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DESCRIPTION OF A NEW SPECIES
OF THE AGAUOPSIS HIRSUTA - GROUP
FROM AUSTRALIA (ACARINA : HALACARIDAE).

BY J. C. OTTO *

TAXONOMY
HALACARIDAE
AUSTRALIA

ABSTRACT: Agauopsis warringa, a new species of the Agauopsis hirsuta-group, is
described from Australia. Records of Agauopsis hirsuta (Trouessart) from Western
Australia refer to an undescribed species.

TAXONOMIE
HALACARIDAE
AUSTRALIEN

ZUSAMMENFASSUNG: Von Australien wird Agauopsis warringa, eine neue Art der
'Agauopsis hirsuta'-Gruppe, beschrieben. Bei der bisher von Westaustralien gemelde-
ten A. hirsuta handelt es sich um eine unbeschriebene Art.

TAXONOMIE
HALACARIDAE
AUSTRALIE

RÉSUMÉ: Une espèce nouvelle du groupe Agauopsis hirsuta, Agauopsis warringa n. sp.
est décrite d'Australie. Les relevés d'A. hirsuta (Trouessart) en Australie occidentale
se rapportent à une espèce non décrite

INTRODUCTION

The 'hirsuta'-group within the genus Agauopsis as
defined by BARTSCH (1986) previously consisted of
1 species only, Agauopsis hirsuta (Trouessart, 1889).
VIETS (1940) gave a detailed redescription of A.
hirsuta based on specimens collected in the Adriatic
sea near Split (Yugoslavia), and CHAPMAN (1955)
recorded it from the Azores. LOHMANN (1893, 1909)
recorded A. hirsuta from Sydney (southeastern
Australia) and Champion Bay, near Geraldton
(Western Australia). BARTSCH (1986) questioned
the identity of the Australian specimens and sug-
gested that they may belong to a different species.

The present author compared specimens collec-
ted in southeastern Australia and Western Austra-
lia with the type specimen of A. hirsuta and with A.
hirsuta specimens collected by VIETS (1940) in the
Adriatic.

METHODS

Specimens were cleared in Nesbitt's solution and
mounted in Hoyer's medium. A few specimens were
prepared for scanning electron microscopy. These
were dehydrated through a graded alcohol series
and transferred to amylacetate and critical point
dried using carbon dioxide. The specimens were
mounted, sputter coated with gold and examined in
a JEOL JS 14-35 or JSM-6400 scanning electron
microscope.

Measurements are given in micrometers. Measure-
ments refer to the median length of a structure
and its width at the widest point. Measurements of
the anterodorsal plate include the anterior nose-like
projection. Measurements of the gnathosoma do
not include palps or chelicerae. Counts and measu-
rements usually are expressed as ranges, followed
by the number of cases involved (in brackets). The
terms anterior, posterior for position of setae on

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appendages are used as in Newell (1971). Terminology follows Green and Macquitty (1987). Drawings were made with the aid of a camera lucida. Each scale bar in the drawings represents 100 μm unless stated otherwise. Palp-1, Palp-2, Palp-3, Palp-4, segments of palps designated from base of palp; ds, dorsal setae numbered in sequence as ds-1 to ds-5 from anterior to posterior (not including dorsal epimeral setae); ANIC, Australian National Insect Collection.

Genus Agaupopsis Viets

Type species: Agaupe brevipalpus Trouessart, 1889 — by original designation.

Agaupopsis warringa n. sp. (fig. 1-14)

Male

Idiosoma. Length 672-705, width 462-584 (n = 6). Outline of body and plates as illustrated in figs. 1, 2.

Dorsum. Plates separated by large bands of striated integument. Anterodorsal plate 242-263 long (n = 5) and 166-187 wide (n = 4), slightly concave posteriorly and with a blunt nose-like projection anteriorly (fig. 3); covered with minute hairs (fig. 5); posterior half of plate covered with small pore-like marks; with 1 pair of dorsal setae ds-1 and 1 pair of small pores in the anterior half. High magnification (1250x) and oil immersion reveal a cone-like structure inside these pores (fig. 6). Ocular plates 131-158 long (n = 4) and 59-87 wide (n = 4), each with 2 corneae in the outer anterior corner of the plate; covered with small pore-like marks except around corneae; posterior to the corneae are 2 pairs of pores, the anterior of which contains a small cone-like process (only visible in high magnification and oil immersion). Posteriorodorsal plate 250-303 long and 158-187 wide (n = 5), covered with small pore-like marks except along the median axis; posteriorly forming a keel-shaped ridge that can best be observed in specimens that are slightly compressed; with a pair of small setae in posterior half of the plate. Setae ds-2, ds-3 and ds-4 situated in striated cuticle. Setae ds-2 123-142 long (n = 5), situated anteromedial to ocular plate. Setae ds-3 and ds-4 similar in length. Setae ds-3 inserted between the ocular plates, setae ds-4 inserted anterolaterally to posterodorsal plate. A pair of anal setae is present dorsally on base of anal papilla but usually is obscured by the posterodorsal plate.

Posterior epimeral plates with 1 pair of dorsal setae.

Venter. Anterior epimeral plate with 3 pairs of setae and 1 pair of epimeral pores between epimeres I and II. A pore-like structure is situated in the centre of a triangle formed by the three ventral setae on each side of the anterior epimeral plate. Posterior epimeral plates ventrally with 3 pairs of setae. A group of pore-like marks is situated in striated integument between anterior and posterior epimeral plates. Genitoanal plate with 2 circles of perigenital setae. The outer circle consists of 31-41, the inner circle is less dense in the posterior half and consists of 15-21 setae (both n = 12). The total number of perigenital setae is 47-52 (n = 12). Setae of the inner circle are shorter than those of the outer circle (fig. 4). A further pair of setae is situated closer to the margin of the plate than to the genital opening. Genital opening 92 long (n = 3) and situated in the centre of the genitoanal plate. Genital valves with 1 pair of stout subgenital setae (in one specimen 3) and with 10-13 (n = 12) smaller subgenital setae (fig. 4).

Gnathosoma. Length 224-245, width 121-158 (n = 4). Small proto- and deutorostral setae and heavier tritostral setae situated near tip of rostrum. One pair of slender basirostral setae situated at level of palp insertions (fig. 7). Pharyngeal plate with a characteristic pattern shown in fig. 8. Palp 4-segmented. Palp-2 with 1 slender seta, Palp-3 with an anteroventrally directed spiniform seta bearing small denticles distally. Palp-4 with 5 setae, of which the 2 at the tip are eupathidia (fig. 9).

Legs. Leg I thickened and armoured with heavy spiniform setae, carrying small denticles on their distal ends (fig. 10a). Chaetotaxy of legs as summarized in table 1 and shown in fig. 10a-d. The
1. — Dorsum. 2. — Venter (specimen is twisted). 3. — Anterior part of anterodorsal plate. 4. — Genital opening

Fig. 1-4: Agawgatis warringa n. sp., male
FIG. 5-6: *Agawopsis warringa* n. sp., male

5. — Anterodorsal plate. 6. — Pore on anterodorsal plate
Table 1. Chaetotaxy of legs of males. Tarsal counts do not include solenidia and parambulacral setae. Number of cases shown in brackets. Number of heavy spiniform setae typical for leg I in Roman Numerals; ‘ = spiniform setae bearing small teeth on leg II-IV.

<table>
<thead>
<tr>
<th>Leg</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trochanter</td>
<td>1(25)</td>
<td>1(19)</td>
<td>3(13)</td>
<td>3(8)</td>
</tr>
<tr>
<td>Basifemur</td>
<td>3(21)</td>
<td>4(18)</td>
<td>2(14)</td>
<td>2(10)</td>
</tr>
<tr>
<td></td>
<td>4(1)</td>
<td>3(2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telofemur</td>
<td>5+III(16)</td>
<td>7(18)</td>
<td>5(13)</td>
<td>5(9)</td>
</tr>
<tr>
<td></td>
<td>6+III(5)</td>
<td>8(1)</td>
<td></td>
<td>6(1)</td>
</tr>
<tr>
<td></td>
<td>5+IV(2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genu</td>
<td>7+II(13)</td>
<td>6(12)</td>
<td>6(8)</td>
<td>5(4)</td>
</tr>
<tr>
<td></td>
<td>6+II(5)</td>
<td>7(7)</td>
<td>5(3)</td>
<td>6(9)</td>
</tr>
<tr>
<td></td>
<td>5+II(1)</td>
<td>4(2)</td>
<td>4(1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3(1)</td>
<td>7(1)</td>
<td></td>
</tr>
<tr>
<td>Tibia</td>
<td>8+III(18)</td>
<td>7+3'(9)</td>
<td>6+3'(4)</td>
<td>6+2'(2)</td>
</tr>
<tr>
<td></td>
<td>7+II(3)</td>
<td>6+3'(2)</td>
<td>7+1'(2)</td>
<td>7+2'(1)</td>
</tr>
<tr>
<td></td>
<td>6+III(1)</td>
<td>8+3'(7)</td>
<td>7+2'(3)</td>
<td>5+3'(3)</td>
</tr>
<tr>
<td></td>
<td>7+II(1)</td>
<td></td>
<td>7+3'(2)</td>
<td>6+3'(2)</td>
</tr>
<tr>
<td>Tarsus</td>
<td>7+I(17)</td>
<td>6(17)</td>
<td>5(12)</td>
<td>5(3)</td>
</tr>
<tr>
<td></td>
<td>8(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chaetotaxy of legs varies within the species (see table 1). Only trochanters I and II, basifemora III and IV, telofemur III and tarsi II-IV show a constant number of setae. Tibiae II-III all carry 1 or more spiniform setae with small teeth along most of their length (fig. 11). All tarsi with 2 lateral claws and 1 median claw. Lateral claws with a double row of small denticles, median claw with a conspicuous additional hook (fig. 12). Tarsi I and II each with 4 eupathidia and 1 solenidion, tarsi III and IV each with 2 eupathidia. All legs are covered with small setae similar to those of the anterodorsal plate, especially on trochanters and genua.

**FEMALE**

Similar to male except the following characters:

*Idiosoma.* Length 567-756, width 470-592 (n = 2).

*Dorsum.* Anterodorsal plate 256 long and 174 wide (n = 1). Posterodorsal plate 269 long and 187 wide (n = 1). Ocular plates 131 long and 67 wide (n = 1).

*Venter.* Genital opening 104-138 long (n = 2) and surrounded by 11 setae (n = 2) (fig. 13). At least 6 subgenital are present on genital valves. In the only specimen suitable for examination a further 4 setal insertion points were visible (fig. 13) and 10 setae may be present normally. Internal genitalia with 2 heavy spiniform endogenous setae, 3 pairs of acetabula and 2 pairs of distally divided endogenous setae close to the genital valves (fig. 14). More such endogenous setae are present internally but their number could not be confidently determined.

*Gnathosoma.* Length 199-258, width 110-166 (n = 2). Morphology and chaetotaxy similar to male.

*Legs.* Chaetotaxy as summarized in table 2. From the small number of specimens examined it is uncertain whether differences between male and female chaetotaxy are sexual differences or part of the intrasexual variability.

**LARVA**

Similar to the female except the following characters:

*Idiosoma.* Length 344-374, width 269-290 (n = 3).

Table 2 : Chaetotaxy of legs of females. Notation as in table 1.

<table>
<thead>
<tr>
<th>Leg</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
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<td>1(4)</td>
<td>1(3)</td>
<td>3(3)</td>
<td>3(2)</td>
</tr>
<tr>
<td>Basifemur</td>
<td>3(4)</td>
<td>4(4)</td>
<td>2(4)</td>
<td>2(3)</td>
</tr>
<tr>
<td>Telofemur</td>
<td>5+III(3)</td>
<td>7(3)</td>
<td>5(3)</td>
<td>5(3)</td>
</tr>
<tr>
<td></td>
<td>3+II(1)</td>
<td>6(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genu</td>
<td>6+II(3)</td>
<td>6(2)</td>
<td>4(2)</td>
<td>4(2)</td>
</tr>
<tr>
<td></td>
<td>3+II(1)</td>
<td>7(1)</td>
<td>5(1)</td>
<td>5(1)</td>
</tr>
<tr>
<td>Tibia</td>
<td>8+III(3)</td>
<td>7+3'(2)</td>
<td>7+2'(2)</td>
<td>5+3'(1)</td>
</tr>
<tr>
<td></td>
<td>6+III(1)</td>
<td>6+2'(2)</td>
<td>7+2'(1)</td>
<td></td>
</tr>
<tr>
<td>Tarsus</td>
<td>7+I(2)</td>
<td>6(3)</td>
<td>5(4)</td>
<td>3(1)</td>
</tr>
<tr>
<td></td>
<td>8(1)</td>
<td></td>
<td>5(2)</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 7-9: *Agauopsis warringa* n. sp., male
7. — Ventral view of gnathosoma. 8. — Pharyngeal plate. 9. — Dorsal view of palp
Legs. All legs with only 5 free leg segments. Chaetotaxy of legs as in table 3. All tarsi with 2 tapering parambulacral setae, tarsi I and II with one solenidion.

<table>
<thead>
<tr>
<th>Table 3: Chaetotaxy of larvae. Parambulacral setae and solenidia are not included in counts. Notation as in table 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg</td>
</tr>
<tr>
<td>Trochanter</td>
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<tr>
<td>Femur</td>
</tr>
<tr>
<td>Genu</td>
</tr>
<tr>
<td>Tibia</td>
</tr>
<tr>
<td>Tarsus</td>
</tr>
</tbody>
</table>

Protonymph

Similar to female except in the following features:

Idiosoma. Length 399-546, width 269-454 (n = 4).

Dorsum. Anterodorsal plate 155-168 long (n = 4) and 91-109 wide (n = 3). Posterodorsal plate 114-146 long (n = 3) and 64-79 wide (n = 3). Setae ds-2 97-116 long (n = 4).

Venter. Genitoanal plate small, 24-27 long and 27 wide (n = 2), bearing 1 pair of internal acetabula.

Gnathosoma. Length 150-151, width at base 99 (n = 2).

Legs. Chaetotaxy as shown in table 4. Tarsi I and II each with 2 pairs of parambulacral setae. The inner seta of each pair shorter than the other one longer. Tarsi I and II with 1 solenidion. Tarsi III and IV each with 1 pair of parambulacral setae. All parambulacral setae tapering. Leg IV with 5 free segments.

Deutonymph

Similar to female except the following characters:

Idiosoma. Length 487-647, width 361-580 (n = 2).


<table>
<thead>
<tr>
<th>Table 4: Chaetotaxy of protonymphs. Notation as in table 1.</th>
</tr>
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<tbody>
<tr>
<td>Leg</td>
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<tr>
<td>Trochanter</td>
</tr>
<tr>
<td>Basifemur</td>
</tr>
<tr>
<td>2(1)</td>
</tr>
<tr>
<td>Telofemur</td>
</tr>
<tr>
<td>Genu</td>
</tr>
<tr>
<td>2+II(2)</td>
</tr>
<tr>
<td>1+II(1)</td>
</tr>
<tr>
<td>Tibia</td>
</tr>
<tr>
<td>Tarsus</td>
</tr>
</tbody>
</table>

Venter. Genitoanal plate 47-59 long and 45-50 wide (n = 2), all but 1 specimen bearing 2 pairs of setae and 2 pairs of genital acetabula, in one specimen 3 pairs of setae were present.

Gnathosoma. Length 176, width at base 130 (n = 1).

Legs. Chaetotaxy as in table 5. Tarsi I and II with 2 pairs of parambulacral setae. One seta in each pair is long, the other one short. Tarsi I and II each with 1 solenidion.

<table>
<thead>
<tr>
<th>Table 5: Chaetotaxy of deutonymph. Notation as in table 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg</td>
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<tr>
<td>Trochanter</td>
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<tr>
<td>Basifemur</td>
</tr>
<tr>
<td>Telofemur</td>
</tr>
<tr>
<td>5+III(1)</td>
</tr>
<tr>
<td>Genu</td>
</tr>
<tr>
<td>Tibia</td>
</tr>
<tr>
<td>7+2'(2)</td>
</tr>
<tr>
<td>Tarsus</td>
</tr>
</tbody>
</table>

Type series


All type specimens are deposited in ANIC, Canberra (Australia).
Fig. 10: Agawopsis warringa n. sp. male legs

a. — Leg I dorsal. b. — leg II posterior. c. — leg III anterior. d. — leg IV anterior
Biology and Behaviour

*Agauopsis warringa* n. sp. was only found in coralline algae and was most common on a nearly vertical wall exposed to moderate wave action. This species possesses 2 nymphal stages like all other species of the genus for which the nymphal stages are known. Samples collected in May were dominated by older stages, such as adults and deutonymphs, whereas January samples contained mostly larvae and protonymphs. Similar observations were made by Bartsch on Rottnest Island (Western Australia) who found 2 adult specimens in January samples, which were dominated by juvenile stages.
This suggests an univoltine life cycle which is usually the case in halacarids (BARTSCH, 1989). The adult mites found in January therefore probably are survivors from the last generation.

The mites moved extremely slowly and were densely covered with detritus when collected, probably due to a cover of fine hairs as described above. One individual was seen preying on another Halacarid, probably a Copidognathus species.

**DISCUSSION**

The ‘hirsuta’ — group (see BARTSCH, 1986) is characterized by the following combination of characters: relatively small dorsal plates which are separated by large bands of striated integument, 1 spine on P-3, 3 setae on P-4, 1 ventral and 2 anteroventral (ventromedial in BARTSCH, 1986) spines on telofemur and tibia I, 1-2 parambulacral setae anteriorly (medially in BARTSCH, 1986) and 1-2 parambulacral setae posteriorly (laterally in BARTSCH, 1986) on tarsus II and 3 dorsal setae on tarsus III. The species here described is easily recognized as a species of the ‘hirsuta’ — group on the basis of these characters. Members of that group appear to be larger than other species of Agauopsis, with remarkably long dorsal setae.

In addition to the specimens of *A. warringa* described above I have also examined the following specimens in the *A. hirsuta*-group:

1. *Agauopsis hirsuta* Trouessart, deutonymph (holotype, sur la mousse de Corse (*Gigartina helminthocorton*) (Museum National d'Histoire Naturelle Paris, specimen number 18A13); 2 females, 1 male, 2 nymphs, Split, 6-viii-1934, K. VIETS coll. (Zoologisches Institut und Museum der Universität Hamburg, micro-slide nr. 5525);
2. One male, Champion Bay, near Geraldton, Western Australia, 12-vii-1905, identified by LOHMANN (1909) as *A. hirsuta*;
3. *Agauopsis* sp., 1 female, 1 male, Western Australia, Rottnest Island, Bickley Point, on seagrass *Amphibolis antarctica*, depth 1.5-2 m, 18-i-1991, I. BARTSCH coll.

*A. warringa* n. sp. differs from *Agauopsis hirsuta* (Trouessart) by possessing a heavier additional hook on each middle claw (figs. 12, 15). The anterior margin of the anterodorsal shield in *A. hirsuta* is triangular (fig. 16), whereas in *A. warringa* it is fairly straight (figs. 3, 5). The nose-like projection in *A. warringa* therefore appears to be relatively shorter in *A. warringa* than in *A. hirsuta*. These differences apply to the deutonymphal type specimens of *A. hirsuta* as well as to the adult specimens of *A. hirsuta* collected by VIETS in the Adriatic. VIETS redescribed *A. hirsuta* on the basis of his specimens collected near Split. He stated, that the median claw in *A. hirsuta* is unidentate, lacking an additional hook. This however is incorrect. His specimens as well as the type specimen possess a small hook on each median claw.

The specimen collected by LOHMANN (1909) at Champion Bay, near Geraldton (Western Australia) differs from *A. hirsuta* in the same characters as *A. warringa*. It differs from *A. warringa* in the morphology of the claws and the relative length of the rostrum and belongs to another yet undescribed species. However, a description cannot be given on the basis of that specimen and has to await further collections.

The author has also examined 2 specimens from Rottnest Island, near Perth (southwest Western Australia) which belong to that species group. These specimens can clearly be assigned to the ‘*A. hirsuta*-group but due to their bad condition they cannot be further identified.

LOHMANN (1893, 1909) recorded *A. hirsuta* from Sydney (southeastern Australia). Apparently no specimens collected by LOHMANN at that locality exist and LOHMANN gave neither a description nor collecting data for these specimens. Since *Agauopsis warringa* is found on the southeastern Australian coast the species collected by LOHMANN is also believed to be *A. warringa*.

*A. hirsuta* therefore does not seem to occur in Australia. Its distribution is smaller than previously thought, since confirmed records are restricted to the northern hemisphere. Other halacarids originally described from Europe and also recorded...
from Australia are Agauopsis microrhyncha (Trouessart), Agauopsis brevipalpus (Trouessart) and Agae chevreuxi Trouessart (Lohmann, 1893). It is possible that these specimens too are not conspecific with their European types.

ACKNOWLEDGEMENTS

I would like to thank Dr. M. NAUDO for the loan of the type specimen of Agauopsis hirsuta and Dr. I. BARTSCH, Dr. G. RACK and Dr. H. DASTYCH for the loan of the other European and the Australian specimens. Many thanks also to Dr. R. B. HALIDAY and Dr. I. BARTSCH for refereeing the manuscript and to the CSIRO for the use of their facilities. The assistance of Mrs. H. GEIER and Mr. C. D. BEATON with the SEM pictures was very much appreciated.

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