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A new species of the feather mite genus *Bregetovia* Dubinin (Analgoidea, Avenzoariidae) with notes on the systematics of the genus

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(With 19 figures)

Abstract

Bregetovia oconnori (Analgoidea, Avenzoariidae) is described from *Tringa guttifer* (Aves, Scolopacidae) from Thailand. Two male morphs occur in this species, a heteromorph and a mesomorph; this is the first true heteromorph described for species of *Bregetovia*, thus, the heteromorphs previously reported are, in fact, mesomorphs. Notes on the systematics of the genus are presented as are keys to the known species of the genus.

Introduction

The feather mite genus *Bregetovia* Dubinin, 1951 (Avenzoariidae: Avenzoariinae) has included only five species until now (Dubinin 1951, 1956; Gaud 1972; Mironov 1992). These mites are associated with certain waders (Charadriiformes: Scolopacidae), namely, godwits (*Limosa*, Limosinae) and some sandpipers (*Tringa*, Tringinae). *Bregetovia* species are usually found on the ventral surfaces of the primary flight feathers of these hosts.

Recently, a new species of *Bregetovia* was discovered with a previously unknown male morph, namely, a true heteromorph. This discovery has made it necessary to reevaluate the systematics of the genus versus male polymorphism. In addition to a discussion on polymorphism, keys to the all known forms of the genus will be presented.

Methods and nomenclature

The materials for this study were collected from bird study skins of the Zoology Museum, University of Michigan, Ann Arbor, Michigan, USA. The signatures for chaetotaxy follow Griffiths et al. (1990) and measurements, in micrometers, are the observed limits, followed in parentheses, that

measurement for the holotype (hetermorphic male). Primary and secondary types are deposited in ZMUM (Zoology Museum, University of Michigan); secondary types are deposited in ZIN (Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia), UAM (Adam Mickiewicz University, Poznań, Poland) and ZMH (Zoological Museum, Hamburg University, Germany).

Systematic section

Males are polymorphic and until the discovery of the new species described herein, *Bregetovia oconnori*, it was believed that there were two discrete male morphs, a hetero- and a homeomorph. These morphs were characterized in part by the development of the gnathosomal venter, the opisthosomal lobes and legs I. These "heteromorphs" (Figs 11, 12) have the subcapitulum expanded posterolaterally, the terminal lobes attenuated, legs I hypertrophied and each tarsus I expanded ventrally as an acuminate spine. The homeomorphs (Fig. 8) have truncated terminal lobes and the subcapitulum and legs I are similar to those of the females.

With *B. oconnori* n.sp., in addition to a typical "heteromorph", a new male morph has been discovered. Both morphs have the subcapitulum expanded and modified legs I, however, in comparing the newly discovered form (Figs 1-3) with the second morph (Figs 4, 5), it is more elongated, has a more complete coxosternum, tarsi I have larger ventral expansions and the opisthosomal lobes are long and approximate. Now, three typical morphs are known for *Bregetovia*, a heteromorph, a mesomorph (= heteromorph of previous authors) and a homeomorph.

With the exceptions of *B. oconnori* and *B. americana* (Oudemans) (see below), *Bregetovia* species have been collected extensively. Strangely, three male morphs have never been reported for any species, and for some species, only one morph is known. Whether heteromorphs and/or mesomorphs have been lost or never developed in some *Bregetovia* species is unknown.

As would be expected, each of the male morphs of a species have been described under different names. Heteromorph and mesomorphs are distinct, but homeomorphs and females of different species are similar and difficult to identify. Consequently, many misidentifications and incorrect host associations have been reported.

Bregetovia obtusolobata Dubinin (1951) was based on a homeomorphic male (Fig. 8) taken from the Greenshank, *Tringa nebularia*, whereas three other species (see below) were based on mesomorphs. Many redescriptions and faunistic records for *B. obtusolobata* (i.e., homeomorphic males) from various species of *Tringa* and *Limosa* are in reality the homeomorphs of species based originally on mesomorphs (*B. limosae*, *B. selenura*) (Dubinin 1956; Gaud 1972; Vasyukova and Mironov 1991). An example of these misidentifications is found in Dubinin (1956: Fig. 202); the male illustrated

as the "heteromorph" of *B. selenura* (Mégnin and Trouessart) is the mesomorph (new meaning) of *B. obtusolobata*, and further, most of Dubinin's redescription of *B. selenura* was based in great part on specimens of *B. obtusolobata*.

Mironov (1992), working with vast new collections and the original materials of Dubinin, gave a general systematic account of the *Bregetovia*, brief redescriptions of known male morphs, descriptions of formerly unreported morphs, and a discussion on host - commensal associations. To summarize the information on the known species of *Bregetovia*:

1. *Bregetovia limosae* (Buchholz, 1869): The type host is the Bar-tailed Godwit, *Limosa lapponica*. This mite is associated with birds of the genus *Limosa*, but it most commonly occurs on the Black-tailed Godwit, *L. limosa*. Meso- and homeomorphic males are known.

2. *Bregetovia selenura* (Mégnin and Trouessart, 1884): The orginal type host was reported as the Asiatic Dowitcher, *Limnodromus semipalmatus*, but Dubinin (1956) believed that the type skin was misidentified. This mite is associated with *Limosa lapponica*. Meso- and homeomorphic males are known.

3. *Bregetovia mucronata* (Mégnin and Trouessart, 1884): The type host is the Spotted Redshank, *Tringa erythropus*, and is restricted to this host species. Only the mesomorphic male is known for this well-collected species.

4. *Bregetovia obtusolobata* Dubinin, 1951: The type host is the Greenshank, *Tringa nebularia*, and is commonly found on this bird. The few records of *B. obtusolobata* from other *Tringa* species (Dubinin 1956; Kurbanova 1970; Mironov 1981) appear to be accidental contaminations or misidentifications. Meso- and homeomorphic males are known.

5. *Bregetovia americana* (Oudemans, 1904): The type host is the Lesser Yellowlegs, *Tringa flavipes*. The status of this species is uncertain, as the original and subsequent descriptions (Oudemans, 1910) were based on a tritonymph. The host record is also doubtful as *Bregetovia* species have not been collected from the named host.

6. *Bregetovia oconnori* sp. n.: The type host is the Spotted Greenshank, *Tringa guttifer*. This is the first time a hetermorphic male (*s.s.*) has been recorded for species of *Bregetovia*. Hetero- and mesomorphic males are known.

Bregetovia oconnori sp. n.

HETERMORPHIC MALE (Figs 1-3, N=4). Idiosoma greatly elongated, idisomal length (anterior margin to apices of lobes) 748-840 (840), idiosomal width 220-240 (240), hystersomal length 585-640 (640). Subcapitulum with

posterolateral angles expanded, basal podomere of palpus expanded laterally. Prodorsal shield expanded laterally between legs I, II, weakly connected to lateral sclerotizations; with 2 longitudinal crests anteriorly; posteriolateral regions with irregular, transverse striae; length of shield 168-182 (182); width at posterior margin 180-182 (182); distance *se:se* 96-112 (106). Setae *c3* positioned on ventrolateral tegument. Hysteronotum with irregular longitudinal striae between setae *e1* and cleft apex; terminal lobes long, almost parallel-sided, acuminate apically; length at least 4 times width at lobe base; terminal cleft pi-shaped; cleft length 242-268 (268), greatest width 45-50 (50); setae *h2* expanded unilaterally at bases; setae *h3* setiform.

Venter with epimerites I Y-shaped, connected posteriorly to extensive coxosternal elements (Fig. 2); posteromedial portion connected to epiandrium to form inverted Y, with genital discs on stem of Y; adanal disc diameters 15-17 (17); distances between setae: *3a:4a* 84-91 (91), *4a:g* 31-34 (34), *g:ps3* 82-91 (91), *ps3:ps1* 204:239 (239).

Legs I hypertrophied, tarsus I expanded ventrally (Fig. 3), femur II with plate-like ventral process curved antiaxially.

MESOMORPHIC MALE (Figs 4, 5; N=1). Similar to heteromorph except modifications of legs, coxosternal elements, terminal lobes either less developed or differently developed. Prodorsal shield length 156, width 153, *se:se* 84. Opisthonotal lobes attenuated apically, separated by U-shaped cleft, cleft length 149, maximal width 55.

Venter with propodosomal coxosternal elements not connected to hystersomal elements, adanal disc diameter 21; distances between setae: *3a:4a* 79, *4a:g* 31, *g:ps3* 86, *ps3:ps1* 132.

HOMEOMORPHIC MALE. Unknown.

FEMALE (Figs 6, 7, 19; N=20): Idiosomal length 520-540, idiosomal width 206-220, hysterosomal length 400-415, setal distances: *se:se* 91-96, *h3:h3* 78-84. All dorsal shields well developed, independent of each other.

Venter with epimerites I free or weakly connected terminally, epigynium well developed, cresentric, height 57-65, width 72-74. Ambulacra of legs IV extend posteriorly to level of setae *h2*.

DIAGNOSIS. The only known males of the new species, the meso- and heteromorphs, differ from all other male mesomorphs in having tarsi I with well-developed and rounded ventral expansions, whereas other males have small acute ventral processes (as in Fig. 15). Females of *Bregetovia oconnori* are unique among known *Bregetovia* species in having epimerites I either free or weakly connected terminally (Figs 5, 19); other known *Bregetovia* females have epimerites I Y-shaped (Fig. 17) or connected by a transverse sclerite (Fig. 18).

TYPE MATERIAL. From *Tringa guttifer*: holotype, hetermorphic male, 3 heteromorphic male paratypes, 14 females, Thailand, Mekong, 28 April 1929, collector: Aagaard (from MZUM avian study skins No. 230990, 230992); 1 mesomorphic male, 6 females, Thailand, Chantaleone, 4 December 1930, collector: Aagaard (ZMUM No. 230992). The holotype and paratypes deposited in ZMUM; paratypes in ZMH (A50/93), UAM and ZIN.

Etymology. This species in named for Dr. B. M. Oconnor, University of Michigan.

Keys to the species of *Bregetovia*

Males

1. Terminal lobes pointed apically (i.e., not truncated) (Figs 1, 11, 14); legs I larger than legs II; tarsi I expanded ventrally as rounded or pointed processes (Figs 2, 15); subcapitula expanded posterolaterally (hetero- and mesomorphs) 2

- Terminal lobes truncated (Fig. 8); legs I as in female; subcapitula without posterolateral expansions (homeomorphs) 7

2. Tarsi I with venters expanded into large, rounded, processes (Fig. 3) 3

- Tarsi I with thin, thornlike processes at base of pretarsi (Fig. 15) 4

3. Terminal lobes long, length 4 times width; cleft narrow (Figs 1, 2) (heteromorph) . . . . . *B. oconnori* sp. n.

- Terminal lobe length less that 4 times width; terminal cleft wide, U-shaped (Figs 4, 5) (mesomorph) . . . . . *B. oconnori* sp. n.

4. Setae *h3* short, lanceolate (Fig. 12); epimerites I connected posteriorly to epimerites II (mesomorph) (Fig. 13) . . . . . *B. mucronata*

- Setae *h3* long, setiform (Figs 11, 14, 16); epimerites I not connected to epimerites II (mesomorph) 5

5. Terminal lobes relatively short, thick, rather rounded apically (Fig. 11) (mesomorph) . . . . . *B. limosae*

- Terminal lobes distinctly acuminate terminally 6

6. Lateral idiosomal margins abruptly narrowed at level of setae *f2*; interlobar membrane extending to middistance between setae *h1*, *ps1*; humeral shields not striated (Fig. 14) (mesomorph) . . . . . *B. selenura*

- Lateral idiosomal margins not abruptly narrowed at level of setae *f2*; interlobar membrance extending about to level of setae *h1* (Fig. 16); humeral shields striated (mesomorph) . . . . . *B. obtusolobata*

7. Setae *c3* postitioned on ventral margin of humeral shields (Fig. 10); width of interlobar membrane at anterior cleft margin 10–12 . . . . . *B. selenura*

- Setae *c3* positioned on tegument mesal to ventral margin of humeral shields; width of interlobar membrane at cleft apex 5–8 8

8. Ratio of terminal cleft length to distance between interlobar membrane margins at level of setae *h1* > 2.2; length of terminal cleft usually > 100 . . . . . *B. limosae*

- Ratio of terminal cleft length to distance between interlobar membrane margins at level of setae *h1* < 2.2; length of terminal cleft usually < 100 . . . . . *B. selenura*

Females

1. Epimerites I free or connected posteriorly by short transverse sclerite (Figs 18, 19) 2

- Epimerites I Y-shaped (Fig. 17) 3

2. Epimerites I free or weakly connected posteriorly (Figs 5, 19) . . . . . *B. oconnori* sp. n.

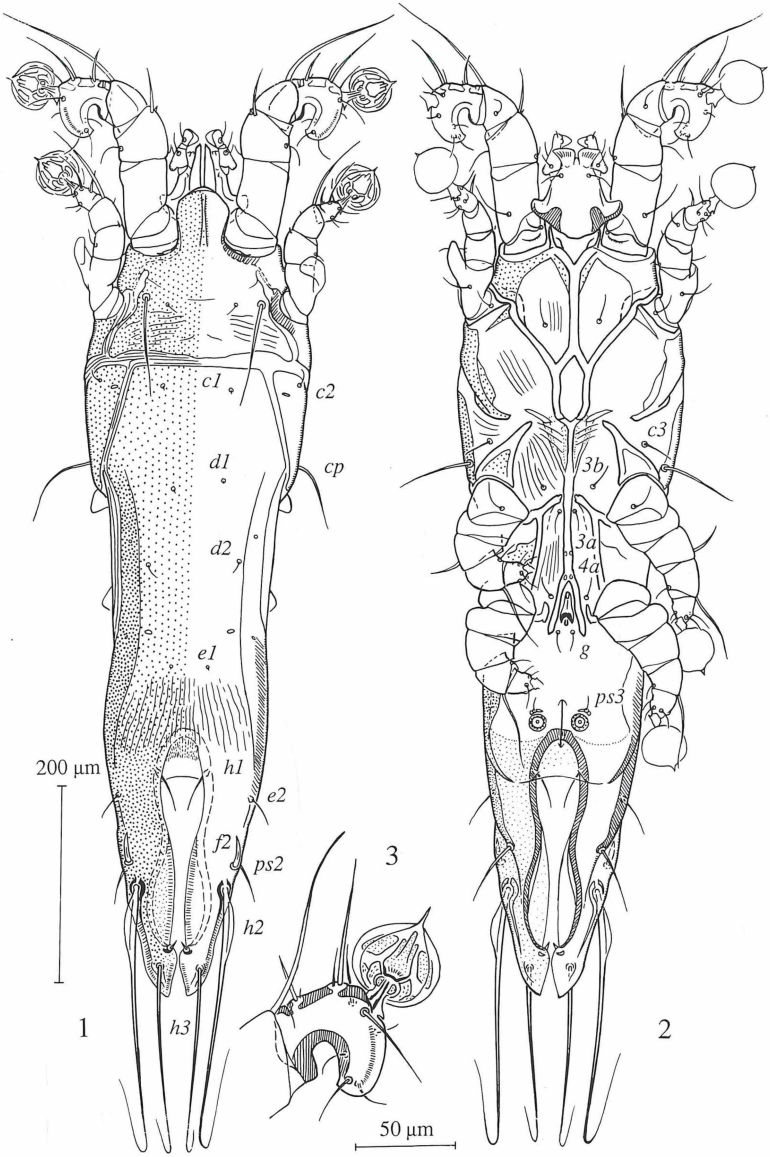
- Epimerites I connected posteriorly by well-developed sclerite (Fig. 18) . . . . . *B. mucronata*

3. Setae *c3* positioned on ventral margin of humeral shields . . . . . *B. selenura*

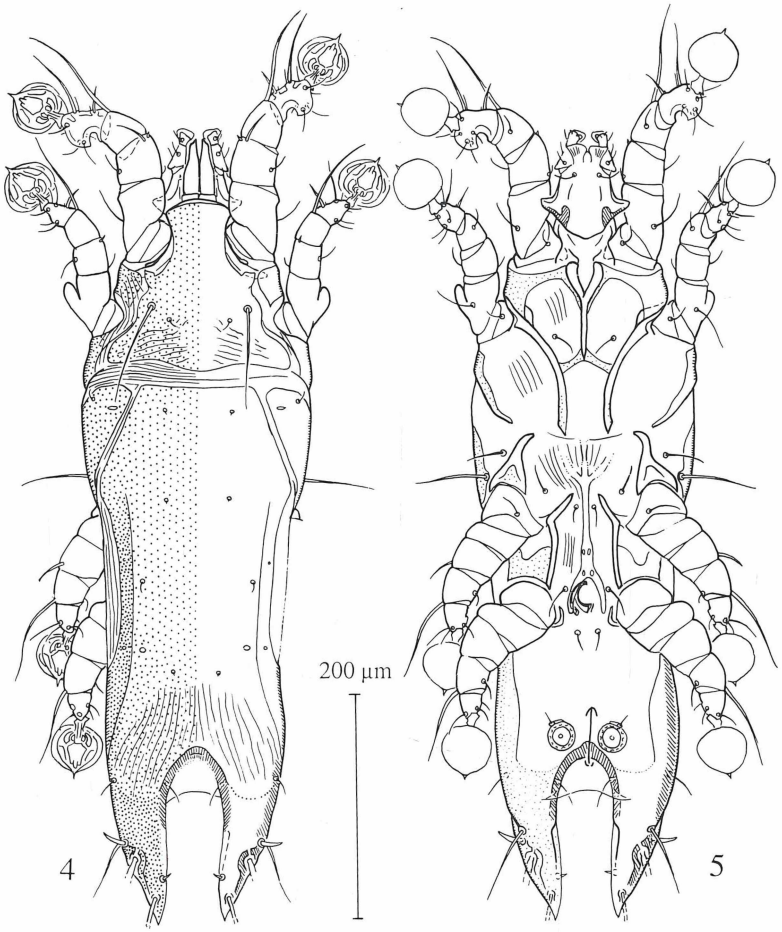
- Setae *c3* positioned on tegument mesal to ventral margin of humeral shields 4

4. Ambulacra IV extending posterior of idiosomal margin; idiosomal length usually < 500 . . . . . *B. limosae*

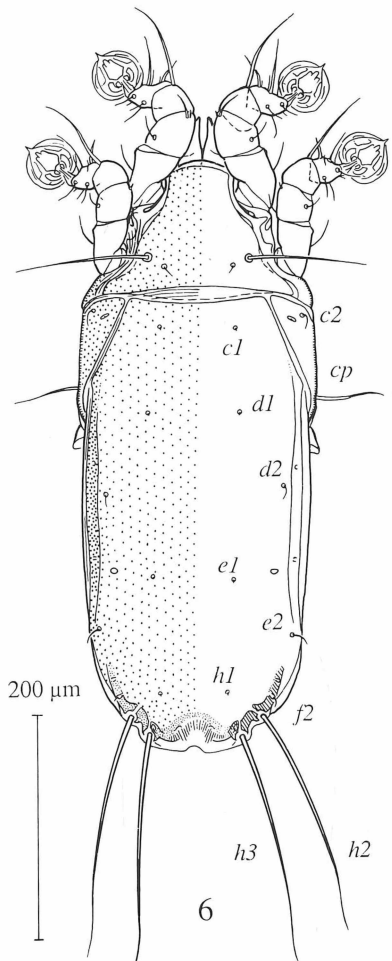
- Ambularca IV not extending to terminal margin of idiosoma; idiosomal length usually > 500 . . . . . *B. obtusolobata*

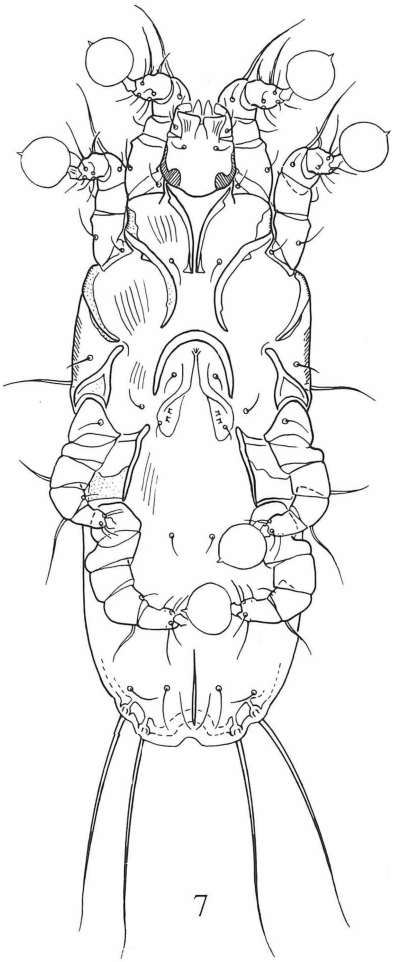


Figs 1-3: *Bregetovia oconnori* sp. n., heteromorphic male. 1: Dorsal aspect; 2: Ventral aspect; 3: Tarsus I.

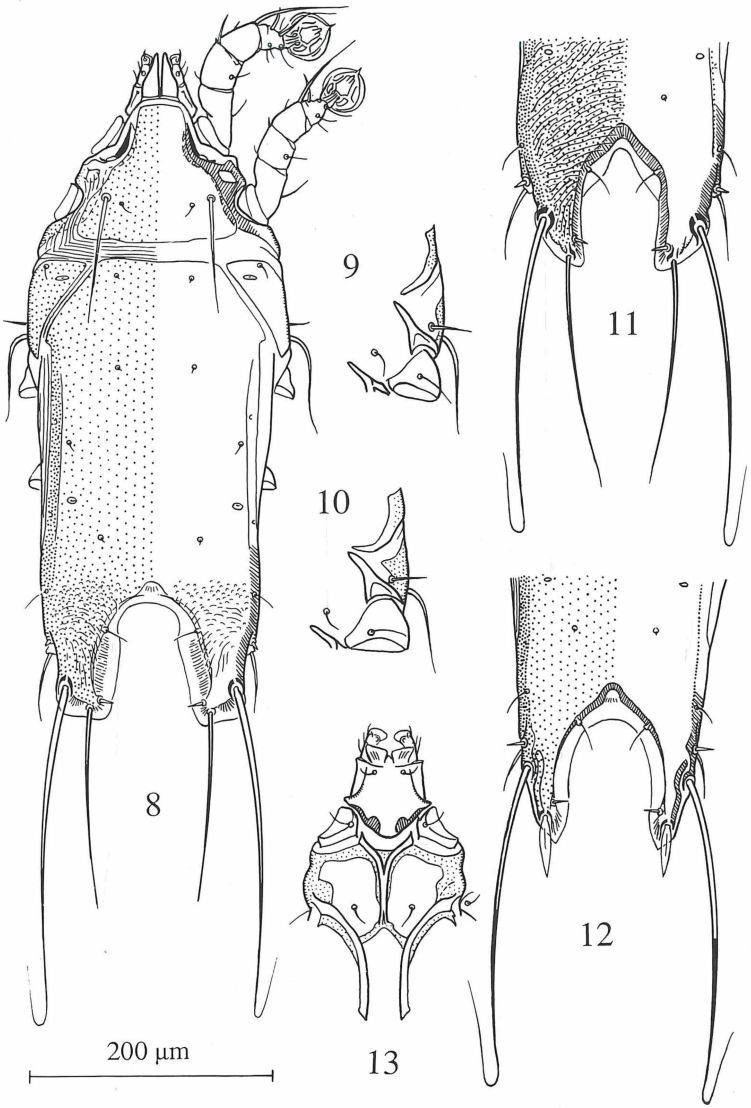


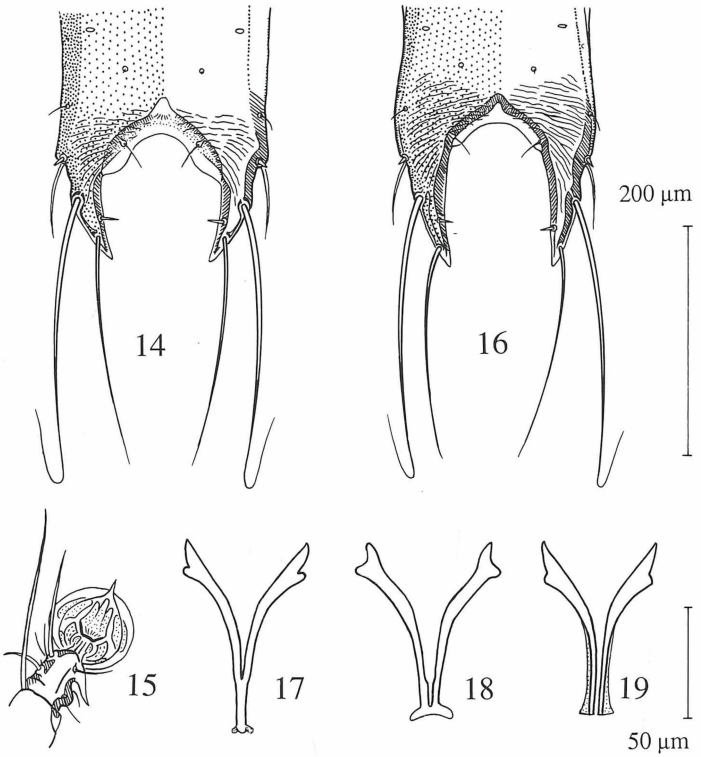
Figs 4, 5: *Bregetovia oconnori* sp. n., mesomorphic male. 4: Dorsal aspect; 5: Ventral aspect.





Figs 6, 7: *Bregetovia oconnori* sp. n., female. 6: Dorsal aspect; 7: Ventral aspect.





Figs 8-19: *Bregetovia* spp.: 8: *B. obtusolobata*, dorsum of homeomorphic male; 9: *B. obtusolobata*, homeomorphic male, ventral aspect of humeral region; 10: *B. selenura*, homeomorphic male, ventral aspect of humeral region; 11: *B. limosae*, mesomorphic male, dorsal opisthosoma; 12: *B. mucronata*, mesomorphic male, dorsal opisthosoma; 13: *B. mucronata*, mesomorphic male, ventral propodosoma; *B. selenura*, mesomorphic male, dorsal opisthosoma; 15: *B. selenura*, tarsus I.; 16: *B. obtusolobata*, mesomorphic male, dorsal opisthosoma; 17: *B. obtusolobata*, female, epimerites I; 18: *B. mucronata*, female, epimerites I; 19: *B. oconnori* sp. n., female, epimerites I.

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