Odonatologica 28(2): 127-137 *June 1, 1999*

THE GENUS *PHASMONEURA*, WITH DESCRIPTION OF *FORCEPSIONEURA* GEN. NOV. AND TWO NEW SPECIES (ZYGOPTERA: PROTONEURIDAE)

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Received August 12, 1998 / Revised and Accepted December 8, 1998

The genus *Phasmoneura* is reviewed with the description of *Phasmoneura janirae* sp. n. (holotype ♂, allotype ♀: Brazil: Mato Grosso, Sinop, X-1976; in MNRJ). *Forcepsioneura* gen. n. is established for *Forcepsioneura garrisoni* sp. n. (generotype and holotype ♂: Brazil, São Paulo, Iguape, 22-IV-1995, in coll. Lencioni) and includes three previously described spp., viz. *Phasmoneura ephippigera* (Selys, 1886), *P. ciganae* Santos, 1968 and *P. itatiaiae* Santos, 1970. Keys and illustrations are given for all members of both genera.

INTRODUCTION

In the state of São Paulo, Brazil, I collected a single male specimen of Protoneuridae which differed in size, coloration and morphology from other congeners in my collection. This specimen appeared closest to *Phasmoneura ciganae* Santos, but differed in morphology of the cerci and prothorax. Dr Sidney W. Dunkle kindly sent me two males of *Phasmoneura ephippigera* for further comparison with my specimen. Through the kindness of Dr Janira M. Costa of the Museu Nacional, Rio de Janeiro, I was able to examine the holotypes of *Phasmoneura ciganae* and *P. itatiaiae*, and specimens of *Phasmoneura exigua*. She also granted me the privilege of studying nine specimens of a new species similar to *Phasmoneura exigua* which I take pleasure in describing as *Phasmoneura janirae*.

The cercus of this new species (like that of *Phasmoneura ephippigera*, *P. ciganae*, and *P. itatiaiae* is forcipate and possesses at its base a medially directed apophysis (here called internal apophysis) and a ventrally directed branch. This combination of characters differs from the cercus of *Phasmoneura exigua* as illustrated by MACHADO (1985). The penes of *P. exigua* and *P. janirae* lack the fila-

Fig. 1. Distribution. – Key to localities: GUYANA: Rockstone; – PERU: Loreto Dept., Explornap Camp on Sucursari River nr Napo River alt 100 mi NE Iquitos; – BRAZIL: Rio de Janeiro (RJ): Rio de Janeiro, Itatiaia and Parati; – São Paulo (SP): Jacareí and Iguape; – Paraná (PR): Guarapuava; – Mato Grosso (MT): Sinop; – Pará (PA): Óbidos; – Amazonas (AM): Manaus.'

ments at the apex of segment 3 (segment 3 is divided in this paper into peduncle and apex, Fig. 7f) characteristic of *P. ephippigera*, *P. ciganae*, *P. itatiaiae* and *Forcepsioneura garrisoni*. The internal fold of the penis is shorter in *Phasmoneura exigua* and *P. janirae* than in *Phasmoneura ephippigera*, *P. ciganae*, *P. itatiaiae* and *Forcepsioneura garrisoni*.

Because of those differences I have erected a new genus, *Forcepsioneura*, to contain *F. garrisoni* and three species previously described under *Phasmoneura*, viz. *P. ephippigera* (Selys, 1886), *P. ciganae* Santos, 1968 and *P. itatiaiae* Santos, 1970. The two genera may be distinguished by the following key.

KEY TO GENERA

1 Cercus lacking an internal apophysis (Figs 3b, 3e), in lateral view with a ventral apophysis at distal 0.5 (Figs 3a, 3d); internal fold short and not touching segment 3 ventrally, apex of segment 3 lacking filaments (Fig. 3f) ..... ***Phasmoneura***

– Cercus with an internal apophysis and a vertically directed branch (e.g. Figs 4b, 4f); penis with internal fold long, touching segment 3 above, apex of segment 3 with two long filaments at apex (Fig. 4d) ..... ***Forcepsioneura***

KEY TO MALE *PHASMONEURA*

1 In lateral view cercus with bluntly triangular shaped apophysis shorter, beginning at distal half of cercus (Fig. 3a); in dorsal view apex of cercus strongly recurved medially (Fig. 3b); 10th abdominal segment with dorsoapical elevation prominent (Fig. 3a); penis with posterolateral margin of apex of the segment 3 forming a right angle with peduncle (Fig. 3c) ..... ***exigua***
In lateral view cercus with bluntly rectangular shaped apophysis longer, beginning at medial third of cercus (Fig. 3d); in dorsal view apex of cercus slightly recurved medially (Fig. 3e); 10th abdominal segment with dorsoapical elevation less prominent (Fig. 3d); penis with posterolateral margin of apex of the segment 3 forming obtuse angle with peduncle (Fig. 3f) ... ***janirae***

PHASMONEURA JANIRAE SP. NOV.

Figures 2b, 3d-f

M a t e r i a l. – **Holotype** ♂: Brazil: State of Mato Grosso, Sinop, X-1976 (Braulio and Roppa). – **Allotype** ♀: same data of holotype. – Additional material (7 ♂ paratypes): all same data as holotype. Specimens deposited in the Museu Nacional collection (MNRJ), Rio de Janeiro, except for one paratype in the author's collection.

E t y m o l o g y. – I dedicate this species to my friend Dr Janira Martins C o s t a for her great contribution to the study of the Brazilian Odonata and for her courtesy in loaning type material for this description.

MALE (Holotype). – H e a d. – Labium, base of mandibles, genae and a narrow line above postclypeus light yellow, labrum yellow except for dark brown basal third; anteclypeus yellow; postclypeus dark brown; frons and epicranium black.

T h o r a x. – Prothorax laterodorsally black dusted with white pruinosity, lateroventrally pale yellow; synthorax black with metallic reflections reaching mesopleural suture; a bluish line at level of interpleural suture; mesepimeron dark green with metallic reflections covered by white pruinosity; mesepisternum dark brown, almost black; metepimeron and metasternum pale blue. Coxae and legs pale yellow; femora with narrow dorsal dark lines; femorae and tibial joints dark brown; claws without tooth.

Wings entirely hyaline; pterostigma brown surrounded by pale line; postnodals in left fore wing 12, in right fore wing 13; in hind wing 11; arculus at level of second antenodal in both wings; antenodal spaces in fore wing: 2:2:2; in hind wing 2:2:1.9; R_{4+5} in both wings originating just before subnodus; R_3 in fore wing originating at 7th postnodal, in hind wing at 5th postnodal; IR_2 in both wings originating at 9th postnodal; CuP in fore wing reaching crossvein descending from subnodus, in hind wing reaching 1st postnodal crossvein before reaching the wing border.

A b d o m e n. – Segments 1 and 2 dark brown dorsally and becoming yellow ventrally; segments 3 to 6 light

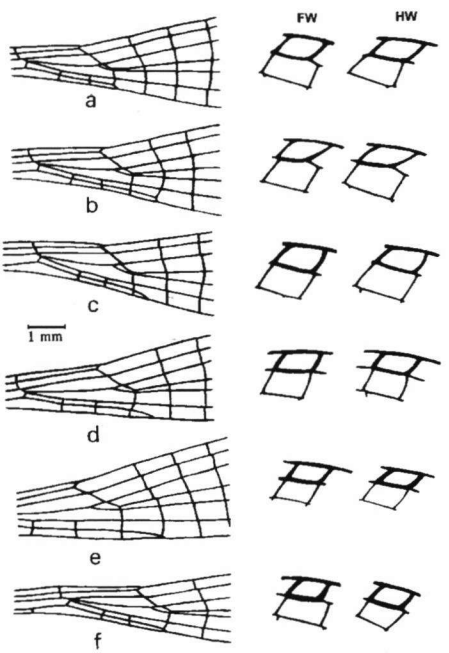

Fig. 2(a-f). Base of male hindwing and pterostigma of male fore- and hindwing: (a) *Phasmoneura exigua*, – (b) *P. janirae* sp. n. – (c) *Forcepsioneura ephippigera*, – (d) *F. ciganae*, – (e) *F. itatiaiae*, – (f) *F. garrisoni* sp. n.

brown dorsally and becoming yellow ventrally, each segment with a yellow ring at base and a dark ring at end; segment 7 entirely brown; segments 8 to 10 black. Anal appendages brown at base and apically black.

Measurements (in mm). – Total body length 36, abdomen 31,5, fore wing 20, hind wing 19.

FEMALE (Allotype). – Head. – Labium, base of mandibles and genae yellow, anteclypeus yellow with a narrow brown line at margin; labrum yellow except for proximal 0.33 light brown; postclypeus and frons brown; epicranium black.

Thorax. – Prothorax laterodorsally light brown, pale lateroventrally; synthorax brown with light green metallic reflections; dorsal carina black mesepimeron brown; metepisternum and metepimeron pale. Legs as in holotype.

Wings [damaged and certain parts lost] entirely hyaline; pterostigma light brown; postnodals in fore wing 13; in hind wing left 10, in right 11; arculus at the level of the second antenodal in both wings; R_{4+5} in both wings originating just before to subnodus; CuP as in holotype.

Abdomen. – Segments 1 to 6 as holotype; 7 entirely brown; 8 dorsally black

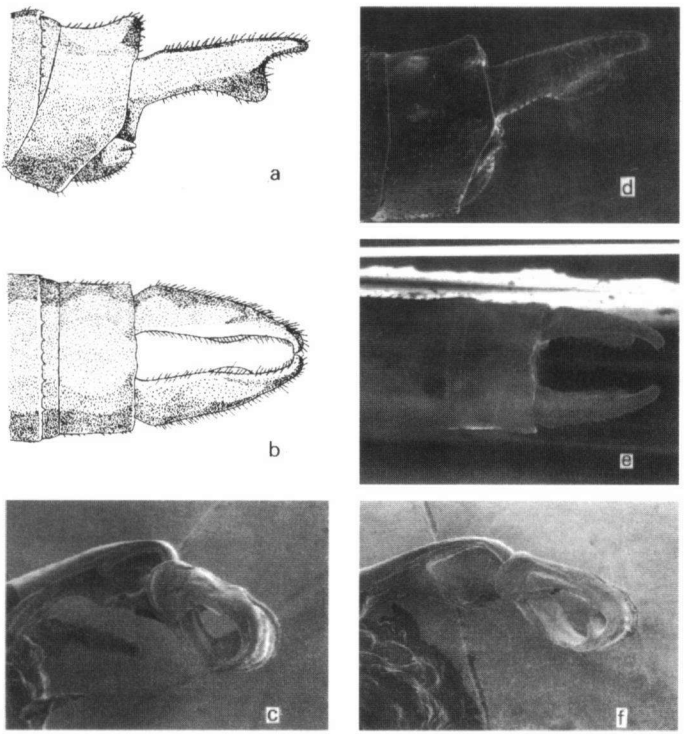

Fig. 3(a-f). *Phasmoneura exigua*: (a) anal appendages, lateral view, – (b) ditto, dorsal view, – (c) penis. – *P. janirae* sp. n.: (d) anal appendages, lateral view, – (e) ditto, dorsal view, – (f) penis.

and ventrally brown; 9 with a large semicircular black spot in each side, remainder brown; 10 brown with some black markings.

Measurements (in mm). – Abdomen 33.

VARIATION. – Among 7 paratypes ♂: Postnodals f.w. [fore wing, right/left]: 13/13 (42.9%), 13/12 (28.6%) and 12/12 (28.6%); h.w.[hind wing] 12/12 (14.3%), 11/11 (57.1%) and 10/10 (28.6%); R3 in f.w. originating at 7/7 (85.7%), 6/ between 6 and 7 (14.3%); h.w. 5 (100%); IR2 f.w. 10/10 (57.1%), 9/10 (14.3%) 10/9 (14.3%) and 9/9 (14.3%); h.w 9/9 (14.3%), 9/8 (28.6%) and 8/8 (57.1%), CuP as holotype except for 2 paratypes: one with CuP in the left hind wing terminating at the half of the distance between the crossvein descending from subnodus and that

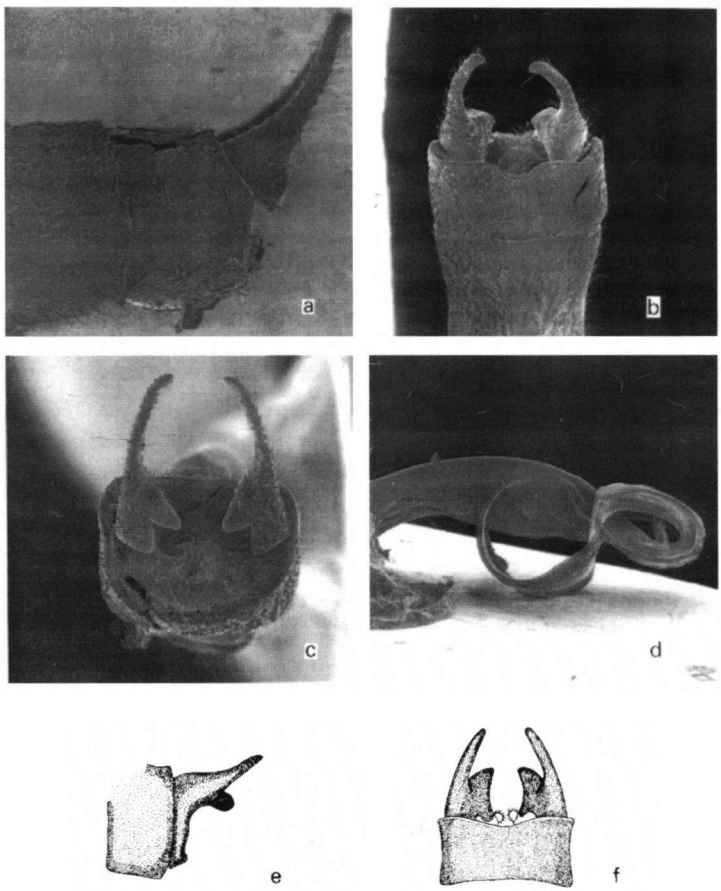

Fig. 4(a-f). *Forcepsioneura ephippigera*: (a) anal appendages, lateral view, – (b) ditto, dorsal view, – (c) ditto, posterior view, – (d) penis. – *F. itatiaiae*: (e) anal appendages, lateral view, – (f) ditto, dorsal view.

descending from first postnodal and the other paratype with the same characteristic but in the right fore wing.

FORCEPSIONEURA GEN. NOV.

Generotype: *Forcepsioneura garrisoni* sp. n.

E t y m o l o g y. – From the Latin "forceps". An allusion to the forcipate condition in the male cerci.

Protoneuridae of medium size, abdomen long and slender, general coloration dark with metallic reflections, apex of segment 3 of penis with two long filaments, internal fold of the penis long, touching segment 3 above, cerci appendages strongly forcipate, each with a ventrally directed branch (small in *F. ephippigera*). Claws

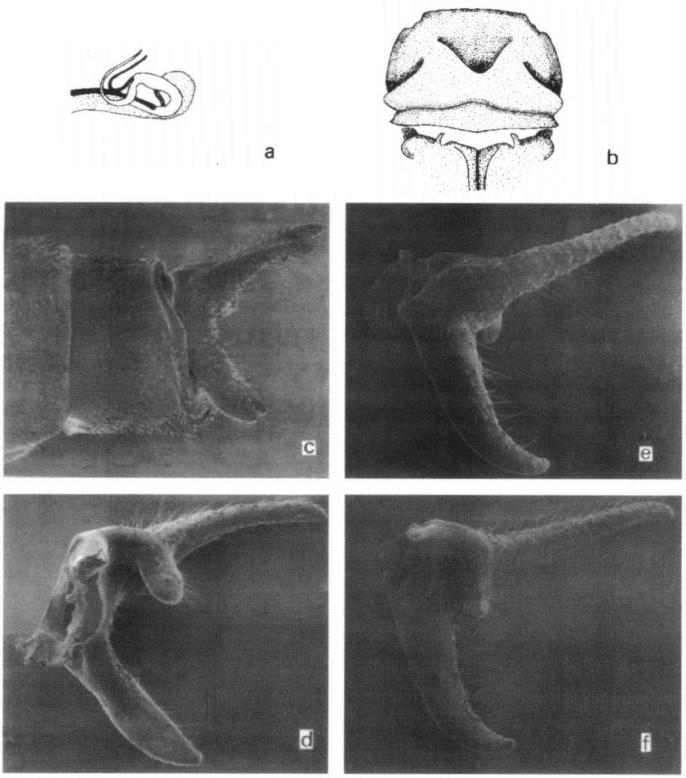

Fig. 5(a-f). *Forcepsioneura itatiaiae*: (a) penis, – (b) prothorax, dorsal view. – *F. ciganae*: (c) anal appendages, lateral view, – (d) ditto, internal view. – *F. garrisoni* sp. n.: (e) ditto, lateral view, – (f) ditto, internal view.

with well-developed tooth. Prothorax with apophysis at extremity of medial lobe (reduced in *F. ephippigera*). Postnodals in fore wing: 11-17, in hind wing: 8-14; R3 in fore wing at 5th, 6th or 7th postnodal, in hind wing at 4th or 5th; IR_2 in fore wing between 7th and 10th postnodal, in hind wing between 5th and 8th; CuP usually crossing descending crossvein from subnodus. IR_3 arising at crossvein descending from or slightly distal to subnodus; R_{4+5} proximal to subnodus. IR_3 distally separated from R_{4+5} by a small crossvein. First antenodal space larger than the second, second space usually smaller than the third.

Forcepsioneura differs from *Phasmoneura* by the characters in the key to genera.

KEY TO MALE SPECIES OF *FORCEPSIONEURA*

1 In dorsal view cerci with internal apophysis at basal 0.33 (e.g. Fig. 4b) 2
– In dorsal view cerci with large internal apophysis at 0.5 (Fig. 4f); in lateral view cerci directed dorsoposteriorly and internal apophysis decumbent (Fig. 4e); prothorax with lateral apophysis at extremity of medial lobe, posterior lobe almost the same size of the medial one (Fig. 5b) .. .. ***itatiaiae***
2 In lateral view cerci strongly directed dorsally (Fig. 4a); in posterior view vertical branch of the cercus short (Fig. 4c) ..... ***ephippigera***
– Cercus not as above 3
3 In mediodorsal view, tip of internal apophysis of cercus rounded (Fig. 5d); in dorsal view prothorax with posterior lobe rounded (Fig. 7a) ..... ***ciganae***
– In mediodorsal view, tip of internal apophysis of cercus straight (Fig. 5f); in dorsal view prothorax with posterior lobe with a medial fossa (Fig. 7c); lateral apophysis of medial lobe pointed and directed distally (Fig. 7c) ***garrisoni***

FORCEPSIONEURA GARRISONI SP. NOV.

Figures 2f, 5e-f, 6d-f, 7c-e

M a t e r i a l. – **Holotype** ♂ Brazil: State of São Paulo, Iguape, 22-IV-1995; deposited in the author's collection.

E t y m o l o g y. – I dedicate this species to my friend Dr Rosser W. G a r r i s o n, who has supported my work and for his great contribution of the study of neotropical Odonata.

MALE (**Holotype**). – H e a d. – Labium, base of mandibles light yellow, genae bluish, labrum black except for brown spot at base; ante- and postclypeus black; epicranium black with dark metallic green reflections.

T h o r a x. – Prothorax light brown with bluish spot laterally and with an apophysis on lateral margin of medial lobe (Figs 7c and 7d), synthorax with metallic green stripe lateral to dark dorsal carina; remainder of mesepisternun and all of mesepimeron brown; mesepisternum light blue, metepimeron and metasternum pale yellow. Legs pale, claws with well-developed tooth.

Wings entirely hyaline; pterostigma dark brown; postnodals in fore wing 11; in hind wing 9; arculus slightly before second antenodal in both wings; antenodal spaces in fore wing: 2:1.9:2; in hind wing 2.1:1.7:2.1; R_{4+5} in both wings originating just before subnodus; R_3 in fore wing originating at 5th postnodal, in hind wing

at 4th postnodal; IR_2 in both wings originating at 7th postnodal; CuP in both wings terminating at level of subnodus.

A b d o m e n. – Segments 1 and 2 brown dorsally and becoming yellow ventrally; segments 3 to 6 as in segments 1 and 2 but each segment with a yellow ring at base; segments 7 to 10 all black with white pruinosity on 9 and 10.

Anal appendages, in lateral view, horizontal branch inclined upward and apical extremity of ventral branch slightly inclined dorsally (Fig. 5e); in dorsal view strongly forcipate; in posterior view apical extremity of the both vertical branch medially recurved (Fig 6e).

M e a s u r e m e n t s (in mm). – Total body length (including appendages) 34, abdomen 29, fore wing 19, hind wing 16, costal side of pterostigma 0.5 mm.

FEMALE unknown.

BIOLOGY. – The holotype was collected while it flew over marshy vegetation at

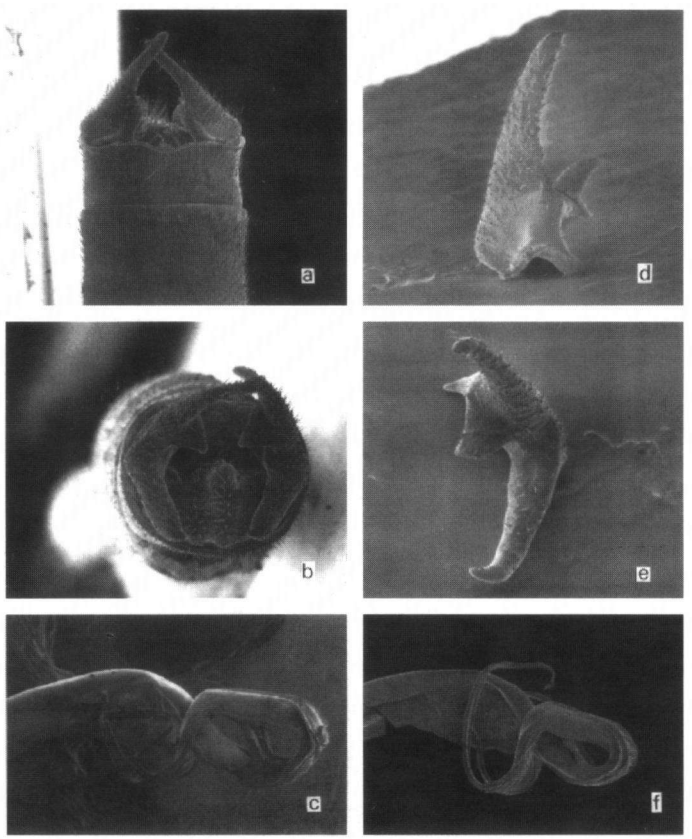

Fig. 6(a-f). *Forcepsioneura ciganae*: (a) anal appendages, dorsal view, – (b) ditto, posterior view, – (c) penis. – *F. garrisoni* sp. n.: (d) anal appendages, dorsal view, – (e) ditto, posterior view, – (f) penis.

the margin of a small stream shadowed by the forest on a cloudy day.

THE STATUS OF *FORCEPSIONEURA*

Of the 12 American genera of Protoneuridae I verified that in eight (*Microneura*, *Protoneura*, *Epipleoneura*, *Epipotoneura*, *Roppaneura*, *Psaironeura*, *Phasmoneura* and *Junix*) the anal vein is rudimentary or absent. In these 8 genera *Microneura*, *Protoneura*, *Epipleoneura*, *Epipotoneura* and *Junix* possess well-developed paraprocts. *Phasmoneura* lacks filaments on the apex of the penis typical of *Forcepsioneura.*

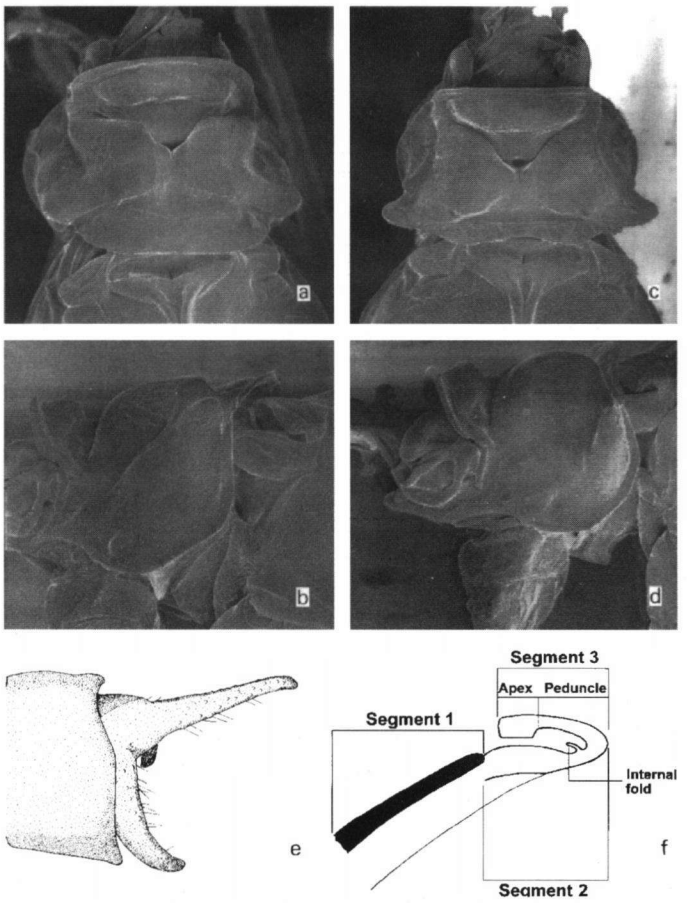

Fig. 7(a-f). *Forcepsioneura ciganae*: (a) prothorax, dorsal view, – (b) ditto, lateral view. – *F. garrisoni* sp. n.: (c) ditto, dorsal view, – (d) ditto, lateral view, – (e) anal appendages, lateral view, – (f) diagram of penis.

Forcepsioneura is similar to *Roppaneura* and *Psaironeura* differing by the following characters. *Roppaneura* differs from *Forcepsioneura* (contrasting characters of *Forcepsioneura* in parentheses) origin of R_3 at 2nd or 3rd postnodal (between 4th and 7th); third antenodal space more than twice the length of second, first not much longer than second (first and third antenodal spaces slightly longer than second); pterostigma much smaller than surmounted cell; presence of two apophyses in the cercus; absence of ventral branch of cercus; anterior and vertical portion of frons and occiput yellow (frons and occiput black); five yellow stripes on thorax (1 on dorsal carina, 1 on mesepisternum and 1 over the mesopleural suture).

Psaironeura differs from *Forcepsioneura* by having the three antenodal spaces subequal; cercus short, wide and with short ventral branch (divaricate and with ventral branch almost of the same size as dorsal branch) red or orange body coloration (brown with metallic reflections).

MATERIAL EXAMINED. – *Phasmoneura ciganae* (holotype ♂) Brazil, Rio de Janeiro, Toca da Onça, Estrada Grajaú-Jacarepaguá 11-V-1963 (MNRJ); – 1 ♂, Brazil, São Paulo, Fazenda Santana do Poço, Jacareí, 13-IX-1996 (F. Lencioni coll.); – 1 ♂, Brazil, São Paulo, Fazenda Santana do Poço, Jacareí, 15-IX-1996, (F. Lencioni coll.); – *P. itatiaiae* (holotype ♂, Brazil, Rio de Janeiro, Parque Nacional do Itatiaia, Cachoeira Itaporani (alt. 1100 m), 11-XII-1968, (MNRJ); – *P. ephippigera* 2 ♂, Peru, Loreto Dept., Explornap Camp on Sucursari River nr Napo River, ca 100 mi NE Iquitos, 14-VIII-1990 (S.W. Dunkle coll.); – *P. exigua* ♂, Brazil, Amazonas, Manaus, Igarapé do Passarinho, XI-1959 (MNRJ).

NOTE ON METHODOLOGY. – Material used in producing photographs are a Digital Scanning Microscope (DSM-940) Carl Zeiss, without gold sputtering and Kodak verichrome pan film 120; Stereoscopic microscope Zenith (MBS-10), Zenith Photoadaptor, Digital CCD Color Camera - Kocom (KCC-530ND), Video Capture Board Pixel View (Combo TV plus), flatbed image Scanner Genius (ColorPage-SP2×), HP LaserJet 6L printer and personal computer Pentium 200 MMX. Figures 3a-b, 4e-f, 5a-b are redrawings from original papers.

ACKNOWLEDGMENTS

I thank Drs ROSSER W. GARRISON and SIDNEY W. DUNKLE for gifts of comparative material and literature and to Dr ANGELO MACHADO for help and encouragement. I am deeply indebted to Dr JANIRA MARTINS COSTA for her aid and help during my research. I thank my friend Dr ELIZABETH HÖFLING and Dr ALBERTO A.G.F. CASTRO RIBEIRO who made possible the scanning electron photographic equipment and to Mr MÁRCIO VALENTIM CRUZ, technician of the Laboratório de Microscopia Eletronica, USP, for kindly rendering the scanning electron micrographs used in this paper. I thank also Dr JÜRG DE MARMELS who sent me information about *Junix elumbis*.

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