TWO NEW SPECIES OF TYDEID MITE (*ACARINA, PROSTIGMATA*) FROM THE MARITIME ANTARCTIC

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ABSTRACT. In a study of the mites of the family Tydeidae in the maritime Antarctic, two genera, *Apotriophtydeus* and *Pretriophtydeus*, were found to have widespread distributions. Amongst approximately 3600 tydeids identified, eight were not assignable to these two genera. Three specimens from Signy Island (South Orkney Islands) were identified as belonging to the genus *Paratriophtydeus*, four specimens from Signy Island and Rothera (Adelaide Island) belonged to the genus *Paratydaeolus*, and a single tritonymph from the Refuge Islands (Marguerite Bay) has not been assigned to a genus. Two new species are described: *Paratriophtydeus dubius* n.sp. and *Paratydaeolus enigmaticus* n.sp., the type locality of each being Signy Island.

INTRODUCTION

While studying the tydeid mites (Acarina, Prostigmata, Tydeidae) of the maritime Antarctic, Usher and Edwards (1986) were able to assign the majority of individuals to one of two genera. One of these genera was *Pretriophtydeus* André (1980), a monotypic genus that is endemic to Antarctica. The other genus was *Apotriophtydeus* André (1980), also endemic to Antarctica, that currently comprises five species, three of which were described by Usher and Edwards (1986) from the maritime Antarctic. Amongst approximately 3600 tydeid individuals identified, eight could not be assigned to either of these genera. Seven specimens were referable to either *Paratriophtydeus* Baker (1965) or *Paratydaeolus* André (1980) and a single tritonymph has not been assigned to a genus.

Five species of *Paratydaeolus* are known. The type species is *P. lukoschusi* André, described from specimens collected in the nest of the blue tit, *Parus caeruleus*, in the Netherlands (André, 1980). The other species are *P. loadmani* (Wood, 1965), from soil in northern England, *P. expressus* (Kuznetzov) and *P. lanceoclaviger* (Livshitz), both collected from the bark of rose bushes in the Soviet Union (Livshitz and Kuznetzov, 1973), and *P. alpinus* Schiess (1982) from an alpine meadow in Switzerland. *Paratriophtydeus* is represented by three known species (André, 1980). The type species is *P. protydeus* (Baker, 1943), collected in Mexico, as was *P. plummeri* (Baker, 1943). The third species, *P. coineau* André (1980), was collected from wheat grain in Canada. All previously known species of *Paratriophytydeus* and *Paratydaeolus* have thus been collected in the Northern Hemisphere.

The specimens of *Paratriophtydeus* and *Paratydaeolus* from Antarctica were examined by Dr H. M. André, who considered that they were unlike any of the described species in either genus. The aim of this work is, therefore, to describe these two new species. Despite the fact that they were found in samples collected in Antarctica, there remains some doubt as to whether they are indigenous Antarctic species or whether they are aliens transported into the Antarctic with scientific equipment. Because of this, the specific names for the two species reflect the possible doubt about their origins.

Specimens

During work on the ecology of soil microarthropod communities on Signy Island, South Orkney Islands (e.g. Usher and Booth, 1984*a*), cores from moss-turf habitats were cut in the field and transported to the laboratory, where the arthropods were extracted by behavioural techniques (see, for example, Usher and Booth, 1984*b*). All three specimens of *Paratriophtydeus*, and three of the four specimens of *Paratydaeolus*, were found in such samples. The other *Paratydaeolus* specimen was found in an extract, obtained in a similar manner, from the fellfield community at Rothera, on Adelaide Island (67° 34′ S, 68° 08′ W). A tritonymph, not yet assigned to genus, was similarly extracted from a sample of mixed moss species (*Pohlia nutans* (Hedw.) Lindb. and *Bryum algens* Card.) collected on the Refuge Islands, Marguerite Bay (68° 21′ S, 67° 08′ W).

Prior to extraction, the tubes, in which the arthropods were to be collected in 10% ethanol, were usually washed in tap water so as to reduce the possibility of contamination by mites of European origin. However, due to the time available, no attempt was made to inspect the washed tubes prior to their use. All the individuals of mites described below were in apparently fresh condition, adding to our belief that they were likely to be of local Antarctic origin (imported mites would probably have died during transit to Antarctica, and hence would have appeared desiccated). However, an extra-Antarctic origin for these eight mites cannot be ruled out entirely.

All eight specimens are deposited in the British Museum (Natural History). In the descriptions below the setal terminology follows André (1981*a*, *b*), and the descriptions follow the pattern of those given by Usher and Edwards (1986) for new species of *Apotriophtydeus*.

Paratriophtydeus dubius n.sp.

(Fig. 1a–e)

Adults: Overall body length ♂ 266 μm, ♀ 298 μm (Fig. 1a).

Setae: Prodorsum procurved, *p1* level with *s*; *p1* 19–20 μm; *p2* 8–13 μm; *p3* 23–28 μm; *s* 35–43 μm; *d1* 15–17 μm; *d2* 16–18 μm; *d3* 16–18 μm; *d4* 18–20 μm; *d5* 20–22 μm; *l1* 18–23 μm; *l4* 23–24 μm; *l5* 29–32 μm; *h1* 18–20 μm; *h2* 25–27 μm; *ps* 12–15 μm; most setae minutely plumed, more so in ♀ than ♂. Dorsal lyrifissures indistinct, positioned as indicated in Fig. 1a. Epimeral formula 3-1-4-3, all setae nude. Four pairs more or less nude aggenital setae and four pairs more or less nude genital setae. Male with five pairs of eupathidial eugenital setae and 'T'-shaped sperm sac (Fig. 1e). Female with one pair of genital acetabula (as defined by Usher and Edwards (1986)), but lacking eugenital setae (Fig. 1d).

Subcapitular setae long, nude, inner pair (10 μm) slightly shorter than outer pair (12 μm). Setae of pedipalp nude, except *v* and *df* (which is slightly roughened): tarsus 14–18 μm, with 6 setae and a solenidion *ω*, *ba* reduced, *v* located close to tip, thick and weakly plumose; *acm* triple-tined and eupathidial (Fig. 1c).

Leg I longer than legs II–IV, all shorter than body. Leg chaetotaxy, I (12, 5, 4, 6, 1); II (8, 2, 4, 4, 1); III (7, 2, 2, 3, 1); IV (7, 2, 1, 2, 0). Tibia I with microseta *k″* situated dorsoapically, two tined, approximately 3 μm long; erect solenidion *ϕ* length 4 μm (Fig. 1b). Tarsus I with erect solenidion *ω*I, length 5–8 μm, eupathidial setae *ft″*, (*tc*) and (*p*). Tarsus II with erect solenidion *ω*II, length 4–5 μm. Femur IV not divided.

Type material: Holotype ♀, ANTARCTICA: SIRS1, Signy Island, South Orkney Islands (60° 43′ S, 45° 36′ W), extracted from *Chorisodontium/Polytrichum* moss-turf,

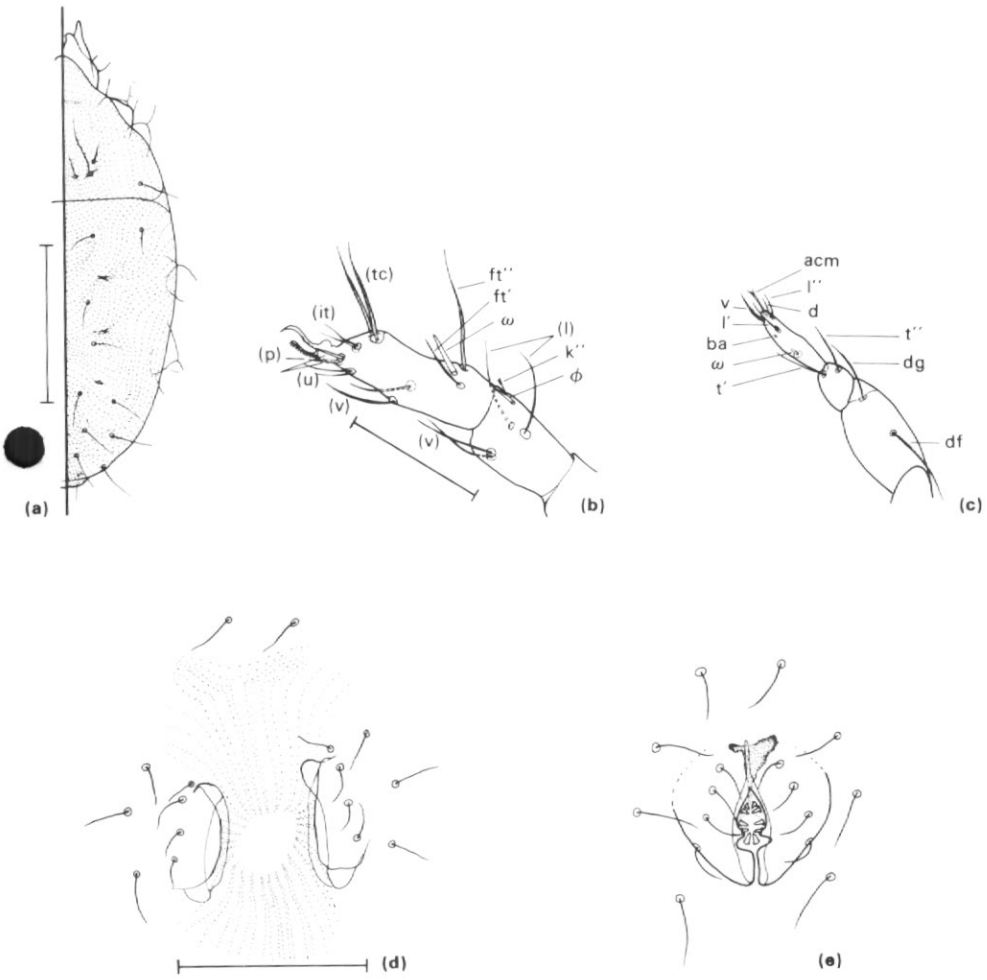

Fig. 1. *Paratriophtydeus dubius* n.sp., adult. (a) Dorsal view of the right hand side of the ♀ idiosoma. The dots are diagramatically placed to indicate the pattern of the surface ornamentation of the mite. Scale = 100 μm. (b) Tarsus and tibia of Leg I, showing nomenclature of setae and solenidia. Scale = 25 μm. (c) Pedipalp, showing nomenclature of setae and solenidion. Scale as leg. (d) Female genitalia. The dots are diagramatically arranged to indicate the radiating nature of the surface ornamentation. Scale = 50 μm. (e) Male genitalia. Surface ornamentation has been omitted for clarity. Scale as leg.

29 December 1981 by R. G. Booth (BMNH 1986. 5.29.1). Paratype male, same data as holotype (BMNH 1986. 5.29.2). Additionally, there is a deutonymph with the same data as the holotype except that it was collected on 10 January 1981 (BMNH. 1986. 5.29.3).

Diagnostic characters: P. dubius is the largest species in the genus, with relatively short setae *s* and *d1* (separating it from *P. protydeus* and *P. plummeri*). Compared with *P. coineaui*, to which it appears most closely related, *P. dubius* has longer setae (see Table I) and longer leg and pedipalp segments.

Table I. A comparison of the four known species of *Paratriophtydeus*. Data are from measurements of the holotype and paratype of *P. dubius*, a series of four paratypes of *P. coineaui*, and from information in the original descriptions of *P. protydeus* and *P. plummeri*. Setal nomenclature follows André (1981*a*, *b*) and measurements are given in μm.

	Body length	*p1*	*s*	*d1*	*d5*	*h1*	*Pedipalp tarsus*	*ft″*II
P. protydeus	210	—	53	20	—	—	15	—
P. plummeri	250	—	50	22	—	—	8	—
P. coineaui	201–250	15–16	32–35	9–10	14–15	12–17	12–15	7–9
P. dubius	266, 298	19, 20	35, 43	15, 17	20, 22	18, 20	14, 17	12, 15

Paratydaeolus enigmaticus n.sp.

(Fig. 2a–d)

Adults: Male unknown. Overall body length 216–231 μm (Fig. 2a).

Setae: Prodorsum procurved, *p1* posterior to *s*; *p1* 15–16 μm; *p2* 4 μm; *p3* 16–17 μm; *s* 26–27 μm, strongly clubbed in apical third, club with many small bristles; *d1* 10–11 μm; *d2* 6–10 μm; *d3* 11 μm; *d4* 12–14 μm; *d5* 12–14 μm; *l1* 14–16 μm; *l4* 18 μm; *l5* 20–22 μm; *h1* 14–15 μm; *h2* 14–18 μm; *ps* 7–8 μm. Dorsal lyrifissures indistinct, as indicated in Fig. 2a. Epimeral formula 3–1–4–3, all setae nude. Four pairs nude aggenital setae and three pairs nude genital setae. Female with one pair of genital acetabula, but lacking eugenital setae (Fig. 2d).

Subcapitular setae long, nude, inner pair 8–9 μm, slightly shorter than outer pair (10 μm). Setae of pedipalp all appearing nude. Tarsus 9 μm with 6 setae excluding solenidion ω, *ba* reduced and *acm* triple-tined and eupathidial (Fig. 2c).

Leg I longer than legs II–IV, all shorter than body. Leg chaetotaxy, I (12, 5, 4, 6, 1); II (8, 2, 4, 3, 1); III (7, 2, 1, 3, 1); IV (7, 2, 1, 2, 0). Tibia I with microseta *k″* situated dorsoapically, two tined, approximately 3 μm long, erect solenidion φ approximately 3 μm long (Fig. 2b). Tarsus I with erect solenidion ωI, length 4–5 μm; eupathidial setae *ft″*, (*tc*) and (*p*); *ft″* slightly roughened, (*tc*) minutely plumed. Tarsus II with erect solenidion ωII, length 3 μm. Femur IV entire.

Tritonymph: Length 208 μm. Relative lengths of body setae approximately as in adult, but setae finer in structure. Four pairs aggenital setae, and one pair genital setae. Le chaetotaxy as in adult.

Type material: Holotype ♀, ANTARCTICA: SIRS1, Signy Island, South Orkney Islands (60° 43′ S, 45° 36′ W), extracted from *Chorisodontium/Polytrichum* moss-turf, 8 February 1982 by R. G. Booth (BMNH 1986. 5.29.4). Paratypes: female with same data as holotype; tritonymph, Factory Cove (Back slopes), Signy Island, South Orkney Islands (60° 43′ S, 45° 36′ W), extracted from moss-turf, 20 January 1982 by R. G. Booth (BMNH 1986.5.29.6 respectively). Additionally, a female was collected at Rothera, Adelaide Island (67° 34′ S, 68° 08′ W), from a fellfield habitat, 8 March 1981 by M. B. Usher (BMNH 1986.5.29.7).

Diagnostic characters: Of the six known species of *Paratydaeolus*, two can be distinguished easily: *P. loadmani* has the idiosomal setae short and plumose (the other species have longer nude setae) and *P. lanceoclaviger* has *s* elongated apically (the

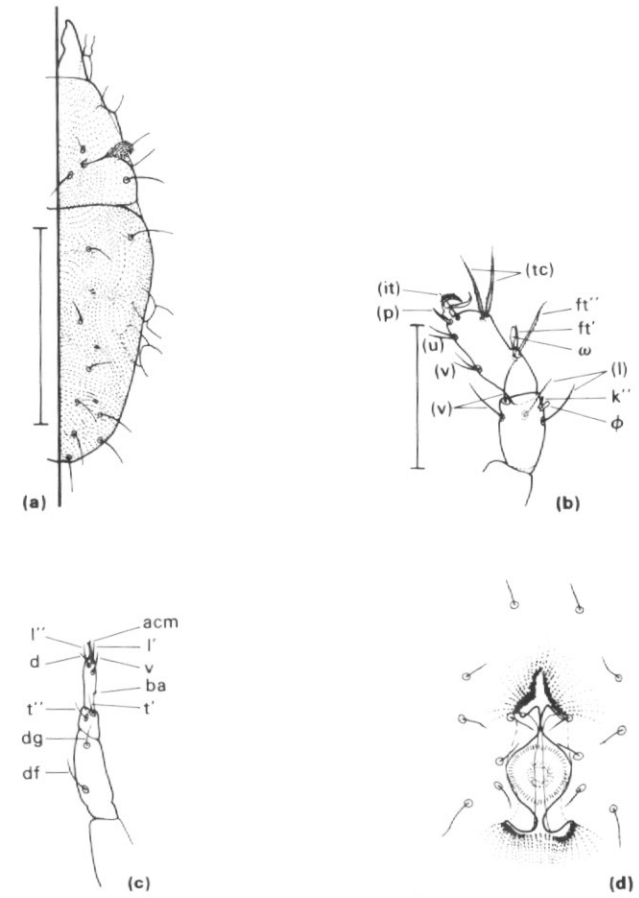

Fig. 2. *Paratydaeolus enigmaticus* n.sp., adult. (a) Dorsal view of the right hand side of the ♀ idiosoma. The dots are diagramatically placed to indicate the surface ornamentation. Scale = 100 μm. (b) Tarsus and tibia of leg I, showing nomenclature of setae and solenidia. Scale = 25 μm. (c) Pedipalp, showing nomenclature of the setae. Scale as leg. (d) Female genitalia. The dots are diagramatically arranged to indicate the radiating nature of the surface ornamentation. In front of and behind the genitalia the dots become larger and closer so as to give a ridged appearance. Scale as leg.

other species have *s* more or less rounded apically). Table II shows that the idiosomal setae, genital setae and leg segments of *P. enigmaticus* are larger than those of *P. alpinus* but are shorter than those of the other two species. One interesting fact is that males are unknown for five of the six species of the genus *Paratydaeolus*, and hence it is possible that some of these species may reproduce parthenogenetically.

Discussion

Although a European origin for *P. dubius* and *P. enigmaticus* cannot be ruled out entirely, the freshness of the specimens described here indicates that the mites were probably alive when extracted from the Antarctic samples. Assuming an Antarctic origin, there is a considerably greater diversity of the prostigmatid fauna in Antarctica than had previously been suspected. The type locality for both of these two new species

Table II. A comparison of the five known species of *Paratydaeolus*. Data are from measurements of the holotype and female paratype of *P. enigmaticus*, the holotype of *P. loadmani*, the holotype and one paratype of *P. lukoschusi*, measurements on the original illustration of *P. alpinus*, and information in the original descriptions of *P. expressus* and *P. lanceoclaviger*. Setal nomenclature follows André (1981*a*, *b*) and measurements are given in μm.

	Body length	*p1*	*p3*	*d1*	*d5*	*h1*	*g1*	*Tarsus I*
P. lukoschusi	201, 207	18, 19	19, 20	12, 13	16, 18	16, 18	7	22, 23
P. loadmani	213	11	11	8	9	10	3	18
P. expressus	—	16	20	—	—	—	—	—
P. lanceoclaviger	150	16	18	—	—	—	—	22
P. alpinus	170±18	6	9	7	15	11	5	17
P. enigmaticus	216, 231	15, 16	16, 17	10, 11	12, 14	14, 15	5	19, 20

is the SIRS1 site on Signy Island in the maritime Antarctic. Usher and Edwards (198[illegible] also report that *Pretriophtydeus tilbrooki* (Strandtmann) and two species of *Apotriophtydeus* are found on the same island. Thus, of the five species known on Signy Island, two are abundant (*P. tilbrooki* and *A. scotia*), one is frequent (*A. penola*) and two are rare (*P. dubius* and *P. enigmaticus*), though, as discussed by Usher and Edwards (1986), the species do demonstrate habitat preferences. Four species of tydeid mite are known from the fellfield at Rothera, which is south of the geographical ranges of *A. penola* and *P. dubius*, but where *A. terror* is frequent.

Studies at other localities in the maritime Antarctic have generally yielded more than one species of tydeid mite. Frequently three species have been found, usually in the two widespread genera. Studies of other prostigmatid genera, for example *Eupodes* (Booth and others, 1985) and *Nanorchestes* (Strandtmann, 1982; Booth, 1984) in the maritime Antarctic, indicated that there were several species in genera that had previously been assumed monotypic. The Prostigmata certainly appear to be the most species-rich group of terrestrial arthropods in the maritime Antarctic, and many of these species also appear to be Antarctic endemics. Little can yet be said about the biogeography of Antarctic Prostigmata until further collecting has been undertaken so as to ascertain the distributions of many of the recently described species. However, the discovery of many new species endemic in the maritime Antarctic supports Wallwork's (1973) contention that the Prostigmata of this biogeographical region are as isolated from the south temperate faunas as are the Prostigmata of eastern Antarctica.

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