

Species of *Megamelus* (Hemiptera: Delphacidae) Associated with Pontederiaceae in South America

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ABSTRACT The genus *Megamelus* Fieber (Hemiptera: Delphacidae), frequently associated with aquatic plants, includes four species in South America. One of these species, *Megamelus scutellaris* Berg, was the only species previously recorded in Argentina. In recent explorations in wetlands of South America (northeastern Argentina, eastern Peru, and southeastern Brazil), five species on Pontederiaceae were studied: *Megamelus electrae* Muir, *Megamelus iphigeniae* Muir, *M. scutellaris*, *Megamelus timehri* Muir, and *Megamelus bellicus* Remes Lenicov & Sosa sp. nov. Male holotypes of *M. electrae*, *M. iphigeniae*, and *M. timehri* were redescribed; females of both winged forms and brachypterous males of *M. electrae* and *M. iphigeniae*, and the female allotype of *M. timehri*, were described for the first time. *M. bellicus* is new for science, and it is described based on the following pattern combination: front coloration, anal segment with asymmetrical spine-like processes, shape of pygofer and aedeagus processes in the male, length of the ovipositor, and shape of the valvifer VIII. A key to distinguish the five South American species, based on male and female genitalia and the external morphology, is presented. This work is an update of knowledge on this genus, incorporating new specific diagnostic characters such as the length of ovipositor, shape and position of valvifer VIII, shape and denticulation of the first and second valvulae, and coloration pattern. Further information on host plants, geographical distribution, and biological data are reported.

KEY WORDS *Megamelus*, *Megamelus bellicus*, Pontederiaceae, systematics, South America

In the Americas, the genus *Megamelus* Fieber (Hemiptera: Delphacidae) is represented from 24 species (Asche 1985, Sosa et al. 2004); four of these species are found in South America: *Megamelus iphigeniae* Muir 1926 in Brazil; *Megamelus electrae* Muir 1926 in Brazil, Puerto Rico, and Trinidad and Tobago; *Megamelus timehri* Muir 1919 in Guyana; and *Megamelus scutellaris* Berg 1883 in Argentina (Sosa et al. 2004, 2005).

Biological aspects of species of *Megamelus* are poorly known, and the host plants from aquatic environments are recognized only for eight species. These plants belong to different families: Cyperaceae (two spp.), Juncaceae (one sp.), Nymphaeaceae (one sp.), Poaceae (two spp.), and Pontederiaceae (three spp.) (Au 1941; Beamer 1955; Crutwell 1973; Wilson and McPherson 1979, 1981; Sosa et al. 2004).

The Pontederiaceae are floating or rooted plants represented in South America by 20 species (Eckenwalder and Barret 1986). Hitherto only three species of *Megamelus* were associated with this family: *Megamelus paleatus* (Van Duzee) on *Pontederia cordata* L. in North America (Wilson and McPherson 1979) and *M. electrae* and *M. scutellaris* on *Eichhornia crassipes* (Martius) Solms-Laubach in South America (Crutwell 1973, Sosa et al. 2004). This latter plant, water hyacinth, is considered

an exotic aquatic weed, which alters the ecosystems of the invaded areas outside of the native range in >50 countries (Julien et al. 1999).

Due to the importance of *M. scutellaris* as a native and potential biocontrol agent against water hyacinth, much more attention has been paid to the genus *Megamelus* in South America, mainly regarding their association with host plants, particularly Pontederiaceae. In recent explorations in wetlands of South America—northeastern Argentina, eastern Peru, and south of Brazil—several specimens of *Megamelus* were collected on six species of Pontederiaceae. This finding allowed us to study three species, one of which is new to science. Although *M. timehri* was only found on Hydrocharitaceae, we included it in this contribution because of its South American distribution.

Because the original descriptions are not fully adequate, holotypes (macropterous males) of *M. electrae*, *M. iphigeniae*, and *M. timehri* were redescribed. The female of both winged forms and brachypterous males of *M. electrae* and *M. iphigeniae*, and the female allotype of *M. timehri* were described for first time. A key to South American species, based on the external morphology, and male and female genitalia, is provided. We also report our observations on host plants, geographical distribution, and biology for each species.

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Fig. 1. Areas surveyed for *Megamelus* spp. on Pontederiaceae in South America. Dots indicate sites sampled and numbers indicate sites where insects were obtained for morphological studies: 1, Berrisso, Buenos Aires; 2, Hurlingham, Buenos Aires (*M. bellicus* type 552 locality); 3, Villa Paranacito, Entre Ríos; 4, Río Colastiné, Santa Fé; 5, Barra do Riveiro, Rio Grande do Sul; 6, Iquitos and surrounded area; 7, Belem (*M. electrae* and *M. iphigeniae* type locality); 8, Mojón de Fierro, Formosa; 9, Colonia Benitez, Chaco; 10, Paso de la Patria, Corrientes; 11, El Palmar, Entre Ríos; 12, Paso de Lontra, Mato Grosso do Sul; 13, Trinidad and Tobago; and 14, Demerara River, Guyana (*M. timehri* type locality).

Materials and Methods

Morphological Studies

The adults examined were both field-collected and museum specimens from five main sites in South America (Fig. 1, numbers indicate sites where insects were obtained for morphological studies). Adults were collected with an aspirator in different wetlands of South America (Bonetto and Hurtado 1999; 25–35° S) as follows: coast of Brazil (southeastern Brazil): April 2000 (5); La Plata basin (northeastern Argentina): 1999–2005 (1–4, 10 and 11); Chaco wetlands (northern Argentina): December 1997, December 1998, and October 1999 (8 and 9); Pantanal (center of western border of Brazil): August 2002 (12); and Amazon basin (northeastern Peru): April 1999 and September 2000 (6 and 7, 13 and 14).

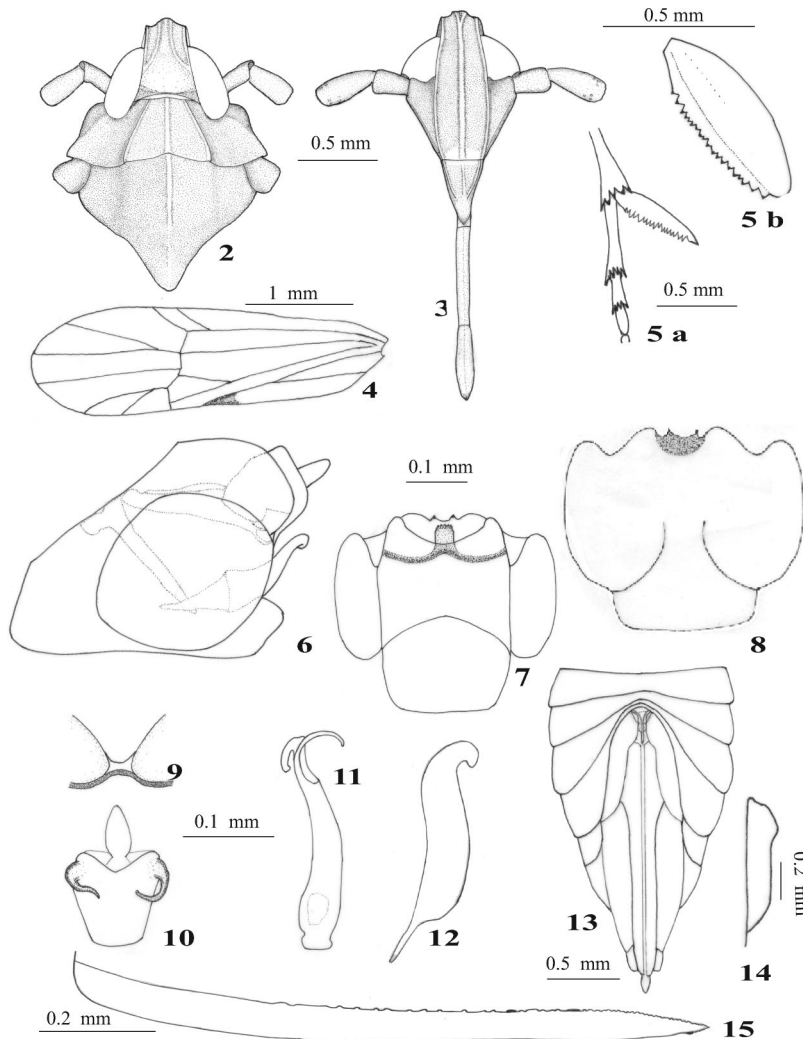
Others specimens were studied from Museo de La Plata (MLP) and Fundación Miguel Lillo (FML) collections from Argentina. Type material of *M. electrae*, *M. iphigeniae*, and *M. timehri* from the Bishop Museum (BPBM), Honolulu, HI, and *M. scutellaris* from MLP were examined.

The macropterous male of the new species of *Megamelus* was described in detail, but only major differ-

ences were considered for females and the other male form. A series of female and male specimens of *M. electrae* and *M. iphigeniae*—most of them found in copula—were considered as “reference specimens” and used for the descriptions and illustrations. Anatomical characteristics of *M. scutellaris* are included in the key, based on the recent work of Sosa et al. (2004, 2005).

Both male and female genitalia of the species were prepared for microscopic examination according to standard taxonomic techniques (Remes Lenicov and Virla 1993). The reported measurements were taken from 10 specimens of each sex and winged form (when possible) and are given in millimeters. The illustrations were drawn using a stereoscopic microscope with a camera lucida. We follow the terminology of Muir (1926) to describe the main morphological characters of the male and female genitalia.

Abbreviations used are as follows: L., total length; B.L., body length; t.l., tegmina length; v.l., vertex length; v.w., vertex width at base; f.l., frons length; M.f.w., maximum frons width; m.f.w., minimum frons width; a.I, first antennal segment length; a.II, second antennal segment length; p.l., pronotum length; m.l., mesonotum length; mti.l., metatibia length; mta.l., metatarsi length; mta.I, first hind tarsomere length; s.l.,



Figs. 2–15. *M. bellicus*. (2) Head and thorax, dorsal view. (3) Head, frontal view. (4) Tegmina. (5a and b) Metatibial spur. (6) Male terminalia, lateral view. (7) Pygofer, dorsal view. (8) Pygofer, ventral view. (9) Diaphragm of pygofer, caudal view. (10) Anal segment, ventral view. (11) Aedeagus, posterior view. (12) Left genital style, posterior view. (13) Female abdomen, ventral view. (14) Left valvifer VIII, ventral view. (15) Second valvula, right, lateral view.

metatibial spur length; and t.n., number of teeth on metatibial spur.

The specimens were deposited in MLP (Argentina) and BPBM (Hawaii) collections.

Laboratory Rearing

Adults and nymphs of the new species of *Megamelus* were collected in Otamendi (Buenos Aires Province, Argentina), in summers 2002, 2003, and 2004, and they were carried to the laboratory. Several generations were reared in outdoor conditions in three pools (2.0 m in length by 1.4 m in width by 0.5 m in depth) containing different species of aquatic plants [Pontederiaceae: *Pontederia cordata*, *P. rotundifolia* L., *Pontederia subovata* (Seubert) Low, *Eichhornia crassipes*, *Eichhornia azurea* (Swartz) Kunth, and *Heteranthera limosa* (Swartz) Willdenow; Alismathaceae: *Echi-*

nodorus grandiflorum (Chamisso et Schlechtendahl) Micelli, and Hydrocharitaceae: *Limnobium laevigatum* Heine]. Some plants with oviposition marks were dissected under the microscope to observe eggs; others were isolated to obtain egg parasitoids.

Results

Key to *Megamelus* species of South America

1. Male anal segment with pair of asymmetrical processes arising near or just below posterior angle (Figs. 10 and 25). Aedeagus with two apical processes curved on each side (Figs. 11 and 26). Ovipositor long (Figs. 15 and 30). 2

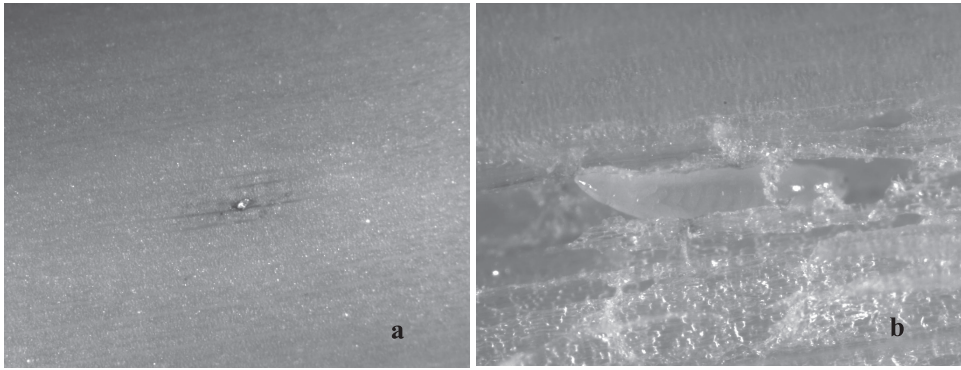


Fig. 16. Oviposición of *M. bellicus*. (a) Detail of a scar in a water hyacinth petiole. (b) Eulophid larva feeding on eggs of *M. bellicus*.

- 1'. Male anal segment without processes (Fig. 39), or with two symmetrical processes arising on base. Aedeagus with one process, or if two, not spiniform. Ovipositor short (Fig. 44) 3
- 2. Processes of male anal segment long, slender, curved upward and projecting inwards just below posterior angle. Aedeagus tubular, processes projected toward base (Fig. 11). Pygofer with sclerotized area bearing a pair of small, sharp-pointed processes between inner lobes (Fig. 8). Female: valvifer VIII with inner margin produced and truncate at base (Fig. 14). Frons with one narrow light stripe on the apex, macropterous tegmina hyaline with only one fuscous mark on apex of clavus (Fig. 4)
 *M. bellicus* Remes Lenicov & Sosa sp. nov.
- 2'. Processes of male anal segment stronger, curved in opposing directions (left dorsad, right ventrad) (Fig. 25). Aedeagus asymmetric with paired apical processes, one directed cephalad, other caudad; plus small dorsal furcate projection near middle (Fig. 26). Pygofer with lobe-like process between inner lobes (Fig. 23). Female: valvifer VIII with inner margin rounded at base (Fig. 29). Frons uniformly colored. Macropterous tegmina heavily infuscated on clavus and apical area (Fig. 19) *M. electrae* Muir
- 3. Male anal segment with two small symmetrical processes (Fig. 53). Aedeagus with one apical closely curved process dorsobasally directed (Fig. 54). Pygofer with a small peg-like projection on ventral surface between inner lobes (Fig. 51). Small species: 3.4 mm. Vertex short, slightly longer than wide. Frons short, with median carina forked below anterior margin of eye. Tegmina hyaline (Fig. 47)
 *M. timehri* Muir
- 3'. Anal segment without processes. Aedeagus with one or two lateral apical processes. Pygofer without processes between inner lobes. Median or large species: 3.8–4.2 mm. Vertex and frons longer, median carina of frons forked above anterior margin of eye. Tegmina infuscated (Fig. 33) 4

- 4. Male anal segment collar like, not pointed. Aedeagus with two apical processes. Pygofer inner lobes rectangular in outline. Dorsal margin of diaphragm medially rectangularly produced. Female: sternite VII finely denticulated medially. Second valvula with conspicuous, truncated, and dorsally denticulated teeth on apical half. Frons with two transverse light stripes *M. scutellaris* Berg
- 4'. Male anal segment slightly pointed on medio-ventral margin of apex (Fig. 35). Aedeagus with one apical process (Fig. 40). Pygofer inner lobes sinuous in outline (Fig. 37). Dorsal margin of diaphragm medially widely rounded produced (Fig. 36). Female: sternite VII with a medial tongue-like projection directed caudally (Fig. 42). Second valvula with small pointed teeth (Fig. 44). Frons brown and uniformly colored
 *M. iphigeniae* Muir

***Megamelus bellicus* Remes Lenicov & Sosa sp. nov.**
 (Figs. 2–16)

Male Macropter (Figs. 2–12). Color: brown. Frons with one transverse pale stripe on frontoclypeal suture. Antennae light brown, first segment paler. Pronotum light brown between lateral carinae, fuscous behind eyes; mesonotum dark brown (Figs. 2 and 3). Tegmina hyaline, lightly fuscous on base and at apex of clavus (Fig. 4). Legs light brown; coxae, apical area of femora, base and apex of tibiae and central area of spurs infuscated. Abdomen dark brown, sternites yellowish medially. Pygofer rufous, diaphragm dark brown laterally.

Structure. Vertex rectangular, longer than wide (1.7:1) projecting beyond eyes about one third of its length, basal compartment short occupying approximately basal third, conspicuous median carinae forming a narrow triangular area continuing just beyond fastigium (Fig. 2). Frons more than twice long as wide (2.4:1) narrower between anterior margins of eyes, lateral margins subparallel, slightly arcuate; carinae

well developed, median forked just below fastigium. Clypeus subtriangular, longer than wide, carinae prominent. Rostrum reaching metacoxae, longer than frons, subapical segment longer than apical (1.2:1). Antennae with first segment length twice its width; second segment 1.5× first, length more than twice width (Fig. 3).

Pronotum with lateral carinae conspicuous, divergent, straight to slightly convex, attaining hind margin. Mesonotum disc as long as vertex plus pronotum, median carina vanishing in apical third, lateral carinae inconspicuous (Fig. 2). Metatibial spur leaf-like, as long as first segment of metatarsi (0.96:1) with a longitudinal, prominent submedian rib; spur bearing 15–20 black-tipped teeth on trailing margin; first hind tarsomere longer than second plus third (1.4:1) (Fig. 5a and b).

Terminalia (Figs. 6–12). Pygofer dorsally with shallow concave anal emargination, anal angles large, broadly rounded, caudally projected (Fig. 7); ventral margin with medium, round, kidney-like outer lobes, partially infolding lateral area of pygofer (Fig. 6); smaller inner lobes, rounded in outline, between them a more sclerotized area bearing a pair of small sharp-pointed processes (Fig. 8); diaphragm short, dorsal margin medially produced to a semiconical process that is dorsally concave (Figs. 7 and 9). Aedeagus long, regularly tubular, narrowing apically; caudally curved slightly ventrad; phallosome near apex on right dorsal surface; apex bearing two curved processes above phallosome, left short finger-like with truncated apex; right longer, thinner, semicircularly curved and spine-like (Fig. 11). Suspensorium sclerotized, strap-like, and long—nearly half length of aedeagus (Fig. 6). Genital styles long, narrow, slightly sinuate, flexed medially in ventral half; apex hook-like (Fig. 12). Anal segment collar-like, large, shallow excavation on ventral margin of apex, with two slender, long, asymmetrical, upwards curved processes, projecting medially just below posterior angle; right process more strongly curved than left, stronger at base; anal style less than 4× longer than broad (Fig. 10).

Measurements. L., 4.65; B.L., 3.2; t.l., 3.8; v.l., 0.45; v.w., 0.25; f.l., 0.65; M.f.w., 0.27; m.f.w., 0.17; a.l.I, 0.2; a.l.II, 0.3; p.l., 0.27; m.l., 0.65; mti.l., 1.13; mta.l., 1.1; mta.I, 0.65; s.l., 0.6; t.n., 15–20.

Male Brachypter. Color similar to macropterous form, tegmina amber, pro- and mesonotum brown, region between lateral carinae yellowish; abdomen brown with median longitudinal yellowish to light brown stripe to genital segments, laterally limited with a pair of yellowish to whitish spots on tergites III–V and VII. Tergite V, and sometimes III and IV, with additional pair of yellow spots on lateral margin.

Mesonotum shorter, more than half of vertex plus pronotum length, three well developed carinae—median and laterals—reaching posterior margin, lateral carinae divergent.

Measurements. B.L., 3; t.l., 1.05; v.l., 0.48; v.w., 0.18; f.l., 0.68; M.f.w., 0.28; m.f.w., 0.2; a.l.I, 0.18; a.l.II, 0.3; p.l., 0.3; m.l., 0.38; mti.l., 1.13; mta.l., 1.15; mta.I, 0.63; s.l., 0.55; t.n., 15–20.

Female Macropter. Color pattern similar to macropterous male, ovipositor dark brown with valvifer VIII light brown.

Longer than male. Frons much longer than wide (2.7:1). Metatibial spur longer, with 19–26 teeth.

Genitalia. (Figs. 13–15). Ovipositor very long, surpassing anal segment (Fig. 13). Sternite VII membranous, finely sculptured medially. Valvifer VIII regularly broad, with small basal projection, inner margin produced and truncate at base; in ventral view closed tightly in repose (Figs. 13–14). First valvula with a dorsal median process languet-like at base, 1.3× wider than long; spoon-like in lateral view. Second valvula wide, almost straight, bearing numerous teeth on dorsal margin for more than half of its length, those on proximate two-thirds, larger, wider and more separated than apical teeth; among them two or three dorsal and one ventral tooth wider and weakly sclerotized are frequently observed (Fig. 15).

Measurements. L., 5.08; B.L., 4; t.l., 4.08; v.l., 0.45; v.w., 0.3; f.l., 0.75; M.f.w., 0.28; m.f.w., 0.18; a.l.I, 0.2; a.l.II, 0.3; p.l., 0.31; m.l., 0.77; mti.l., 1.25; mta.l., 1.25; mta.I, 0.75; s.l., 0.72; t.n., 16–26.

Female Brachypter. Body coloration pattern similar to brachypterous males and the genitalia similar to macropterous female.

Measurements. B.L., 4.4; t.l., 1.25; v.l., 0.45; v.w., 0.3; f.l., 0.8; M.f.w., 0.3; m.f.w., 0.22; a.l.I, 0.2; a.l.II, 0.33; p.l., 0.35; m.l., 0.5; mti.l., 1.38; mta.l., 1.38; mta.I, 0.8; s.l., 0.77; t.n., 16–24.

Biological Aspects. *M. bellicus* was recorded during 1997–2005 on several plants of the family Pontederiaceae: *Pontederia cordata*, *P. rotundifolia*, *Eichhornia crassipes*, and *E. azurea*, and plants from other families: *E. grandiflorum* (Alismathaceae) and *L. laevigatum* (Hydrocharitaceae). Brachypters were the most abundant throughout the year, whereas macropters were frequently found at the end of the summer. In the laboratory, this planthopper was also reared on *P. subovata* and *H. limosa*.

Although several colonies were maintained in the lab on each of the host plants mentioned above, nymphs and oviposition scars were only observed on Pontederiaceae.

The female inserts the eggs deeply into the aerenchyma of the petiole, more frequently on the basal two thirds and extending toward the leaf apex if they reach high densities. The scars are irregularly distributed and the incisions in the petiole tissue are single; in each one, inside the aerenchyma, the female ovipositor makes one to four holes in the inner septa, where one to four eggs are laid per hole. The scars are notorious due to the necrosis produced (Fig. 16a).

We observed that this planthopper occupies the same ecological habitat as *M. scutellaris*, in the subregions Delta of Paraná River and La Plata River belonging to the wetland La Plata Basin (Bonneto and Hurtado 1999), which is the southern border of the native range of the Pontederiaceae. When *M. bellicus* and *M. scutellaris* share a water hyacinth leaf, the former exhibits aggressive behavior and displaces *M. scutellaris*.

Natural Enemies. An unidentified eulophid wasp, *Aprostocetus* (*Ootetrastichus*) sp., inserts its eggs into eggs of *M. bellicus*. Larvae develop within the egg, and once emerged, they consume the other eggs in the scar (Fig. 16b). Nymphs also were parasitized by an unidentified dryinid.

Geographical Distribution. ARGENTINA: Santa Fe, Entre Ríos and Buenos Aires province. BRAZIL: Rio Grande do Sul state. PERU: Loreto department.

Material Examined. HOLOTYPE: 1 ♂ macropter, ARGENTINA: Buenos Aires, Hurlingham, 20-VI-2001, on *P. cordata*, Sosa col. (MLP), ALLOTYPE: 1 ♀ macropter, same data (MLP). PARATYPES: 1 ♀ macropter, ARGENTINA: Buenos Aires, Hurlingham, 04-V-2001, on *P. cordata*, Sosa col. (BPBM); 1 ♀ brachypter, Buenos Aires, 20-VI-2001, Hurlingham, on *P. cordata*, Sosa col. (BPBM); 1 ♂ macropter same data (BPBM), 1 ♂ brachypter, same data (BPBM); 2 ♂♂ macropters same data (MLP); 3 ♂♂ brachypters, Buenos Aires, 20-VI-2001, Hurlingham, on *E. grandiflorum*, Sosa col. (MLP); 2 ♀♀ macropters, same data, 3 ♀♀ brachypters, Buenos Aires, 27-II-1999, Hurlingham, on *E. crassipes*, Sosa col. (MLP). Additional Specimens. ARGENTINA: Santa Fe, 2 ♂♂ brachypters, Río Colastiné, 15-IX-2000, on *P. cordata*; Sosa col. (MLP); Entre Ríos, 2 ♂♂ brachypters, Villa Paranacito, 12-IX-2003, on *P. cordata*, Sosa col. (MLP); Buenos Aires, 1 ♀ macropter, 16 ♀♀ brachypters, 1 ♂ macropter, Otamendi, *E. azurea*, 25-I-2005, Sosa col. (MLP); 6 ♀♀ macropters, Hurlingham, 20-VI-2001, on *E. azurea*, Sosa col. (MLP); 7 ♂♂ macropters, 11 ♀♀ brachypters, Hurlingham, 20-VI-2001, on *P. cordata*, Sosa col. (MLP); 14 ♂♂ brachypters, Hurlingham, 20-VI-2001, on *E. crassipes*, Sosa col. (MLP); 2 ♀♀ brachypters, Hurlingham, 20-VI-2001, on *E. grandiflorum*, Sosa col. (MLP); 1 ♂ macropter, Berisso, 3-I-2003, on *E. crassipes*, Barrios col. (MLP); BRAZIL: Rio Grande do Sul, 1 ♀ brachypter, Barra do Riveiro, IV-2000, on *P. cordata*, Sosa col. (MLP); PERU: Loreto, 1 ♂ brachypter, one nymph, Iquitos, Puru Cocha, 29-IV-1999, on *E. crassipes*, Cordo col. (MLP).

Etymology. The specific name comes from the Latin word "bellum" meaning war, a reference to the aggressive behavior in the field.

Remarks. *Megamelus bellicus* can be easily recognized from the South American species *M. electrae* because of the coloration pattern of the tegmina, the arrangement of the processes of the anal segment and aedeagus, and the size and shape of the lateral and inner lobes of the pygofer.

Megamelus electrae Muir, 1926

(Figs. 17–30)

Megamelus electrae Muir 1926: 26.

Male Macropter. (Figs. 17–27). Color: Light brown. Pronotum fuscous behind eyes and over mesonotum which is darker on lateral portion. Basal compartment of vertex, antennae and legs lighter than ground color (Figs. 17 and 18). Tegmina hyaline, fuscous over cross veins, apical portion of M 3 + 4 and Cu, and apical

portion of M 1 and 2; a dark mark on the three last apical cells and on apex of clavus (Fig. 19). Abdomen dark brown, sternites yellowish medially. Pygofer darker. Coloration (field specimens): legs with brown markings on apices of metafemora, metatibiae (at base and apex), metatibial spurs and third tarsomere, abdominal sternites yellowish on lateral margins.

Structure. Vertex, rectangular, longer than wide (1.8:1), projecting beyond eyes less than half its length, basal compartment occupying third basal of vertex; conspicuous median carinae forming a narrow triangular area continuing beyond fastigium (Fig. 17).

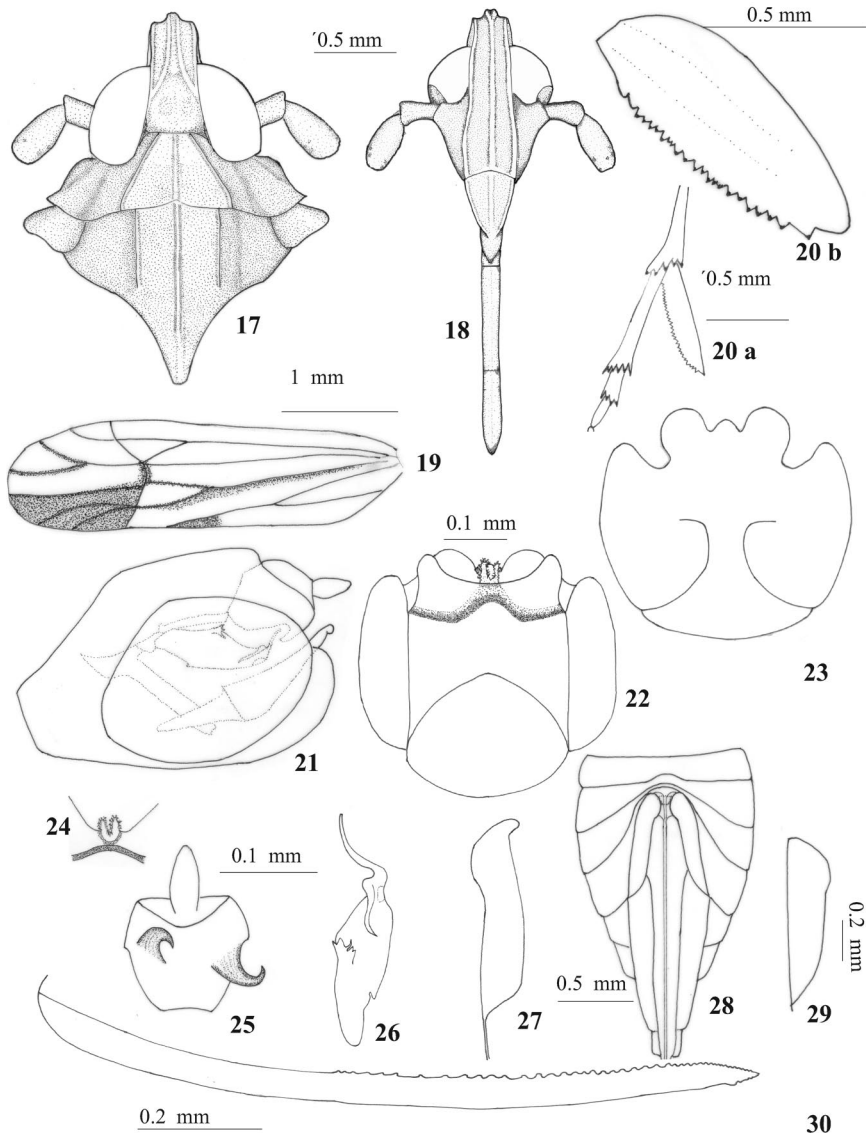
Frons 3× longer than wide (3.1:1), narrower between anterior margins of eyes, lateral margins subparallel, slightly divergent toward apex, carinae well-developed, median carina forked just below fastigium. Clypeus subtriangular, longer than wide, carinae prominent. Rostrum long, exceeding metacoxae, equal or slightly longer than frons; subapical segment longer than apical (1.3:1). Antennae with first segment with length approximately twice width; second segment 1.5× longer than first and exceeding twice width (Fig. 18).

Pronotum with lateral carinae conspicuous, divergent, straight to slightly convex, attaining hind margin. Mesonotum disc almost long as vertex plus pronotum, median carina becoming obsolete in caudal third, lateral carinae conspicuous, slightly divergent posteriorly, not reaching posterior margin (Fig. 17). Metatibial spur wide, leaf-like, lightly longer than first segment of metatarsi (1.2:1), without rib, with 20–22 black-tipped teeth on trailing margin; first hind tarsomere longer than second plus third (1.4:1) (Fig. 20a–b).

Terminalia (Figs. 21–27). Pygofer dorsally with shallow concave anal emargination, anal angles slightly produced (not as rounded as *M. bellicus*) (Fig. 21); ventral margin with round, kidney-like outer lobes enfolding larger portion of lateral area of pygofer (Fig. 22), leaf-like inner lobes—rounded in outline—with a lobe-like process between them (Fig. 23); diaphragm short, dorsal margin bearing asymmetrical arborescent processes (Figs. 22 and 24). Aedeagus asymmetric, tubular—narrowed toward base and apex—with paired apical processes, one directed cephalad, other caudad above phallosome, which is near apex on ventral surface; small dorsal furcate projection near middle (Fig. 26). Suspensorium sclerotized, tape-like, short, reaching aedeagus furcated projection (Fig. 21). Genital styles long, narrow, straight, apex slightly curved not hook-like (Fig. 27). Anal segment collar-like, with two asymmetrical, large processes near middle on ventral surface, curved in opposing directions—left dorsad, right ventrad; anal style less than 4× longer than broad (Fig. 25).

Measurements. HOLOTYPE: L., 3; t.l. 3.45. Material Examined: L., 4.5; B.L., 3.13; t.l. 3.5; v.l., 0.43; v.w., 0.23; f.l., 0.7; M.f.w., 0.25; m.f.w., 0.18; a.l.I, 0.2; a.l.II, 0.3; p.l., 0.25; m.l., 0.63; mti.l., 1.05; mta.l., 1.15; mta.I, 0.63; s.l., 0.63; t.n., 15–20.

Male Brachypter. General coloration similar to macropterous form, except for tegmina amber with



Figs. 17-30. *Megamelus electrae*. (17) Head and thorax, dorsal view. (18) Head, frontal view. (19) Tegmina. (20a and b) Metatibial spur. (21) Male terminalia, lateral view. (22) Pygofer, dorsal view. (23) Pygofer, ventral view. (24) Diaphragm of pygofer, caudal view. (25) Anal segment, ventral view. (26) Aedeagus, posterior view. (27) Left genital style, posterior view. (28) Female abdomen, ventral view. (29) Left valvifer VIII, ventral view. (30) Second valvula, right lateral view.

apical and anterior margin white, fuscous at apex of clavus; abdomen brown, with pale longitudinal median stripe that is laterally limited by pair of yellow spots on tergites III-V and VII. Tergite V with pair of yellow spots on lateral margin. Pygofer reddish brown laterally and ventrally. Anal segment and anal style brown.

Frons 2.7× longer than wide. Mesonotum disc shorter, lateral carinae reaching posterior margin.

Measurements. B.L., 3; t.l., 1.05; v.l., 0.38; v.w., 0.23; f.l., 0.7; M.f.w., 0.25; m.f.w., 0.18; a.l.I, 0.18; a.l.II, 0.3; p.l., 0.28; m.l., 0.4; mti.l., 1.08; mta.l, 1.1; mta.I, 0.65; s.l., 0.64; t.n., 22.

Female Macropter. Structurally identical—coloration pattern and anatomical features—to the type specimen.

Genitalia. (Figs. 28-30). Ovipositor very long, surpassing anal segment (Fig. 28). Sternite VII membranous and finely sculptured medially. Valvifer VIII regular, wide, with inconspicuous basal projection, inner margin rounded at base; separated in repose; cuticle finely denticulate at base (Figs. 28-29). First valvula with a dorsal median process languet-like at base, 1.5× wider than long. Second valvula long and straight, lightly curved at base, bearing numerous blunt teeth on dorsal margin for more than half of its length, larger

and more separated proximally, smaller and closer distally; with few ventral teeth (Fig. 30).

Measurements. L., 5.2; B.L., 4.4; t.l., 4; v.l., 0.45; v.w., 0.25; f.l., 0.75; M.f.w., 0.28; m.f.w., 0.18; a.l.I, 0.23; a.l.II, 0.33; p.l., 0.3; m.l., 0.95; mti.l., 1.2; mta.l., 1.2; mta.I, 0.63; s.l., 0.75; t.n., 24.

Female Brachypter. Structurally identical—coloration pattern and anatomical features—to brachypterous male. Genitalia similar to macropterous form.

Measurements. B.L., 3.4; t.l., 1.1; v.l., 0.5; v.w., 0.25; M.f.w., 0.325; m.f.w., 0.12; f.l., 0.75; a.l.I, 0.2; a.l.II, 0.33; p.l., 0.3; m.l., 0.45; mti.l., 1.25; mta.l., 1.33; mta.I, 0.75; s.l., 0.8; t.n., 22.

Biological Aspects. In the field *M. electrae* was recorded on *E. azurea* but also on *E. crassipes* in the La Plata Basin, subregions Iberá System and Uruguay River. Both adults and nymphs were observed feeding and adults mating on newly emerged leaves of *E. crassipes* at the Uruguay River. Oviposition scars were irregularly distributed on the petioles, and were similar to those of *M. bellicus*. This is the first record of *E. azurea* as host of *M. electrae*.

Geographical Distribution. ARGENTINA: Formosa, Chaco, Corrientes, Entre Ríos and Santa Fe provinces. BRAZIL: Para (Muir 1926) and Mato Grosso do Sul states. TRINIDAD and TOBAGO, Saint George county. PUERTO RICO: Salina and Ponce (Caldwell and Martorell 1951).

Material Examined. HOLOTYPE: 1 ♂ (macropter), BRAZIL: Belem, Para, VI-1924, F.X. Williams col., Nro 1168 (BPBM). Additional specimens. ARGENTINA: Formosa, 1 ♂ macropter, Mojón de Fierro, 21-XII-1948, Golbach col. (FML); Chaco, 2 ♂♂ macropters, Colonia Benítez, XII-1948, Golbach col. (FML); Corrientes, 2 ♀♀ brachypters, 13-XII-1998, on *E. azurea*, Sosa col. (MLP); 2 ♀♀ brachypters, 1 ♂ macropter, 3 ♂♂ brachypters, two nymphs, Paso de la Patria, II-2004, on *E. azurea*, Sosa col. (MLP); 2 ♀♀ brachypters, Corrientes, X-2004, Sosa col. (MLP); 1 ♂ macropter, Corrientes, 25-IX-2003, Sosa col. (MLP); Entre Ríos, ♀ macropter, RT 14, El Palmar, 18-VI-2001, on *E. azurea*, Sosa col. (MLP); 2 ♀♀ brachypters, 13-XII-1998, on *E. azurea*, Sosa col. (MLP); Santa Fe, Reconquista, ♂ macropter, 26-XI-1939, Biraben Vezzi col. (MLP); BRAZIL: Mato Grosso do Sul, 2 ♀♀ brachypters, 1 ♂ brachypter, Paso do Lontra (37.432), IV-2001, on *E. azurea*, Sosa col. (MLP); ♂ macropter, Paso do Lontra, on *E. azurea*; 2 ♀♀ macropters, Paso do Contra, 21-VIII-2002, on *E. azurea*, Sosa col. (MLP); 1 ♀ macropter, 1 ♀ brachypter, Paso do Lontra, 25-VIII-2002, on *E. azurea*, Sosa col. (MLP); 1 ♀ macropter, 1 ♂ brachypter, Paso do Lontra, 25-IX-2003, on *E. azurea*, Sosa col. (MLP); TRINIDAD and TOBAGO: Saint George, 2 ♂♂ macropters, Curepe, VI-1972 (SABCL); 1 ♂ macropter, Curepe, VI-1972, on *Eichhornia* sp., det M.S.K. Ghauri 1972 (N° 5624) (SABCL).

Remarks. The various museum specimens show similar structural and coloration features to the holotype male of *M. electrae* Muir except the darker pigmentation founded among specimens from the field. This species is easily distinguishable from the other

South American species by the following set of characteristics: its large size, the long vertex, frons and rostrum, and the configuration of the genitalia: male with asymmetrical processes on anal segment; arborescent processes on diaphragm, shape and processes of aedeagus and the lobe-like process between pygofer inner lobes; and the valvifer VIII rounded at base in the female.

Megamelus iphigeniae Muir, 1926

(Figs. 31–44)

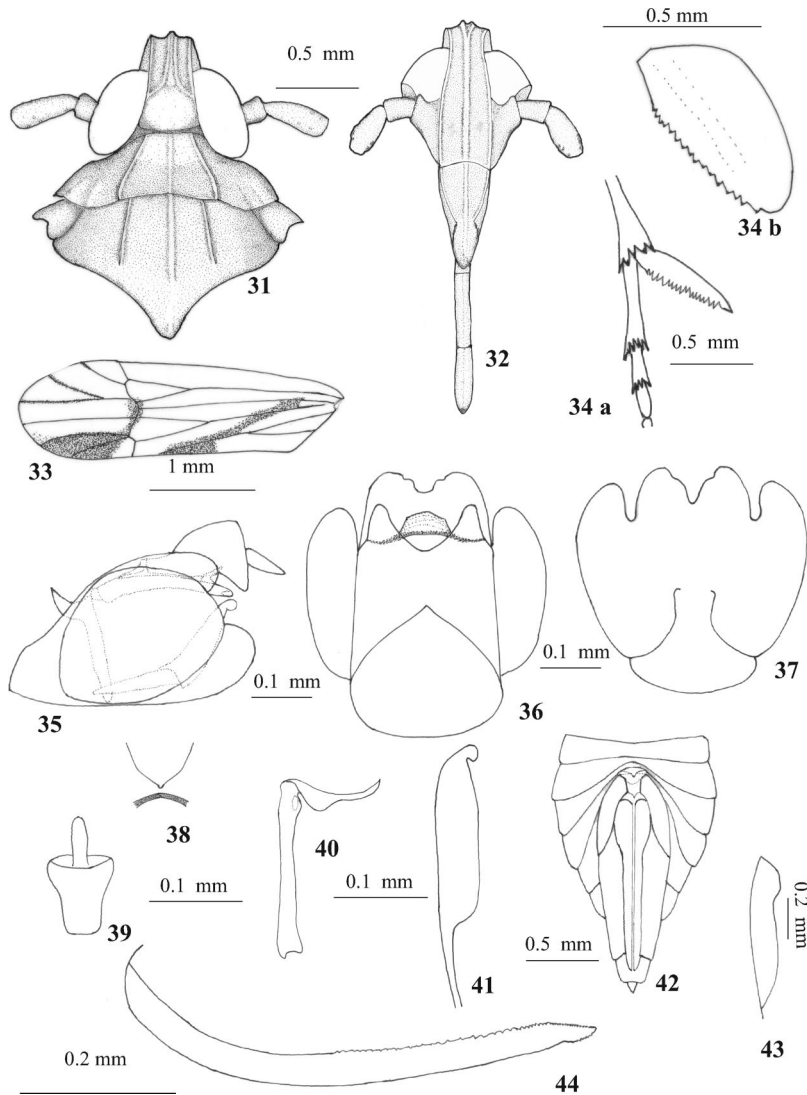
Megamelus iphigeniae Muir 1926: 28.

Male Macropter (Figs. 31–41). Color: light brown. Carinae and basal compartment of vertex, frons and clypeus, and rostrum paler. Pronotum fuscous behind eyes; mesonotum brown, darker laterally (Figs. 31 and 32). Tegmina hyaline, fuscous on basal cell along M and Cu reaching apex of clavus, with fuscous mark over cross veins and two last apical cells (Fig. 33). Abdomen brown, sternites yellowish medially. Pygofer darker. Coloration (field specimens): legs with dark markings on middle of procoxae, mesocoxae at base and apex, apex of metafemora, base of metatibiae, metatibial apical spines and a median longitudinal stripe along spurs.

Structure. Vertex rectangular, slightly longer than wide (1.5:1), projecting beyond eyes about half of length, basal compartment occupying approximately the basal third of vertex, medial carina conspicuous forming a long narrow triangular area continuing just beyond fatigium (Fig. 31). Frons more than twice long as wide (2.5:1), slightly narrowed between anterior margins of eyes, lateral margins subparallel, carinae well-developed, median fork just below fastigium. Clypeus subtriangular, as long as wide, carinae conspicuous. Rostrum reaching metacoxae, slightly longer than frons, subapical segment longer than apical (1.15:1). Antennae with first segment one-third longer than width, second segment 1.7× longer than first and twice its width (Fig. 32).

Pronotum with lateral carinae divergent and straight to slightly convex attaining hind margin. Mesonotum disc shorter than vertex plus pronotum, carinae prominent, becoming obsolete apically (Fig. 31). Metatibial spur leaf-like, with median rib becoming obsolete apically, slightly longer than metatarsomere I, with 19–24 regular, large, black-tipped teeth on trailing margin; first hind tarsomere longer than second plus third (1.1:1) (Fig. 34a and b).

Terminalia (Figs. 35–41). Pygofer dorsally with deeply concave anal emargination, anal angles distinctly projected caudad (Fig. 36); ventral margin with large, round, kidney-like outer lobes enfolding greater portions of lateral area of pygofer (Fig. 35); large inner lobes sinuous on medial margin (Fig. 37); diaphragm short, dorsal margin medially produced to wide and rounded process (Figs. 36 and 38). Aedeagus straight, with ventrally directed apical process; process flat and expanded proximally, curved upwards apically, small phallotreme on dorsal surface on right (Fig. 40). Suspensorium quite



Figs. 31–44. *M. iphigeniae*. (31) Head and thorax, dorsal view. (32) Head, frontal view. (33) Tegmina. (34a and b) Metatibial spur. (35) Male genitalia, lateral view. (36) Pygofer, dorsal view. (37) Pygofer, ventral view. (38) Diaphragm of pygofer, caudal view. (39) Anal segment, ventral view. (40) Aedeagus, posterior view. (41) Left style. (42) Female, abdomen, ventral view. (43) Left valvifer VIII. (44) Second valvula, right lateral view.

sclerotized, tape-like, short, less than half length of aedeagus. Genital styles long, narrow, straight, apex curved hook-like (Fig. 41). Connective short and straight (Fig. 35). Anal segment collar-like slightly pointed on medio-ventral margin of apex, without spine-like processes. Anal style 4× longer than broad (Fig. 39).

Measurements. HOLOTYPE: L., 4.2; B.L., 2.6; t.l., 3; v.l., 0.35; v.w., 0.26; f.l., 0.63; M.f.w., 0.25; m.f.w., 0.15; a.l.I, 0.15; a.l.II, 0.35; p.l., 0.23; m.l., 0.55; mti.l., 0.9; mta.l., 0.93; mta.I, 0.53; s.l., 0.6; t.n., 19–24.

Male Brachypter. Color light brown, paler in basal compartment of vertex. Mesonotum yellowish medially, slightly darker laterally. Tegmina amber with apical and anterior margin white, fuscous at apex of clavus. Abdomen paler medially forming a central

stripe—in some specimens wider on tergites II to V; a pair of pale spots on each one of tergites III, IV, V, and VII, next to stripe laterally; lateral and ventral portion of pygofer dark brown; sternites brown with posterior margin yellowish.

Measurements. B.L., 2.8; t.l., 1.0; v.l., 0.4; v.w., 0.25; f.l., 0.65; M.f.w., 0.25; m.f.w., 0.15; a.l.I, 0.15; a.l.II, 0.25; p.l., 0.25; m.l., 0.35; mti.l., 0.89; mta.l., 0.9; mta.I, 0.55; s.l., 0.63; t.n., 21.

Female Macropter. Similar in structure and coloration pattern to type specimen and similar in color and morphology to male.

Genitalia (Figs. 42–44). Ovipositor short, reaching anal segment (Fig. 42). Abdominal sternite VII membranous, finely denticulated, ending with small

tongue-like projection medially. Valvifer VIII regularly broad slightly excavated on inner margin near base, with inconspicuous basal projection; tightly closed in repose in ventral view, cuticle finely sculptured at base (Fig. 43). First valvula with a dorsal median languet-like process at base, slightly wider than long, with a median sculptured area projected cephalad (Fig. 42). Second valvula curved at base, bearing numerous broad and irregularly separated teeth on dorsal margin for half of its length; teeth smaller and closer near apex (Fig. 44).

Measurements. L., 4.5; B.L., 3.6; t.l., 3.5; v.l., 0.43; v.w., 0.25; f.l., 0.7; M.f.w., 0.28; m.f.w., 0.18; a.l.I, 0.2; a.l.II, 0.4; p.l., 0.25; m.l., 0.7; mti.l., 1.1; mta.l., 1.13; mta.I, 0.63; s.l., 0.75; t.n., 20–23.

Female Brachypter. Color similar to brachypterous male.

Measurements. B.L., 4; t.l., 1.2; v.l., 1.12; v.w., 0.6; f.l., 0.8; M.f.w., 0.75; m.f.w., 0.4; a.l.I, 0.55; a.l.II, 0.9; p.l., 0.8; m.l., 1.25; mti.l., 1.3; mta.l., 1.3; mta.I, 0.8; s.l., 0.8; t.n., 21.

Biological Aspects. Adults and nymphs of *M. iphigeniae* were found abundantly on *E. azurea* and *E. crassipes* in northeastern Argentina (La Plata Basin, subregion Iberá System) and also on *P. parviflora* in Brazil (Pantanal, subregion Paraguay River).

Geographical Distribution. ARGENTINA: Formosa, Chaco and Corrientes provinces. BRAZIL: Para and Mato Grosso do Sul states.

Material Examined. HOLOTYPE. 1 ♂ macropter, BRAZIL: Belém, Para, VI-1924, F.X. Williams col., Nro 1169 (BPBM). Additional specimens examined: ARGENTINA: Formosa, 1 ♂ macropter, Mojón de Fierro, 21-XII-1948 Gollbach col (FML); Chaco, 1 ♂ macropter, Colonia Benítez, XII-1948, Gollbach col. (FML); Corrientes, on *E. azurea*, 1 ♀ brachypter, 1 ♀ macropter, 2 ♂♂ macropters, Paso de la Patria, II-2004, Sosa col. (MLP), 1 ♂ macropter, 21-VIII-2002, Sosa col. (MLP), 1 ♂ macropter, Sosa col. (MLP), 2 ♂♂ brachypters, Sosa col. (MLP); BRAZIL: Mato Grosso do Sul, 1 ♀ macropter, on *E. azurea*, Paso do Lontra, 25-VIII-2002, Sosa col. (MLP).

Remarks. The material examined corresponds to the male holotype and to the original description. No notable intraspecific differences were observed except for the ground color darker. We agree with comment of Muir (1926) that *M. iphigeniae* and *M. electrae* are similar in structure and color.

Megamelus timehri Muir, 1915

(Figs. 45–58)

Megamelus timehri Muir 1915: 36.

Male Macropter (Figs. 45–55). Color dark brown. Carinae of head, clypeus and rostrum light brown. Antennae and genal area below antennae light brown. Pronotum light brown between lateral carinae, fuscous behind eyes; mesonotum dark brown, darker laterally (Figs. 45 and 46). Tegmina hyaline, veins brown, fuscous on apex of clavus, extensive toward axilar region, covering anal veins and cubital and median basal cells; apical cells infuscated—in field specimens (Fig. 47). Legs light

brown except coxae, apex of femora and tibiae at base and apex infuscated.

Structure. Vertex rectangular, longer than wide (1.5:1) projecting beyond eyes about one third of its length, basal compartment occupying approximately more than third basal, conspicuous median carinae forming a narrow triangular area surpassing fastigium (Fig. 45). Frons twice as long as wide (2.5:1), slightly narrow at base, lateral margins subparallel, gradually divergent toward apex, carinae well developed, median forked far from fastigium. Clypeus subtriangular, as long as wide, carinae prominent. Rostrum reaching metacoxae, as long as frons, subapical segment longer than apical (1.2:1). Antennae with first segment length 1.5 its width, apical margin obliquely truncated posteriorly; second segment length less than 2× first and more than twice its width (Fig. 46).

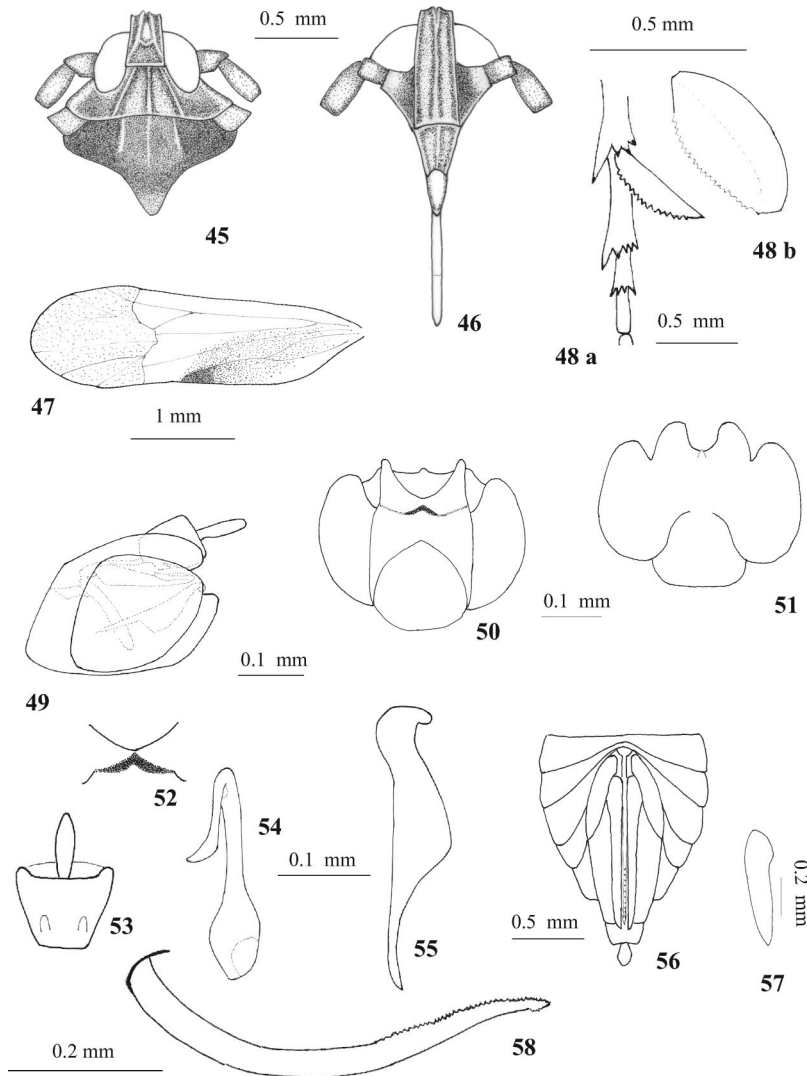
Pronotum with conspicuous carinae, lateral divergent and straight, attaining hind margin. Mesonotum disc as long as vertex plus pronotum, carinae becoming obsolete apically (Fig. 45). Metatibial spur large, broadly rounded, slightly longer than first segment of metatarsi, without rib; bearing 18 black-tipped teeth on trailing margin; first hind tarsomere longer than second plus third (1.5:1) (Fig. 48a and b).

Terminalia (Figs. 49–55). Pygofer dorsally with deeply concave anal emargination, anal angles distinctly projected caudad (Fig. 50); ventral margin with medium, round, kidney-like outer lobes, enfolding lateral area of pygofer (Fig. 49); smaller inner lobes, rounded in outline, a median small peg-like projection on ventral surface behind them (Fig. 51); diaphragm narrow, dorsal margin widely excavate and semicircularly produced, with a median longitudinal rib on ventral surface (Figs. 50 and 52). Aedeagus tubular, in general view somewhat bottle-shaped, wide at base, regularly narrow toward apex; caudally curved ventrad; phallosome near apex on left side; with an apical closely curved process dorsobasad directed on left; expanded distally (Fig. 54). Suspensorium quite sclerotized, strap-like; nearly half of aedeagus length. Connective short and straight (Fig. 49). Genital styles slightly sinuous, wider in middle, outer margin straight, slightly convex apically, inner margin slightly concave basally, apical margin truncate, apex rounded curved, hook-like (Fig. 55). Anal segment collar-like, apical margin straight emarginate ventrally; with two basal small finger-like cephalad directed processes; anal style 2.5× longer than broad (Fig. 53).

Measurements. L., 2.2; B.L., 2; t.l., 3; v.l., 0.3; v.w., 0.2; f.l., 0.48; M.f.w., 0.25; m.f.w., a.l.I, 1.25; a.l.II, 0.23; p.l., 0.23; m.l., 0.53; mti.l., 0.75; mta.l., 0.83; mta.I, 0.48; s.l., 0.5; t.n., 18.

Female Brachypter. (Figs. 56–58). Color pattern similar to macropterous male, ovipositor brown with valvifer VIII light brown.

Frons almost twice long as wide (1.8:1). Metatibial spur longer, with 20 teeth.



Figs. 45–58. *M. timehri*. (45) Head and thorax, dorsal view. (46) Head, frontal view. (47) Tegmina. (48a and b) Metatibial spur. (49) Male genitalia, lateral view. (50) Pygofer, dorsal view. (51) Pygofer, ventral view. (52) Diaphragm of pygofer, caudal view. (53) Anal segment, ventral view. (54) Aedeagus, posterior view. (55) Left style. (56) Female, abdomen, ventral view. (57) Left valvifer VIII. (58) Second valvula, right lateral view.

Genitalia. (Figs. 56–58). Ovipositor short, reaching anal segment (Fig. 56). Abdominal sternite VII membranous finely sculptured medially. Valvifer VIII regularly broad, inner margin produced and truncate at base; in ventral view separated in repose; cuticle finely sculptured at base (Fig. 57). First valvula without a dorsal median process languet-like at base (Fig. 56). Second valvula curved, bearing numerous teeth on distal one-thirds of dorsal margin; teeth smaller apically (Fig. 58).

Measurements. B.L., 3; t.l., 0.9; v.l., 0.4; v.w., 0.25; f.l., 0.5; M.f.w., 0.28; m.f.w., 0.2; a.l.I, 0.13; a.l.II, 0.18; p.l., 0.25; m.l., 0.38; mti.l., 1.25; mta.l., 1; mta.I, 0.6; s.l., 0.6; t.n., 20.

Biological Aspects. *M. timehri* was recorded during spring 2003 on *L. laevigatum* (Hydrocharitaceae) in

northeastern Argentina (La Plata Basin, subregion Iberá System).

Geographical Distribution. British Guiana, Demerara River. ARGENTINA, Corrientes province.

Material Examined. HOLOTYPE. 1 ♂ macropter, BRITISH GUIANA, Demerara River 31-III-1913, Nro 937 (BPBM). ALLOTYPE: 1 ♀ brachypter, ARGENTINA, Corrientes 14-IX-2003, on *Limnobium laevigatum*, Sosa col., 1 ♂ macropter, same data (MLP).

Remarks. *M. timehri* can be easily recognized from the South American species *M. iphigeniae* because of the tegmina coloration pattern, the processes of the anal segment, the shape of the aedeagus and its apical process, and the peg-like projection between the pygofer inner lobes.

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