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LARVAE OF NEOTROPICAL COLEOPTERA. XXVI: DESCRIPTION OF IMMATURES AND ADULT OF A NEW SPECIES OF *ONOPELMUS* SPANGLER, 1980, WITH NOTES ON HABITATS AND REARING (DRYOPOIDEA, DRYOPIDAE)

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ABSTRACT

Larva, pupa and adult of Onopelmus guarani, sp. n., are described from specimens collected in southern Brazil - type locality, Brazil: São Paulo, São Paulo (Parque Estadual da Cantareira). Larvae and adults were found in shallow flowing streams. A pupa and a female were obtained from larvae reared in laboratory. The adults of the new species differ from O. inca Spangler, 1980, the only other known species of Onopelmus Spangler, 1980, mainly by characteristics of the male genitalia. The presence of a carinate tubercle in the first ventrite of males, a sexual dimorphism not noticed before in the genus, is reported for the first time. Immatures of Onopelmus were undescribed up to date.

Keywords: Coleoptera larvae, Dryopoidea, Dryopidae, *Onopelmus*.

INTRODUCTION

The family Dryopidae "is worldwide in distribution with over 230 species in 17 genera" (Brown, 1991: 400). Among them only larvae of 4 genera

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and pupae of 3 genera had been previously described. Beling (1882) described the immatures of *Pomatinus substriatus* Müller, 1806 (= *Helichus substriatus*) and *Parnus auriculatus* Illiger, 1798 (= *Dryops ernesti* des Gozis, 1886); Böving & Craighead (1930-1931) illustrated the larva of *Dryops auriculatus* (Geoffroy, 1785); Bertrand (1939) illustrated and described the immatures of *Dryops* sp. and *D. auriculatus*, and redescribed and illustrated the immatures of *D. ernesti* and *H. substriatus*; Leech & Chandler (1956) gave general characters and bionomics of North American Dryopidae and keyed the larvae of genera occurring in North America (*Helichus* Erichson, 1847, *Pelonomus* Erichson, 1847, *Dryops* Olivier, 1791); Leech & Sanderson (1959) keyed the larvae of *Helichus*, *Pelonomus* and *Dryops* and illustrated the larvae of *Pelonomus* sp. identified as *P. obscurus obscurus* LeConte, 1852 in Brown (1983); Bertrand (1972) keyed the dryopid larvae and pupae by zoogeographical region and presented the same figures as in Bertrand (1939); Brown (1972) included in the key to genera of aquatic and semi-aquatic dryopoid beetles of the United States *Dryops*, *Pelonomus* and *Helichus*; Rusek (1973) described and illustrated the adult and larvae of *D. rudolfi* (= *D. auriculatus*) from Moravia; Doyen & Ulrich (1978) gave general data and bionomics of *Dryops*, *Pelonomus* and *Helichus* and illustrated the larvae of *Helichus* sp.; Ulrich (1986) described and illustrated the larvae and pupae of *H. suturalis* LeConte, 1852 and *H. productus* LeConte, 1852; Nelson (1989) erected *Postelichus* for several species of *Helichus* including *H. productus*; Brown (1991) presented general characters and bionomics of Dryopidae, also presented illustrations of *D. auriculatus* (as *D. rudolfi*), *Pelonomus obscurus* and *Helichus suturalis*; Barr & Spangler (1992) described and figured the adult and larva of *Stygoparnus comalensis* from Comal Springs, Texas, USA.

While conducting routine collection of water beetles in the neighborhood of São Paulo City (Parque Estadual da Cantareira), larvae and adults of a dryopid beetle were found in shallow water streams which flow through a secondary forested area. Larvae were reared in the laboratory, confirming the correlation between immatures and adults. After the study of the adults, the species proved to belong to the genus *Onopelmus* Spangler, 1980. That genus was based on the single species *O. inca* Spangler, 1980, as far as known, only represented by the type specimens collected at blacklight, near the bank of the Rio Huallaga, Peru (Spangler, 1980). Thus, the range of the genus is considerably expanded with the record of the new species from southern Brazil. According to Spangler (1980: 164), the genus is characterized by a 13-segmented antenna with the second segment dilated and the penultimate segment of maxillary palp short, a combination of characters shared with the new species.

Adult of the new species is described below, characters are given to

distinguish the 2 known species of *Onopelmus*, and description of the immatures including comments on habitats and rearing are also presented.

The material examined (larvae, pupa and adults) is deposited in the Museu de Zoologia, Universidade de São Paulo, São Paulo (MZSP). The terminology of the wing veins follows Kukalová-Peck & Lawrence (1993).

***Onopelmus guarani*, sp. n.**

(Figs. 1-38)

TYPE MATERIAL. Holotype ♂ (adult). "Brasil, São Paulo: São Paulo, Parque Estadual da Cantareira, 13.ii.1995, Exc. MZSP col." (dissected). Paratypes: same locality as holotype, 16.xii.1992, 1 larva, 1 pupa reared from larva, 1♀ reared from larva (dissected); 20.x.1994, 1 larva, 2♀; 05.i.1995, 1♂, 1♀.

OTHER MATERIAL EXAMINED (not paratypes, some specimens dismembered in ethanol). Same locality as holotype, 16.xii.1992, 2 last instar larval exuviae, 1 pupal exuvia; 20.x.1994, 2 larvae (dissected), 1 larval exuvia.

ETYMOLOGY. From "guarani", name of a South American Indian Tribe whose large dominions included, in the past, the type locality of the species.

TYPE LOCALITY. Brazil. São Paulo: São Paulo (Parque Estadual da Cantareira).

ADULT. Male (Figs. 8-11) length: 7.7 (paratype) - 8.2 mm (holotype). Female (Figs. 1-7, 12-16) similar to male, length: 7.5-8.9 mm. Body elongate, subparallel, dark reddish brown to black, with uniform yellowish brown pubescence; antennae, maxillary and labial palpi, mentum, tibiae and tarsi reddish brown; pro-, meso-, metasternum, ventrites and femora dark reddish brown to black, with dense yellowish brown pubescence.

Head moderately coarsely and densely punctate, punctures on frons very close, separated by less than half their diameter. Eyes hemispherical and densely pubescent, separated by 1.8x their diameter. Antenna (Fig. 2) 13-segmented; densely pubescent; scapus not enlarged; pedicellus dilated, about 1.6x as long as wide; dorsal side of segments 3-13 with 2 broad spatulate setae. Labrum transverse, dense and finely punctate, uniformly pubescent; anterior margin emarginate; anterior angles rounded. Mandibles (Fig. 4) symmetrical; each mandible with apex tridentate; outer margin with stiff and elongate setae; protheca well developed, lobe-like, apex curved and spinose, inner margin with a fringe of elongate setae; mola not tuberculate, setose in the upper half. Maxilla (Fig. 3): galea and lacinia densely setose; palp 4-segmented; distal

segment cylindrical, elongate, about 1.4x as long as 3 basal segments combined, with rounded sensory pit near basal inner margin; second segment short, about one-fifth as long as distal segment. Labium (Fig. 5): ligula rhomboidal, widened; palp 3-segmented; distal segment dilated, about 1.2x as long as 2 basal segments combined, bearing a small spatulate setae in basal outer margin; mentum transverse, anterior margin strongly sinuous, anterior angles acute and produced, lateral sides and posterior angles rounded; submentum transverse, narrow, about 0.4x as long as mentum.

Pronotum transverse; about 1.4-1.5x as wide as long, widest at anterior third; regularly convex; surface densely punctate; punctures on disc close, separated by less than half their width; sides arcuate-sinuate, distinctly margined; antero- and posterolateral angles very acute, posterior ones larger and strongly produced; anterior margin feebly arcuate; posterior margin strongly trisinuate, not crenulate.

Elytron with 9 complete striae of punctures, irregular in size and separated by variable distance, in some places coalescent; rows of punctures well visible in anterior half or three-fourths of elytra, obscured by pubescence in posterior fourth or half; base slightly wider than basal width of prothorax; humeri rounded; outer margin distinctly margined; sides nearly parallel but slightly constricted near anterior third, then gradually converging from apical three-fourths to apices conjointly rounded.

Scutellum flat; transverse; 1.5-1.6x as wide as long, subtriangular; margins arcuate; densely pubescent.

Hind wing (Fig. 7) about 2.6x as long as wide; radial cell open; r3 short, spur-like; r4 crossvein well marked; second cubito-anal cell (= wedge cell) present, triangular-shaped; medial field (posterior to MP_{1+2}) containing 5 veins in main group (not including AP_{3+4}): MP_{3a} (shortened), MP_{3b} , MP_4 , AA_{1+2} and AA_{3+4} .

Underside. Prosternal process lanceolate, carinate medially. Procoxae separated by distance about equal to their width; mesocoxae separated by distance about equal to half their width. Metasternum sulcate medially. Abdomen: ventrite I with an elongate and carinate tubercle in male, flattened at middle in female; suture between ventrites I and II sinuous at middle; remaining sutures straight; ventrites II-IV subequal in length; ventrite V about as long as III and IV combined; all ventrites without plastron setae.

Legs (Fig. 6): femora dilated, densely pubescent, tibiae and tarsi sparsely pubescent; femora sulcate beneath and with minute irregularly teeth; tibiae without cleaning fringe, slightly curved inwards distally, bearing 2 short apical spurs; distal tarsomere about as long as preceding 4 combined; claws long and stout.

Male terminalia (Figs. 8-11). Spiculum gastrale (Fig. 11) with distal apex enlarged; with a pair of slender, straight projections. Aedeagus (Figs. 8-10) of trilobed type; phallobase elongate, about 1.3x as long as penis, median foramen slightly twisted with opening in left side; parameres free, not setose, dorsally contiguous at base, sides arcuate and slightly narrowed near distal third, each inner margin with pre-apical curved and acute tooth; penis divided into dorsal and ventral lobes; dorsal lobe longitudinally divided at midline, apex lanceolate and with median dorsal carina; ventral lobe strongly sclerotized, rod-like, with apex slightly expanded, asymmetrically truncate.

Female terminalia (Figs. 12-16). Sternite VIII (Fig. 16) with distal margin emarginate, sclerotized portion Y-shaped. Ovipositor (Figs. 12-13) wedge-shaped; coxites blade-like, apices acute, asymmetrical, left shorter than right one; styli absent; baculi slightly shorter than right coxite. Bursa copulatrix rounded; bearing 2 ovate, flattened sclerites, contiguous at base, with slightly overlapping inner margins (Figs. 14-15).

REMARKS. *Onopelmus guarani* is very similar to *O. inca*. Both species share a 13-segmented antennae; however, unlike *O. inca* which has a single spatulate seta on segments III-XII (Spangler, 1980: 163, Fig. 2), the new species has 2 distinct spatulate setae on segments III-XIII. The maxillary palpi are also similar in both species, although in *O. inca* the second segment of maxillary palp may be slightly shorter (one-sixth as long as distal segment, according to original description) than in *O. guarani* (one-fifth as long as distal segment); furthermore, the distal segment of maxillary palp of *O. guarani* lacks the long apical seta present in *O. inca* (Spangler, 1980: 163, Fig. 3).

The two species can be easily distinguished by the aedeagus: in *O. guarani* the inner margins of parameres have a pre-apical tooth (smooth in *O. inca*, Spangler, 1980: 163, Figs. 4 and 5), and the penis is lanceolate and carinate at apex (evenly rounded in *O. inca*). They differ, also, by the ovipositor, proportionately shorter and broader in *O. guarani*.

The remarkable sexual dimorphism present in *O. guarani*, the carinate tubercle in the middle of ventrite 1 of males, absent in females, was not reported in the original description of *Onopelmus*. The presence or absence of this kind of dimorphism should be verified in *O. inca*, since we had not the opportunity to examine specimens of that species.

The wing venation of *O. inca* is rather similar to that of *Dryops viennensis* Laporte, 1840, illustrated by Forbes (1922, Fig. 4). Wings of both species agree in the presence of 1 open radial cell, 1 anal cell (or wedge cell) and 5 veins in the main group, and differ chiefly by the very shortened MP_{3a} in *O. inca*.

Some interesting features have been found during this study, although we cannot ascertain the full extent of their value yet, due the lack of compara-

tive data in literature. The 2 large sclerites present in the bursa copulatrix, and the rounded sensory pit in the sub-basal inner side of the distal segment of maxillary palp should deserve further studies.

MATURE LARVA (Figs. 17-34). Length: 12.2 mm; width: 1.4 mm. Wire-worm-like. Dorsum strongly sclerotized; densely punctate; dark brown; with few scattered setae; integument shallowly and transversely sulcate. Ventral side weakly sclerotized on thorax and abdominal segments I-VI with few setae.

Head. Prognathous; partially visible from above and retracted into prothorax; lateral margins arcuate; basal region lighter than anterior one. Dorsal side (Fig. 21) strongly punctate and dark brown at anterior and median regions; 3 pairs of long setae next to frontal suture; 4 lateral microsetae on posterior region; frons triangular, 1 pair of setae next to frontoclypeal suture. Ventral side (Fig. 23) punctate on anterior region, with 4 pairs of setae; hypostomal ridge extending from mandibular base to half of cephalic head. Epicranial suture (Fig. 21) Y-shaped; coronal suture extending to half of cephalic head; frontal suture attaining antennal bases. Stemmata (Fig. 22), 6 on each side: 2 dorsal, 3 lateral and 1 ventral at mandibular base. Antenna (Fig. 24) short, 3-segmented; scapus slightly longer than wide, about 2x larger than pedicellus, with 2 sensorial spots; pedicellus elongate, with 2 apical sensillae; flagellum elongate, narrower and shorter than pedicellus, with 1 sensorial spot; sensorial appendix conical, longer and larger than flagellum. Clypeus (Fig. 21) trapezoidal, divided; anteclypeus strongly sclerotized, with few punctures, 2 pairs of lateral setae; postclypeus membranous. Labrum (Fig. 30) transverse; anterior margin narrower than posterior, curvate posteriad; posterior margin arcuate; median region with 2 pairs of long setae, some short setae and rounded sensillae. Epipharynx (Fig. 29): anterior margin with 3 pairs of lateral stout setae; lateral margins with 5 pairs of anterior stout setae; lateral regions with 2 inclined setose bands and 2 sclerotized areas connected with posterior longitudinal bars; median region with 3 setose areas and 3 groups of sensorial pits. Mandibles (Figs. 25, 26) symmetrical, well sclerotized, stout and with tridentate apex; each mesal margin with 1 subapical tooth; protheca and mola absent; dorsal side (Fig. 26) with 1 seta and some sensillae. Maxilla (Figs. 31, 32): cardines roughly triangular, united by membrane; stipites fused with postmentum, with 2 pairs of lateral setae and punctate ventrally (Fig. 32), dorsal side (Fig. 31) densely punctate on a longitudinal lateral band; galea and lacinia close but distinct; galea larger than lacinia, with a group of stout setae on apex (Fig. 31), ventral side (Fig. 32) with 1 sensorial spot and punctures concentrically arranged; lacinia partially hidden by labium, densely punctate and with lateral stout setae (Fig. 31); palpifer indistinct; palp 4-segmented, segments diminishing in width and increasing in length apicad, segments 1-3

densely punctate on membranous area. Labium (Fig. 32): ligula well developed, transverse, anterior area densely setose, 1 pair of stout and short median setae, posterior area densely punctate; prementum with some large punctures, basal area with transverse band of minute punctures; postmentum with 2 pairs of setae and large punctures; palpiger absent (or indistinct); palp 3-segmented; segment 1 with 2 sensorial spots, distal segment with a small sensorial cone. Hypopharynx (Fig. 31): lateral areas with long setae; mesal region with 2 bands of short setae; posterior region with 2 oblique bars.

Prothorax elongate, dorsally (Fig. 17) as long as meso- and metathorax at middle; anterior margin with 7 pairs of setae, posterior margin with 3 pairs of setae; laterally (Fig. 18) with 2 shallow depressions on each side; ventrally (Fig. 20) narrower than dorsum, membranous, weakly pigmented, sternum narrow and transverse. Meso- and metathorax transverse, dorsum and venter with same length; dorsal side (Fig. 17) with 1 pair of setae; lateral side (Fig. 18) with 5 pairs of setae. Legs (Figs. 27, 28) similar in shape and size, short, robust; coxa large, with few setae; trochanter conical, basal region with rows of short, stout setae and with a long marginal seta; femur with dorsal side larger than ventral one, with few setae; tibia with scattered setae; tarsungulus stout, unisetose. Spiracles (Fig. 34) biforous, on membranous lateral area of mesothorax.

Abdomen. Segments I-VIII transverse, similar in size, cylindrical; segment IX slightly longer than wide, conical, anterior margin straight. Dorsal side (Fig. 17): segments I-VII with 1 pair of lateral setae; segment VIII with 1 pair of lateral setae, 4 pairs on mesoposterior region; segment IX bearing 3 small well marked tubercles, triangularly disposed. Lateral side (Fig. 18): segments I-VIII with 4 pairs of setae; segment IX with marginal setae. Ventral side (Fig. 20): sternum very narrow in segments I-VI, absent in segments VII-X; segments I-V with 1 pair of setae; segments VI-VIII with 2 pairs of setae. Segment X flattened, elliptical, forming a ventral hinged operculum; ventral side irregularly punctate and carinate, with 3 pairs of setae, distal region with a shallow transverse depression; dorsally with a pair of small distal hooks (Fig. 19). Spiracles (Fig. 33) biforous, laterally placed on a less sclerotized area in segments I-VII; mesodorsally placed in segment VIII, close to posterior margin.

REMARKS. The described larvae of Dryopidae present some differences that are worth comment. The maxillae and labium may be fused or not, being fused in *Helichus*, *Postelichus*, *Stygoparnus*, *Onopelmus* and apparently in *Pelonomus* (Leech & Chandler, 1956: 1014, Fig. 38.67); separated maxillae and labium appear to be characteristic of the genus *Dryops*. The number of segments of labial palp is also controversial: 2-segmented with palpiger (e. g.,

Bertrand, 1972; Brown, 1991) or 3-segmented with palpiger absent (e. g., Ulrich, 1986; Barr & Spangler, 1992); the presence of 2 sensillae at the basal segment led us to follow this last interpretation. Böving & Craighead (1930-1931) are the only authors who presented the mandible bearing a large plumose seta in *D. auriculatus*. Until now the larva of *O. guarani* is the only one with 3 dorsal tubercles on segment IX (Fig. 17).

PUPA (Figs. 35-38). Length: 10.8 mm; width: 2.6 mm. Elongate, adecticous, exarate, setose, long setae inserted on small tubercles; whitish, integument light brown, gin-traps and eyes partially dark brown.

Head. Partially visible from above; 6 pairs of frontal setae, 2 pairs on each eye, 2 pairs on clypeus, 1 pair on labrum.

Thorax. Pronotum (Fig. 35) about 1.5x as wide as long; anterior margin arcuate; lateral margins densely setose, slightly curved mesad; posterior margin almost straight; posterior angles projected posteriad; anterior region with 3 pairs of setae; slightly and irregularly elevated on mesoposterior region; hypomera (Fig. 37) with 9 pairs of setae. Metanotum (Fig. 35) with 1 pair of setae next to anterior margin; 2 pairs of short setae on lateroposterior region; a group of microsetae on each lateral region. Mesopterothecae with long setae on dorsal side (Fig. 35).

Abdomen. Lateral margins slightly convergent posteriad; segments transverse. Dorsal side (Fig. 35): 2 pairs of setae on segments I-VII; segment VIII with 4 pairs, posterior region finely, transversely carinate, posterior margin arcuate; segment IX bearing a pair of acute urogomphi. Lateral side (Fig. 38) with 2 pairs of setae on segment I, 3 pairs on segments II-VII, 4 pairs on segment VIII, 6 pairs on segment IX; segments VII-VIII finely carinate; spiracles on segments I-VII. Ventral side (Fig. 37) with 2 pairs of setae on segments III-VII; segment IX with many setae, finely carinate. Gin-traps (Fig. 36) salient, dorsally placed on segments II-VI.

REMARKS. The pupa of *O. guarani* is quite different from other previously known dryopid pupae by: 4 sets of gin-traps on segments II-VI; segments III-VI with 2 anterior gin-trap plates, being 1 circular and 1 transverse; and 1 pair of lateral acute urogomphi. Pupae of *Dryops*, *Helichus* and *Postelichus* present: 5 sets of gin-traps on segments II-VII, in *H. suturalis* and *P. productus* the 5th set is atrophic; segments III-VII with only 1 anterior, transverse gin-trap plate; and 1 single median projection on segment IX named as "cerque" in *Dryops* and *H. substriatus* by Bertrand (1939) and spicula in *H. suturalis* and *H. productus* (= *P. productus*) by Ulrich (1986).

Dorsal gin-traps are probably a characteristic feature of Dryopidae pupae. Hinton (1946) pointed out that these structures serve as a defense mechanism. However Ulrich (1986: 332) suggested another function for them: "gin-

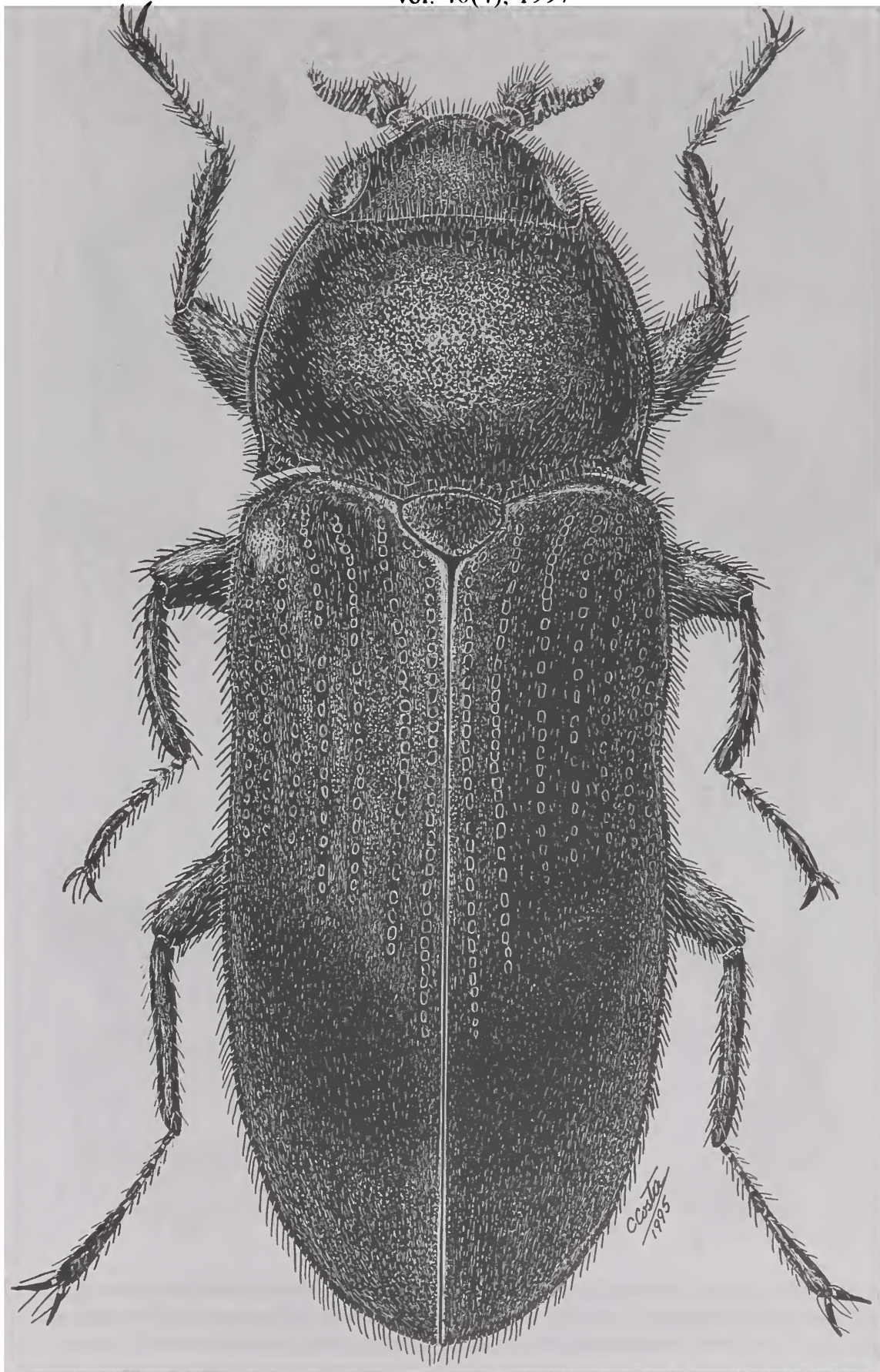
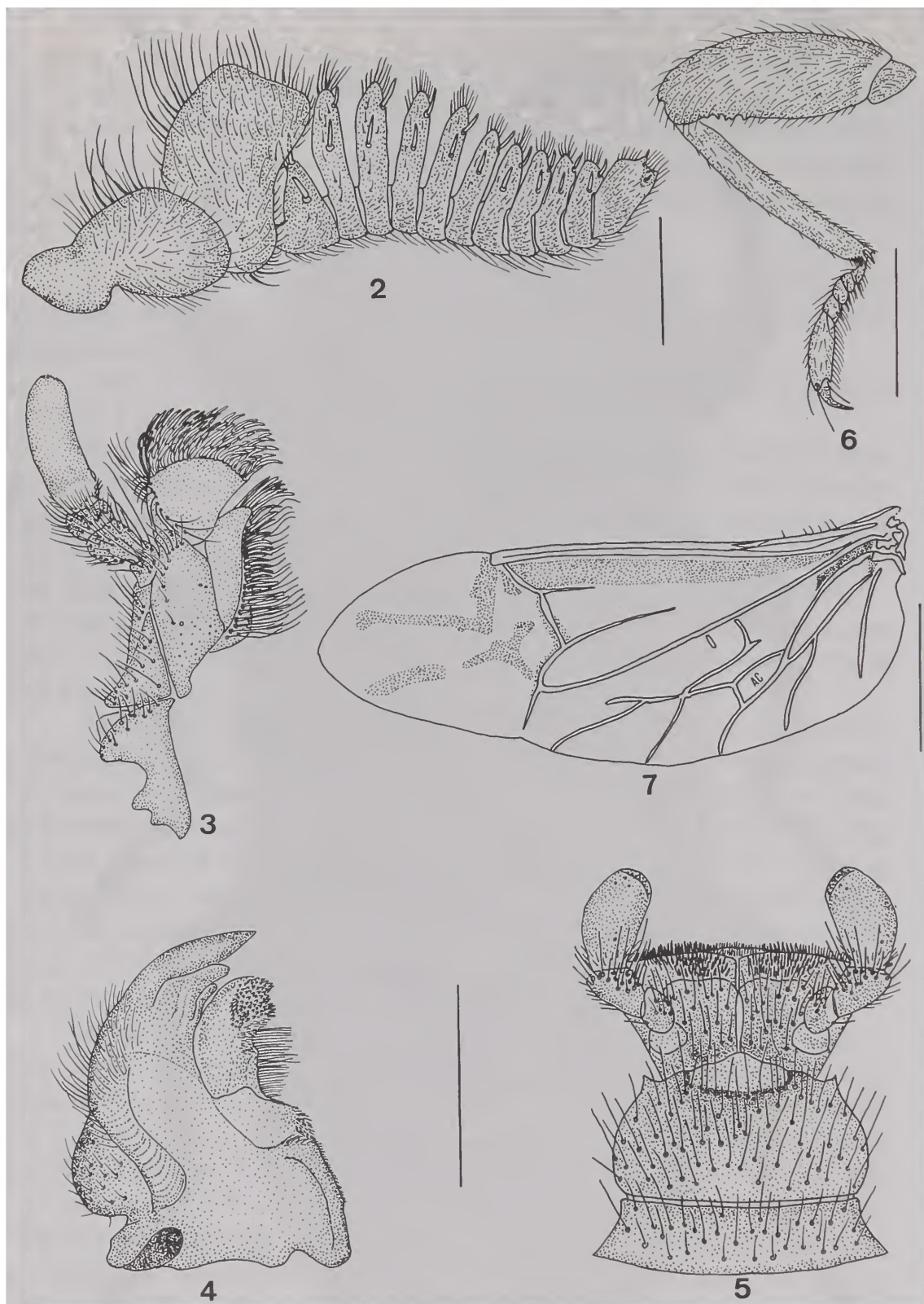
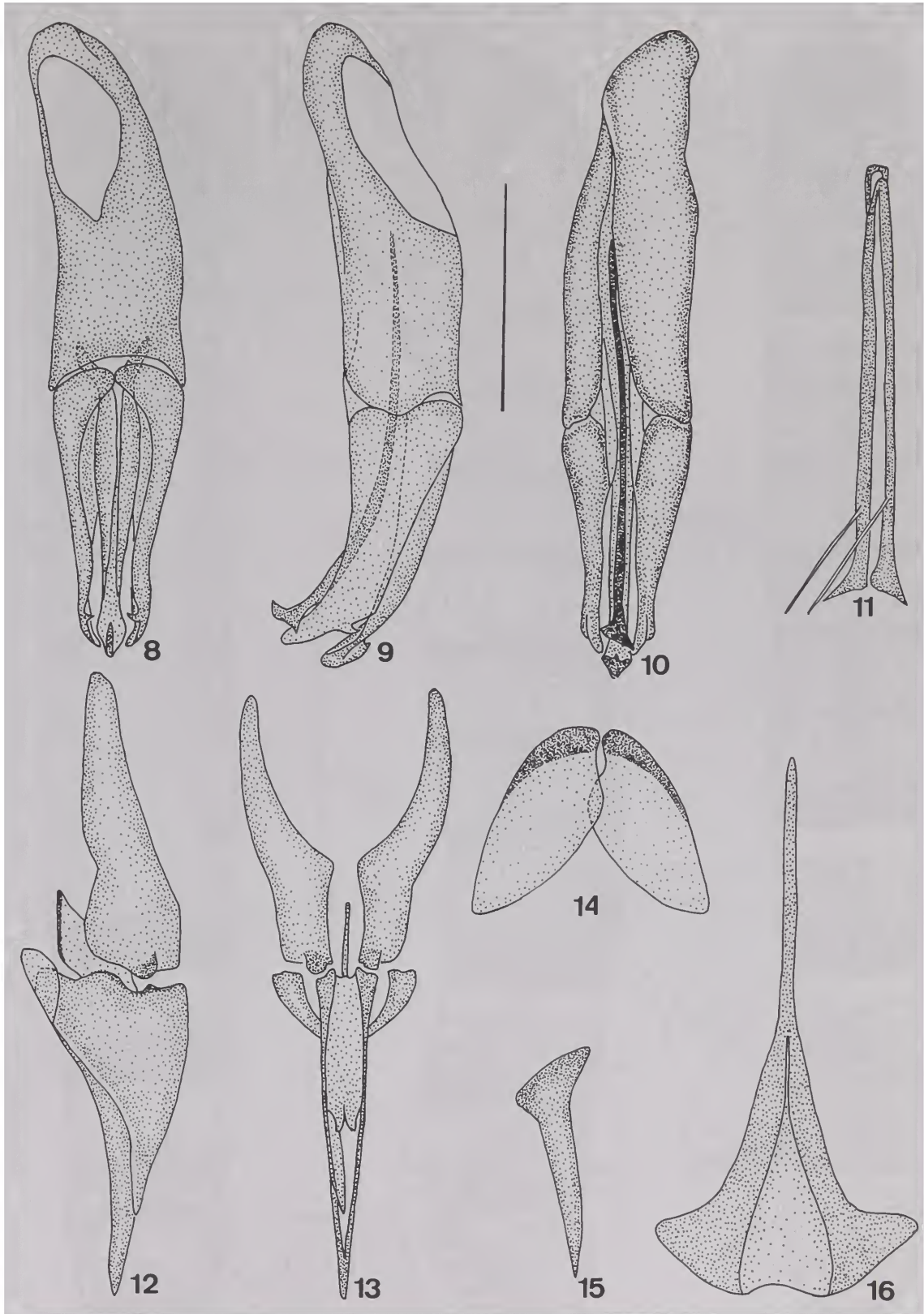


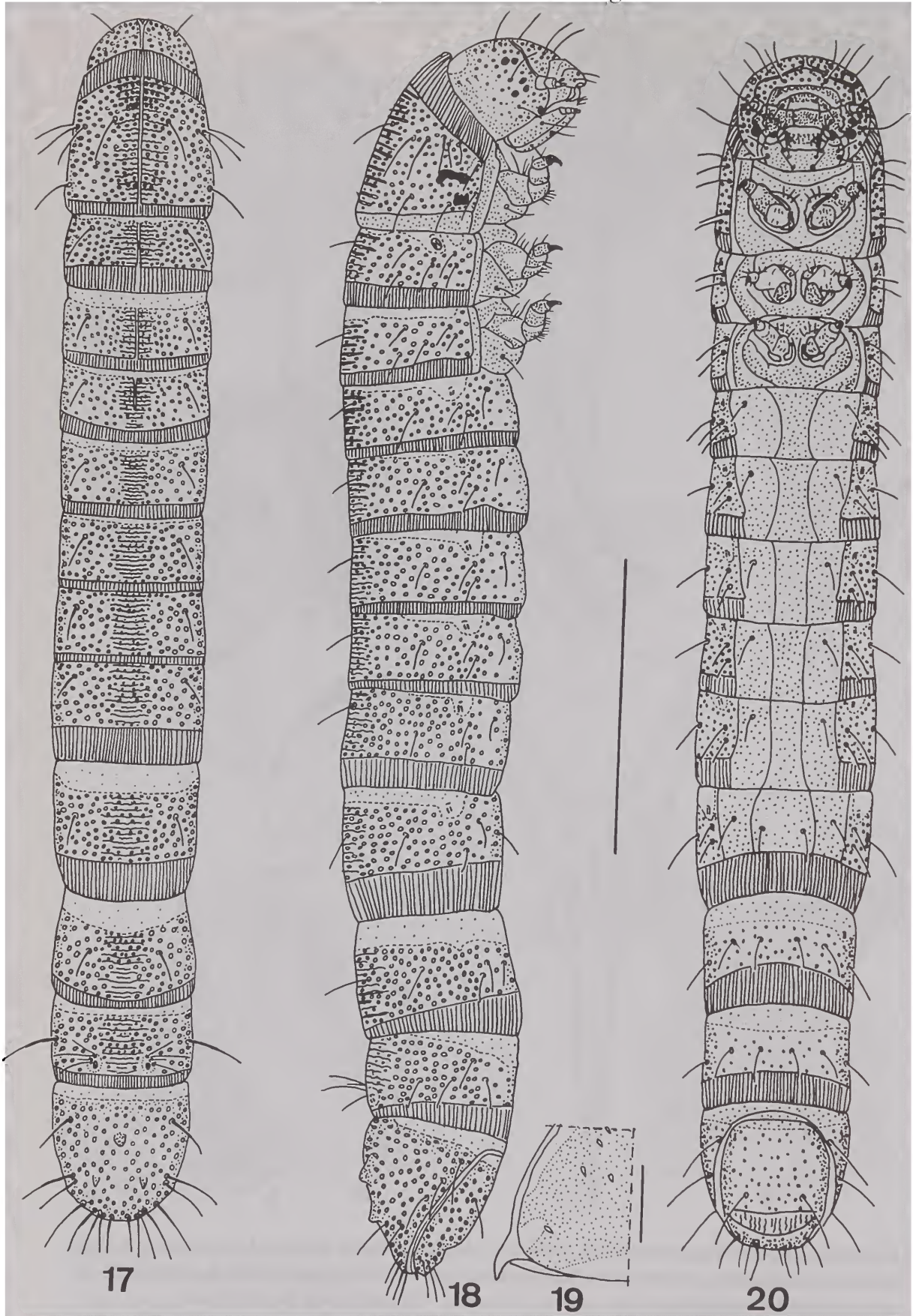
Fig. 1. *Onopelmus guarani*, sp. n., paratype ♀. Length: 7.9 mm.



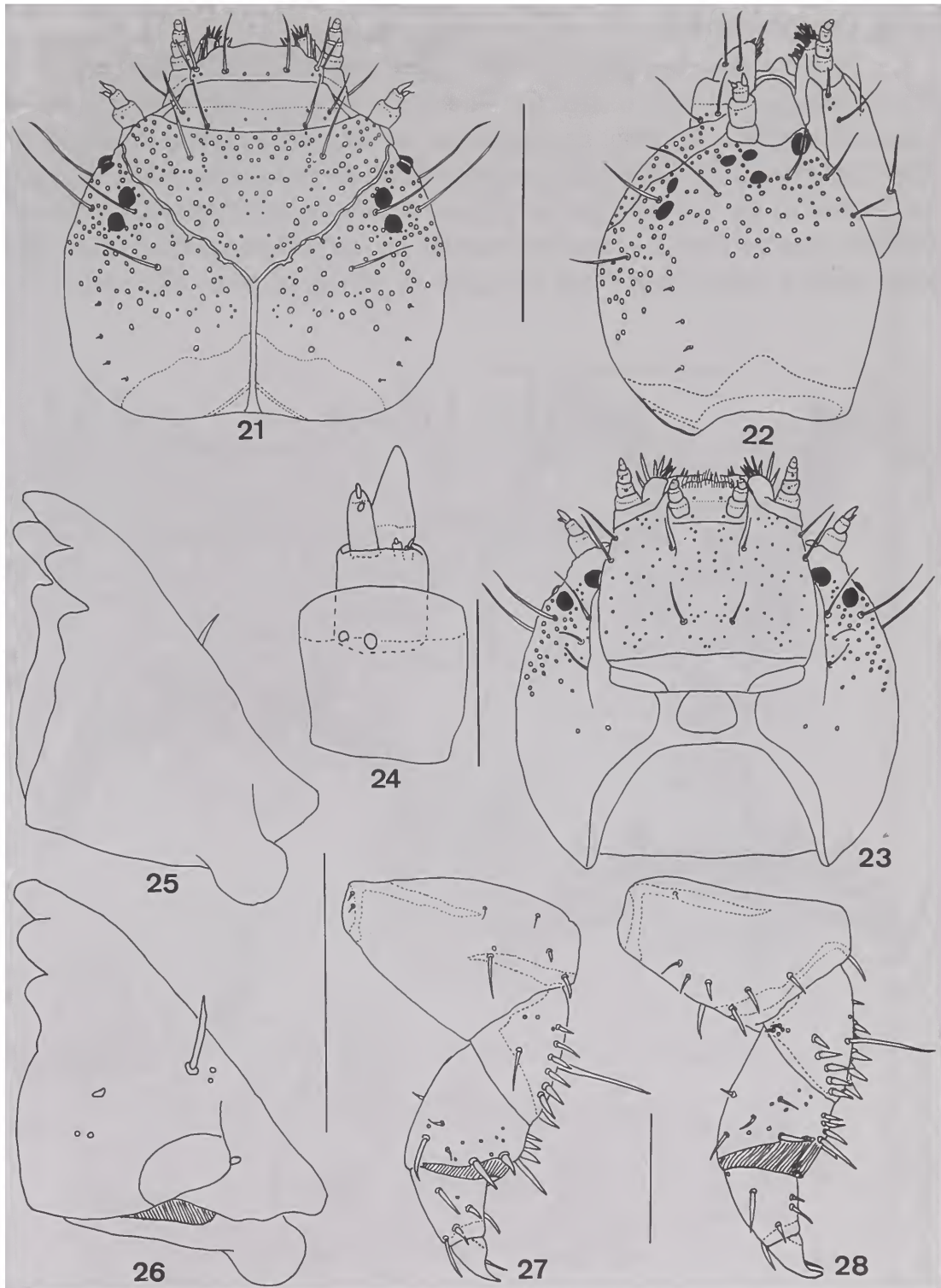
Figs. 2-7. *Onopelmus guarani*, sp. n. Adult (paratype ♀): 2, antenna (dorsal); 3, maxilla (ventral); 4, mandible (dorsal); 5, labium; 6, left fore leg; 7, membranous wing. AC = second cubito-anal cell. Scale: Figs. 2 = 0.1 mm; 3-5 = 0.5 mm; 6 = 1 mm; 7 = 2 mm.



Figs. 8-16. *Onopelmus guarani*, sp. n. Adult 8-11. Male (holotype): 8-10, aedeagus (dorsal, lateral, ventral); 11, spiculum gastrale 12-16. Female (paratype): 12, 13, ovipositor (lateral, dorsal); 14, 15, sclerites of bursa copulatrix (dorsal, lateral); 16 sternite VIII. Scale: Figs. 8-16 = 1 mm.



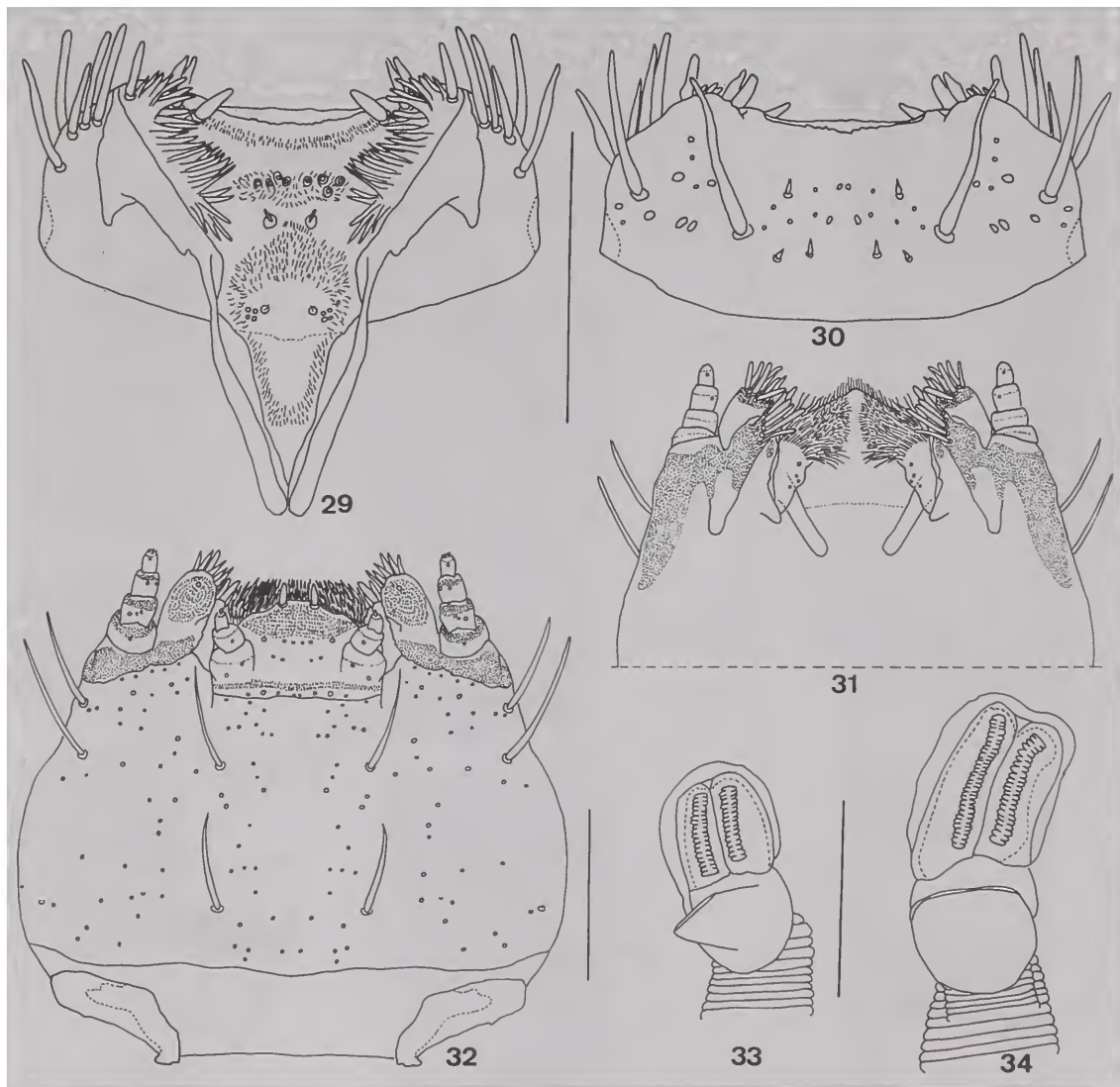
Figs. 17-20. *Onopelmus guarani*, sp. n. Mature larva: 17, 18, 20, habitus (dorsal, lateral and ventral); 19 detail, distal spine of segment X (dorsal). Scale: Figs. 17, 18, 20 = 3 mm; 19 = 0.1 mm.



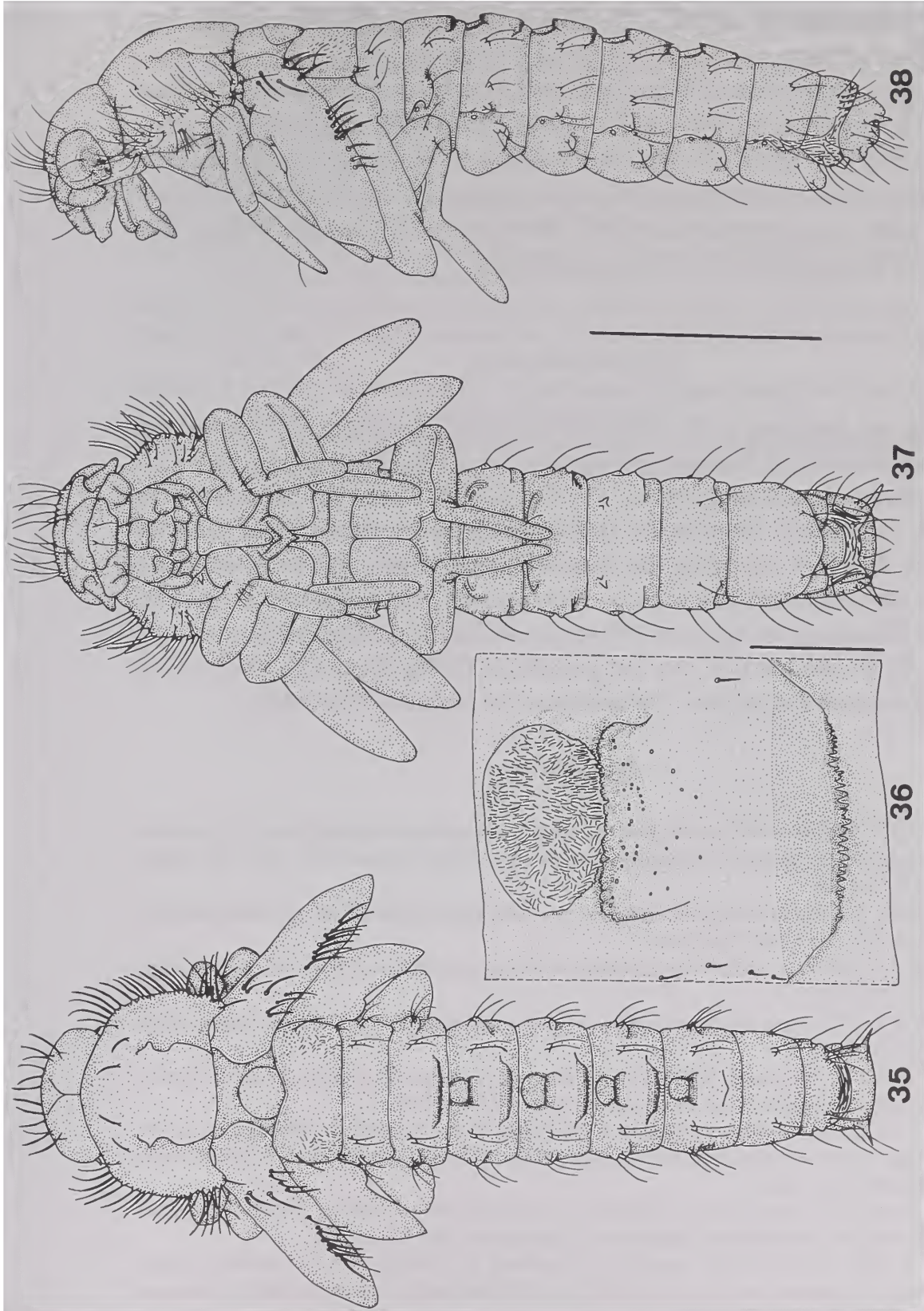
Figs. 21-28. *Onopelmus guarani*, sp. n. Mature larva: 21-23, head (dorsal, lateral, ventral); 24, antenna (dorsal); 25, 26, mandibles (left, ventral; right, dorsal); 27, 28, fore leg (mesal, external). Scale: Figs. 21-23 = 0.5 mm; 24 = 0.1 mm; 25-28 = 0.3 mm.

traps in *Helichus suturalis* and *H. productus* appear to anchor the pupa, ensuring successful eclosion”.

NOTES ON HABITATS AND REARING. Adults and larvae of *Onopelmus guarani* were collected in two streams which flow through a secondary forested area, in the Parque Estadual da Cantareira, in the neighborhood of São Paulo City. The small sampled streams are very shallow, have clear water, slightly acid (pH 6.0-6.2). The substrate of streams consists of shifting sand in rapids, with few scarce rocks, and muddy ground in pools. When sampled, the water depth ranged from about 3 cm in rapids to 40 cm in pools. Excepting the



Figs. 29-34. *Onopelmus guarani*, sp. n. Mature larva: 29, epipharynx; 30, labrum; 31, maxillae and hypopharynx; 32, maxillae and labium; 33, abdominal spiracle; 34, thoracic spiracle. Scale: Figs. 29-32 = 0.3 mm; 33-34 = 0.1 mm.



Figs. 35-38. *Onopelmus guarani*, sp. n. Pupa: 35, 37, 38, habitus (dorsal, ventral, lateral); 36, detail of third gin-trap. Scale: Figs. 35, 37, 38 = 3 mm; 36 = 0.3 mm.

reared female, all larvae and adults were found on partially submerged brushwood and decayed leaves trapped by various obstructions in the streams. The larvae were also found inside sticks exposed above the water line.

Three mature larvae collected in 16.xii.1992 were brought to the laboratory. One was fixed, and the other two were individually kept in plastic vials, 5.2 cm in diameter and 5 cm deep, on a substrate of wet sand with pieces of the sticks where the larvae were found. One larva pupated 2 days later (18.xii.1992) and the adult emerged on 29.xii.1992; the pupal period lasted 11 days. The other larva pupated on 11.ii.1993 and was fixed.

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