

THE SECOND SPECIES IN THE SUBFAMILY PODONOMINAE
RECORDED FROM JAPAN, *PAPABOREOCHLUS OKINAWANUS*,
NEW SPECIES (DIPTERA: CHIRONOMIDAE)

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ABSTRACT. - *Paraboreochlus okinawanus*, new species, is described and illustrated from collections in a small stream of Okinawa Main Island, southwest Japan. *Paraboreochlus okinawanus* is the second species described in the Subfamily Podonominae from Japan. Prior to the present *Paraboreochlus* included only two species: *P. minutissimus* (Strobl, 1894) and *P. stahli* Coffman, Ferrington and Seward, 1988. A differential diagnosis for *P. okinawanus* and the described two species indicates distinct differences between these three species, e.g. in *P. okinawanus*, the antennal ratio is very small (ca.0.5), median antepnotals are absent, centrally two apodemes of the hypopygium form a straight bar.

INTRODUCTION

The subfamily Podonominae is divided into two tribes, Boreochlini and Podonomini (Brundin, 1966). As far as the existing species, fifteen genera and about 170 species of the subfamily are known to occur in the world (ibid.). In the Holarctic region, seven genera are known: *Lasiodiamesa*, *Boreochlus*, *Paraboreochlus* and *Shilovia* (Boreochlini) and *Trichotanypus*, *Parochlus* and *Linevitschia* (Ponomini) (Ashe & Cranston, 1990; Ashe, Murray & Reiss, 1987; Brundin, 1966; Brundin, 1989; Cranston & Edward, 1998; Schlee, 1975).

The genus *Paraboreochlus* includes only two species, *minutissimus* (Strobl, 1894) and *stahli* Coffman, Ferrington & Seward, 1988. The former occurs in Europe (including Corsica), Bulgaria and Greece, and the latter is recorded from the Nearctic region (Pennsylvania and Kansas, U.S.A.). It is an interesting fact that the nearest known relative of *Paraboreochlus* may be a 130 million years old species found in the Neocomian amber of Lebanon, *Libanochilus neocomicus* Brundin, 1976 (Brundin, 1976, 1989).

In Japan, the recorded Podonominae are represented by only one species. The male imago of *Boreochlus thienemanni* Edwards, was redescribed by Okazawa, Kamimura and Sasa, 1993 from Toyama Prefecture (Sasa & Okazawa (1993) further redescribed the same species based on the same specimens in a second publication). Larvae of *Paraboreochlus* sp. are recorded from the hyporheos in the bar-island of a mountain stream in Nara Prefecture by Y. Takemon (in press) in his ecological study.

The male imago of Podonominae is easily separable from other subfamilies by the following characters: free end of costal extension reaching tip of wing, R_{2+3} lacking, MCu present. Further clues are the short ultimate antennal flagellomere (penultimate flagellomere is several times length of the ultimate except for one of the austral genus *Podochlus*); postnotum short and arched, with several setae but median fissure lacking; fusion of tergum IX with sternum IX (Brundin, 1989). *Paraboreochlus* Thieneman, 1939 is separable from other genera of Podonominae in the male hypopygial volsella consisting of an anterior slender, sinuous lobe with some stout setae subapically and a swollen basal posterior lobe.

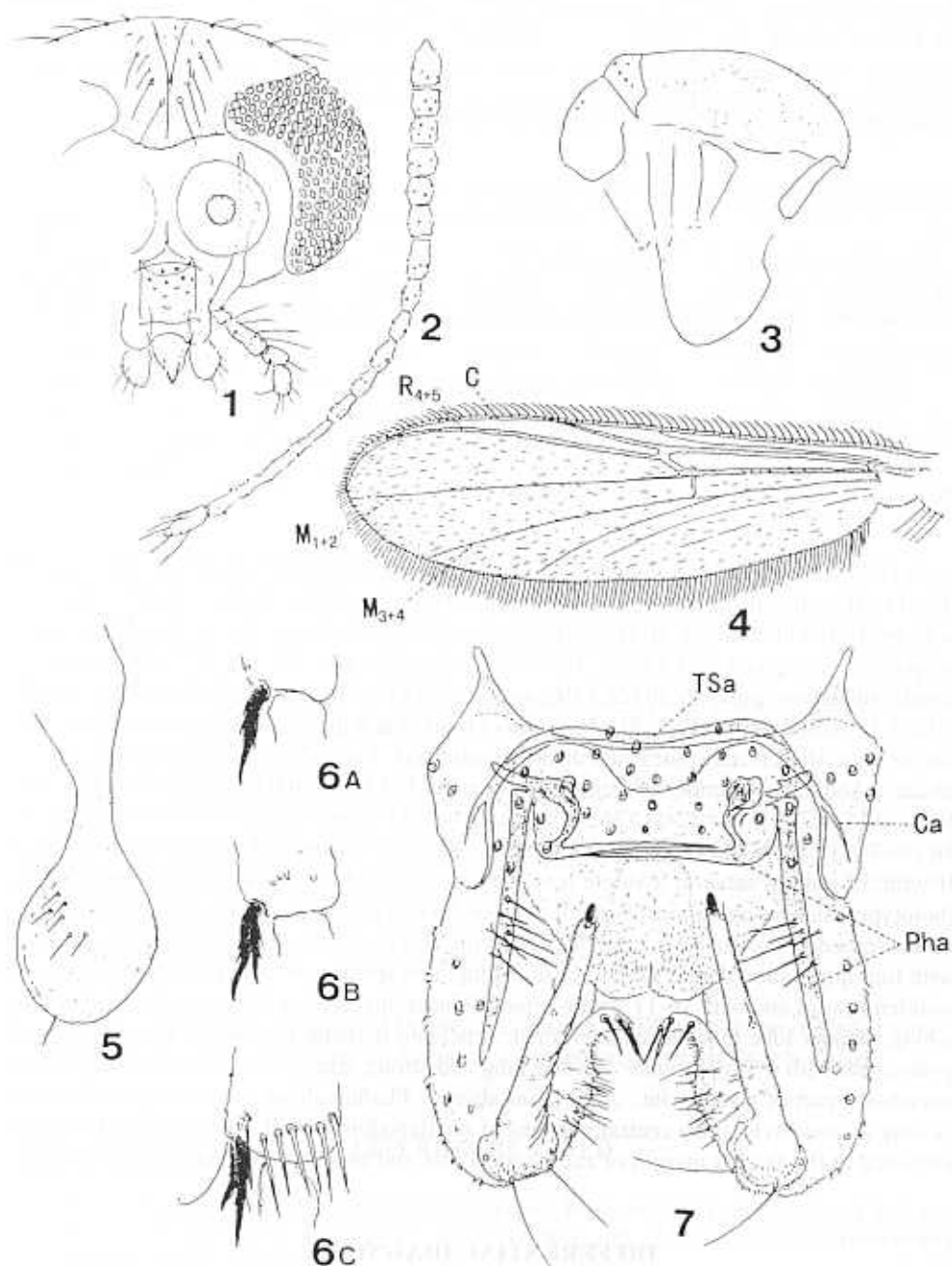
MATERIALS AND METHOD

Five male imago specimens of *P. okinawanus* were collected in a Malaise Trap in Okinawa Main Island. The applied mounting procedure is outlined by Pinder (1989), using Euparal as the mounting medium. Morphological nomenclature follows Brundin (1966) and Saether (1980). All measurements are micrometers (μm) unless otherwise stated and given as ranges followed by a mean in parentheses and the number examined.

Specimens examined. - All type specimens were collected by Ryoichi Kuranishi and Masaaki Kimura at Hiji River, Okinawa Main Island (26°42'N, 126°12'E), and are deposited at the Natural History Museum and Institute, Chiba. Holotype: one male imago, 1 Mar.1996, CBM-ZI 76761. Paratypes: one male imago, CBM-ZI 76762, 15 Feb.1996; one male imago, CBM-ZI 76763, 1 Mar.1996; two male imagines, CBM-ZI 76764, 76765, 13 Mar.1996. Female imago and immature stages are unknown.

DESCRIPTION OF TYPES

Coloration. - Head, dorsum of thorax dark brown, abdomen and legs light brown. Body length 1.6-1.9 (1.76 (5)) mm. Head (Fig. 1): Antenna (Fig. 2) with 14 flagellomeres, A. R. = 0.48-0.51 (0.49 (9)), penultimate flagellomere 2.38-3.69 (3.10 (9)) times length of the ultimate, terminal flagellomere not set at a distinct angle, flagellomeres 13 and 14 completely separated, separation weakly oblique; eyes with a moderate dorsomedial extension; setae of head: 14-15 (14.8 (6)) temporals, 2-4 (3.0 (7)) postorbitals, 7-10 (8.7 (3)) clypeals, cephalic tubercles absent; maxillary palp with 5 segments typically and extremely short, 82.5-89 (84.6 (4)) μm long; sometimes segments II and III are completely fused into one segment, among five individuals examined three have fused segments on one side. Lengths of segments are shown in Table 1. Thorax (Fig. 3): anteprepronotum notched at middle; thoracic setae: 6-7 (7.0 (5)) lateral anteprepronotals, no median ones, 34-35 (37 (3)) acrostichals, 29-41 (35.2 (9)) dorsocentrals, 17-19 (17.9 (7)) prealars, 2 (2 (8)) supraalars, 12-17 (15.4 (5)) scutellars and 4-5 (4.3 (4)) postnotals; acrostichals begin at anteprepronotum. Wings (Fig. 4): Wing length 1.1-1.2 (1.14 (6)) mm; venarum ratio 0.88-0.96 (0.92 (5)); squama with 2-9 (5.71 (7)) setae; wing covered with microtrichia and macrotrichia, but lacking in basal cells between costa



Figs. 1-7. *Paraboreochlus okinawanus*: Structure of male imago (holotype): 1. head (maxillary palp segment II and III fused into one segment), 2. antenna, 3. thorax, 4. wing, C – costa, 5. halter, 6A. tip of front tibia, 6B. tip of mid tibia, 6C. tip of hind tibia, 7. hypopygium, TSa – transvers sternapodeme, Ca – coxapodeme, Pha – phallopodeme.

Table 1. Lengths of palpal segments (?m)

I	II	III	(II+III)	IV	V	Total length
10-15	14-18	18-19	32-35	17.5-20	20-22	82.5-89
(12.5 (4))	(16.3 (4))	(18.6 (5))	(32.3 (3))	(18.6 (8))	(20.9 (8))	(84.6 (4))

Means and numbers of the parts examined in parentheses

Table 2. Lengths of leg segments (?m) and leg ratios.

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR
p1	430-480 (44.7 (8))	550-640 (577.0 (10))	250-300 (272.5 (10))	120-140 (128.5 (10))	80-100 (91.0 (10))	60-70 (67.5 (10))	70-80 (74.5 (10))	0.45-0.51 (0.47 (10))
p2	470-525 (497.5 (8))	530-605 (565.0 (9))	230-280 (276.9 (8))	120-125 (123.1 (8))	80-100 (93.8 (8))	60-70 (66.3 (8))	70-80 (75.0 (8))	0.42-0.53 (0.49 (8))
p3	450-500 (474.4 (9))	610-690 (646.3 (8))	390-445 (411.3 (9))	160-200 (180.6 (9))	110-140 (122.8 (9))	75-80 (78.3 (9))	75-85 (78.9 (9))	0.63-0.64 (0.63 (7))

Means and numbers of the parts examined in parentheses

and radius, and in cells m , r , r_1 and $r_{2,3}$. Costal extension 100 μm to wing tip; M_{1+2} slightly distal to R_{4+5} , R_{4+5} distal to M_{3+4} . Cu_1 curved a little at middle. Halteres (Fig. 5): Covered with microtrichia, totally 6-10 (8.0 (6)) setae on both sides. Legs (Fig. 6): Leg lengths and proportions are given in Table 2. Front tibia with one spur, 31-38 (35.7 (10)) μm long; middle tibia, two spurs, 26-30 (28.4 (9)) and 31-40 (34.9 (9)) μm ; hind tibia, two spurs, 28-30 (28.4 (9)) and 35-40 (37.1 (8)) μm ; comb of hind tibia with 3-6 (4.0 (9)) setae; claws with two or three short basal spines, and distally spatulated. Empodium as long as claw; pulvilli absent. Abdomen: Number of tergal setae, tergum I 37-43 (40.0 (2)), II 35-39 (36.7 (3)), III 31-37 (34.7 (3)), IV 32-41 (36.3 (3)), V 31-45 (37.7 (3)), VI 28-47 (37.7 (3)), VII 36-46 (39.7 (3)), VIII 24-35 (30.0 (3)), IX 34-43 (38.3 (3)). Sternum I without setae, sternum II with 3-4 lateral setae in a single row. Hypopygium (Fig. 7): Gonostylus 105 μm long (holotype), slender and almost straight. Gonocoxite bears large apical volsella, originating on dorsomedial margin near base of gonostylus and directed anteriorly; volsella sinuous, with four large, stout dorsal spines 16 μm in length on apical part. The basal part of volsella swollen inward and with 16-17 strong setae. Gonostylus swollen at base and extended into a long, slender lobe that carries a terminal, small and lamellar megaseta. Basal portion of gonocoxite with 6-7 long setae. Several long and strong setae present directed medially at dorsobasal part of gonocoxite. Anal point absent. Phallapodeme in gonostylus thick and as long as gonostylus, two central portions of phallapodemes well sclerotized and straight, anchored at the frontal margin of each gonocoxite and together forming a transverse bar.

DIFFERENTIAL DIAGNOSIS

The differential species diagnosis refers mainly to Brundin (1989, 1966) and Goetghebuer (1934, *Ablabesmyia pecteniphora*; regarded as a synonym of *minutissimus* by Brundin (1966)) concerning *minutissimus*; and Coffman, Ferrington & Seward (1988) concerning *stahlii*. Based on these sources, *P. okinawanus* can be separated from them as follows.

Differences from *minutissimus* (characters of *minutissimus* in parentheses):

Eye with moderate dorsomedial extension (absent); ultimate flagellomere of antenna is not bent at a distinct angle to flagellum (ultimate flagellomere bent at right angle to flagellum); MCu situated almost below RM (MCu joining M at a distance from RM equal to its own length). Centrally two well sclerotized apodemes of hypopygium form an transverse straight bar (form an arch); 6-7 strong setae directed medially at the dorsobasal portion of gonocoxite (weak(?), judging from the figures of *minutissimus* by Brundin(1989) and Goethegauer (1934)); volsella not double, but just swollen at its basal portion ('double').

Differences from *stahli* (characters of *stahli* in parentheses):

AR 0.49 (0.75, 0.78); penultimate flagellomere 3.10 times length of the ultimate (5.4 times); seven lateral anteprenotals, without median setae (with 4-5 lateral and 2 median setae); centrally two apodemes forming almost straight transverse bar (forming an arch); the numbers of tergal setae much fewer than those of *stahli* (60-76-79-74-60-60-53-40-60); squamals 2-8 (13).

The specific name of the present species is based on the name of collection site, Okinawa Main Island.

KEY TO SPECIES OF THE GENUS *PARABOREOCHLUS*

- 1: Eye without dorsomedial extension; antennal ultimate flagellomere bent at right angle to flagellum; MCu joining M at a distance from RM equal to its own length. *minutissimus*
- Eye with dorsomedial extension; antennal ultimate flagellomere not set at right angle to flagellum; MCu situated almost below RM. 2
2. AR 0.7-0.8; median anteprenotals present; centrally 2 apodemes forming an arch *stahli*
- AR ca.0.5; median anteprenotals absent; centrally 2 apodemes forming a straight bar. *okinawanus*

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