



***Phenrica littoralis* (Bechyné, 1955) (Coleoptera: Chrysomelidae) a potential candidate for the biological control of alligator weed, *Alternanthera philoxeroides* (Martius) Grisebach (Amaranthaceae): redescription of the adult, first description of immature stages, and biological notes**

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Abstract

Flea beetles of alligator weed, *Alternanthera philoxeroides* (Martius) Grisebach (Amaranthaceae), were collected in Argentina, Uruguay, Paraguay, and Brazil. Species in the genera *Disonycha* Chevrolat, *Agasicles* Jacoby, *Systema* Chevrolat and *Phenrica* Bechyné were frequently found on this weed. *Phenrica littoralis* (Bechyné) was the most abundant within this genus. The male is described and the holotype female is redescribed adding new diagnostic characters of the mouthparts, hind wings, metendosternite, and male and female genitalia. Larva and pupa are described and illustrated for the first time providing data for future phylogenetic studies in the subtribe Disonychina.

Key words: Galerucinae, Alticini, *Alternanthera philoxeroides*, *Phenrica littoralis*, immature stages, Argentina, weed biocontrol

Introduction

Alligator weed, *Alternanthera philoxeroides* (Martius) Grisebach (Amaranthaceae), is an amphibious plant native to southern South America that was introduced into several countries, including the United States and Australia, where it became a serious aquatic and terrestrial weed (Holm *et al.* 1997).

In recent explorations conducted in Argentina, Uruguay, Paraguay and Brazil to assay the native range of alligator weed and its natural enemies, several species of Alticini flea beetles were collected (Sosa *et al.* 2004). Species in the genera *Disonycha* Chevrolat, *Agasicles* Jacoby, *Systema* Chevrolat and *Phenrica* Bechyné were considered for further studies as potential biocontrol agents (Sosa *et al.* unpublished).

The Neotropical Alticini genus *Phenrica*, included in the subtribe Disonychina, is distributed in temperate and subtropical areas of South America (Cabrera & Roig-Juñent 1998). Bechyné (1956) described several new species and proposed new combinations under the name *Phenrica* for species formerly included in the genus *Disonycha* and *Nephrica* Harold. As the genus was not formally described at that time, Bechyné (1958) subsequently described it, designating *Disonycha austriaca* Schaufuss as the type species. Bechyné and Springlová de Bechyné (1966) recognized two subgenera: *Phenrica* (type species *Disonycha austriaca* Schaufuss) and *Orthophenrica* Bechyné & Springlová de Bechyné (type species: *Nephrica quadrimaculata* Clark).

Species of *Phenrica* were collected on Amaranthaceae and on cultivated Fabaceae. Our field studies focused on *Phenrica littoralis* (Bechyné), which was one of the most abundant species of flea beetle on *A. philoxeroides*. This species was originally described as *Nephrica littoralis* Bechyné from Brazil, Paraguay and Argentina, and subsequently transferred to the genus *Phenrica*. Nothing has been published on the immature stages and the biology of this species.

The goal of this paper is to provide a detailed redescription of the adult and the first description of the immature stages of *P. littoralis* as an initial step to conduct studies for biological control of *A. philoxeroides* with this flea beetle. Diagnostic structures of adults, such as mouthparts, wing venation, binding patch, metendosternite, and genitalia, are included as a new set of diagnostic characters useful for species identification. Additionally, biological notes, including field and laboratory host range are presented.

Material and methods

Insect collection and study material. Adults and larvae of *P. littoralis* used in this study were collected from *A. philoxeroides* from Misiones Province, Argentina. A laboratory colony was set up to obtain sufficient specimens for morphological studies and laboratory tests. Specimens were preserved in 70% ethyl alcohol. The methods of dissection, preparation and examination of immature stages follow Goulet (1977) and May (1979).

Some of the species that we studied belong to the collections of the following institutions: Departamento de Zoología, Universidad Federal de Paraná, Curitiba, Paraná, Brazil, **DZUP**; Museu Anchieta, Porto Alegre, RS, Brazil, **MAPA**; Museo del Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Venezuela, **MIZA**; Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil, **MZSP**; Naturhistorisches Museum, Basel, Switzerland, **NHMB** and Fundación para el Estudio de Especies Invasivas Collection, Buenos Aires, Argentina, **FUEDEI**.

Morphological descriptions are complementary, that is, the shared features between male and female are not repeated after first mention. Morphological terminology of adults follows Cabrera and Cabrera Walsh (2004), Duckett (1999), Konstantinov (1998, 2002), Lingafelter and Konstantinov (2000). Terminology for morphological features of the immatures follows Le Sage (1986), Cox (1996), LeSage and Zmudzinska-Krzesinska (2004). Measurements and abbreviations used in the text were: length of pronotum (PL), pronotum width (PW); humeral width (HW), elytral length (EL), and elytral width (EW) as defined by Cabrera and Cabrera Walsh (2004). Body length was measured from the posterior margin of the eyes to the apex of the longest elytron. The relative proportions for PW/PL, HW/PW, and EW/HW were computed.

Drawings were made using a camera lucida on a Leitz compound microscope and a Wild dissecting microscope. Electron micrographs of head and binding sites of the elytra were taken with a scanning electron microscope (SEM) Jeol-JSM-T100. These structures were previously mounted on metal studs and coated with gold-palladium.

Voucher specimens are deposited at the Museo de La Plata, MLP, and Fundación para el Estudio de Especies Invasivas, Buenos Aires, Argentina FUEDEI.

Results and discussion

Phenrica littoralis (Bechyné)

(Figs 1–39)

Nephrica littoralis Bechyné 1955: 126, 1957: 11.

Phenrica littoralis Bechyné 1956: 1018 (new combination), 1958: 660, Scherer 1960: 252; Bechyné & Bechyné 1961: 76.

Diagnosis. Head with impressed punctures on interocular space and close to inner margin of eyes. Elytra piceous with eight yellow spots. Median lobe of aedeagus strongly curved, dorsal median process strongly curved upwards laterally, internal sac with sclerotized plate at base, and larger sclerotized area in the middle. Spermatheca with rounded receptacle, pump smaller, and pronounced neck between both parts.

Redescription. Body oval to elongate, slightly convex (Fig. 1), length 3.57–4.55mm, width 2.60–3.00mm. **Color.** Head capsule piceous, labrum and mouthparts brown tinged with yellow, apical one-third of mandibles, and maxillary palpi 3–5 dark brown. Antennae piceous, basal half of antennomeres 1 and inner margin of 1–3 flavous. Pronotum yellow. Scutellum, elytra and epipleura piceous; each elytron with four yellow spots, one oval near scutellum, two on the disk, and basal subrectangular one not reaching apical margin. Coxae 1 and trochanter

yellowish, coxae 2 and 3, tibiae, and tarsi dark brown, metafemora piceous. Venter, prosternum yellow, meso-metasternum piceous, abdomen dark brown tinged laterally with yellow.

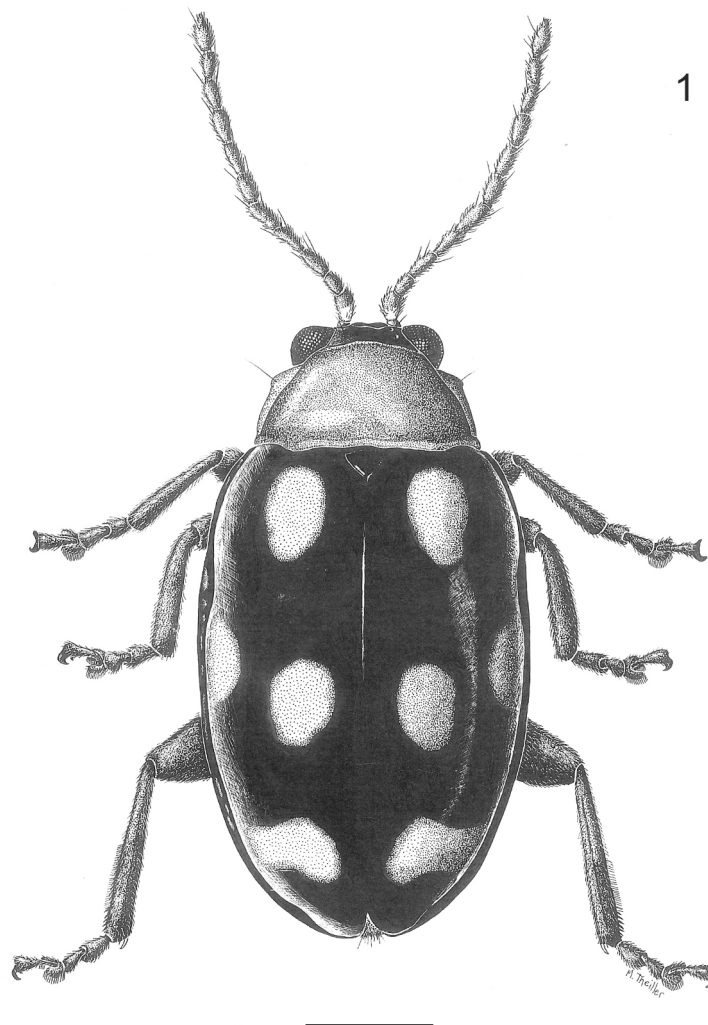
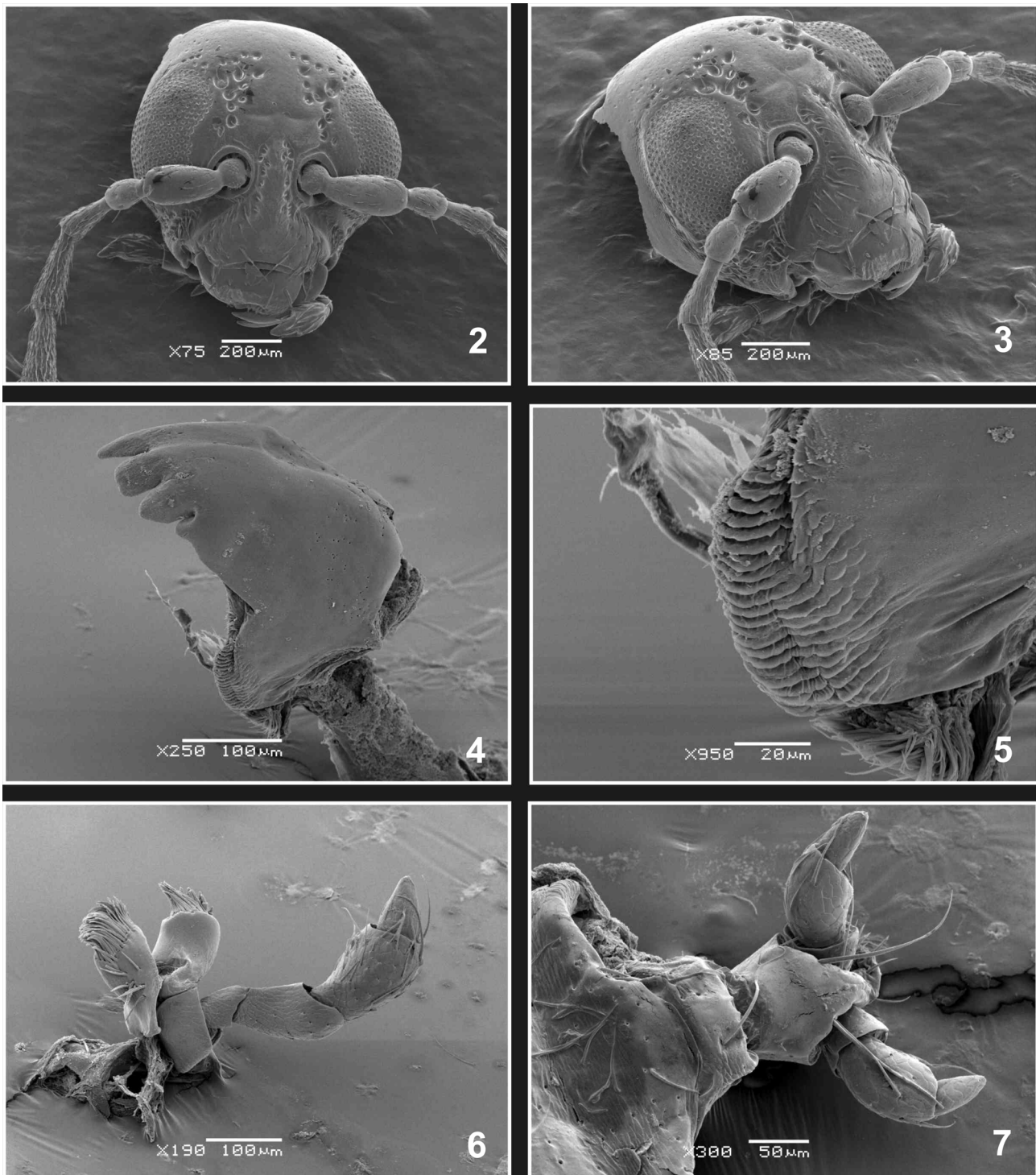


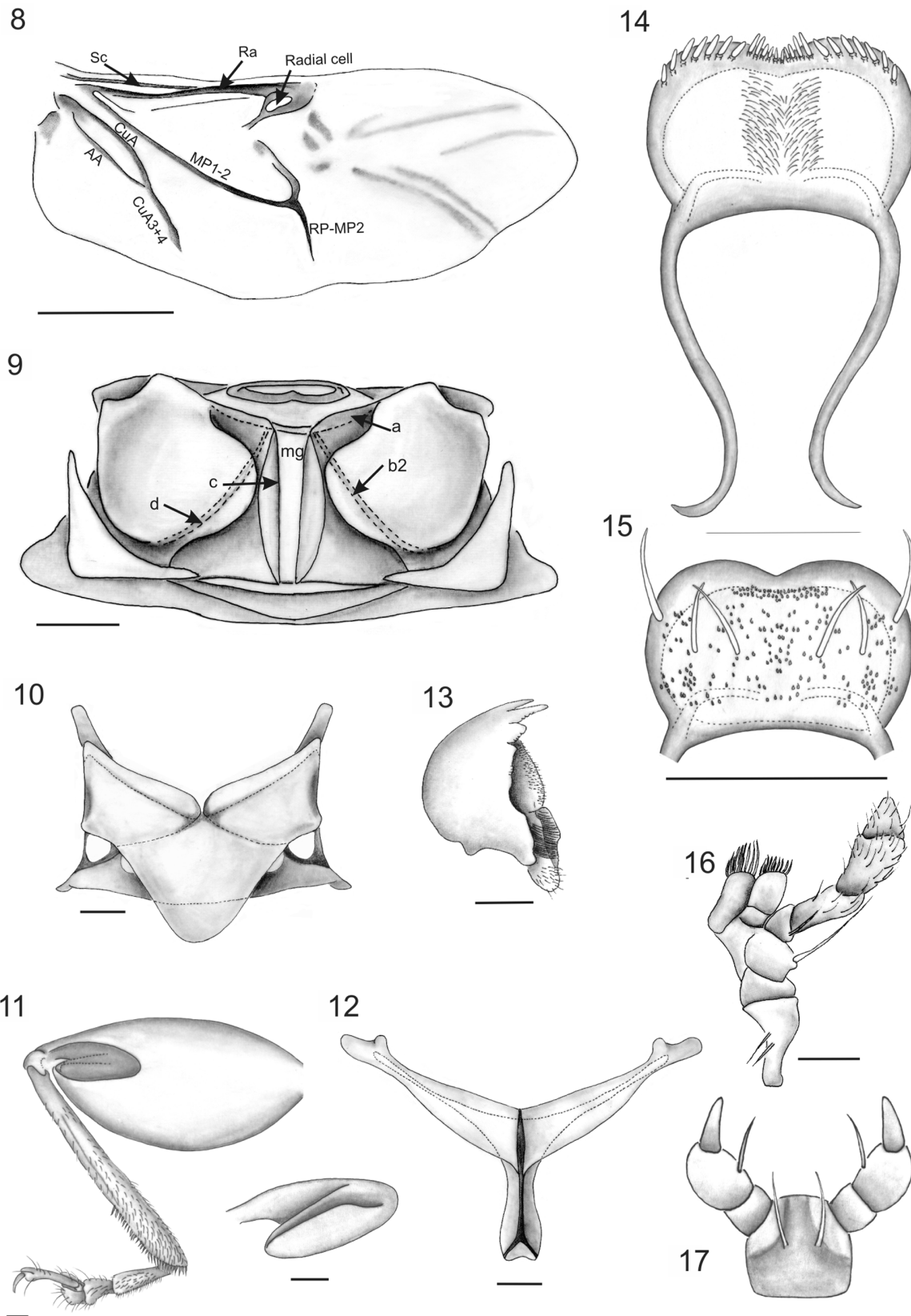
FIGURE 1. *Phenrica littoralis* (Bechyné), male, dorsal habitus.

Head (Figs. 2–3) Vertex smooth; more or less convex in lateral view, with coarse impressed punctures on interocular space near eyes and others close to inner margin of eyes, antennal calli barely raised, trapezoidal, narrower than antennal sockets; supracallinal sulcus and midfrontal sulcus hardly impressed; antennal sockets closed to anterior margin of eyes; interantennal space slightly narrower than transverse diameter of antennal sockets. Eyes convex. Frontal ridge narrow, moderately convex, surrounded laterally by seven long setae, and seven setae below antennal sockets; anterofrontal ridge not separated from frontal ridge, slightly lower than frontal ridge in lateral view. Antennae 11-segmented, inserted below midline of eyes, extending a little more than half length of elytra; antennomere 2 subconical, shorter than 3, antennomeres 4–10 elongate, similar in length, antennomere 11 apically acuminate; antennomeres 1–3 scarcely setose, antennomeres 4–11 densely setose throughout, all antennomeres with erect, sparse setae at apex. Clypeus with 4 preapical long setae. Labrum (Figs. 14–15) approximately rectangular, lateral margins rounded, anterior margin with small central notch, with a row of six long setae, ventrally eight thick setae in each lateral margin, about eight central, short setae in notch. Mandibles (Figs. 4, 13) 5-toothed, teeth 3–5 visible on external face, teeth 2–3 acute, subequal, tooth 3 more than 2.0 times longer than 4; tooth 4 blunt at apex, almost 2.0 times the length of 5, tooth 5, short, acute, teeth 1–2 visible on internal face, tooth 1 narrow, acute, one-half the length of 2nd, mola (Fig. 5) well developed. Maxillae (Figs. 6, 16), cardo apically broadened, with two long setae near outer margin; galea and lacinia rectangular, both with fringe-like pilosity, scarcer and shorter in the galea. Maxillary palpi with palpomere 1 quadrangular; palpomere 2 short,

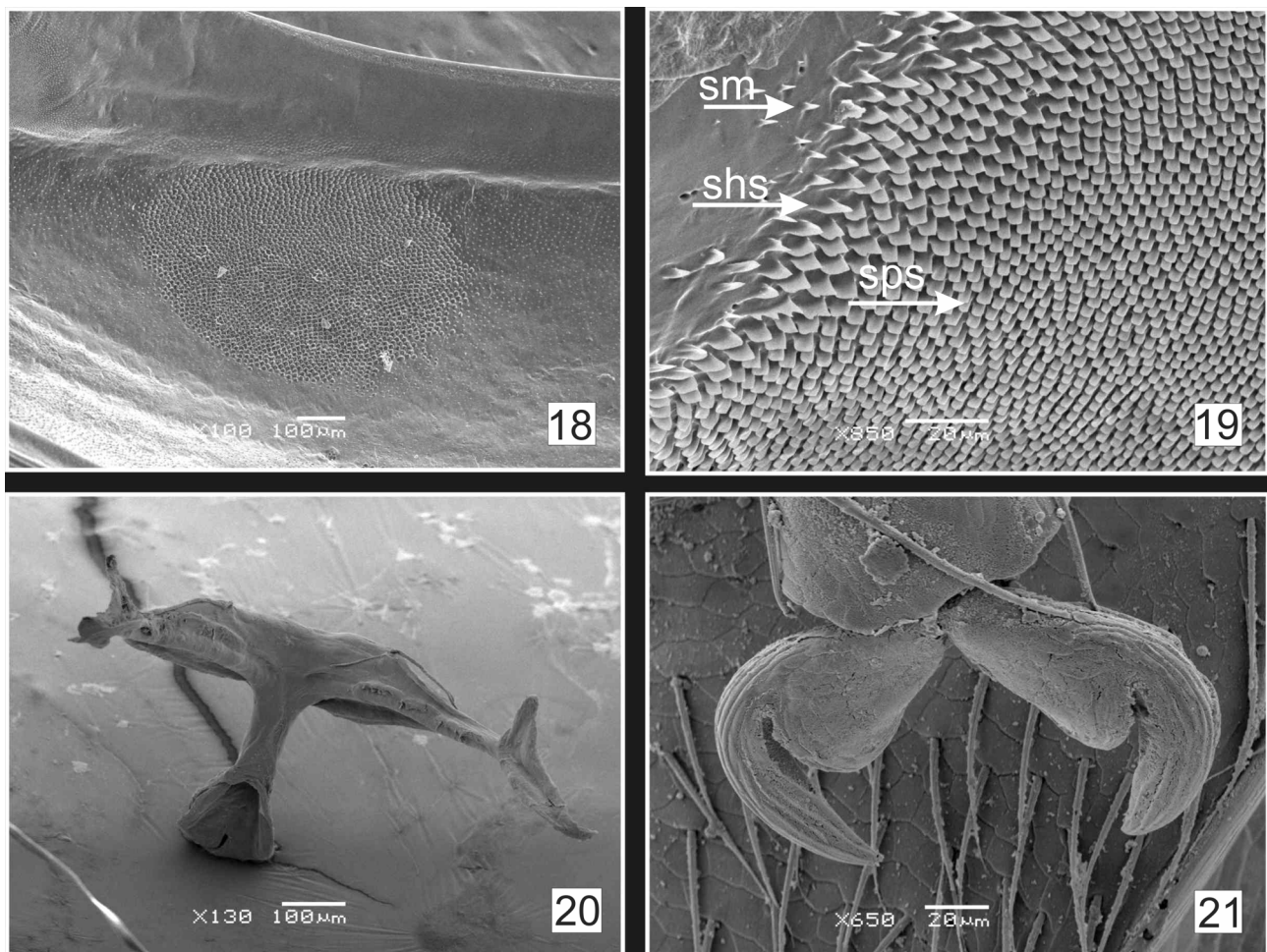
subquadrate; palpomere 3 subcylindrical, more than one half length of palpomere 2, palpomere 4 subcylindrical, palpomere 5, subconical with wide base, tapering apically, digitiform, subrectangular sensilla patch on externo-basal corner. Labium (Figs. 7, 17) with two setae between bases of palps, ligula rectangular. Labial palp with palpomere 1 rectangular; palpomere 2 subconical, more than 2.0 times longer than 1; palpomere 3 subconical with narrow base.



FIGURES 2–7. *Phenrica littoralis* (Bechyné) (2) Head, frontal view. (3) Head, lateral. (4) Mandible, external face. (5) Mandible, detail of mola. (6) Maxilla, ventral view. (7) Labium, dorsal view.

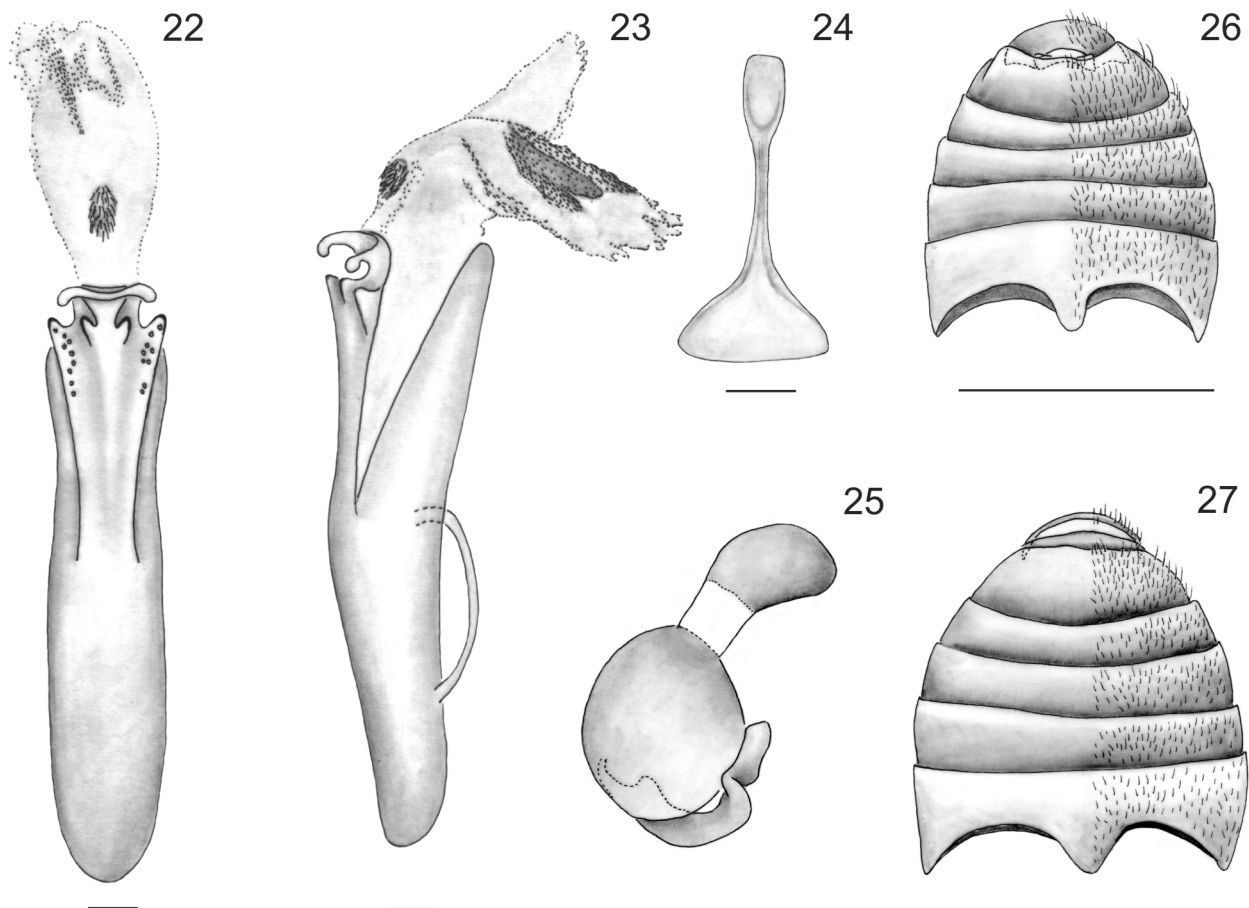


FIGURES 8–17. *Phenrica littoralis* (Bechyné) (8) Hind wing. (9) Metanotum. (10) Scutellum. (11) Metaleg, detail of metafemoral spring. (12) Metendosternite, dorsal view. (13) Mandible, external face. (14) Labrum, ventral view. (15) Labrum, dorsal view. (16) Maxilla, ventral view. (17) Labium, dorsal view. Abbreviations: a, metanotal ridge a; AA, anal anterior vein; b2, metanotal ridge b2; c, metanotal ridge c; CuA, cubitoanal vein; CuA 3+4, cubito anal vein 3+4; d, metanotal ridge d; mg, median groove; MP 1-2, medial posterior vein 1-2; RA, radial vein; RP-MP2, radial posterior-medial posterior vein 2; SC, subcostal vein. Scale bars= 0.1mm.



FIGURES 18–21. *Phenrica littoralis* (Bechyné) (18) Elytron ventral view, detail of binding patch. (19) Detail of binding patch, surface covered with spoonbill shaped spicules and sharktooth-shaped spicules on distal area. (20) Metendosternite. (21) Tarsal claws appendiculate. Abbreviations: shs, sharktooth spicule; sm, spiniform microtrichia; sps, spoonbill spicules.

Thorax Pronotum slightly convex, rectangular, PW/PL: 1.61–2.46 times wider than long, widest at middle, PW: 1.70–2.00mm; surface shiny, minutely punctate; anterior margin almost straight, lateral sides slightly expanded anteriorly, posterior margin arched; anterior callosity well produced, rounded, posterior callosity poorly developed, dentiform; each one bearing a long seta. Prosternum convex; intercoxal prosternal process thin, procoxal cavities closed, oval. Scutellum (Fig. 10). Metanotum transverse, wider than long; metanotal ridge *d* (Fig. 9) intersecting *c* anteriorly to midpoint of *c*. Metasternum transverse, slightly concave centrally, with slightly pronounced bidentate projection between inner margin of metacoxae; metacoxal cavities inserted at posterior margin, narrowly separated. Metendosternite (Figs. 12, 20) T-shaped, stalk wider at base, shorter than lateral arms, lateral arms widen to apex; mesofurcal-metafurcal tendons well developed, inserted near apex of lateral arms. Hind wings (Fig. 8) with veins RA, MP, CuA well sclerotized whereas veins CuA₂ RP-MP₂ and AA scarcely sclerotized. Vein SC connected to RA more than half its length, radial cell darkly pigmented, elongate, subtriangular; RP-MP₂ not reaching r₄; RP-MP less than one-half the distance of MP₁₋₂, AA connected to CuA₃₊₄ more than one-half the distance from origin of CuA; cubital anal cell closed, elongate. Elytra oval, convex, surface densely, uniformly punctate, elytra slightly wider than pronotum, HW/PW: 1.16–1.29, humeral calli rounded, slightly prominent, EW/HW: 1.20–1.29; greatest width near apical one thirds of elytra; epipleura subvertical, basally broad, gradually narrowed at apical half of elytral length; basal inner surface of elytra with an oval binding patch (Figs. 18–19) uniformly covered with spoonbill-shaped spicules, small sharktooth-shaped spicules covering anterior and posterior end of binding patch, surface close to binding patch covered with thin micro-spicules. All legs similar; pro- and mesotibiae without apical spine, metafemora (Fig. 11) robust, metatibiae thick, curved, tarsomere 1 of metalegs longer than tarsomeres 2+3 together. Metafemoral spring (Fig. 11). Tarsal claws (Fig. 21) appendiculate.



FIGURES 22–27. *Phenrica littoralis* (Bechyné) (22) Median lobe, dorsal view. (23) Median lobe, lateral view. (24) sternite 8. (25) Spermatheca. (26) Abdomen, male, ventral view. (27) Abdomen, female, ventral view. Scale bars= 1mm.

Abdomen Male with apical margin of tergite 7 with about ten long curved setae, base with few scattered microtrichia, indistinct under low magnification; apical margin of sternite 7 (Fig. 26) weakly truncate, lateral margin with two curved setae. Female with tergite 7 (Fig. 27) triangular, covered with long setae evenly distributed and six long, curved setae on each lateral margin and 2 rows of 4 curved setae, base densely covered with spiniform microtrichia centrally and compound microtrichia laterally; margin of sternite 7 with four curved setae laterally; and sternite 6 with two lateral, curved setae.

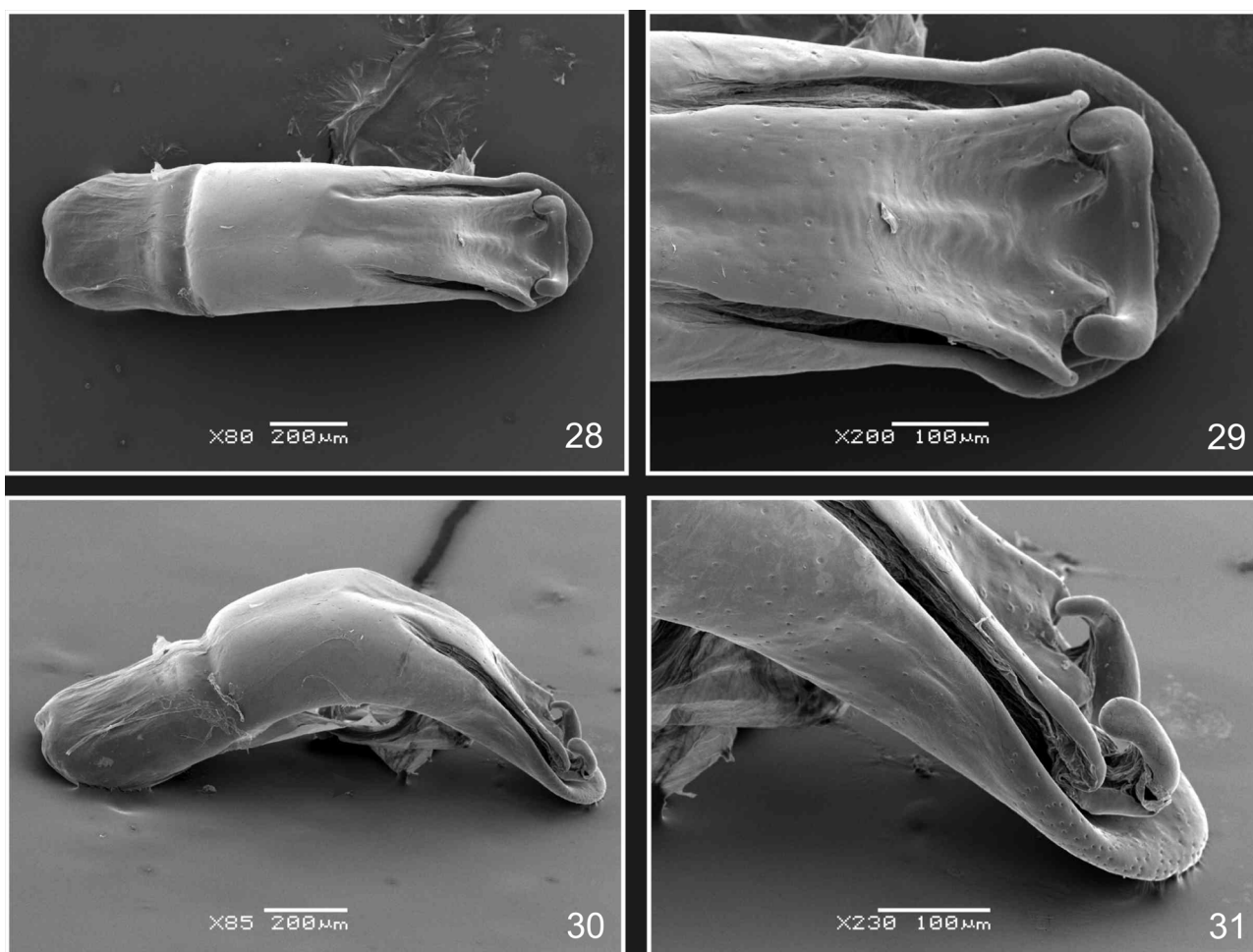
Male genitalia. Median lobe of aedeagus (Figs. 23, 30–31) strongly curved in lateral view. In dorsal view (Figs. 22, 28–29), scarcely wider at apex, ostium relatively large, almost reaching middle of median lobe length, dorsal median process strongly curved upwards laterally; basal foramen wide, internal sac with small rounded sclerotized plate at base and larger sclerotized area in middle of median lobe; tegmen Y-shaped, stem slightly curved, lateral arms longer than stem.

Female genitalia. Sternite 8 (Fig. 24) with a narrow, basal, rectangular-shaped area, distal area broad, triangular, gonocoxae asetose. Bursa copulatrix membranous, without sclerotized areas. Receptacle (Fig. 25) and pump of spermatheca well sclerotized, receptacle rounded, pump smaller than receptacle, oval, pronounced neck between both parts, proximal spermathecal duct curved, well sclerotized.

Variability. Specimens from Argentina and northern areas of Brazil (Santa Catarina and Mato Grosso states) are similar in color pattern to the holotype, however, some of these individuals differ by the following traits: presence of a small piceous basal vitta on the thorax, color of abdomen from light brown to yellowish, basal half of metafemora yellowish, tarsi yellowish brown to entirely brown, and elytral spots deeply punctate.

Geographic range. This species was originally described from Brazil (Santa Catarina state), Paraguay and Argentina (Misiones province) (Bechyné 1955). Later Bechyné recorded this species from other Brazilian states (Bahia, Mato Grosso, Santa Catarina and Rio Grande do Sul (Bechyné 1956, 1957). The range of *Phenrica*

littoralis includes the Chaco province (Chaco Domain) and Paranense and Cerrado provinces (Amazonian Domain) following the biogeographic scheme proposed by Cabrera and Willink (1980) also denominated Cerrado and Caatinga provinces (Chaquena subregion) and Bosque Paranaense province (Paranaense subregion) according to Morrone (2001).



FIGURES 28–31. *Phenrica littoralis* (Bechyné), (28) Median lobe, dorsal view. (29) Median lobe, detail of dorsal median process. (30) Median lobe, lateral view. (31) Median lobe, detail of dorsal median process. Scale bars= 1mm.

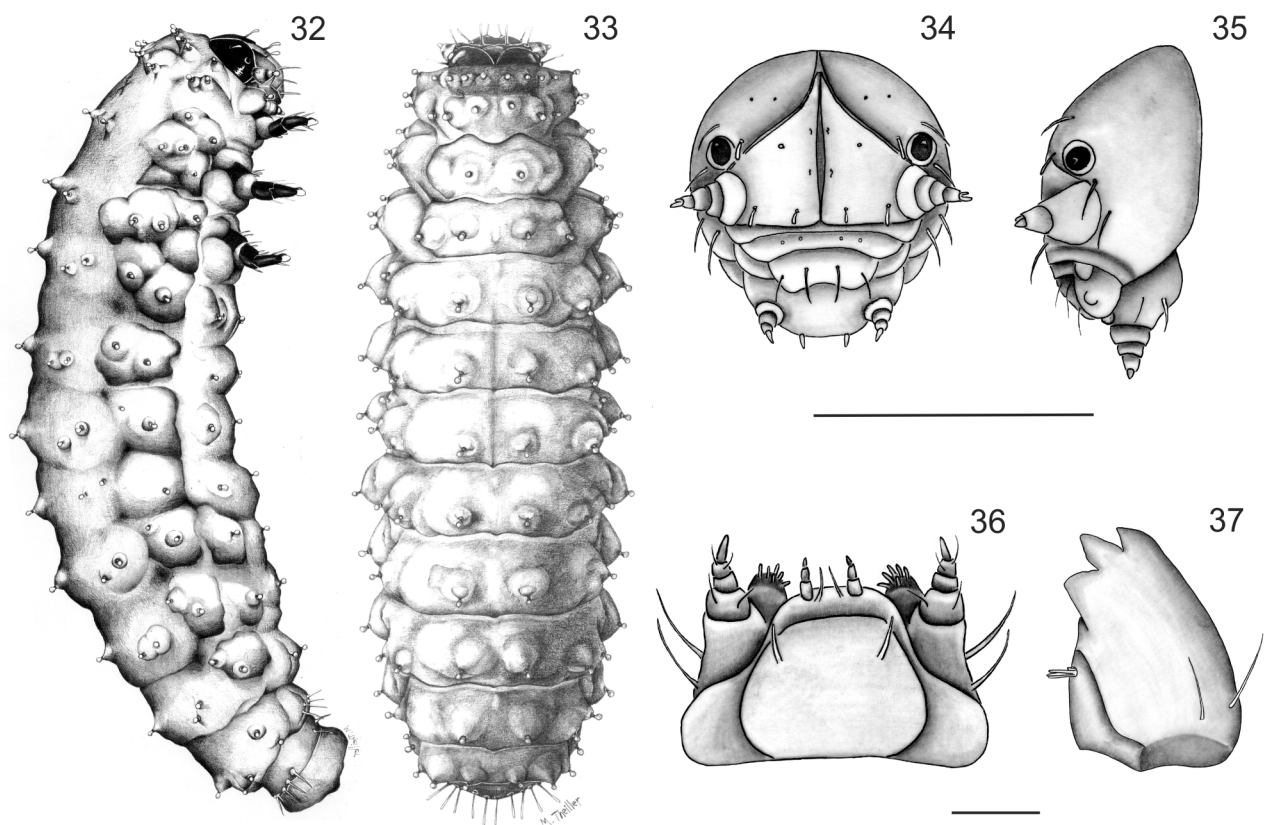
Remarks. The original description of *P. littoralis* in the genus *Nephrica* included a dichotomous key for six *Nephrica* species: *N. austriaca* Schaufuss, *N. cisseis* Bechyné and *N. huebneri* Weise (unknown to Bechyné) and the new species: *N. aequinoctialiformis*, *N. weyrauchi* y *N. mapiriensis*. All these species are characterized by the presence of two transverse elytral vittae (each one sometimes divided in two sections) and two rounded spots situated near scutellum. According to the key proposed by Bechyné (1955) and specimens examined from different museums, we conclude that *P. littoralis* is closely related to *P. mapiriensis* (type specimen examined by Cabrera). This species, described from Bolivia, differs from *P. littoralis* in its longer body, general color dark brown with the ventral surface entirely black, head with only few punctures, prothorax smooth without anterobasal depression, and few isolated punctures next to upper margin of eyes.

Material examined. Type material. Bechyné (1955) described *P. littoralis* from a female collected in Brazil. Bechyné normally used the word “Type” or “Holotype” on his identification label to indicate the holotype. This female is labeled as Brasilien, Nova Teutonia, 27° 11' 8 52° 23', Fritz Plaumann typeface/ Type, *Nephrica littoralis* m., handwriting, J. Bechyné det., 1954 typeface. This specimen is deposited at the Naturhistorisches Museum, Basel, Switzerland (NHMB).

Additional material examined. ARGENTINA: **Misiones:** 12 males and 9 females, San Ignacio, 6-XI-03, Sosa and Dorado col. (FUEDEI); 8 males and 4 females, Playa del Sol, 23-I-04, Sosa and Dorado col. (FUEDEI); Iguazú, Estación Garganta, 1 male 1 female, Sosa and Dorado col. (FUEDEI). BRAZIL: Rio Grande do Sul: Serro

Azul (actually Cerro Largo), 1 male, VIII-1939, P. Buck col. (MAPA), 1 male, II-1943, P. Buck col. (MAPA), 2 males, X-1945, P. Buck col. (MAPA), 2 females, XI-1949, P. Buck col. (MAPA), 1 male, Marcelino Ramos, XII-1938, F. Plaumann col. (MIZA). **Santa Catarina:** 1 male, Nova Teutonia, II-1935, B. Pohl col. (MZSP), 2 males and 1 female, V-1935, B. Pohl col. handwritten *Phenrica littoralis* Bechyné, det. G. Scherer 1954 (MZSP), 1 female, 12-1939, B. Pohl col., 2° handwritten *Phenrica littoralis* Bechyné, et. B. Pohl 1959 (MZSP), 3 males, 11-1944, B. Pohl col. (MZSP), 1 male, XII-1938, F. Plaumann col. (MIZA), 1 female, Dirings col, 2° handwritten *Phenrica littoralis* Bechyné, det. Bechyné 1966 (MZSP), 3males and 4 females, 1975, 27° 11'B 52° 23', 300-500m, Fritz Plaumann, 2° handwritten *Phenrica littoralis* det Scherer 1981 (DZUP). **Mato Grosso:** 1 male, Riacho Herval, Rio Paraná, 1-1952, B. Pohl col., handwritten *Phenrica littoralis* Bechyné, et. B. Pohl 1959 (MZSP); Itapiranga, 1 female, IX-1953, P. Buck col. (MAPA), 2 females, V-1954, P. Buck col. (MAPA), 2 males, IX-1954, P. Buck col. (MAPA), 1 male, X-1954, P. Buck col. (MAPA), 1 female, I-1960, P. Buck col. (MAPA); 2 males and 1 female, X-1954 (MIZA).

Mature Larvae (Figs 32–33). Length 3.7–5.6mm, width 1.0–1.7mm. Body weakly convex when preserved, bright yellow, with prominent scoli each with a seta in dark ring. Head capsule, mouthparts, tubercles, and legs light brown. Microsculpture of the body granulate.



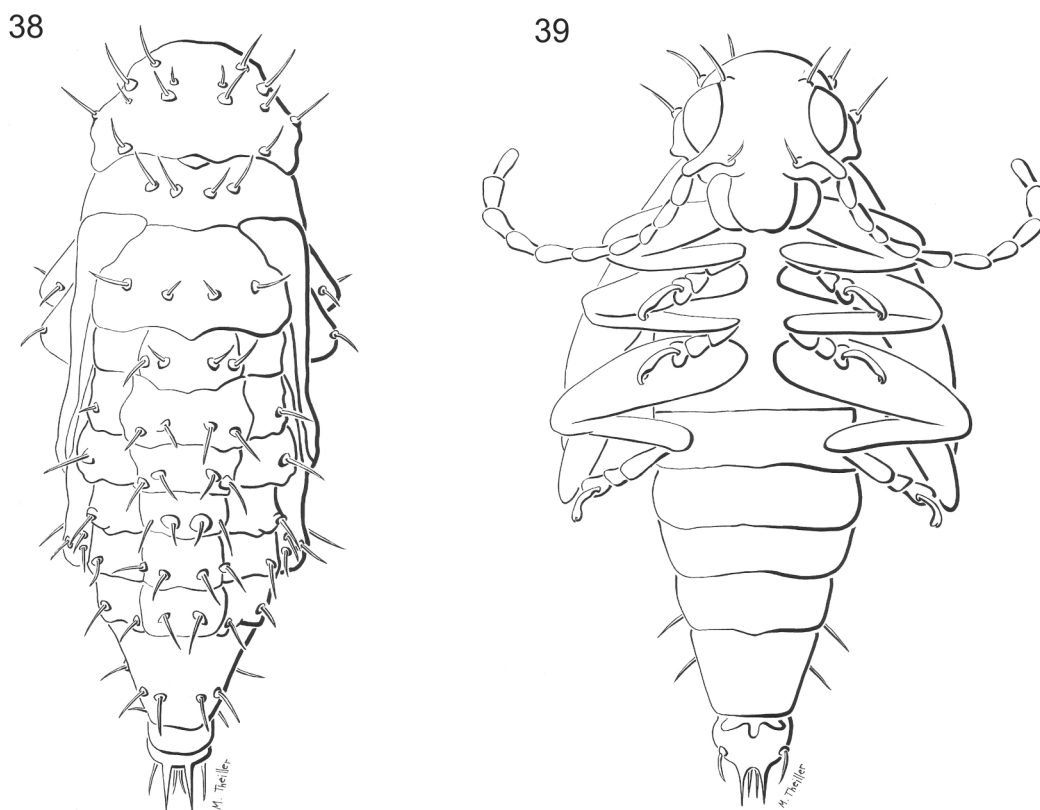
FIGURES 32–37. *Phenrica littoralis* (Bechyné), mature larvae (32) Habitus, lateral view. (33) Habitus, dorsal view. (34) Cephalic capsule, frontal view. (35) Cephalic capsule, lateral view. (36) labium and maxilla. (37) Mandible, dorsal view. Scale bars= 1mm.

Head (Figs 34–35). Hypognathous, rounded, well sclerotized. Epicranial suture distinct, Y-shaped; well developed, coronal suture short, extending more than one fourth the length of head, frontal arms pale, distinct throughout, broadly divergent and curved. Endocarina present a black line extending to fronto-clypeal sutures. Frons bearing one pair of long setae medially, two pairs fixed on anterior margin and another two pairs on clypeal area. Each side of epicranial plate bearing two large, dorsal, capitate setae along frontal suture, one fixed laterally on disc, one behind stemmata, and another on the outer side of antennae, four microsetae arranged in a longitudinal row near middle. Antennae short, 3-segmented; attached to head capsule by large, translucent membrane, segment 1 transverse bearing three setae, segment 3 with conical sensory appendage at base. Clypeus transverse, bearing

one seta on each lateral margin. Labrum transverse, apical margin emarginated; bearing four large setae in median row. Mandibles (Fig. 37) robust, heavily sclerotized at apex, 4-toothed, tooth 1 small, teeth 2–3 sharply pointed, tooth 4 blunt at apex, half the length of the previous two teeth, two long mandibular setae inserted dorso laterally, penicillus consisting of four thick setae. Maxillae (Fig. 36) cardo well-sclerotized, subtriangular, bearing two setae at outer side. Stipes quadrate, with short, narrow inner projection with two long outer setae. Mala densely setose, with about six short setae. Maxillary palpi: palpiger bearing two long setae, segment 1 with two short setae, segment 3 conical. Labium (Fig. 36) with submentum not much sclerotized, widened at base, with a pair of long, filiform submental setae; prementum broad, with a pair of long setae between labial palpi, labial palpi 3-segmented, short. Hypopharynx densely setose.

Thorax. Pronotum transverse, pronotal sclerite not well defined, dorsal side with short club-like setae each borne on a minute tubercle arranged in anterior and posterior rows, epipleural tubercle bearing three setae, small pre-hypopleural tubercle bearing one seta. Meso- and metathorax wider than prothorax, each bearing four setae arranged along mid-line. Meso- and metapleura each with alar tubercle bearing two setae and anterior epipleural bearing one seta, pro-meso- and metasterna with two medial setae. Spiracle annuliform displaced into mesothoracic region. Legs 5-segmented, strongly chitinized, the third pair slightly increased in size; coxa trapezoidal bearing 3 long setae and a sensilla; trochanter, triangular, with two setae, femur sub-rectangular bearing eight long setae; tibia bearing six setae. Tarsungulus moderately curved, with single basal seta; paranonchial appendix projecting behind tarsungulus.

Abdomen. Abdominal segments 1–8 with a pair of dorsal setae, posterior parascutal area bearing two setae, epipleural and hypopleural areas each bearing one seta, ventrally eusternal area of segments 1–7 with a pair of very short club like setae; segment 8 with four pairs of long, filiform setae segment 9 forming fleshy pygopod. Spiracles 1–8 annuliform.



FIGURES 38–39. *Phenrica littoralis* (Bechné), pupae (38) Habitus, dorsal view. (39) Habitus, lateral view. Scale bars= 1mm.

Pupa (Figs. 38– 39). Length 3.4–4.1mm, width 1.8–2.5mm. Color of body pale yellow. Tubercles, base of spiracles and cerci light brown. Head deflexed, not visible from above, with only two pairs of setae: one on eyes and one subantennal. Mouthparts well developed. Pronotum with seven pairs of pronotal setae situated on disc and

margins: two pairs on disc, three pairs on outer margins, and one pair on posterior margin, one pair of rounded spiracles. Meso- and metathorax with two pairs of meso- and metathoracic setae arranged in transverse rows. Podothecae with two pairs of femoral setae on apex of femora. Abdominal segments 1–6 transverse, each with two pairs of dorsal setae one pair of spiracles and one pair of pleural setae originating from a lateral projection, abdominal segment 6–7 with similar chaetotaxy but without spiracles, abdominal segment 7 subconical. Abdominal segment 8 reduced with two short lateral setae, abdominal 9 with one pair of urogomphi straight with two pairs of setae at base, ventrally two pairs of lateral setae and other two shorter setae medially.

Remarks. Considering all known larvae of Disonychina, *Phenrica* is more closely related to those of *Disonycha*. Lawson (1991) illustrated larvae of *Disonycha xanthomelas* (Dalman), *D. triangularis* (Say) and *D. alternata* Illiger, however the lack of detailed chaetotaxy characters for these descriptions prevent in-depth comparisons with *P. littoralis*. *Phenrica littoralis* shares the following characters with these disonychine species: similar arrangement of body setae, head and legs brown, antennae 2-segmented, stemmata present, abdomen with prominent light scoli. Larvae of *P. littoralis* differs by the shape of mandibles, maxillae, tarsunguli and the number of body setae.

Little is known about Disonychina pupae. The pupae of only five species of *Disonycha* have been described by different authors (Chittenden, 1899; Frers, 1919; Hemenway & Whitcomb, 1968; Whitehead, 1918). However, only the descriptions of *D. argentinensis* Jacoby, *D. xanthomelaena* and illustrations of *D. bicarinata* Boheman (the three latter modified by Cox 1996, 1998) can be compared with *Phenrica*. *Disonycha glabrata* (Fabricius) has not been described in detail and is therefore impossible to properly compare.

The pupa of *P. littoralis* differs mainly from *D. argentinensis* by the presence of seven pairs of setae on the pronotum, femora bearing two setae, abdominal segments with two pairs of dorsal setae and one pair of pleural setae, ventral surface without setae and urogomphi straight. It is difficult to compare in detail with the pupa of *D. xanthomelaena*, but according to the characters presented by Cox (1996), differences were observed by the number of setae on the pronotum, abdominal sternites, and the urogomphi slightly divergent. According to the illustrations of *D. bicarinata*, this species shares with *Phenrica* the number of setae on the pronotum, abdomen and femora.

Phenrica littoralis differs by its more slender body, distribution of head setae, the conical shape of abdominal segment 7, and number of its setae and urogomphi straight and close together.

On the other hand, some pupal features, like the position and presence of some setae and urogomphi, allow conjecturing as to the pupation biology of this species (Cox 1996). According to this author, the chief function of both structures is to protect the pupal integument from abrasion against the walls of the cell. Therefore, it should be present in species that build cells. Laboratory observations indicate *P. littoralis* pupates in the soil substrate in a cell probably built with soil cemented with some excretion ($n=23$). It was also observed that some individuals pupated even if deprived of a substrate (sand or soil), but emergence success was much lower (2/10). These observations are similar to those for *Disonycha* spp., which pupate in wet soil and build a mud cell sealed with cement-like anal or oral exudates, or both, applied in successive layers (Vogt *et al.* 1979).

Host specificity. None of the *Phenrica* species are listed as pests in Argentina (Cabrera 2004) or Brazil (D'Áraujo e Silva *et al.* 1968), but some species recorded on Amaranthaceae (*Irene*, *Cyathula* and *Althernanthera*) (Jolivet & Hawkeswood 1995), were also observed on cultivated Fabaceae on which they occasionally caused some damage (Bechyné & Bechyné 1966). *Phenrica guerini* (Bechyné) was the first species in the genus mentioned as a biocontrol agent of another weed, Barbados gooseberry, *Pereskia aculeata* Miller (Cactaceae) (Klein 1989).

Biological aspects. *Phenrica littoralis* was found in San Ignacio, Misiones and in several locations nearby. In the field, adults were found in large numbers on shaded plants growing under trees in a completely terrestrial situation. Larvae have not been observed in the field. In the laboratory, egg masses were obtained on moist tissue paper (14.5 ± 5.7 eggs/mass, $n=12$). Around 85% emergence occurred between 9 and 12 days after oviposition. Eggs are yellow and larvae and pupae are light pink. Larvae fed on alligator weed leaves and pupated in the substrate. Immature stages lasted between 24 and 35 days (28.3 ± 4.3 days, $n=23$), and the larval survival was 46 % (23/50). Immature duration and biological aspects are similar to its close related species *P. guerini* (Klein 1989).

Final considerations. Duckett (1999) proposed the first phylogenetic hypothesis of relationships among the subtribe Disonychina based on adult morphology. In this analysis it is postulated that species of *Balzanica*, *Disonycha* and *Phenrica* constitute a clade supported mainly by genitalic characters. Duckett (1999) further proposed that the series *Disonycha* should include the genera *Phenrica* and *Disonycha* and that *Phenrica* may be a

junior synonym of *Disonycha*. Although as only one species of *Phenrica* was included, a detailed analysis of the genera is still needed.

This is the first description of the immature stages of *Phenrica*, which will contribute to enhance the taxonomic and biological knowledge of Alticini. As a complement of the study of adult structures, the morphology of immature stages provide a source of new characters that could help establish a phylogenetic hypothesis of relationships among taxa.

Other flea beetles were proposed as potential candidates for the biological control of *Alternanthera philoxeroides* (Julien & Chan 1992; Sosa *et al.* 2004), but these species were not sufficiently specific. *Phenrica littoralis* was only found on terrestrial alligator weed and preliminary information from laboratory (unpublished data) encourages new studies. The beetle has being introduced into quarantine facilities in Australia to study its host specificity.

Agasicles hygrophila Selman & Vogt is the first flea beetle used as biological control agent of alligator weed. If a high-level of specificity of *P. littoralis* is confirmed it will be the second flea beetle – utilized for the biological control of *Alternanthera philoxeroides* worldwide.

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