populations to the point where, today, it has achieved generic significance. This possibility supports the arguments advanced by Hammer and Wallwork (1979) in interpreting distribution patterns of cryptostigmatid mites in relation to continental drift.

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