

A review of *Beardius* Reiss & Sublette, with description of a new species from Everglades National Park, Florida

(Insecta, Diptera, Chironomidae)

Richard E. Jacobsen & Sue A. Perry

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Beardius reissi, spec. nov. from Everglades National Park, Florida, USA, is described in the larval, pupal, and adult stages. The female of *B. aciculatus* Andersen & Sæther, and the pupae of *B. truncatus* Reiss & Sublette and an unassociated species designated as *Beardius* sp. B are described for the first time. Unassociated larvae from Brazil, designated *Beardius* sp. C, are also newly described, and the larval description of *Beardius parvus* Reiss & Sublette is emended. The generic description for *Beardius* is emended, and keys to males, females, pupae and larvae are updated or offered for the first time. Two species groups based upon adult morphology are proposed: the *parvus* group, comprising *B. parvus*, *reissi*, and *aciculatus*, and the *truncatus* group, including *B. truncatus*, *breviculus* Reiss & Sublette, *lingulatus* Andersen & Sæther, and *triangulatus* Andersen & Sæther. Comments are presented on systematics of the genus, as well as on ecology of the species found in Everglades National Park.

Richard E. Jacobsen, Sue A. Perry, South Florida Natural Resources Center, Everglades National Park, Homestead, Florida 33034, USA.

Introduction

Reiss & Sublette (1985) erected the genus *Beardius* for three species, *B. parvus*, *breviculus* and *truncatus*, from South America, Panama, and the southwestern United States, respectively. Andersen & Sæther (1996) described an additional three species, *B. aciculatus*, *triangulatus* and *lingulatus*, from adults collected in Central America. Based upon adult material, Epler (1992, 1995) reported *B. truncatus* and *breviculus* from Florida. He provided illustrations for larvae of *B. truncatus* and an unassociated species called *Beardius* sp. A that he thought might be the larva of *B. breviculus*.

Very little information exists on the Chironomidae of the southern Everglades and Everglades National Park (ENP), even though they are the predominant aquatic insect family there. We are currently inventorying the nematoceran Diptera fauna in ENP, primarily through collections of pupal exuviae, and examining how its composition changes among sites with different hydropatterns within the Rocky Glades, the higher Rockland marshes in the eastern portions of ENP. Larval exuviae of both species illustrated by Epler were collected during this program. Reared associations of his *B. sp. A* showed that it is distinct from all established congeners.

This paper provides descriptions for all life stages of the new species, as well as notes on its systematics and ecology. In addition, previously unknown pupal stages are characterized for two other

Beardius found in ENP. Upon comparing material of described species, two paratype larvae of *B. parvus* were found to represent a different, presently unassociated form. The first description for the female of *B. aciculatus*, collected in Mexico, could be added to this review through courtesy of Drs A. Contreras Ramos and T. Andersen.

Methods

Adults, pupae, and fourth instar larvae for rearing were collected while sampling for pupal exuviae at the water surface with a dipping pot and 125 μm -opening sieve, preserved in 95 % ethanol, and mounted in Euparal. All material listed was collected by the senior author and is kept in the ENP museum or in his personal collection unless indicated otherwise. Morphological terminology and abbreviations follow Sæther (1980) and Langton (1995), except 'taeniae' and 'taeniate' are used as suggested by Langton (1994) to describe flattened L, D, Dc, and anal lobe fringe setae of pupae. Measurements follow Soponis (1977), where applicable. Inferior and superior volsella lengths were measured from their junction to the respective apices. Lateral spines on tergite VIII were measured from the posterior margin of their base. Mentum width is the distance between the outer margins of the fifth laterals, not the width at the base. Postmentum length is the distance from the apex of the pale median tooth to the post-occipital margin. Measurements are reported as a range, followed by the mean when sample size $n > 3$, followed by n in parentheses. All measurements are in μm unless stated otherwise. Abbreviations of life stages: L = larva, P = pupa, ex = exuviae.

Abbreviations of names and institutions: ERCC = Everglades Region Collection Center, Everglades National Park; JHE = J. H. Epler; REJ = R. E. Jacobsen; ZMBN = Zoological Museum, University of Bergen, Norway; ZSM = Zoologische Staatssammlung, Munich, Germany.

Beardius Reiss & Sublette 1985, emended

Beardius Reiss & Sublette, 1985: 179; Andersen & Sæther 1996: 34.

Type-species: *Beardius parvus* Reiss & Sublette, 1985: 183, by original designation.

Description

The description by Reiss & Sublette (1985) and emendation of Andersen & Sæther (1996) can be further emended as follows:

Acrostichal setae of normal length, reduced, or lacking. Male inferior volsella upright or inturned; median volsella acicular, narrowly conical to truncate-conical, cylindrical-cornate, triangular, or tongue-shaped.

Female gonocoxite IX small, bare or with 1 seta. Seminal capsule with or without microtrichia; spermathecal duct wide, straight, bare or with thorn-like special secretory cells along proximal half.

Thoracic horn of pupa with 6 strong, smooth branches, or with anterior branch notably larger and beset with fine spinules. Tergites II-VI each with conspicuous anterior band of strong spinules continuous with median field of finer shagreen, or T II with uniform strong shagreen and T III-VI with anterior points only slightly larger than posterior points. Conjunctives glabrous except IV/V which has a continuous wide band of anteriorly directed strong spinules, and I/II which may have a median patch of fine spinules. Paratergite V with fine spinules in small posterior patch or as band extending half to nearly full length of segment. Posterolateral corner of segment VIII with wide, short, single or double spur usually bearing basal hair-fine spinules [bare on some *B. sp.* B]; anteriorly contiguous to spur are small to large, straight to posteriorly-curved spines or clusters of spinules. Segment V with 3-4 pairs of taeniate L setae. Anal lobe with few (<25) uniserial fringe taeniae.

Larval head with labral sclerite 2 present; clypeus separate or fused into frontoclypeal apotome. Antenna with 5, 6, or 7 segments; basal segment somewhat shorter to slightly longer than flagellum. Mola of mandible with 0-2 spines. Mentum with first lateral tooth notched; ventromental plates separated by 1-2 times width of median tooth of mentum, each about $\frac{2}{3}$ to full width of mentum.

Key to adult males of *Beardius* Reiss & Sublette

The key in Andersen & Sæther (1996) is modified with the following changes to couplets 1 and 2:

1. Superior volsella pediform, with basal and median microtrichia; inferior volsella with thick stem and spine-like, apically dissected sensilla chaetica. HR > 0.89 *parcus* group, 2.
 – Superior volsella digitiform, at most with a few basal microtrichia; inferior volsella slender, slightly clavate, without spine-like sensilla chaetica: HR < 0.84 *truncatus* group, 3.
2. Median volsella spine-like; with one seta, otherwise bare. Scutal tubercle prominent. (Andersen & Sæther 1996: fig. 3) *aciculatus* Andersen & Sæther
 – Median volsella short, triangular to cylindrical-coronate, with apical cluster of microtrichia or setae. Scutal tubercle absent or vestigial 2a.
- 2a. Median volsella triangular, with about 10-15 long apical microtrichia or setae; inferior volsella with thick stem and lacking knob-like apex, sensilla chaetica slender. Wing vein R without setae. Acrostichals absent. (Reiss & Sublette 1985: figs 1-14) *parcus* Reiss & Sublette
 – Median volsella short, cylindrical to coronate, with 4-6 apical setae; inferior volsella with slender stem and enlarged knob-like apex, sensilla chaetica stout. Vein R with 4-8 setae. 3-6 acrostichal setae. (Figs 1a-c, e) *reissi*, spec. nov.

Tentative key to adult females of *Beardius* Reiss & Sublette

(*B. breviculus*, *lingulatus*, *triangulatus*, *truncatus* extrapolated from males, not yet collected)

1. Scutum without a tubercle or broad anterior hump 2.
 – Scutum with a tubercle or broad anterior hump 3.
2. Acrostichals present. Palpomere 5 length <120 mm *reissi*, spec. nov.
 – Acrostichals absent. Palpomere 5 length >120 mm *triangulatus* Andersen & Sæther
3. Acrostichals present *truncatus* Reiss & Sublette
 – Acrostichals absent 4.
4. Scutum with small tubercle with strong anterior and posterior sloping so that it clearly projects above surrounding surfaces 5.
 – Scutum with broad anterior hump that projects clearly above only the posterior scutum surface 6.
5. Clypeus with 16-24 setae, abdomen and legs with color patterns ... *aciculatus* Andersen & Sæther
 – Clypeus with less than 16 setae, abdomen and legs pale *lingulatus* Andersen & Sæther
6. Wing with setae on R *breviculus* Reiss & Sublette
 – Wing without setae on R *parcus* Reiss & Sublette

Key to pupae of *Beardius* Reiss & Sublette

(*B. aciculatus*, *breviculus*, *lingulatus*, *triangulatus* unknown)

1. Tergite II with shagreen points distinctly stronger in anterior transverse band; paratergite V with fine spinules extending over at least half segment length; T III-VI each with 4 pairs of D setae; (Fig. 2d; Reiss & Sublette 1985: fig. 15) 2.
 – Tergite II shagreen points strong and uniform throughout; paratergite V with fine spinules confined to small posterior patch; T III-VI each with 5 pairs of D setae; (Fig. 3g) 3.
2. Abdominal segment VIII with 1-8 strong spines along lateral margin anterior to spur (Fig. 2c). Frontal apotome length/ width about 0.9, apex acute (Fig. 2a) *reissi*, spec. nov.

- Abdominal segment VIII with at most only tiny spinules along lateral margin anterior to spur (Reiss & Sublette 1985: fig. 19). Frontal apotome length/ width about 0.5-0.6 *parvus* Reiss & Sublette
- 3. Abdominal segment V with 3 taeniate L setae. Thoracic cuticle with unpigmented area along the oblique hinge line near the median suture (Fig. 3d). Conjunctive I/II bare; pigmentation within shagreen on tergite II diffusely spread between points (Fig. 3f); hook row of 30-44 hooklets sp. B
- Abdominal segment V with 4 taeniate L setae. Thoracic cuticle pigmented along the oblique hinge line near the median suture (Fig. 3c). Conjunctive I/II with median patch of fine spinules (Fig. 3g); pigmentation within shagreen on tergite II confined to discrete blotches at point bases (Fig. 3e); hook row of 46-73 hooklets..... *truncatus* Reiss & Sublette

Key to larvae of *Beardius* Reiss & Sublette

(*B. aciculatus*, *breviculus*, *lingulatus*, *triangulatus* unknown)

- 1. Antenna with 7 segments (Fig. 5b), but segments 2-4 may be only partially separated 2.
- Antenna with 5 or 6 segments 3.
- 2. Clypeus distinct from frontal apotome (Fig. 6a). Ventromental plates separated by about width of pale median tooth of mentum. Procercus with 8 anal setae. AR 0.87-1.05. (Reiss & Sublette 1985: figs 21-25) *parvus* Reiss & Sublette
- Clypeus fused into frontoclypeal apotome (Fig. 6d). Ventromental plates separated by about twice width of pale median tooth of mentum (Fig. 5a). Procercus with 7 anal setae. AR 0.70-0.79 (Fig. 5b) sp. C
- 3. Antenna with 5 segments (Epler 1992, 1995: 7.27). Surface of frontoclypeal apotome granular from anterior margin to S4 setae (Fig. 6c) *truncatus* Reiss & Sublette
- Antenna with 6 segments (Fig. 2e). Surface of frontoclypeal apotome granular from anterior margin to about 2/3 distance to S4 setae (Fig. 6b)..... *reissi*, spec. nov.

Beardius reissi Jacobsen, spec. nov.

(Figs 1, 2, 6b)

Beardius sp. A Epler, 1992: 7.27; 1995: 7.27.

Types. Holotype: ♂ (slide-mounted in Euparal); USA: Florida, Dade Co., Everglades National Park, marl prairie along road to Royal Palm, on water surface, 20.IX.1999, R. E. Jacobsen; deposited in Zoologische Staatssammlung, Munich, Germany. - Paratypes: Florida, Dade Co., Everglades Natl Park: marl prairie along FL 9336 1.5 mi. W. of Taylor Slough: 1♀, 1♂, both with Pex+Lex, reared from P and L collected 17.IX.1999, emerged 18.X and 27.X; 2♀+Pex+Lex, reared from P collected 6.IX.1999, emerged 8.IX; 2♀♀, 6.IX.1999, 1 Lex, 6.X.1998; as previous except 1 mi. W. of Taylor Slough: 2♂♂, 1 Lex, 28.VIII.1999; 1 L, 1 Lex, 1 female P+Lex, 1 Pex+Lex, 29.VIII.1999; 1♂, 1♂+Pex+Lex reared from P, collected 6.IX.1999, emerged 8.IX.1999; as previous except 400 m E. of Rock Reef Pass: 1 Pex, 7.X.1998, 3 L, 4.VI.1999, 1 L, 11.VI.1999, 1♂, 13.VI.1999, 10 Pex, 20.VI.1999; marl prairie along L-31W canal 400 m E. of Taylor Slough: 1♂+Pex+Lex, reared from L collected 17.IX.1999, emerged 27.IX; as previous except 1 mi. N. of Taylor Slough: 6 L, 7.X.1998, M. C. Bruno & R. Jacobsen; Long Pine Key, solution hole along Wilderness Road: 10 Pex, 16.+20.VII.1998, M. C. Bruno & R. Jacobsen, 1♂, 30.IX.1999; Chekika, marl prairie along SW 237 Avenue 1 mi. S. of Chekika entrance: 1♂, 27.IX.1999. Hardee Co., Big Slough at SR 72: 3 L, dipnet, 24.VIII.1999, J. Lancaster & D. Durbin. Paratypes deposited at ZSM, ZMBN, ERCC, and in colls JHE, REJ.

Diagnosis. Adults of *B. reissi*, spec. nov. are distinguished from other congeners by the presence of acrostichal setae and the lack of a median tubercle or anterior hump on the scutum. In males, the short, cylindrical-coronate median volsella with 4-6 apical setae, and the club-like inferior volsella bearing stout, apically dissected sensilla chaetica are also distinctive. The pupa is characterized by the anterior transverse band of stronger points on tergite II, the presence of spines along the lateral margin of VIII, and the apically acute frontal apotome with length/width about 0.9. The 6-segmented antenna and the

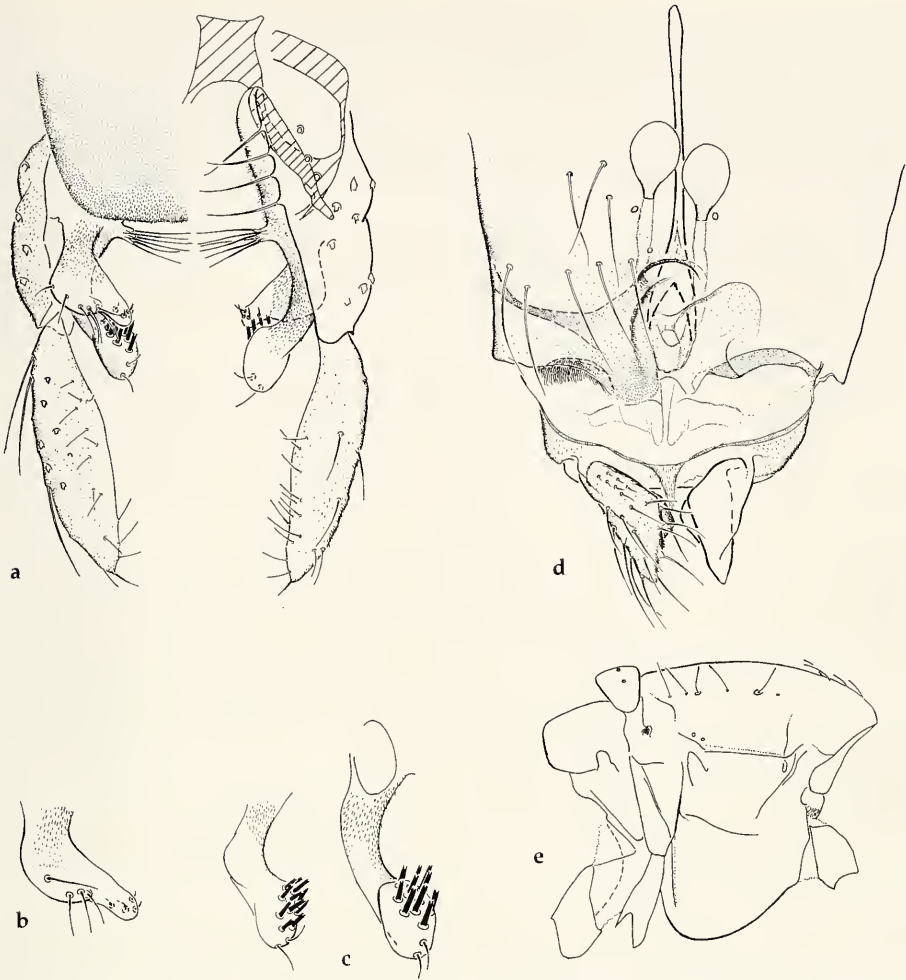


Fig. 1. *Beardius reissi*, spec. nov.; adults (male except d.). a. Hypopygium, left: dorsal, right: ventral. b. Superior volsella. c. Inferior volsella, two views. d. Female genitalia, ventral. e. Thorax.

frontoclypeal apotome with anterior granulation abruptly ending well anterior to the S4 setae are distinctive features of *B. reissi* larvae.

Etymology. Named in honor of Friedrich Reiss for his contributions to chironomidology, including erecting the genus *Beardius* with James Sublette.

Description

Adult male (n=8 unless stated otherwise).

Total length 2.28-2.67, 2.50 mm. Wing length 1.11-1.36, 1.19 mm. Total length/wing length 1.91-2.20, 2.11. Wing length/profemur length 1.64-1.99, 1.77. Alcohol-preserved specimens stramineous except vittae, median anepisternum II and postnotum brown; pedicel and legs light brown with apices of tibiae darker.

Head. AR 0.81-0.96, 0.88; terminal flagellomere 323-404, 357 long. Temporal setae 8-12, 10 in single row. Clypeus with 6-9, 7 setae. Interocular distance 115-132, 121. Tentorium 98-114, 109 long. Palpomere lengths 19-25, 22; 24-31, 28; 59-70, 65; 60-77, 70; 73-113, 93; Pm3 with 2-5, 3 lanceolate sensilla clavata.

Thorax (Fig. 1e). Scutal tubercle absent. Anteprenotal setae absent; acrostichals 3-6, 5, not reduced; dorsocentrals 4-6, 5 in single row; prealars 1-2, 2; scutellars 2-4, 3 in single row.

Wing. VR 1.17-1.29, 1.21. Punctuation visible at 200X. Squama bare. Brachiolum with 2 setae; R 4-8, 5; R₁ 0-2, 0; R₄₊₅ 1-2, 2.

Legs. Tibial spur lengths: fore 25-36, 30; mid 40-48, 44; hind 41-48, 45. Tibial apex widths: fore 43-53, 49; mid 44-50, 49; hind 49-55, 51. Mid ta₁ with 0-1, 0 sensilla chaetica positioned 0.78-0.87 length of ta₁ from base; sensilla chaetica absent on hind ta₁. Lengths and proportions of legs (n=7):

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p ₁	602-750, 673	440-522, 484	642-764, 716	330-398, 361	287-343, 313	204-250, 225
p ₂	529-603, 557	466-554, 500	259-289, 276	144-170, 157	117-141, 129	70-80, 76
p ₃	630-735, 671	550-652, 597	427-487, 462	252-294, 270	197-228, 211	98-114, 109
	ta ₅	LR	BV	SV	BR	
p ₁	91-95, 93	1.43-1.60, 1.49	1.83-1.94, 1.88	1.53-1.69, 1.61	2.5-3.3, 2.9	
p ₂	50-56, 54	0.52-0.57, 0.55	3.09-3.29, 3.21	3.75-4.02, 3.84	2.9-4.0, 3.3	
p ₃	62-69, 66	0.74-0.79, 0.77	2.59-2.70, 2.64	2.69-2.86, 2.75	3.4-4.9, 4.1	

Abdomen. Number of setae on tergites I-VIII (n=6-7): 17-28, 20; 18-28, 24; 27-29, 28; 28-35, 31; 31-36, 33; 30-34, 33; 30-34, 32; 26-34, 29. Number of setae on sternites I-VIII (n=6-7): 0; 0; 3-7, 5; 7-10, 9; 10-13, 11; 11-19, 16; 12-23, 17; 23-25, 24.

Hypopygium (Fig. 1a). Tergite IX with posterior margin straight or slightly rounded, without anal point, tergal bands, and setae. Laterosternite IX without setae. Phallapodeme 58-74, 66 (7) long; transverse sternapodeme 21-29, 25 (7) long. Gonocoxite 110-128, 199 (7) long; superior volsella (Fig. 1b) pediform, bilobed, with 4-6, 5 long setae on dorsal lobe and 3-4, 4 short ventral setae on medial lobe; median volsella short, cylindrical-cornate, with fine microtrichia and 4-6, 5 long apical setae; inferior volsella (Fig. 1c) club-shaped, stem with prominent, elbow-like ventrolateral swelling, 56-62, 59 long with 10-12, 11 stout, apically-dissected sensilla chaetica and 2 slender apical setae. Gonostylus 108-127, 121 (7) long. HR 0.93-1.02, 0.98 (7); HV 1.94-2.23, 2.11 (7).

Adult female (n=5, unless stated otherwise).

Total length 2.02-2.44, 2.20 mm. Wing length 1.24-1.48, 1.32 mm. Total length/wing length 1.61-1.66, 1.64. Wing length/profemur length 2.03-2.22, 2.11. Coloration of alcohol-preserved specimens similar to male but slightly paler.

Head. AR 0.31-0.36, 0.33; flagellomere lengths 89-104, 97; 58-62, 60; 49-64, 56; 46-54, 50; 77-99, 86; Fm1 apparently representing two fused, subequal flagellomeres. Temporal setae 7-10, 8 in single row. Clypeus with 7-11, 9 setae. Interocular distance 124-154, 136. Tentorium 98-118 (3) long. Palpomere lengths 19-22, 21; 24-29, 27; 44-64, 56; 52-65, 60; 84-99, 92 (4); Pm3 with 3-5, 4 lanceolate sensilla clavata.

Thorax. Scutal tubercle absent. Anteprenotal setae absent; acrostichals 4-8, 5; dorsocentrals 4-7, 5 in single row; prealars 1-2, 2; scutellars normally 2-4, 3 in single row, but 0 on one specimen.

Wing. VR 1.22-1.34, 1.28. Squama bare. Brachiolum with 1-2, 2 setae; R 4-6, 5; R₁ 0-3, 2; R₄₊₅ 3-10, 7.

Legs. Tibial spur lengths: fore 26-32, 29; mid 38-48, 44 (4); hind 38-53, 45. Tibial apex widths: fore 45-50, 48; mid 44-49, 47; hind 48-54, 52. Mid ta₁ with 2-3, 2 sensilla chaetica positioned 0.69-0.89 length of ta₁ from base; hind ta₁ with 2-4, 3 positioned 0.54-0.89 length of ta₁ from base. Lengths and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p ₁	593-666, 629	392-466, 431	686-862, 748	319-407, 351	289-355, 314	214-245, 224
p ₂	495-561, 523	455-556, 496	248-289, 266	139-158, 147	110-133, 122	65-76, 71
p ₃	605-700, 641	542-657, 588	412-490, 445	240-282, 255	180-221, 198	97-114, 102
	ta ₅	LR	BV	SV	BR	
p ₁	92-103, 96	1.66-1.85, 1.73	1.80-1.89, 1.84	1.31-1.47, 1.42	2.9-3.2, 3.1	
p ₂	50-60, 54	0.52-0.57, 0.54	3.15-3.33, 3.26	3.65-3.88, 3.82	2.8-3.2, 3.0	
p ₃	57-72, 64	0.74-0.77, 0.76	2.61-2.78, 2.70	2.72-2.80, 2.76	3.2-3.9, 3.5	



Fig. 2. *Beardius reissi*, spec. nov.; pupa and larva. a-d. Pupa. a. Frontal apotome. b. Thoracic horn, schematic. c. Abdominal segment VIII lateral margin, dorsal. d. Tergites II-VI. e-h. Larva. e. Antenna. f. Mandible. g. Maxilla. h. Mentum.

Abdomen. Number of setae on tergites I-VIII (n=3): 15-20, 12-19, 17-25, 18-25, 21-25, 19-25, 22-24, 11-18. Number of setae on sternites I-VIII (n=3): 0, 0, 2-3, 11-14, 18-21, 19-21, 21-24, 19-21.

Genitalia (Fig. 1d). Tergite IX with 18-24, 20 setae. Gonocoxite IX bare. Cercus 61-77, 68 long. Seminal capsule 24-33, 29 wide; 37-45, 42 long including 9 long neck; apparently without microtrichia. Spermathecal duct straight, without special secretory cells. Notum 132-146, 139 long.

Pupa (n=18, unless stated otherwise).

Total length 3.02-3.80, 3.44 mm (15). Cephalothorax light brown; darker at bases of antennae, leg and wing sheaths, on wing margins, post-occipital area, and median suture of frontal apotome; abdominal tergites clear with brown shagreen points; paratergites V-VIII with progressively wider, darker longitudinal pigment bands; anal lobes brown near bases of taeniae.

Cephalothorax. Antennal sheath usually with minute pearl row above pedicel. Frontal apotome apically acute (Fig. 2a), length/width about 0.9; frontal tubercle apically pointed, thorn-like, 12-23, 17 long, 10-18, 14 wide, with subapically inserted frontal seta 22-38, 28 long. Lateral antepnotum usually with vestigial seta and occasionally an additional setal alveolus. Thoracic horn (Fig. 2b, schematic) apparently with 6 branches: a stout anterior branch with small spinules near apex, a median arm with two slender, smooth branches, and a posterior arm with 3 slender, smooth branches; basal ring elliptical, 24-39, 31 long, with one tracheal branch 10-16, 13 wide. One precorneal seta, 28-47, 37 (13) long. Dorsocentral seta Dc_1 stiff, spine-like, alveolus weakly sclerotized; Dc_2 and Dc_3 slender, taeniate, alveoli strongly sclerotized; Dc_4 hair-like, alveolus unsclerotized; lengths: Dc_1 18-35, 26; Dc_2 30-52, 42; Dc_3 22-48, 34; Dc_4 8-14, 11; distance Dc_1 to Dc_2 5-23, 10; Dc_2 to Dc_3 114-143, 129; Dc_3 to Dc_4 4-10, 5. Usually with 1 vestigial prealar seta or sensilla and 1-2 setal scars.

Abdomen. Tergites I, VII, and VIII without shagreen; T II-VI (Fig. 2d) with anterior, transverse band of points distinctly stronger than posteriorly contiguous shagreen, the latter with increasing segment number progressively separating into 2 lobes and reduced until only few points present on VI. Conjunctive IV/V with 3-4 rows of anteriorly-directed points or 2-5-toothed point rows, point field extends $\frac{2}{3}$ width of segment. Paratergite V with extensive field of fine points starting near base of L_1 and extending almost to posterior margin, all other pT bare. Hook row on II continuous, extending $\frac{2}{3}$ width of segment, of 27-59, 39 hooklets. Sternites I, VII, and VIII bare; S II with median field and a few posterolateral fine points; III with anterior field; IV with lateral band; V and VI with scattered anterior fine points. Pedes spurii A on IV. Pedes spurii B weakly developed on II. Segment VIII lateral margin (Fig. 2c) with 2-7, 3 strong, straight or posteriorly-curved spines, longest spine 19-36, 27; also occasionally with isolated or clustered small spinules. Anal spur single or double, 8-17, 13 long, with hair-like spinules at base. Male genital sac extends 60-99 (3) beyond anal lobe. Setation: Segment I with 2 D, 0 L, and 1 V seta; II with 2 D, 3 L, and 2 V setae; III-IV with 4 D, 3 L, 3 V setae; V with 4 D, 3 taeniate L, 3 V setae; VI with 4 D, 4 taeniate L, 3 V setae; VII with 2-4 (usually 2) D, 4 taeniate L, 3 V setae; VIII with 0-1 D, 4 taeniate L, 1 V seta. D_3 seta on III-VI distinctly taeniate and longer than others. Anal lobe with 13-22, 17 fringe taeniae.

Larva (n=14-16, unless stated otherwise).

Body length 3.36-5.10, 4.30 mm (9). Head capsule length 0.28-0.39, 0.34 mm. Head light brown to brown, body red-orange with dark green markings on segments I-III and some light green markings on IV-V; specimens freshly removed from hollowed twigs and grass culms have head, posterior segments and anal tubules noticeably redder than other segments; alcohol preserved larvae are yellow with light brown to brown head capsules.

Head dorsum (Fig. 6b). With labral sclerite 2 and frontoclypeal apotome, the latter distinctly granular from anterior margin to approximately $\frac{2}{3}$ distance to S4 setae.

Antenna (Fig. 2e). 6-segmented. AR 0.90-1.18, 0.98. Segment lengths 53-76, 63; 12-18, 14; 12-17, 14; 14-19, 16; 11-17, 14; 6-8, 7. Basal segment 16-27, 20 wide; distance from base to ring organ 12-17, 14, to basal setal mark 13-18, 14, to distal mark 46-65, 54. Blade 55-79, 65 long, subequal to or slightly longer than flagellum; accessory blade 8-12, 10 long. Lauterborn organs large, 12-14, 13 long; segment 3 apical style 7-10, 9 long.

Labrum. SI slender, tapering, only medially fimbriate, SII only apically fimbriate. Labral lamella with uniform fringe. 2 spinulae, and 4 long posterior and 5-6 short anterior chaetulae. Pecten epipharyngis composed of 3 separate plates, each with 3-5 apical teeth, with 8 chaetulae laterales and 2 apically notched chaetulae basales. Premandible 67-88, 80 long, bifid, with brush. Seta premandibularis simple.

Mentum (Fig. 2h). Width 87-104, 97 (12). With a pointed to worn-rounded pale median tooth and five pairs of dark lateral teeth. First lateral notched, fourth and fifth basally fused. Ventromental plate 62-86, 73 wide, with smooth anterior margin and approximately 20-30, 27 striae. Ventromental plate width / mentum width 0.65-0.84, 0.76. Postmentum 148-193, 172 long, with pebbled surface texture between ventromental plates. Seta submenti with 1-3 short, splinter-like branches.

Maxilla (Fig. 2g). With 3 scale-like lamellar and 2 fimbriate lacinial chaetae.

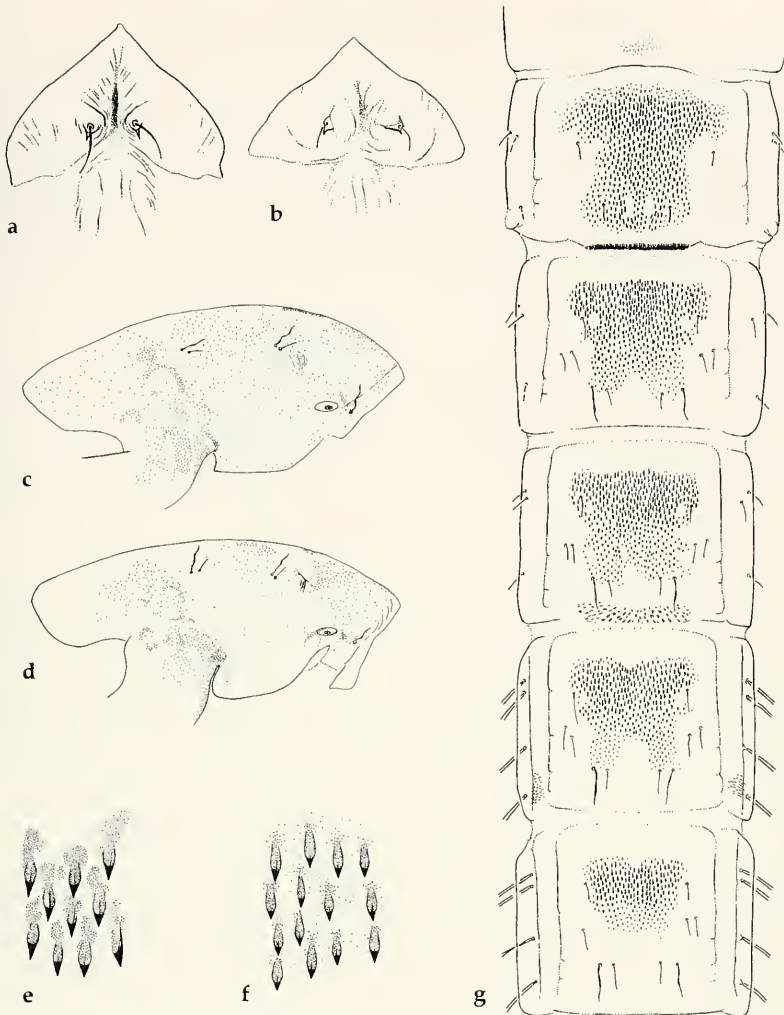


Fig. 3. *Beardius truncatus* Reiss & Sublette and *B. sp. B.*; pupae. **a-b.** Frontal apotome. **c-d.** Thorax, lateral. **e-f.** Tergite II shagreen pigmentation pattern. **g.** Tergites I (posterior) to VI. **a,c,e,g.** *B. truncatus*. **b,d,f.** *B. sp. B.*

Mandible (Fig. 2f). Length 123-152, 141. Outer margin often with lightly pebbled or wrinkled surface. Pecten mandibularis of about 8-10 lamellae. Seta interna with 3 extensively branched arms, lowest arm with 2 major branches. Mola with 1-2 small spines.

Body. Anterior 3 segments with conspicuous setae, posterior segments without notable setae. Procercus 23-36, 31 (10) high, 30-38, 34 (10) wide, with 8 anal setae up to 397-490, 438 (11) long. Supraanal seta length 294-416, 338 (11). Supraanal/anal seta ratio 0.68-0.91, 0.77. Posterior parapod about 125-165, 145 (6) long. Anal tubules conical-digitiform; ventral 72-94, 83 long, 44-62, 52 (5) wide; dorsal 65-86, 76 long, 34-46, 38 (5) wide.

Comments. The 3 larvae from Big Slough, Hardee Co., differ from reared specimens from Everglades National Park in having a longer, darker, more sclerotized head capsule and a higher antennal ratio. The greater size and sclerotization of larvae from Big Slough may be due to lower ambient temperatures and/or nutrient enrichment from agriculture at this site.

Beardius truncatus Reiss & Sublette, emended

(Figs 3a,c,e,g, 6c)

Beardius truncatus Reiss & Sublette, 1985: 188 (male); Epler 1992: 7.27, 1995: 7.27 (larva).

Material examined. USA, Florida: Columbia Co., Santa Fe River at US 441 at High Springs, 1 male P+Lex, 1♂, 1♀ P, 13.II.1990, Environmental Sciences and Permitting personnel (in coll. JHE). Dade Co., Everglades Natl Park, solution hole along L-31W canal 2 mi. N. of Taylor Slough, 2 Pex, 21.XI.1999; solution hole in Long Pine Key along Wilderness Rd, 4 Pex, 16.VII.1998, M. C. Bruno & R. Jacobsen; 1 mile W. of Taylor Slough along FL 9336, 3 Pex, 7.X.1998, 7 Pex, 5.II.1999, D. Levitis & R. Jacobsen; Taylor Slough 100 m downstream of L-31W canal, 1 Pex, 12.V.1999.

Description

Pupa (n=17-19, unless stated otherwise)

Total length 3.19-4.20, 3.62 mm (10). Cephalothorax light brown to gray, darker at bases of leg and wing sheaths, on wing margins, post-occipital area, and median suture of frontal apotome between cephalic tubercles; thoracic cuticle along oblique hinge line (Langton 1995: 184) with light brown pigmentation near median suture (Fig. 3c); tergites with pale yellow, brown or gray pigmentation; pigmentation strongest on T I, progressively diminishing on successive segments; pigmentation within shagreen fields confined to points and discrete patches at bases of points (Fig. 3e); paratergites V-VIII with increasingly wider, darker longitudinal bands of pigment.

Cephalothorax. Antennal sheath with or without minute pearl row above pedicel. Frontal tubercle arising from a low prominence (Fig. 3a), apically pointed, thorn-like, 17-28, 22 (10) long, 14-20, 17 (10) wide, with subapical-anteriorly inserted frontal seta 30-40, 35 (15) long. Anteprepronotum occasionally with alveolus or vestigial seta. Thoracic horn not clearly observable in available mounts, with a stout anterior branch with spinules on at least the distal half; and at least 3 other, smooth branches; basal ring elliptical, 34-56, 42 long, with 1 tracheal branch 12-20, 15 wide. 1 taeniate precorneal, 36-44, 41 (4) long. Dorsocentral seta Dc₁ stiff, hairlike, alveolus well sclerotized; Dc₂ and Dc₄ taeniate, alveoli strongly sclerotized; Dc₃ hairlike, alveolus lightly sclerotized; lengths Dc₁ 28-43, 35; Dc₂ 31-67, 48; Dc₃ 48-65, 56 (16); Dc₄ 18-31, 24; distance Dc₁ to Dc₂ 6-17, 12; Dc₂ to Dc₃ 150-248, 207; Dc₃ to Dc₄ 9-20, 13. With or without prealar setal scars.

Abdomen. Tergites I, VII, and VIII without shagreen; T II (Fig. 3g) shagreen widest in anterior third, narrowing abruptly behind anterior muscle marks and widening over posterior half; central points strong, generally uniform in size, diminishing only at periphery; III to V with progressively smaller, more posteriorly-bilobed fields, with anterior points notably larger than posterior points; VI has anteromedian field with short posterior lobes of smaller points. Conjunctive I/II with a small median patch of very fine spinules; IV/V with 4-5 rows of anteriorly-directed points or pairs of points, point field extends about 2/3 width of segment. Paratergite V with posterior patch of fine spinules, VI usually with a few fine spinules near base of L₄. Hook row on II continuous, extending 1/2 width of segment, of 46-73, 59 hooklets. Sternites I, IV-VIII bare; II and III with posteromedian field of scattered fine points. Pedes spurii A on IV. Pedes spurii B present on II. Segment VIII lateral margin with 0-8, 3 straight or posteriorly-curved spines, longest spine 17-46, 25 long. Anal spur usually single, occasionally double, 7-14, 10 long, with hair-like spinules at base. Male genital sac extends 94-109, 104 (4) beyond anal lobe. Setation: Segment I with 2 D, 0 L, 1 V seta; II with 2 D, 3 L, 3 V setae; III-IV with 5 D, 3 L, 3 V setae; V-VI with 5 D, 4 taeniate L, 3 V setae; VII with 3D, 4 taeniate L, 3 V setae; VIII with 0 D, 4 taeniate L, 1 V seta. D₄ seta on III-VI distinctly taeniate and longer than others. Anal lobe with 12-18, 15 fringe taeniae.

Beardius sp. B

(Figs 3b,d,f)

Material examined. USA: Florida, Dade Co., Everglades Natl Park, Taylor Slough, alligator hole 1 mi. S. of FL 9336, 2 Pex, 12.II.1999; *Typha* stand 1 mi. S. of FL 9336, 1 Pex, 14.I.1999, 1 Pex 12.II.1999; *Cladium* stand 1 mi S. of FL 9336, 1 Pex, 12.II.1999, all D. Levitis & R. Jacobsen; 200 m W. of FL 9336 bridge, 1 Pex, 6.X.1998; 200 m E. of FL 9336 bridge, 1 Pex, 5.II.1999; upstream of FL 9336 bridge, 3 Pex, 5.II.1999.

Description

Pupa (n=9-10, unless stated otherwise)

Total length 2.62-3.48, 3.15 mm (7). Coloration similar to *B. truncatus* except thoracic cuticle along oblique hinge line (Langton 1995: 184) with unpigmented spot near median suture (Fig. 3d), and pigment within shagreen fields on points and diffusely spread between points (Fig 3f).

Cephalothorax. Antennal sheath with or without minute pearl row above pedicel. Frontal tubercle arising from low prominence (Fig. 3b), apically pointed, truncated cone- to thorn-like, length 12-17, 14 (3), width 18-26, 22 (4), with subapically inserted frontal seta 19-30, 25 (7) long. Anteprenotum without setae. Thoracic horn with 6 branches: a stout anterior branch covered with small spinules in distal half, a median arm with two slender, smooth branches, and a posterior arm with 3 slender, smooth branches. Basal ring of thoracic horn elliptical, 34-43, 38 long, with one tracheal branch 12-15, 14 wide. One taeniate precorneal, length 31-68, 44 (3). Dorsocentral seta Dc_1 stiff, hairlike, alveolus well sclerotized; Dc_2 and Dc_4 taeniate, alveoli strongly sclerotized; Dc_3 hairlike, alveolus lightly sclerotized; lengths Dc_1 22-36, 28; Dc_2 34-48, 40; Dc_3 36-48, 41; Dc_4 19-25, 23; distance Dc_1 to Dc_2 8-17, 11; Dc_2 to Dc_3 117-163, 138 (8); Dc_3 to Dc_4 13-26, 18. Occasionally with a prealar setal scar.

Abdomen. Shagreen pattern on tergites similar to *B. truncatus* except T II shagreen not notably widened in posterior half of field behind anterior muscle marks. Conjunctive I/II bare, IV/V with 4-5 rows of anteriorly-directed points or pairs of points, point field extends more than half width of segment. Paratergite V with patch of fine spinules, VI with a few fine spinules near posterior margin. Hook row on II continuous, extending about $\frac{1}{3}$ width of segment, of 30-44, 36 hooklets. All sternites bare. Pedes spurii A on IV. Pedes spurii B present on II. Segment VIII lateral margin with 0-4, 2 straight or posteriorly-curved spines, longest spine 24-31, 27. Anal spur single, length 10-13, 11, with or without fine hair-like spinules at base. Setation: Same as *B. truncatus* except segment V has 3 taeniate L setae. Anal lobe with 11-15, 13 fringe taeniae.

Comments. *Beardius* sp. B may be the pupa of *B. breviculus* an adult male of which has been collected in the northern Everglades (Epler 1992, 1995).

Beardius aciculatus Andersen & Sæther, emended

(Fig. 4)

Beardius aciculatus Andersen & Sæther, 1996: 40 (male).

Material examined. MEXICO: Campeche, Calakmul, Calakmul Biosphere Reserve, large lake in the "zona arqueología, aguada grande", 18°07'26.7"N, 89°48'56.7"W, 265 m a.s.l., 11♀, 15.XI.1998, light trap, A. Contreras Ramos et al. (ZSM, REJ).

Description

Adult female (n=10-11, unless stated otherwise).

Total length 2.03-2.56, 2.29 mm. Wing length 1.11-1.40 mm. Total length/wing length 1.68-1.91, 1.79. Wing length/profemur length 1.94-2.19, 2.07. Head pale; thorax brown; femora with distal $\frac{2}{3}$ brown, front tibia brown, mid and hind ti with proximal $\frac{1}{4}$ brown, fore tarsomere 1 pale with light brown apex, successive ta increasingly darker, mid and hind ta_{1-4} pale, ta_5 light brown; abdomen with tergites I-IV or V brown with pale median area, T V or VI-VIII brown.

Head. AR 0.26-0.33, 0.29; flagellomere lengths 89-108, 97; 61-72, 64; 59-70, 65; 52-66, 59; 69-96, 83; Fm1 apparently represents two fused, subequal flagellomeres. Temporal setae 7-11, 10 in single, staggered row; including 2-3, 2 inner verticals; 2-5, 3 outer verticals; 3-5, 4 postorbitals. Clypeus with 16-24, 20 setae. Interocular distance 92-110, 100. Tentorium 116-146, 129 long, 18-23, 21 wide. Stipes 125-149, 135 long. Palpomere lengths 24-37, 31; 36-44, 38; 71-98, 88; 88-113, 101; 156-190, 170; Pm3 with 2-4, 4 lanceolate sensilla clavata.

Thorax (Fig. 4a). Scutal tubercle present. Anteprenotal and acrostichal setae absent; dorsocentrals 6-10, 8 in single row; prealars 1-2, 2; scutellars 4-6, 5, uniserial or biserial.

Wing. VR 1.32-1.41, 1.37. Squama bare. Brachiolum with 2 setae; R 4-9, 7; R_1 3-8, 6; R_{4+5} 15-22, 18, longest apical seta length 55-76, 67.

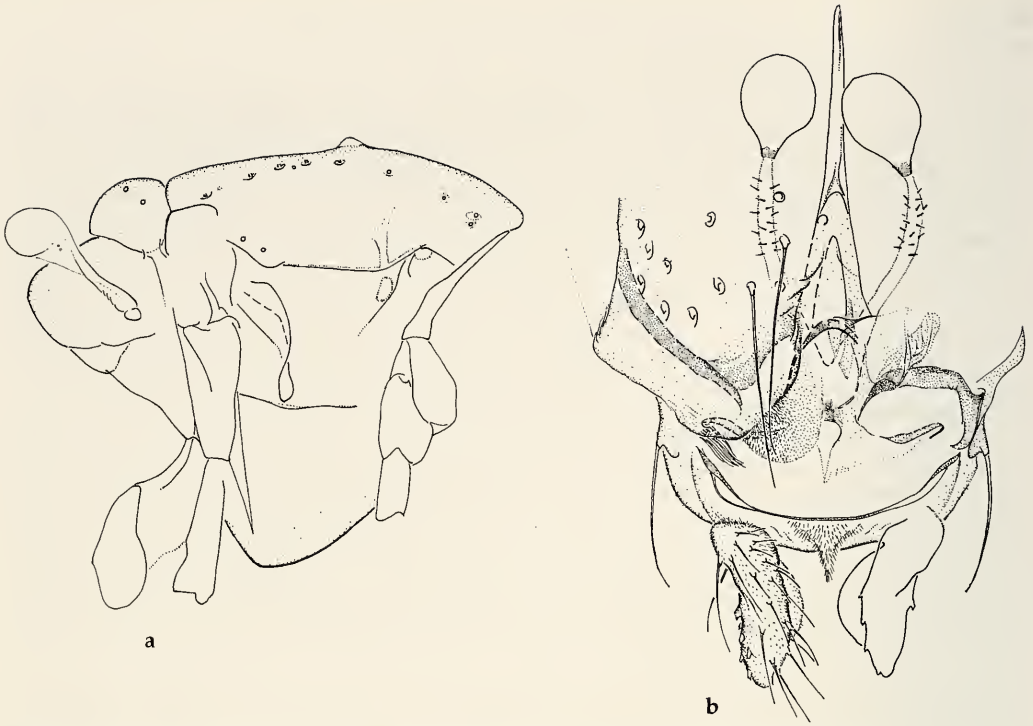


Fig. 4. *Beardiuss aciculatus* Andersen & Sæther; female. a. Thorax, lateral. b. Genitalia, ventral.

Legs. Tibial spur lengths: fore 34-41, 37; mid 33-42, 37; hind 41-50, 43. Tibial apex widths: fore 41-49, 45; mid 41-49, 45; hind 45-53, 50. Mid ta_1 with 8-11, 10 sensilla chaetica positioned 0.67-0.98 length of ta_1 from base; hind ta_1 with 8-13, 10 positioned 0.61-0.98 length of ta_1 from base. Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4
p_1	564-676, 614	370-446, 406	588-760, 679 (7)	289-355, 321 (7)	218-284, 252 (7)	146-188, 171 (7)
p_2	554-691, 617	456-578, 513	269-348, 301 (9)	134-169, 152 (9)	101-130, 115 (9)	58-79, 70 (9)
p_3	632-821, 726	490-637, 554	401-497, 447	199-247, 221	158-186, 175	72-89, 81
	ta_5	LR	BV	SV	BR	
p_1	74-96, 88 (7)	1.59-1.70, 1.64 (7)	2.02-2.10, 2.06 (7)	1.48-1.59, 1.52 (7)	2.9-3.8, 3.4 (7)	
p_2	48-61, 55 (9)	0.57-0.60, 0.58 (9)	3.53-3.86, 3.67 (9)	3.65-3.89, 3.77 (9)	2.8-3.3, 3.0 (9)	
p_3	55-68, 61	0.76-0.83, 0.80	3.11-3.40, 3.24	2.77-3.21, 2.90	3.0-4.4, 3.8	

Abdomen. Number of setae on tergites I-VIII: 13-24, 19; 17-27, 23; 18-25, 22; 16-20, 19; 14-19, 16; 13-16, 14; 9-16, 13; 6-12, 9. Paratergites I-II bare, III-V with 1-3 setae. Number of setae on sternites I-VIII: 0; 0; 2-5, 3; 3-8, 5; 7-16, 11; 10-20, 14; 12-18, 15; 20-32, 25. Parasternites I-IV and VIII bare; V-VII with 1-3 setae.

Genitalia (Fig. 4b). Tergite IX with 16-22, 19 setae. Gonocoxite IX with 1 seta. Cercus 68-89, 78 long. Seminal capsule 28-35, 32 wide; 47-58, 50 long, including 9-13, 12 long neck with 5-12, 7 long sclerotized band at apex. Spermathecal duct straight, with spine-like special secretory cells in proximal half. Notum 96-110, 102 long.

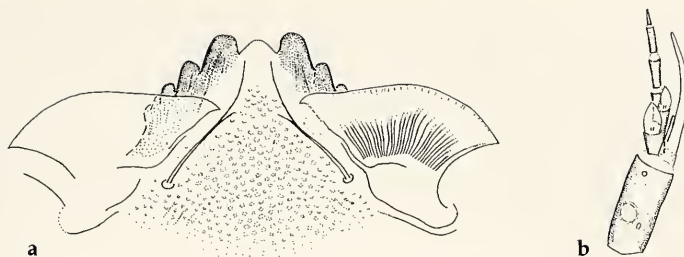


Fig. 5. *Beardius* sp. C, larva. a. Mentum. b. Antenna.

***Beardius* sp. C**
(Figs 5, 6d)

Beardius parvus Reiss & Sublette, 1985: 183 (in part: 2 of the paratype larvae)

Material examined. BRAZIL: Paraiba state, Itaparica, 2 L, 25.I.1935, F. Lenz (ZSM).

Description

Larva (n=2)

Body length about 4.6 mm (1). Head capsule length 0.29-0.32 mm. Head light amber-brown.

Head dorsum (Fig. 6d). With labral sclerite 2 and frontoclypeal apotome, the latter with granularity that apparently extends past S4 setae and gradually weakens.

Antenna (Fig. 5b). 7-segmented, segments 2-4 may be incompletely separated. AR 0.70-0.79. Segment lengths 40-52, 12-13, 10, 10-12, 13, 12-13, 6. Basal segment 18-20 wide. Distance from base to ring organ 12-17, to basal setal mark 17, to distal mark 28-42. Blade 50-56 long, subequal to or slightly longer than flagellum; accessory blade length 10. Lauterborn organs large, length 11; segment 3 apical style length 9.

Mentum (Fig. 5a). Width 94 (1). Ventromental plates separated medially by distance about twice width of median tooth of mentum; each 89-98 wide, with smooth anterior margin and approximately 29 striae. Ventromental plate width / mentum width 0.95 (1). Postmentum 146-152 long, with pebbled surface texture between ventromental plates that extends beyond setae submenti about halfway to occipital margin. Seta submenti with 1 splinter-like branch.

Mandible. Length 124-151. Outer margin apparently smooth. Pecten mandibularis of about 12 lamellae. Mola without spines.

Body (n=1). Anterior 3 segments with conspicuous setae, posterior segments without notable setae. Procercus 29 high, 34 wide, with 7 anal setae up to 441 long. Supraanal seta length 295. Supraanal/anal seta ratio 0.67. Posterior parapods about 220 long. Anal tubules globose; ventral 103 long, 130 wide; dorsal 100 long, 132 wide.

***Beardius parvus* Reiss & Sublette, emended**
(Fig. 6a)

Beardius parvus Reiss & Sublette, 1985: 183 (male, pupa, larva in part: see *B. sp. C* above); Andersen & Sæther 1996: 36 (female).

Material examined (all ZSM). BRAZIL: Rio Amazonas, Ilha do Careiro, Lago dos Passarinhos, 1 L from surface drift, 31.V.1971, F. Reiss; lower Rio Solimoes, Lago do Calado, 2 P+Lex, on floating meadows, 2.IX.1968, W. Junk.

Description

Larva (n=3). As in Reiss & Sublette (1985) with the following additions.

Head dorsum (Fig. 6a). With labral sclerite 2, clypeus, and frontal apotome. Clypeus with fine granularity, other sclerites smooth.

Antenna. 7-segmented, segments 2-4 may be incompletely separated. AR 0.87-1.05. Segment lengths 60-70, 12-14, 10-16, 9-10, 12-13, 13-14, 7. Basal segment 19 wide; distance from base to ring organ 12-15, to basal setal mark 13-20, to distal mark 48-60. Blade 55-62 long, reaching to apex of segment 6; accessory blade length 9-16. Lauterborn organs large, length 12-14; segment 3 apical style length 10.

Mentum. Width 98-101. First lateral tooth notched or smooth due to wear. Ventromental plates separated by about width of median tooth of mentum; each 86-93 wide, with smooth anterior margin and approximately 29-35 striae. Ventromental plate width / mentum width 0.85-0.95. Postmentum 163-173 long, with granular surface texture between ventromental plates anterior of setae submenti.

Mandible. Length 139-146. Outer margin lightly granular. Pecten mandibularis of about 12-15 lamellae. Mola without spines.

Abdomen (n=1). Procercus 39 high, 48 wide, with 8 anal setae up to 530 long. Supraanal seta length 407. Supraanal/anal seta ratio 0.77.

Systematics

Andersen & Sæther (1996) proposed a phylogeny and accompanying key for *Beardius* that split the genus into two distinct clades, here designated as the *parcus* group (*parcus*+*aciculatus*) and the *truncatus* group (*truncatus*+*lingulatus*+*breviculus*+*triangulatus*), based upon character states of hypopygial features and the relative degree of anteromedial extension of the antepnotum. Within that phylogenetic concept, *B. reissi*, spec. nov. shows apomorphic character states for almost all traits leading up to Trend 8. The inferior volsella (stout stem; presence of spine-like, apically dissected sensilla chaetica), median volsella (reduced), superior volsella (pediform), gonostylus (robust), and hypopygium ratio (HR > 0.90) all indicate that *B. reissi* belongs within the *parcus* group. The presence of a frontoclypeal apotome in larval *B. reissi*, *truncatus* and sp. C indicates this character state is not autapomorphic in *Paratendipes*. The relative degree of anteromedial extension of the antepnotum in *B. reissi* is difficult to assign to one of Andersen & Sæther's categories and, considering the close similarity of opposite character states for *B. aciculatus* and *lingulatus* (Andersen & Sæther 1996: figs 3B and 5B), probably should not be considered a diagnostic synapomorphy for the *parcus* group. The absence of setae or long microtrichia on tergite IX in *B. reissi* males indicates that this character state is not synapomorphic for the *truncatus* group.

Resolving relationships between species within the *parcus* group is dependent upon how one interprets adult male characters such as the morphology of the inferior and median volsellae, the presence or absence of a scutal tubercle, the setation of R, R_v, and R₄₊₅, and the presence of setae on tergite IX. Apart from the inferior volsella, these either show considered variation within species groups, or homoplasy within the genus. The incurved, laterally tapered stem of the inferior volsella with either a ventrolateral swelling or ridge, and the stout sensilla chaetica at the apex of the inferior volsella, are distinctive synapomorphies of *B. reissi* and *aciculatus*, suggesting that these species share common ancestry.

The pupal morphology of *B. parcus*, *reissi*, and *truncatus* lends support to Andersen & Sæther's (1996) proposed phylogeny based upon the adults. Both *B. parcus* and *reissi* have tergite shagreen with a distinct anterior band of stronger points, extensive fields of fine spinules on paratergite V, and normally only 4 pairs of D setae on T III-VI, character states not found in *B. truncatus* or sp. B. Though the identity of *B. sp. B* is presently unknown, it could be *B. breviculus*, another member of the *truncatus* group that is present in the Everglades (Epler 1992). No notable concordance in larval and adult morphology within species groups has been found so far, except that known larvae of *parcus* group species have more than 5 antennal segments, whereas *B. truncatus* larvae have only 5. The validity of the *parcus* and *truncatus* species groups will require further assessment when the immature stages of more species become known.

Ecology

Based upon our collection records from the Rocky Glades, *Beardius reissi*, spec. nov. is most abundant in higher elevation marl prairie habitats with relatively short (3-7 months), seasonal inundation periods. These sites in eastern Everglades National Park typically have shallow, patchy soils between

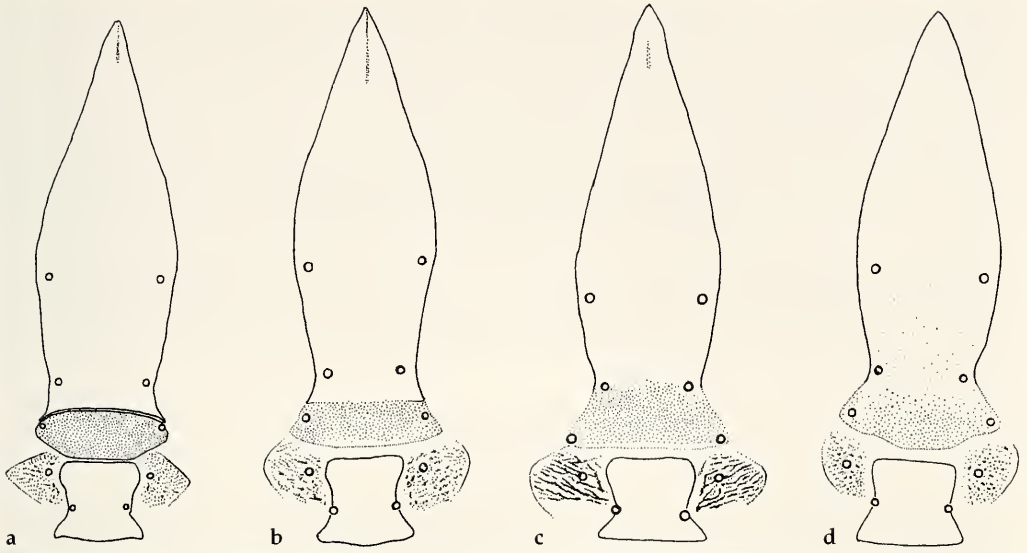


Fig. 6. *Beardius* spp., dorsal sclerites of larval head. a. *B. parvus* Reiss & Sublette. b. *B. reissi*, spec. nov. c. *B. truncatus* Reiss & Sublette. d. *B. sp. C.*

rock outcrops, and uneven soil elevation due to solution and weathering of the limestone bedrock. Their plant communities are consequently diverse and patchy, with *Cladium jamaicense* Crantz often a co-dominant with *Schoenus nigricans* L., *Panicum tenerum* Beyr., *Spartina bakerii* Merrill, *Schizachyrium rhizomatum* (Swallen), and *Muhlenbergia filipes* M. A. Curtis (Gunderson & Loftus 1993). Bottom substrates and submerged plant stems develop a 1-2 cm thick periphyton growth comprising primarily calcareous, filamentous cyanobacteria. Ranges for select physical and chemical parameters at collection sites yielding *B. reissi* were as follows: temperature 21-39 °C, conductivity 137-526 $\mu\text{S}/\text{cm}$ at 25 °C, pH 7.5-8.7 (in periphyton mats up to 9.2), dissolved oxygen 1.1-14.5 mg/l. Dissolved oxygen levels in unenriched Everglades marsh systems with extensive periphyton typically show strong diel fluctuations (e.g. 0-12 mg/l, McCormick et al. 1997).

Specimens from Big Slough were collected from an intermittent wetland peripheral to the main channel that floods during the rainy season.

Larvae of *B. reissi* in the Rocky Glades constructed tubes, often incorporating fragments of periphyton, within small, hollowed pieces of twigs and dead culms of *Muhlenbergia* and *Schizachyrium*. The guts of larvae contained fungal hyphae and spores, plant fragments and periphyton, suggesting a generalist, gathering-collector mode of feeding. Pupation occurred in these fragments of vegetation within tubes with pore plates. The pupa fills the entire length of tube between these plates, sometimes with the terminal abdominal segments folded underneath the rest of the abdomen.

Development and emergence patterns of *B. reissi* appear to be highly dependent upon seasonal hydropatterns. Third and fourth instar larvae were common inside fragments of plant stems and twigs in samples collected 4.VI.1999 from marl prairie sites only a few days after rewetting. Within two weeks of rewetting, emergence had greatly exceeded that of all other species at short-hydroperiod marl prairie sites with large populations of *Muhlenbergia* and *Schizachyrium*, and at one site (400 m east of Rock Reef Pass) even exceeded the concurrent total chironomid emergence at longer-hydroperiod wet prairie and slough sites. cursory examinations of the gut contents of fish (*Gambusia holbrooki*) incidentally captured during sample collection indicated that *B. reissi* pharate adults and emerged adults were an important prey item for fish at short-hydroperiod sites after rewetting.

Emergence peaks were observed at the Rock Reef Pass site in mid-June, mid-July, and in early September after a brief dry-down in mid August. Exuviae were rare after September, even though this site remained inundated until late December. These observations suggest *B. reissi* completed at least 2, most likely 3 generations over the year at Rock Reef Pass: 1 or 2 during the first three months of the rainy season and another over the remainder of the year ending with eclosion shortly after the onset

of the next rainy season in late-May to early-June. *B. reissi* may have physiological and/or behavioral adaptations such as seasonal aestivation of larvae, and perhaps pupae, in drought-resistant cocoons for surviving desiccation in these habitats during the dry season (see Tokeshi 1995, Pinder 1995, Williams 1996 for reviews). Further work is needed to resolve the dry season habits, adaptations, and life history strategies that enable *B. reissi* to thrive in this seasonal habitat.

Beardius truncatus exuviae were collected in low numbers mainly from marl prairie solution holes and depressions and also from the main channel of Taylor Slough. Unlike *B. reissi*, *B. truncatus* does not show a seasonal pattern of emergence, and exuviae were collected from wetted sites throughout the year.

Exuviae of *B. sp. B* were collected primarily from the main channel of Taylor Slough and from adjacent marl prairie sites within approximately 400 m of the main channel. Though relatively few exuviae of this species have been observed, they have been collected from July to February, suggesting emergence is not seasonal. The larval habits of this species, nor those of *B. truncatus*, have not been determined.

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