



***Bradyagaue* from Western Australia, description of a new species (Acari, Halacaridae)**

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Abstract: *Bradyagaue exilis* sp. nov., from southwestern Australia, is described. This is the second *Bradyagaue* species from Western Australia.

Résumé : *Bradyagaue de l'Australie du sud-ouest, description d'une nouvelle espèce (Acari, Halacaridae). Bradyagaue exilis* sp. nov., une espèce de l'Australie du sud-ouest, est décrite. C'est la deuxième espèce du genre *Bradyagaue* d'Australie Occidentale.

Keywords: south-western Australia, Halacaridae, *Bradyagaue*, new species, description.

Introduction

A century ago, Trouessart (1902) published a description of a species (*Leptospathis alberti*) characterized by long, cylindrical leg segments and the prominently curved tarsi (especially tarsus IV) ending with a very strong and bidentate median claw. The species was collected off Spitsbergen (Svalbard), at 430 m depth. Soon, similar looking specimens were found amongst material from Antarctica, *Halacarus (Polymela) drygalskii* Lohmann, 1907 and *Leptospathis alberti antarctica* Trouessart, 1907 (Lohmann, 1907; Trouessart, 1907). In 1971, Newell established the genus *Bradyagaue* for *Agauae drygalskii* and its congeners. Since those first descriptions, numerous species and records of this genus have been published, from

polar, cold and warm temperate areas, from shallow water and the deep sea.

Material and methods

In the course of an International Marine Biological Workshop, held in Esperance, Western Australia, the author collected halacarid mites in tidal and subtidal habitats.

The mites were cleared in lactic acid and mounted in glycerine jelly. The holotype female and paratype larva are deposited in the Western Australian Museum, Perth (WAM).

Abbreviations used in the descriptions: AD, anterior dorsal plate; AE, anterior epimeral plate; ds-1 to ds-6, first to sixth pair of dorsal setae from anterior backward; GA, genitoanal plate; GO, genital opening; OC, ocular plate(s); P-2, P-3 and P-4, second, third and fourth palpal segment; pas, parambulacral seta(e); PD, posterior dorsal plate; PE, posterior epimeral plate(s); pgs, perigenital setae. Epimera,

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legs and their segments are numbered from I to IV; the leg segments are trochanter, basifemur, telofemur, genu, tibia, and tarsus.

Systematics

Genus *Bradyagaue* Newell, 1971

Diagnosis

Idiosoma elongate, length about twice the width. Dorsal and ventral plates large, with cerotegumental layers. AD, OC and PD each with a pair of gland pores. Adanal setae on anal plate. AE with three pairs of ventral setae. PE with three ventral setae, two or three dorsal setae (rarely one seta) anterior to leg III and two setae anterior to leg IV. Opposing margins of PE often straight and approaching in the median. Female GA with 5–12 pairs of pgs; subgenital setae lacking. Male GA with more than 100 pgs arranged in a dense ring around GO; genital sclerites with five pairs of spur- or stump-like subgenital setae. Rostrum parallel-sided, very slender, generally longer than gnathosomal base. One pair of maxillary setae on gnathosomal base, one pair in basal part of rostrum; the four setae inserted close together. P-2 with one distal seta, P-3 without or with one small seta, P-4 with three basal setae. Genua of legs shorter than adjoining segments. Telofemora, genua and tibiae often with cerotegument. Tibia I with two or three pairs of bristle-like ventral setae; tibia II–IV with 4–5, 3–4, 3–4 ventral setae, these setae neither spiniform nor bipectinate. Tibiae and genua III and IV in general with setigerous processes. Tarsi III and IV slightly curved. Tarsus I with dorsolateral solenidion, tarsus II with dorsomedial one. Tarsi I to IV with 1, 0–1, 0, 0 ventral setae (without eupathidia) and 3, 3, 3, 3 dorsal setae. All tarsi with massive, bidentate median claw. Paired claws longer but generally more slender than median claw and with accessory process and pecten.

Type species. *Bradyagaue drygalskii* (Lohmann, 1907).

Bradyagaue exilis sp. nov.

Figures 1-17

Material examined

Holotype female, WAM N° T56791. Australia, Western Australia, Esperance Bay, 33.84°S, 121.93°E, 10.9 m depth, from *Scaberia agardhii* Greville (Phaeophyta); coll. I. Bartsch, 11 February 2003.

Paratype: One larva, WAM N° T56792; same collection data.

Etymology

From 'exilis' (Latin), slender.

Diagnosis

Idiosoma slender. Cerotegumental layer present though not conspicuous and not lamelliform. AD, OC and PD almost

similar in length. AD extending anteriorly beyond camerostome; its posterior margin truncate. Epimera III with pair of adjunct setae anterior to leg III. Anterior margin of female GA rounded, only slightly extending beyond GO. Gnathosoma small. Genua and tibiae III and IV with setigerous processes. Leg chaetotaxy: leg I, 1, 2–3, 6, 5, 8, 4; leg II, 1, 2, 5, 4, 8, 3; leg III, 2, 2, 4, 4, 7, 3; leg IV, 1, 2, 4, 4, 7, 3. Telofemora and genua with pads of cerotegumental villi.

Description

Female

Idiosoma slender, length 730 µm, width 310 µm. Plates with thin and smooth cerotegumental layer; thickest layers in anterior and posterior end of idiosoma. Cerotegument slightly brown. Major parts of dorsal plates pierced by numerous canaliculi (Fig. 1). Integument between plates densely striated. Striated integument in general without cerotegument except within two marginal pairs or areolae, one medial to posterior margin of AD, the other medial to anterior part of PE. Length of AD 209 µm, width 192 µm; its oviform anterior part extending beyond camerostome. First pair of gland pores near lateral margin at level of insertion of leg I. Length of OC 195 µm, width 135 µm; with gland pore near lateral margin, at about 0.51 relative to length of plate. No corneae present. Length of PD 275 µm, width 195 µm; not extending anteriorly beyond posterior corner of OC. With single pair of gland pores close to posterior margin. Dorsal setae small; ds-1 immediately medial to first pair of gland pores; ds-2 in striated integument just anterior to OC, ds-3 on OC; ds-4 within striated integument between OC and PD; ds-5 on PD level with insertion of leg IV; ds-6 on anal plate in ventral position.

Shortest distance between insertion of leg II and III slightly less than width of idiosoma (Fig. 2). Ventral plates almost smooth, with thin cerotegumental layer. Length of AE 145 µm, width 272 µm, with crescent internal markings from muscle strings in midline. Length of PE 350 µm, included anterior cerotegumental area; medial margin truncate. PE with eight setae, a dorsal and two ventromarginal setae anterior to insertion of leg III, two ventral setae close to truncate medial margin, and one ventral and two dorsal setae close to insertion of leg IV. Length of GA 145 µm, width 135 µm. Plate with five pairs of pgs, two pairs along truncate anterior margin, two pairs lateral to GO and one pair posterior to GO. Length of GO 60 µm; genital sclerites without subgenital setae. Ovipositor extending to level of insertion of leg III. GO with three pairs of large internal genital acetabula.

Gnathosoma small, length 147 µm, width 76 µm, and 0.20 of idiosomal length. Pharyngeal plate large. Rostrum slender, length 82 µm, width 12 µm. Both pairs of maxillary setae close together near base of rostrum; basal pair of setae longer and stronger than apical pair (Fig. 3). P-2 with long

dorsal seta. P-3 without seta. P-4 with three setae in basal whorl; apically with three spurs and one wide setula (Fig. 4).

Legs shorter than idiosoma; legs III and IV longer than legs I and II (Figs 7–10). Tarsus I shorter than tibia I, tarsi III and IV slightly longer than these legs' tibiae. Tarsi with small fossa membranes. Tarsi II to IV slightly curved; base of tarsi III and IV narrow, then height of segment increased. Telofemora and genua of all legs and tibia I with ventral pads of cerotegumental villi (Figs 9, 11); basifemora with scattered villi and filaments. Cerotegument on dorsal, lateral and marginal flank smooth. Telofemora III and IV and genua and tibiae II to IV with setigerous processes. Leg chaetotaxy (solenidia, pas and further eupathid setae omitted), leg I, 1, 2–3, 6, 5, 8, 4; leg II, 1, 2, 5, 4, 8, 3; leg III, 2, 2, 4, 4, 7, 2–3; leg IV, 1, 2, 4, 4–5, 7, 3. Tibia I with two pairs of ventral setae; tibia II with four ventral setae, two of them paired; tibiae III and IV with the four setae in line, inserted on setigerous processes. Tarsus I with tubiform solenidion (Fig. 5) and adjacent small lamella (famulus) in lateral position, one ventral seta, and four pairs of eupathid pas. Tarsus II with similar shaped solenidion in medial position (Fig. 6), a pair of eupathid pas and a single eupathid ventral seta. On one of tarsi III basal fossary seta absent. Tarsi III and IV each with pair of single pas.

Median claw increasing in size from tarsus I to III; claws of tarsi III and IV similar in size. Paired claws slender, long, with numerous tines.

Larva

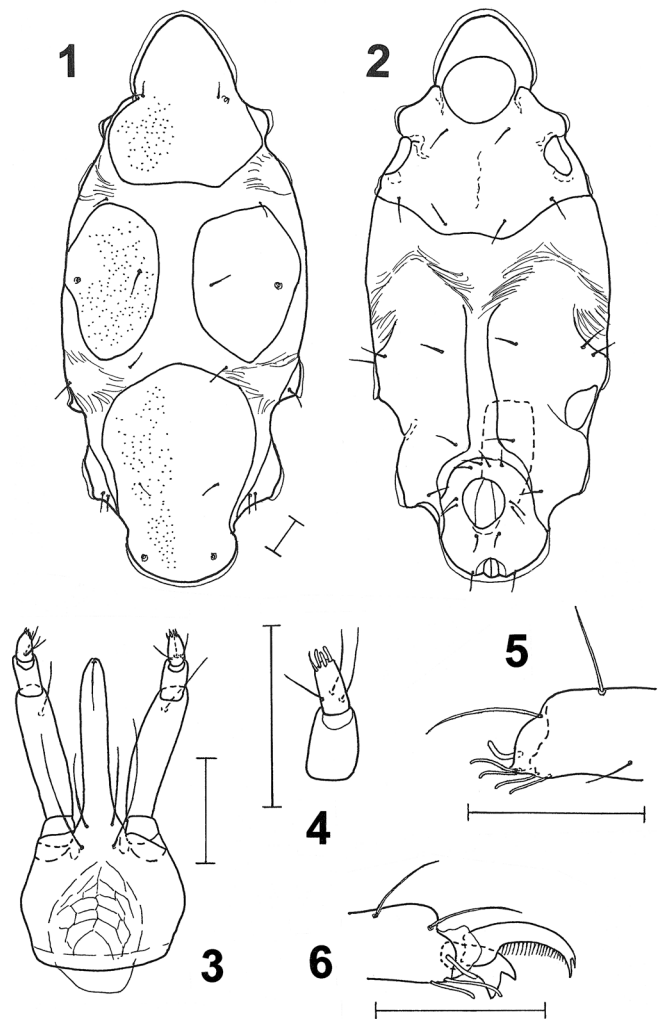
Idiosoma slender, length 340 μm , width 122 μm . Plates almost smooth. Cerotegument faintly developed. Anterior margin of AD truncate (Fig. 12), not extending beyond camerostome. OC short, about as long as wide. PD short. Pair of ds-1 on AD; ds-3 in margin of OC, ds-2, ds-4 and ds-5 within striated integument. AE with two pairs of setae (Fig. 13) and a pair of small epimeral pores (Fig. 14). PE close to end of idiosoma, in the larva at hand distance between insertions of legs II and III equalling 1.8 times width of idiosoma. PE with a single seta.

Gnathosoma 77 μm long which equals 0.23 of idiosomal length; shape and setation of rostrum and palps same as in female.

Legs five-segmented; basi- and telofemora fused (Figs 15–17). Leg chaetotaxy (solenidia and pas omitted): leg I, 1, 1+2, 4, 5, 4; leg II, 1, 1+3, 4, 5, 3; leg III, 1, 1+2, 3, 5, 3. Genua and tibiae II and III with setigerous processes. Telofemora with small areolae with delicate cerotegumental villi. Tarsi II and III curved. Tarsus I with one ventral seta, apex with pair of doubled pas. Tarsi II and III with pair of pas singlets. Else tarsi similar to those of female.

Remarks

Bradyagaue exilis is the second representative of the genus *Bradyagaue* in Australia, the other one, *B. scutella* Bartsch,



Figures 1-6. *Bradyagaue exilis* sp. nov., female.

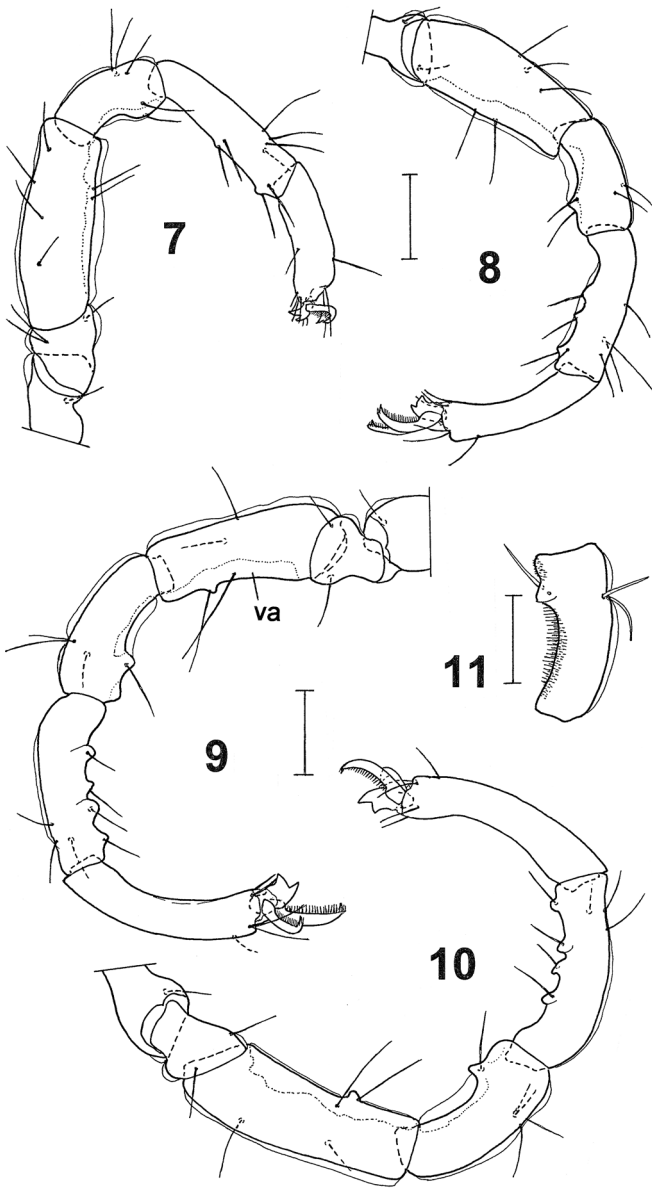
1. Idiosoma, dorsal; 2. idiosoma, ventral; 3. gnathosoma, ventral; 4. P-3 and P-4, ventral; 5. tip of tarsus I, lateral (medial setae omitted); 6. tip of tarsus II, medial (lateral setae, pas and claw omitted). Scale bar = 50 μm .

Figures 1-6. *Bradyagaue exilis* sp. nov., femelle.

1. Idiosome, vue dorsale ; 2. idiosome, vue ventrale ; 3. gnathosome, vue ventrale ; 4. P-3 et P-4, vue ventrale ; 5. extrémité du tarse I, vue postérieure (sans les soies et la griffe antérieures) ; 6. extrémité du tarse II, vue antérieure (sans les soies et la griffe postérieures). Echelle = 50 μm .

1992, was extracted from the epiflora and -fauna of the seagrass *Amphibolis*, from Rottneest Island, Perth (Bartsch, 1992).

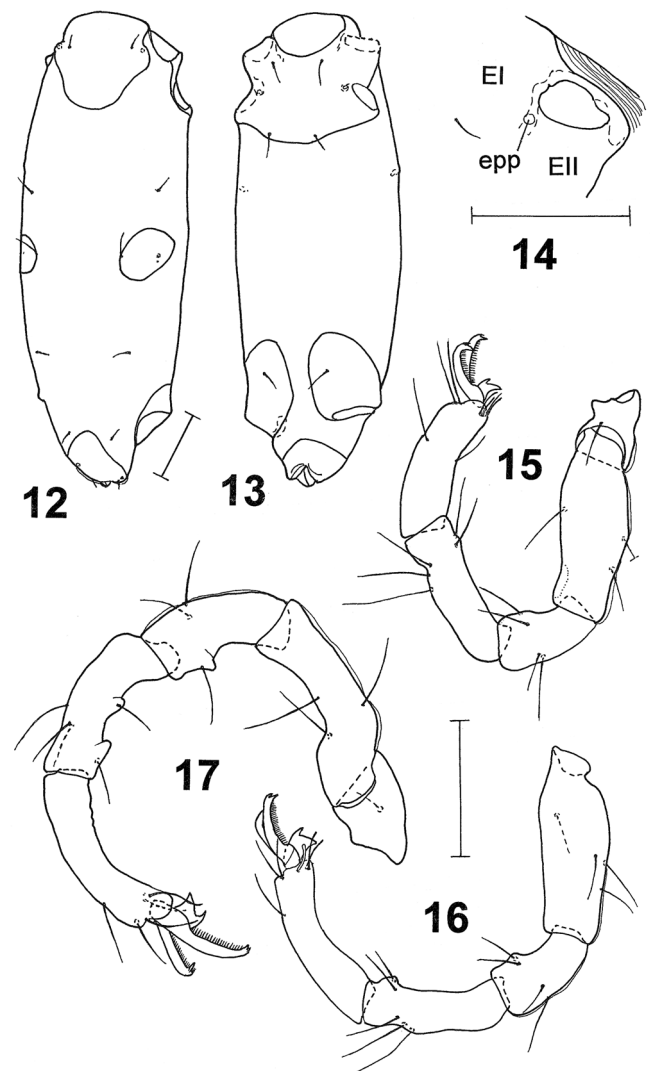
Characters which can be used to distinguish between adults of the species *B. exilis* and *B. scutella* are: (1) posterior margin of AD: truncate vs rounded; (2) cornea on OC: absent vs present; (3) cerotegument on striated dorsal integument: two marginal pairs of cerotegumental plates vs a single median plate; (4) number of pgs in females: 10 vs



Figures 7-11. *Bradyagaue exilis* sp. nov., female,
7. Leg I, medial; 8. basifemur to tarsus II, medial; 9. leg III,
medial; 10. leg IV, medial; 11. genu IV, medial. Scale bar = 50 μ m
(va, area with villose cerotegument).

Figures 7-11. *Bradyagaue exilis* sp. nov., femelle,
7. Patte I, vue antérieure ; 8. basifémur à tarse II, vue antérieure ; 9. patte III, vue postérieure ; 10. patte IV, vue postérieure ; 11. genou IV, vue postérieure. Echelle = 50 μ m (va, zone avec cérotégument velu).

13; (5) shape of anterior margin of female GA: arched vs triangular; (6) length of P-2: hardly longer than gnathosomal base vs more than twice its length. In both species, the legs bear pads with cerotegumental villi. Larvae of *B. exilis* can be separated from *B. scutella* on the base of its shorter P-2.



Figures 12-17. *Bradyagaue exilis* sp. nov., larva
12. Idiosoma, dorsal; 13. idiosoma, ventral; 14. epimeral plates
I and II, ventral; 15. leg I, medial; 16. femur to tarsus II, medial;
17. leg III, medial. Scale bar = 50 μ m (epp, epimeral pore; EI, EII,
epimera I and II).

Figures 12-17. *Bradyagaue exilis* sp. nov., larve
12. Idiosome, vue dorsale ; 13. idiosome, vue ventrale ; 14. plaques épimèrales I et II ; 15. patte I, vue antérieure ; 16. fémur à tarse II, vue antérieure ; 17. patte III, vue postérieure. Echelle = 50 μ m (epp, pore épimèral ; EI, EII, plaques épimèrales I et II).

An obvious character of *Bradyagaue exilis*, discernible also at low magnification, is the prolonged anterior idiosoma, distinctly extending beyond the camerostome. A similarly shaped anterior idiosoma is present in *B. scutella* and *B. medialis* Newell, 1984. In the two latter species the ds-3 are within the striated integument whereas in *B. exilis* the ds-3 are on the OC. Records of *B. medialis* are from the southeastern Africa (Newell, 1984).

Ontogenetic development

When describing halacarid species, characters of juveniles often have been outlined, too (Bartsch, 1972, 1996, 2001; Abé, 1990, 1996; Otto, 1993), and in recent years, development of external characters from stage to stage have been studied in detail (Bartsch, 1998, 2003).

In the material at hand a single larva but no proto- and deutonymph were available. As in most halacarid species, the number of dorsal plates, idiosomatic setae and gland pores is the same in larvae and adults but the plates are considerably smaller in larvae. Larvae have a pair of epimeral pores; such pores are absent in adults of *Bradyagaue*, as also in congeneric proto- and deutonymphs (e.g. in *B. grandiphora* Newell, 1984 studied by the author). The number of setae on the AE and PE is incomplete, two on the AE and one single, ventral seta on the PE. Adjunct setae are lacking. The anus is in similar position in both the larva and adult. All trochanters bear one seta. Basifemora and telofemora are still fused. The ventral seta is expected to be in the portion representing the basifemur. In the portion representing the telofemur two dorsal setae are present on leg I, three on leg II, and a single dorsal and a ventral seta on leg III. There are five setae on all tibiae, as in the majority of halacarid larvae. Except for the number of eupathidia, the number of setae of the tarsi is the same in the larval and adult *Bradyagaue*.

The character combination found in *Bradyagaue exilis* is similar to that present in larvae of the majority of halacarid genera. Though, in contrast to *Copidognathus* and the rhombognathine genera *Metarhombognathus*, *Rhombognathides* and *Rhombognathus* (Bartsch, 1998, 2003), telofemur III bears one ventral and one single dorsal seta instead of two dorsal setae.

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References

- Abé H. 1990.** Two species of the genus *Actacarus* (Acari, Halacaridae) from Japan. *Zoological Science*, **7**: 111-126.
- Abé H. 1996.** Rhombognathine mites (Acari: Halacaridae) from Hokkaido, Northern Japan. *Publications of the Seto Marine Biological Laboratory*, **37**: 63-166.
- Bartsch I. 1972.** Ein Beitrag zur Systematik, Biologie und Ökologie der Halacaridae (Acari) aus dem Litoral der Nord- und Ostsee. I. Systematik und Biologie. *Abhandlungen und Verhandlungen des naturwissenschaftlichen Vereins in Hamburg*, (Neue Folge) **16**: 155-230.
- Bartsch I. 1992.** Two new species of the genus *Bradyagaue* (Halacaridae, Acari) from the Southern Indian Ocean. *Cahiers de Biologie Marine*, **33**: 433-440.
- Bartsch I. 1996.** Halacarines (Acari: Halacaridae) from Rottneest Island, Western Australia: the genera *Agauopsis* Viets and *Halacaropsis* gen. nov. *Records of the Western Australian Museum*, **18**: 1-18.
- Bartsch I. 1998.** A new species of the *Copidognathus pulcher* group (Acari: Halacaridae) from Western Australia: Description of adults and juveniles and notes on developmental pattern. *Species Diversity*, **3**: 187-200.
- Bartsch I. 2001.** A new halacarid genus (Acari: Halacaridae: Halacarinae) from the Great Meteor Seamount, Eastern North Atlantic. *Species Diversity*, **6**: 117-125.
- Bartsch I. 2003.** The subfamily Rhombognathinae: developmental pattern and re-evaluation of the phylogeny (Arachnida, Acari, Halacaridae). *Senckenbergiana biologica*, **82**: 15-57.
- Lohmann H. 1907.** Die Meeresmilben der Deutschen Südpolar-Expedition 1901–1903. *Deutsche Südpolar Expedition 1901-1903*, **9**: 361-413.
- Newell I.M. 1971.** Halacaridae (Acari) collected during cruise 17 of the R/V Anton Bruun, in the southeastern Pacific Ocean. *Anton Bruun Report*, **8**: 3-58.
- Newell I.M. 1984.** Antarctic Halacaroida. *Antarctic Research Series*, **40**: 1-284.
- Otto J.C. 1993.** Description of a new species of the *Agauopsis hirsuta*-group from Australia (Acarina : Halacaridae). *Acarologia*, **34**: 211-221.
- Trouessart, E.L. 1902.** Note préliminaire sur les Acariens marins (Halacaridae) recueillis par S.A. le Prince de Monaco, dans les mers arctiques. *Bulletin de la Société zoologique de France*, **27**: 66-70.
- Trouessart, E.L. 1907.** Acari. Halacaridae (Acariens marins). *National Antarctic Expedition 1901-1904, Natural History*, **3**, 7 pp.