

**THE LARVA OF *HETAERINA MENDEZI* JURZITZA,  
WITH COMMENTS ON *H. ROSEA* SELYS  
(ZYGOPTERA: CALOPTERYGIDAE)**

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*H. mendezi* larva is described and illustrated for the first time based on specimens from Misiones Province, Argentina. Larvae of *H. rosea* from NW Argentina are found to partially differ from its original larval description, and that species is re-diagnosed. A comparative table for all known larvae of *Hetaerina* and related calopterygid genera is provided.

**INTRODUCTION**

There are five genera of calopterygid damselflies in the New World, of which the larvae of *Iridictyon* Needham & Fisher, 1940 and *Bryoplathanon* Garrison, 2006 are still unknown. In South America, species of *Hetaerina* Hagen in Selys, 1853 are widely sympatric with those of the closely related calopterygid damselfly genera *Mnesarete* Cowley, 1934 and *Ormenophlebia* Garrison, 2006, and are in many occasions found sharing the same habitats. GARRISON (1990, 2006) provided excellent revisions of the adults, and he (2006) provided the only known description of a larva of *Mnesarete* (*M. grisea* [Ris, 1918]), and of *Ormenophlebia* (*O. imperatrix* [McLachlan, 1878]) showing that they do not differ substantially from known larvae of *Hetaerina*, and that these three genera cannot be adequately diagnosed based on the morphology of their larvae. Larvae of the temperate North American genus *Calopteryx* Leach, 1815 are easily distinguished by their long premental cleft, reaching mid length of prementum (WESTFALL & MAY, 1996), which in all known larvae of *Hetaerina*, *Mnesarete* and *Ormenophlebia* reaches only the base of premental palps.

*Hetaerina* species, commonly known as ruby spots due to a conspicuous red

spot on the wings of their males, are grouped in a New World genus comprising 37 species (GARRISON, 1990), most speciose in the neotropical region. They breed in riverine environments, and approximately half of their larvae (Tab. I) have been described (GEIJSKES, 1943; SANTOS, 1970a, 1970b, 1972; PROVONSHA & McCAFFERTY, 1973; DE MARMELS, 1985; NOVELO-GUTIÉRREZ, 2000;

Table I

Diagnostic characters for known last larval instars of *Hetaerina*, *Mnesarete* and *Ormenophlebia*. Question marks indicate character states either not mentioned in their descriptions, or taken from illustrations with doubts

	Distribution	A	B	C	D	E	F	G	H	I	J	K	L	M
<i>H. americana</i>	Canada to Honduras	3	3	1	1	3	1	1-3	1	2	1	1	1	3
<i>H. auripennis</i>	S Brazil	2	2	2	1	1	1	4	1	1	?	1?	3	4
<i>H. brightwelli</i>	Brazil	2	3?	2	2	2?	1	1?	1	1?	?	1?	3?	?
<i>H. caja</i>	Mexico to Peru	2	2	2	1	1	1	2	1	1	2	1	3	3
<i>H. capitalis</i>	Mexico to Ecuador	2	3	2?	2	2	1	2	1	1	3	1	1	2
<i>H. cruentata</i>	Mexico to Colombia	2	2	2	1	3	3	1	1	2	3	1	1	3
<i>H. fuscoguttata</i>	Costa Rica to Ecuador	1	2	2?	1	2	3	2	1	1	1	1	1	4
<i>H. sp.</i> (Geijskes, 1943)	Suriname	2	1	2?	2	1?	2?	2	1	1?	2?	1?	3?	?
<i>H. hebe</i>	Brazil	?	?	2	3	?	1	3?	2	1	2?	1?	2?	3
<i>H. infecta</i>	Mexico to Guatemala	2	3	2	2	3	1	4	1	1	3	1	1	2
<i>H. majuscula</i>	Costa Rica to Colombia	2	3	2?	2	4	1	2	1	1	3	1	1	3
<i>H. mendezi</i>	SE Brazil to NE Argentina	2	1	1	1	1	3	4	1	1	2	1	3	1
<i>H. miniata</i>	Guatemala to Ecuador	2	2	2?	2	1	1	3	2	1	2	1	2	3
<i>H. moribunda?</i>	Venezuela to N Brazil	?	1	2?	1	1?	1	2	1	1?	2?	1?	3?	?
<i>H. occisa</i>	Mexico to Peru	2	2	2?	1	3	1	2	1	1	2	1	3	2
<i>H. rosea</i>	Peru to Argentina	2	2	2	1	2	1	2	1	1	2	1	3	3
<i>H. sempronina</i>	Mexico to Colombia	3	3	2	2	4	1	2	2	1	3	2	1	2
<i>H. titia</i>	US to Costa Rica	2	1	2?	1	2	1	2	1	1	2	1	3	1
<i>H. vulnerata</i>	US to Colombia	3	3	2	1	2	1	2	1	1	1?	1	1	3?
<i>M. grisea</i>	S Bolivia to NW Argentina	2	2	2	1	2	1	2	1	1	2	1	1	1
<i>O. imperatrix</i>	Colombia to Ecuador	2	2	2	1	2	2	4	1	2	2?	1	1	?

A: Ratio of first antennal segment length to head width, 1: about equal; 2: about 0.7-0.9; 3: about 0.6

B: Postocular lobe, 1: very prominent and pointed; 2: less prominent and blunt; 3: lacking or represented by a low mound

C: Prementum, 1: approximately trapezoidal; 2: petiolated

D: Premental setae, 1: 1; 2: 2; 3: 3

E: Lateral pronotal process in dorsolateral view, 1: as long as twice its basal width; 2: about as long as basal width, at midlength of pronotum; 3: about as long as basal width, almost reaching posterior margin of pronotum; 4: absent

F: Mediodorsal tubercles on abdominal segments, 1: absent; 2: on 3,4-10; 3: on 1,2-9

G: Lateral spines on abdominal lateral carinae, 1: on 9; 2: on 8-9; 3: on 7-9; 4: on 1,4-9

H: Row of spines on posterior margin of abdominal segments 8-9, 1: absent; 2: present

I: Mediodorsal spine/s on posterior margin of segment 10, 1: present; 2: absent

J: Spines along margins of caudal lamellae, 1: very small, of similar size and regularly spaced; 2: coarse, of similar size and regularly spaced; 3: coarse, of different size and irregularly spaced

K: Tubercles on surfaces of lateral caudal lamellae, 1: absent; 2: present

L: Lateral caudal lamellae in lateral view, 1: parallel sided along medial third; 2: widening distally to maximum width at mid length; 3: widening distally to maximum width at distal third

M: Ratio medial lamella length/ maximum width, 1: < 2.5; 2: 2.5-3; 3: 3-4; 4: > 4

PESSACQ & MUZÓN, 2004; ZLOTY et al. 1993). Diagnostic morphological characters for larvae of this genus were outlined by ZLOTY et al. (1993). PESSACQ & MUZÓN (2004) described the larva of *H. rosea* Selys, 1853 and summarized diagnostic characters for all known South American larvae following ZLOTY et al. (1993).

*Hetaerina rosea* is a widespread and variable species (GARRISON, 1990), ranging from Peru south to Bolivia, Paraguay, SE Brazil and Argentina. Its final instar larva was described from specimens from E Argentina (Corrientes and Buenos Aires provinces, PESSACQ & MUZÓN, 2004). Specimens I examined from NW Argentina (Tucumán and Salta provinces) differ in several diagnostic characters from eastern populations of this species, and that variability is included here in order to allow for their specific recognition. In NW Argentina *H. rosea* is widely sympatric with *M. grisea*, and a large series of larvae from the latter species was also examined in order to unambiguously diagnose them.

*Hetaerina mendezi* Jurzitza, 1982 is distributed from SE Brazil to NE Argentina (GARRISON, 1990; MUZÓN & VON ELLENRIEDER, 1998), and I describe and illustrate its final instar larva here.

Confirmed diagnostic characters for all known New World calopterygid larvae excluding *Calopteryx*, are included in a comparative table based on examinations of specimens and literature (GEIJSKES, 1943; SANTOS, 1970a, 1970b, 1972; PROVONSHA & McCAFFERTY, 1973; NOVELO-GUTIÉRREZ & GONZÁLEZ-SORIANO, 1991; ZLOTY et al., 1993; WESTFALL & MAY, 1996; NOVELO-GUTIÉRREZ, 2000; PESSACQ & MUZÓN, 2004; GARRISON, 1990, 2006).

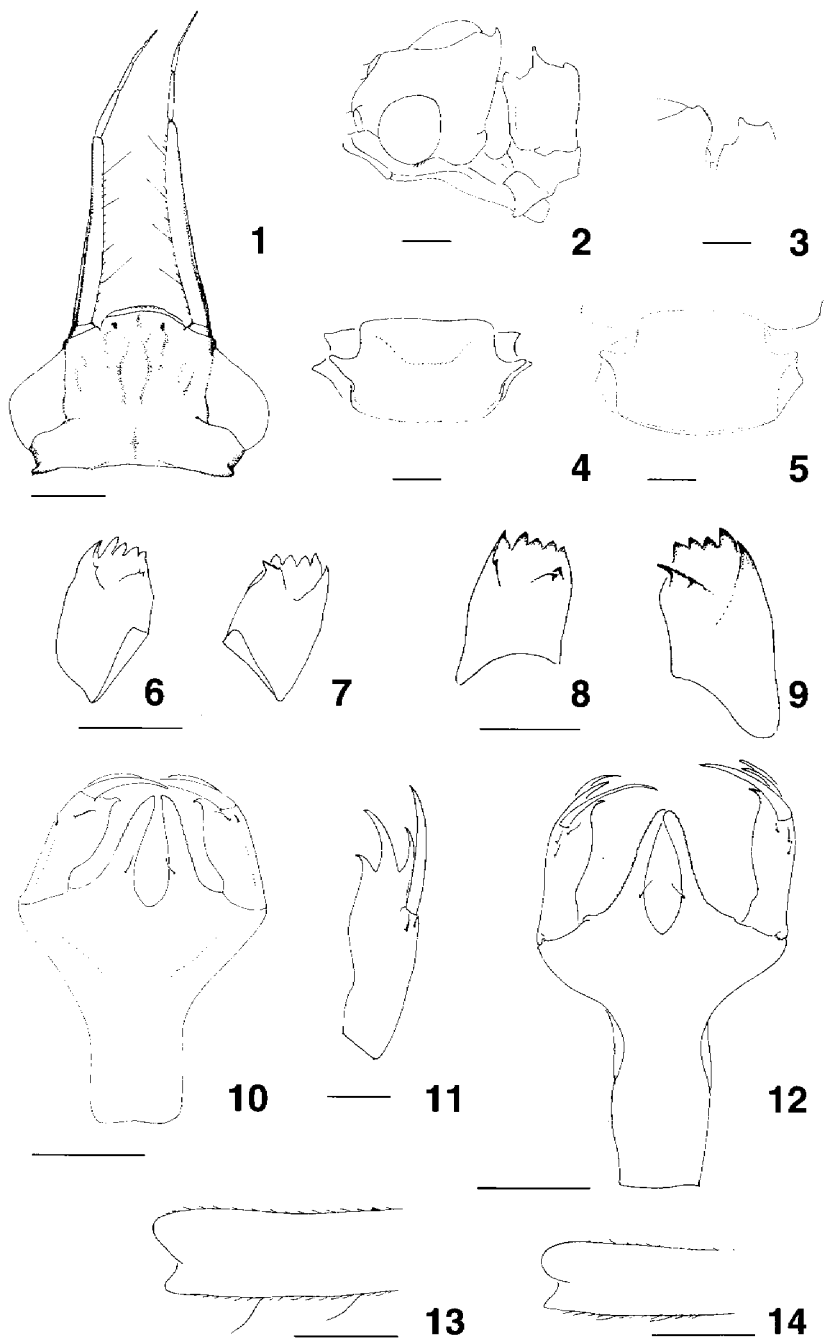
#### MATERIAL AND METHODS

Drawings were made with the aid of a camera lucida coupled to a Wild M-8 binocular microscope. Measurements are in millimeters. Terminology for the mandibular formula follows WATSON (1956). Ratios and measurements refer only to the final instar larva, but structural characters were examined in all specimens, including younger instars. The redescription of the larva of *H. rosea* includes only those characters which deviate from the original description (PESSACQ & MUZÓN, 2004).

Acronyms for collections are as follows:

- FML: Fundación Miguel Lillo, Tucumán, Argentina
- MLP: Museo de La Plata, Argentina
- NE: Natalia von Ellenrieder personal collection, Salta, Argentina

Specimens examined. – *HETAERINA MENDEZI*: Argentina, Misiones prov., Provincial Park Urugua-í, Uruzú stream at provincial route 19, 7-XI/11-XII-1999, 25°55'S, 54°17'W, C. Molineri leg., 1 ♂, 1 ♀ exuviae last larval instar, reared in situ (NE), 4 ♂ penultimate larval instar (FML). – *HETAERINA ROSEA*: Argentina, Tucumán prov., Aguilares, Barrientos stream, 400 m.a.s.l., 27°26'52.6"S, 65°37'33.1"W, 5-IV-2005, C. Molineri leg., 1 ♂ emerged in laboratory, 1 ♂ last larval instar (NE); 6 younger (than penultimate) instar larvae (FML, MLP); Río Pueblo Viejo, provincial road 301, 5-IV-2005, C. Molineri leg., 1 ♂ reared in situ (NE). Salta province: stream 5 km SE to Isla de Cañas, 22°56'05"S, 64°38'57"W, 761 m.a.s.l., 17-V-2006, N. von Ellenrieder leg., 10 younger (than penultimate) instar larvae (NE). – *MNESARETE GRISEA*: Argentina, Salta prov.,



Lesser stream, 1312 m.a.s.l., 15-IV-1998, N. von Ellenrieder leg., 2 ♂, 1 ♀ (emerged in lab.), same but 13-X/10-XI-2005, 13 younger instar larvae (MLP, NE); La Sala stream, El Rey National Park, 24°43'32.4"S, 64°39'47.1"W, 938 m.a.s.l., 30-XI-2005, 4 last instar larvae, 14 younger instar larvae (NE). Jujuy prov., stream at provincial road 6 to Palma Sola, 23°52'12"S 64°22'44"W, 534 m.a.s.l., 5-XI-2005, 4 younger instar larvae (NE); El Pantanoso private reserve, Rio Las Piedras, 23°31'17"S, 64°35'39"W, 609 m.a.s.l., 4-XI-2005, 3 last instar larvae, 7 younger instar larvae (NE). Larvae of all three species were found among riparian vegetation in stony streams and rivers.

### *HETAERINA MENDEZI* JURZITZA, 1982

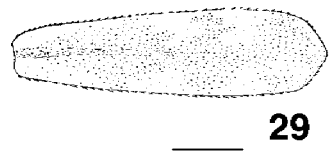
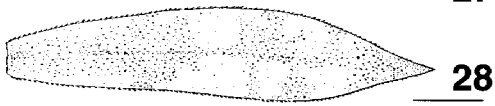
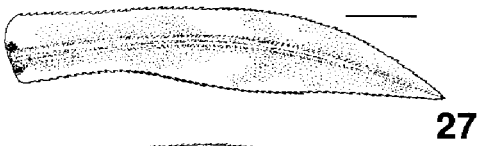
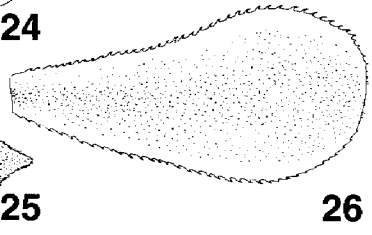
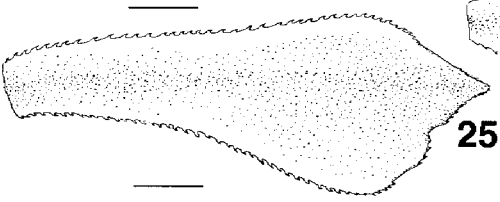
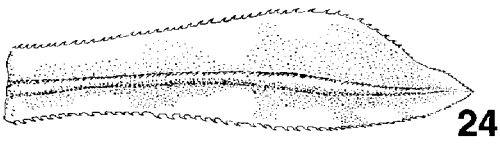
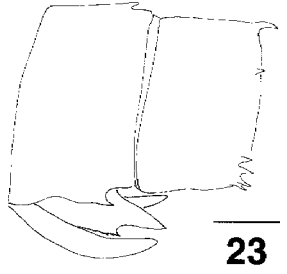
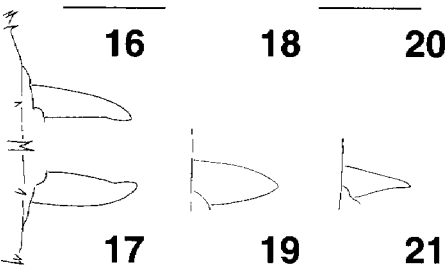
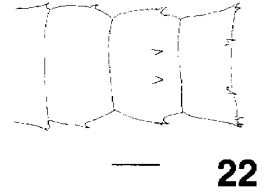
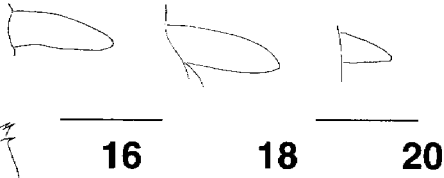
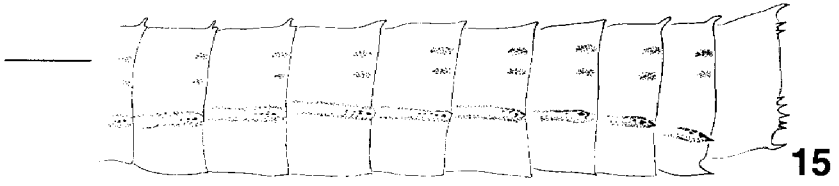
Figures 1-2, 4, 6-7, 10-11, 13, 15, 18-26

**DESCRIPTION.** – **H e a d:** maximum width 3.6 mm; posterolateral angles projected into prominent pointed postocular lobes (Figs 1-2). Antenna 7-segmented; first antennomere 0.53 length and 0.70 width of head, bearing 3-5 long hairs and a series of short setae along inner margin (Fig. 1). Outer ventrolateral margin of compound eye with a row of 4-6 setae (Fig. 2). Prementum nearly trapezoidal (Fig. 10) about 0.65 times as wide as long, reaching posteriorly to anterior margin of coxa 2; median cleft of ligula 0.45-0.48 as long as maximum premental width and 0.3-0.31 of premental length, with one setae on each side of cleft and outer margins crenulated. Premental palp with three teeth, medial one the longest, and 2 short setae basal to movable hook (Fig. 11); movable hook as long as 0.86 of external margin of palp. Mandibles (Figs 6-7) with following formula:  $L\ 1'12345\ 0\ a\ (m^{1234-6})\ b, R\ 12345\ y\ a\ b$

**T h o r a x.** – Mostly dark with 2-3 diffuse pale longitudinal stripes. Pronotum quadrangular with a prominent lateral anterodorsally directed fingerlike projection on each side (Figs 2, 4). Prothoracic supracoxal apophyses well developed and pointed (Fig. 4). Wing pads reaching anterior margin of abdominal segment 5. Femur 1 (Fig. 13) with short hairs along anterior and posterior margins, posterior margin also with some long hairs and on anterior margin 0 to 2 short spines. All femora dark with a pale band at distal third, tibiae and tarsi pale.

**A b d o m e n.** – Pale with 2 laterodorsal dark spots on each segment. A mediadorsal tubercle present on posterior margin of segments 1-9, on 4-7 lower (Fig. 15). Segments 1-9 with lateroventral carinae, bearing a series of spines near their apical portion, of which the last 1-2 are longest (Fig. 15). Posterior margin of segment 10 with 2 mediadorsal, 1-2 dorsolateral, 4-5 lateroventral, and 1-2 ventrolateral spines both in male and female (Figs 15, 22-23). Cerci of male digitiform and blunt (Figs 18-19), of female triangular and pointed (Figs 20-21). Male

Figs 1-14. Last larval instar, Figs 1-2, 4, 6-7, 10-11, 13: *Hetaerina mendezi* Jurzitza, 1982; Figs 3, 5, 8-9, 12, 14: *H. rosea* Selys, 1853; – (1) head, dorsal view; – (2-3) head and prothorax, dorsolateral view – (4-5) prothorax, dorsal view; – (6, 8) right mandible, inner view; – (7, 9) left mandible, inner view; – (10, 12) prementum, dorsal view; – (11) premental palp, dorsal view; – (13-14) apical portion of femur 1, dorsal view. [Scales: Figs 1-5, 10, 12: 1 mm; Figs 6-9, 11, 13-14: 0.5 mm]



gonapophyses triangular (Fig. 22), female outer gonapophyses with denticulate margins (Fig. 23). Caudal lamellae pale with transverse dark bands (Fig. 24) to mostly dark with some paler marginal areas (Figs 25-26); margins with coarse, similarly sized and regularly spaced spines. Lateral caudal lamellae triquetral, as long as 3 times their maximum width; widening to distal third, more abruptly so in dorsolateral view (maximum width over 3 times basal width, Fig. 25) than in lateral view (maximum width almost 2 times basal width, Fig. 24). Medial lamella foliaceous and oblong, as long as 2.2 times its maximum width and about 0.75 of lateral caudal lamellae length, widening to about 4 times its basal width at distal 0.3 (Fig. 26).

Penultimate instar larvae agreeing with final instar larvae in morphology and color pattern.

**Measurements** (in mm) [reared male followed by reared female in brackets]. – Total length without appendages, 15.5. Head, maximum length 2 [2.35], width 3.6 [3.6]. Antennae length, 4.75 [5.05]; antennomere 1 length, 2.5 [2.75]. Prementum length 3.3 [3.35], maximum width 2.2 [2.15]; cleft length 1 [1.05]; movable hook length 0.85 [0.8]. Femur 1 length 3.5 [3.4]; tibia 1 length 4.7 [4.7]. Inner wing pads 6.15; external wing pads 5.8. Lateral caudal lamella length 7.35 [6.9]; maximum width 2.5 [2.3]; medial caudal lamella length 5.6 [5.1], maximum width 2.5 [2.3].

**DIAGNOSIS.** – The last larval instar of *H. mendezi* can be diagnosed by its trapezoidal prementum (Fig. 10, shared only with *H. americana* [Fabricius, 1798]), presence of mediodorsal tubercles on abdominal segments 1 or 4 to 9 (Fig. 15, shared only with *H. cruentata* [Rambur, 1842], *H. fuscoguttata* Selys, 1878 and *O. imperatrix* [McLachlan, 1878]), and presence of lateral spines on lateral carinae of abdominal segments 1 or 4 to 9 (Fig. 15, shared with *H. auripennis* [Burmeister, 1839], *H. infecta* Calvert, 1901 and *O. imperatrix*). The larva of *Hetaerina* sp. described by GEIJSKES (1943) based on immature larvae from Suriname had mediodorsal tubercles on abdominal segments; but if these are retained by the last larval instar or not needs to be confirmed.

The first two character states mentioned above separate *H. mendezi* from all sympatric species (see Tab. I). It also differs from them (contrasting character states in parenthesis) by its prominent and pointed postocular lobes (Fig. 2; lower and rounded lobes, as in Fig. 3), and its considerably widened medial caudal lamella (Fig. 26; not considerably widened, as long as 3 or more times its maximum width, as in Fig. 29).

Figs 15-28. Last larval instar, Figs 15, 18-26: *H. mendezi*; Figs 16-17, 27-29: *H. rosea*; – (15) male abdominal segments 1-10, lateral view; – (16-19) male cercus, (16, 18) lateral view, (17, 19) dorsal view; – (20-21) female cercus, (20) lateral view, (21) dorsal view; – (22) male abdominal segments 7-10, ventral view; – (23) female abdominal segments 9-10, lateral view; – (24, 27) lateral caudal lamella, lateral view; – (25, 28) lateral caudal lamella, dorsolateral view; – (26, 29) medial caudal lamella, lateral view. [Scales: Figs 15, 22, 24-29: 1 mm; Figs 16-21, 23: 0.5 mm]

*HETAERINA ROSEA* SELYS, 1853

Figures 3, 5, 8-9, 12, 14, 16-17, 27-29

**REDESCRIPTION.** – First antennomere as long as 0.51-0.6 of antennal length and 0.76-0.83 of head width, with a few long hairs along inner margin which can be lacking. Prementum distinctly petiolated (Fig. 12) about 0.63-0.65 times as wide as long; median cleft of ligula 0.41-0.5 as long as maximum premental width and 0.26-0.33 of premental length. Premental palp with 2-3 short setae basal to movable hook (Fig. 12); movable hook 0.91 as long as external margin of palp. Mandibles (Figs 8-9) with following formula: L 1<sup>7</sup>12345 0 a (m<sup>1234-6</sup>) b, R 12345 y a b. Molar teeth (a and b) of right mandible pointed (Fig. 9).

**T h o r a x.** – Pronotum quadrangular, with a blunt lateral anterodorsally directed fingerlike projection on each side (Figs 3, 5). Prothoracic supracoxal apophyses blunt and weakly developed (Fig. 5). Anterior femora with short hairs along anterior and posterior margins, posterior margin also with some long hairs (Fig. 14). Femur 1 with three, femora 2 and 3 with two dark bands. Tibiae and tarsi pale.

**A b d o m e n.** – Pale with two laterodorsal dark spots on each segment. Cerci of male digitiform and blunt (Figs 16-17). Caudal lamellae pale with 3-4 irregular transverse dark bands (Figs 27-29) to mostly dark with some paler marginal areas; margins with coarse, similarly sized and regularly spaced spines. Lateral caudal lamellae triquetal, as long as 4.5-5.8 times maximum width; gradually widening to distal third; maximum width about 2 times basal width in dorsolateral view (Fig. 28), and 1.2-2 times basal width in lateral view (Fig. 27). Medial lamella (Fig. 29) foliaceous and oblong, as long as 3.6 times its maximum width and about 0.7 of lateral caudal lamellae length, slightly widening distally (to about 1.5 times its basal width at distal 0.3).

Younger instar larvae agree with final instar larvae in morphology and color pattern, except for the presence of mediadorsal prominences on abdominal segments 1-9 (apparently decreasing in height along development, being more pronounced in younger instars).

**M e a s u r e m e n t s** (in mm) [range for last larval instar exuviae and larva, N = 3 males]. – Total length without appendages, 13.5-17.25. Head, maximum length 2.1-2.2, width 3-3.1. Antennae length, 3.9-4.5; antennomere 1 length, 2.3-2.6. Prementum length 2.95-3.2, maximum width 1.85-2.1; cleft length 0.8-1.05; movable hook length 0.8-0.85. Femur 1 length 2.85-3; tibia 1 length 3.6-3.9. Inner wing pads 5-5.1; external wing pads 4.75-4.8. Lateral caudal lamella length 6.3-6.45; maximum width 1.1-1.4; medial caudal lamella length 4.5, maximum width 1.2-1.25.

**DIAGNOSIS.** – No unique set of characters will separate last instar larvae of *H. rosea* from all other known species (Tab. I). However, it can be diagnosed from all known sympatric species as follows: from *H. mendezi* by its lower postocular lobes and pronotal lateral projections, blunt supracoxal apophyses (Fig. 3 versus Fig. 2) and distinctly petiolated prementum (Fig. 12 versus Fig. 10), from *H. auripennis*, *H. caja* (Drury, 1773) and *H. occisa* Hagen in Selys, 1853 by the shape of



the lateral projections of pronotum (Tab. I), from *H. brightwelli* (Kirby, 1823) and *H. hebe* Selys, 1853 by the number of premental setae (one versus two or three), and from *M. grisea* by the shape of lateral caudal lamella (Figs 27-28, widening to its distal third, versus parallel sided) and by the ratio length/ width of medial lamella (3-4 versus less than 2.5).

## DISCUSSION

Some of the morphological characters previously suggested as diagnostic for *Hetaerina* larvae were found to be variable. These include presence and degree of development of hairs and setae on first antennal segment, and hairs, setae and spines on femur 1 (ZLOTY et al., 1993): in *M. grisea* and *H. rosea* they can be present or absent, in *H. mendezi* some specimens had spines on femur 1 and others lacked them; ratio of premental cleft length to maximum premental width (ZLOTY et al., 1993, PESSACQ & MUZÓN, 1994): in *H. rosea* it overlaps the cutoff value of  $> 0.45$  or  $\leq 0.40$  used in its description; shape of the molars (PESSACQ & MUZÓN, 1994): in *H. rosea* they can be blunt (NE populations) to pointed (NW populations studied). The shape of the postocular tubercles, pronotal processes, supracoxal apophyses, and caudal lamellae and position of abdominal projections and spines seem to be reliable diagnostic characters. However, caution should be used when identifying younger instars, because some of these characters, such as presence of mediodorsal tubercles on abdominal segments vary according to development; younger instars of both *M. grisea* and *H. rosea* have mediodorsal prominences on abdominal segments 1-9, but these are absent in the last instar; this was also observed for many of the Costa Rican species by ZLOTY et al. (1993).

## ACKNOWLEDGEMENTS

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