

## **FIVE NEW *ERPETOGOMPHUS* HAGEN IN SELYS LARVAE FROM MEXICO, WITH A KEY TO THE KNOWN SPECIES (ANISOPTERA: GOMPHIDAE)**

R. NOVELO-GUTIÉRREZ

Departamento de Entomología, Instituto de Ecología, A.C., Apartado Postal 63,  
MX-91070 Xalapa, Veracruz, Mexico  
e-mail: novelor@ecologia.edu.mx

*Received April 15, 2004 / Revised and Accepted February 18, 2005*

The final instars of *Erpetogomphus bothrops* Garrison, *E. elaps* Selys, *E. eutainia* Calvert, *E. liopeltis* Garrison, and *E. viperinus* Selys are described and illustrated. Most of these are similar in many features, except *E. eutainia* which is notoriously different. A key for the separation of all known *Erpetogomphus* larvae is included.

### **INTRODUCTION**

In my previous contributions (NOVELO-GUTIERREZ, 2002a, 2002b), I described five *Erpetogomphus* larvae and summarized the knowledge on the immature stages of this genus. In the present paper, the larvae of five additional species are described, bringing the total number of described species to 17, which represents 77.2% of a total of 22. A key for the separation of all known larvae is provided for the first time.

One of the larvae here described belongs to the *eutainia*-group, the remainder are referable to the *crotalinus*-group of GARRISON (1994).

### **METHODS**

Correlation, larva-imago, was verified by rearing ultimate instar larvae. Descriptions are based on exuviae and preserved last instar larvae. Illustrations were rendered using a stereomicroscope and camera lucida. Measurements were made using an ocular micrometer (0.1-10 mm). Total length was measured from anterior margin of labrum to apices of caudal appendages; that of abdomen and metafemora from ventral midline and along the dorsal margins, respectively; abdominal lateral spines dorsally as shown in NOVELO-GUTIÉRREZ (2002b, fig. 14). Terminology of setae follows CORBET (1953).

All material has been deposited in Colección Entomológica del Instituto de Ecología, A.C. at Xalapa (IEXA) with duplicates, when available, in the Ken J. Tennessen collection (KT) in Wisconsin, USA, and in the International Odonata Research Institute (IORI), Gainesville, Florida, USA.

### *ERPETOATOMPHUS BOTHROPS* GARRISON

Figures 1, 2a, 3a-b, 4-7, 10a

**Material.** — 15 exuviae last instar (8♂, 7♀ reared), 14 last instar larvae (3♂, 2♀). MEXICO: Morelos; Tehuixtla, Río Amacuzac, 18°33'34"N, 99°16'15"W (870 m asl) 5-IV-1986; 23-V-2001, R. Novelo leg.; — Vicente Aranda, Río Amacuzac, 18°33'44"N, 99°14'13"W (852 m asl), 2-II-1985, R. Novelo leg.; — Huajintlán, Río Amacuzac, 18°36'35"N, 99°25'30"W (920 m asl), 8-V-1983, L. Vázquez leg.; — deposited in IEXA, IORI, and KT.

**DESCRIPTION.** — Larvae yellow with light brown spots and dots (Fig. 1), exuviae light yellow, body finely granulose, hairy at sides.

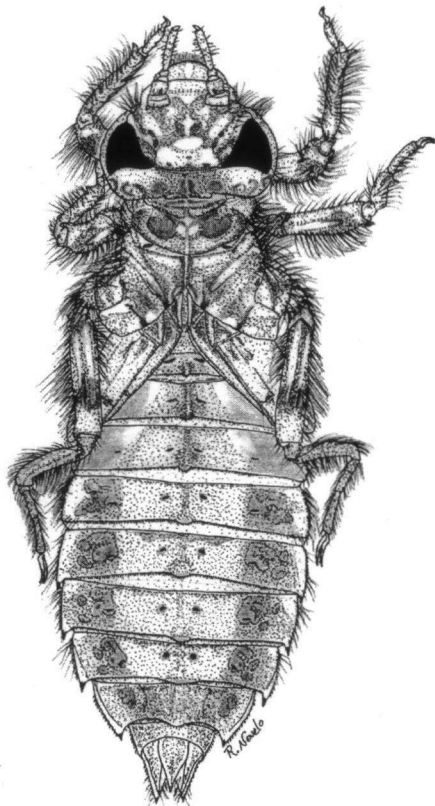


Fig. 1. Last instar larva of *Erpetogomphus bothrops* female, dorsal view.

**Head.** — Wider than long, densely covered with scale-like setae except following areas: a central oval on labrum; anteclypeus; two small, darker, subrectangular areas in front of anterior ocellus, one oval area in front of each lateral ocellus, and five areas on occiput of which two are circular, the other three sub-oval or nearly so; posterior margin of occiput slightly concave, cephalic lobes bulging. Antennae setose, third antennomere cylindrical, five times longer than wide, parallel-sided (same width along the whole antennomere) (Fig. 2a), scaly on dorsal surface, setose on lateral margins, fourth antennomere conical. Mandibles two-branched (Figs 3a-b), external branch of left mandible with four stout cuspids, the internal one with five cuspids (Fig. 3a), external branch of right mandible with four stout, sharp cuspids, the ventral one with a small triangular cuspid at base, internal branch with four cuspids, the central ones smaller (Fig. 3b). Maxilla (Fig. 4) covered with

abundant, long, delicate setae; galeolacinia with seven robust, moderately incurved hooks, three in dorsal row equal, ventral set of four of variable length and robustness, the apical hook the strongest; palp short, hairy, ending in a small stout spine. Labium short, prementum-postmentum articulation almost reaching posterior margin of prosternum; prementum quadrate (Fig. 5a), dorsal surface with abundant, delicate, whitish setae arranged in a row to each side of the midline and converging at ligula; lateral margins with short, stiff setae on basal 0.70, a submarginal (lateroventral) row of small serrulations which appear as granules. Ligula convex (Fig. 5a), slightly prominent, its apical margin with 25-27 small serrations and abundant piliform setae. Palp short and thick (Fig. 5b), its distal margin rounded, the internal one serrate with 10-12 serrations; movable hook shorter than palp.

**T h o r a x.** — Prothorax narrow; pronotum mostly pale and granular, except one large, glabrous, subrectangular brown area to each side of the midline, sides rounded, posterior margin widely rounded (Fig. 1). Synthorax yellow, granular, with a short brown line on upper part of pleural and interpleural sutures. Legs hairy, yellow; burrowing hooks moderately developed on first two pairs of tibiae (Fig. 1); femora granulose except: two enlarged glabrous areas, one dorsal area and the other one laterodorsal, with a well-defined, subapical, dark brown ring (Fig. 1); tarsi whitish, claws yellowish. Wing pads widely divergent, reaching basal half of abdominal segment four.

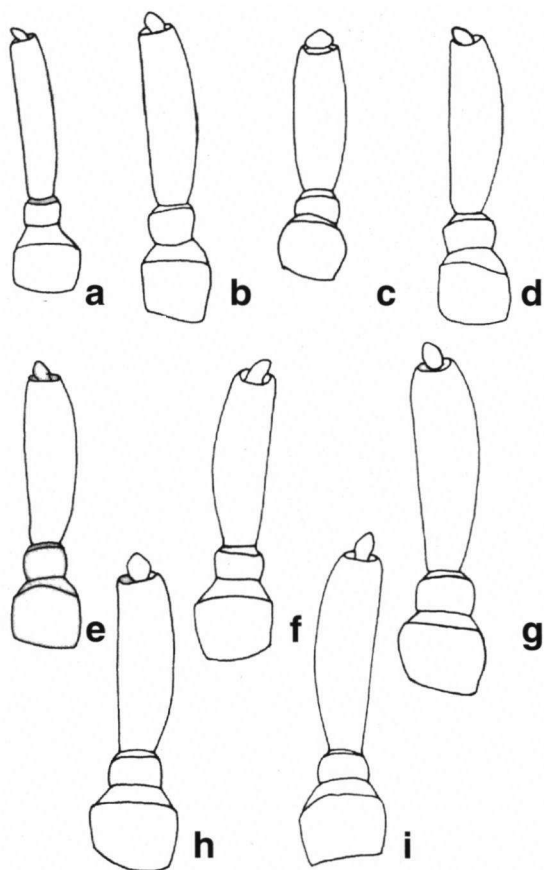
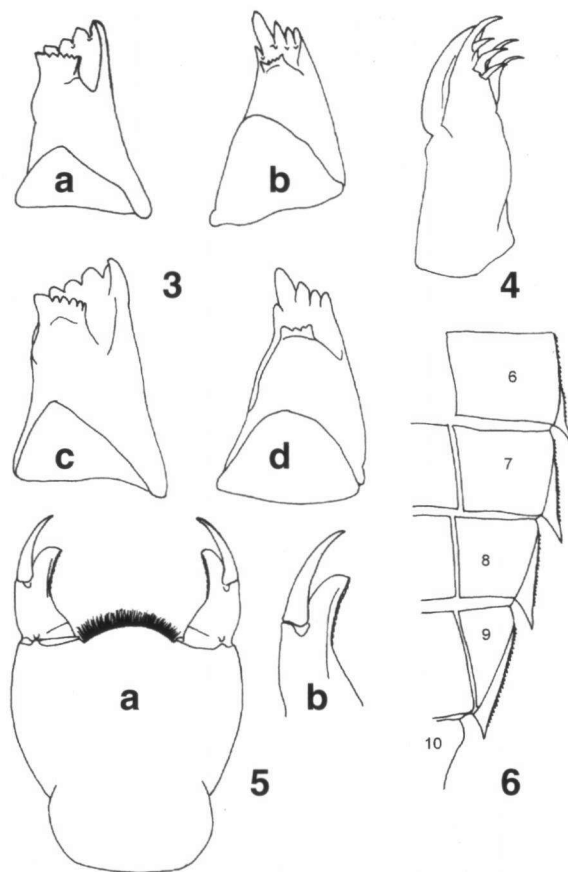


Fig. 2. Antennae of *Erpetogomphus* larvae. (a) *bothrops*; — (b) *elaps*; — (c) *eutainia*; — (d) *liopeltis*; — (e) *viperinus*; — (f) *compositus*; — (g) *crotalinus*; — (h) *designatus*; — (i) *lampropeltis natrix*. — (a-e, g-h, right antennae; f and i, left antennae; all setae omitted).

**Abdomen.** — Finely granulose, with a complex mottled pattern due to combined pigmented and bare areas. Lateral margins of segments 2-5 and basal half of 6 densely setose, apical half of 6 and 8-10 spiny and setose, setae decreasing in abundance caudad. Lateral spines on 6-9 strong and acute, increasing in length caudad (Fig. 6). Dorsal protuberances well developed on segments 2-4, high on 2-3, low on 4, rudimentary on 5-9 (Fig. 7). Posterior margin of tergites 2-9 with abundant, blunt, minute spines; that on 10 smooth. Sternites 2-10 finely granu-



Figs 3-6. Details of the morphology of *Erpetogomphus* larvae: (3a-b, 4-6) *bothrops*; — (3c-d *liopeltis*); — (3) ventrointernal view of mandibles: (a, c) left mandibles; (b, d) right mandibles; — (4) right maxilla, ventral view; (5) dorsal view of prementum (a), detail of the left labial palp (b), dorsal view; — (6) ventral view of the left side of abdominal segments 6-10 showing the lateral spines.

of 9; posterior margin of 10 smooth; sternites 2-9 with three plates, longitudinal suture of sternite 9 ending at posterolateral angle (Fig. 6). Male gonapophyses absent, vestigial in female. Caudal appendages yellow, ending in a sharply pointed reddish spine; epiproct densely granulose, in the male a pair of reddish tubercles at basal 0.65, one to each side of the midline (Fig. 10a), tip of epiproct gently decurved. External surface of cercus covered with granules and minute spines; its tip slightly downcurved. Paraproct pyramidal, with a lateral row of short, blunt, reddish spines along basal 0.80, its tip straight; in ventral view internal margin with abundant long setae. Size proportions: Epiproct 1.0, cercus, 0.94, paraproct 0.96.

**Measurements (mm).**

— Total length (TL) 20.1-21.4; abdomen (AB) 12.6-13.8; hind femur (HF) 3.2-3.5; maximum

width of head (MWH) 4.2-4.8; caudal appendages (CA) 1.3-1.5; length of spine (LS) on abdominal segment 6, 0.1-0.2; on 7, 0.25-0.3; on 8, 0.3-0.35; on 9, 0.3-0.4.

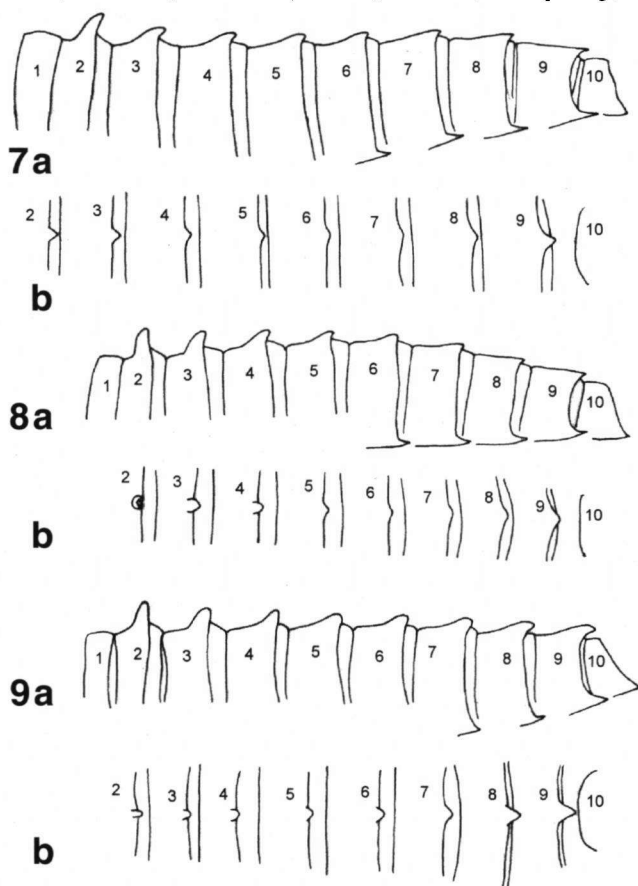
**ECOLOGY.** — Larvae were found in a shallow river among small stones and rough gravel, distributed all across the channel where the water flow is slow. Emergence was not observed in the field, but all the specimens reared in laboratory emerged in June, when one specimen emerged at 1708 h on 16-VI-1986.

### ERPETO GOMPHUS ELAPS SELYS

Figures 2b, 8, 10b

**Material.** — 7 exuviae last instar (5♂, 2♀, reared), 8 last instar larvae (5♂, 3♀). MEXICO: Estado de México; Tonicato, El Salto, 18°48'04"N, 99°40'11"W (1640 m asl), 13-IV-1990, R. Arce leg.; — Morelos; El Estudiante, Río Amacuzac, 18°34'37"N, 99°17'46"W (870 m asl), 15-V-1983, L. Vázquez leg.; — Tetlama, 18°49'45"N, 99°17'00"W (1285 m asl), 6-IV-1985, R. Novelo leg.; — Jardines de Xochitepec, Río Sabinos, 18°45'57"N, 99°14'23"W (1050 m asl), 14/15-VI-1997, 5-IV-2002, R. Novelo leg.; — Vicente Aranda, Río Amacuzac, 4-IV-2002, R. Novelo leg.; — Michoacán; Gabriel Zamora, Presa Cupatitzio, 19°05'23"N, 102°22'50"W, (stream at 920 masl), 9-VI-1998, R. Novelo leg.; — Villa Victoria, 18°45'103"N, 103°22'68"W (680 m asl), 17-V-2002, R. Novelo leg.; — deposited in IEXA, IORI and KT.

**DESCRIPTION.** — Larva light brown to reddish-brown, exuviae yellowish-brown, body finely granulose, hairy at sides; similar to *E. bothrops* with the following dif-



Figs 7-9. Larval abdomen: (7) *bothrops*; — (8) *elaps*; — (9) *eutainia*. — a = left lateral view; — b = dorsal view, showing the dorsal protuberances.

ferences:

**H e a d.** — Third antennomere 3.6 times longer than its widest part, external margin slightly convex, internal margin straight (Fig. 2b), ventral surface moderately flattened. Internal branch of left mandible with seven cusps.

**A b d o m e n.** — Dorsal protuberances well developed on abdominal segments 2-6 as follows: high on 2-5, low on 6, rudimentary on 7-9 (Fig. 8), that on 2 the largest, quite vertical in lateral view, remainder gradually decreasing in height caudad. Tergite 6 with a transverse, basal, dark spot in some specimens. Epiproct yellow-brown, moderately granulose, a pair of tubercles on basal 0.65 in male (Fig. 10b). External surface of cercus with reddish spines. Paraproct with a row of small reddish spines along the lateral margin. Size proportions: Epiproct 1.0, cercus 0.96, paraproct 0.96.

**M e a s u r e m e n t s** (mm). — TL 19.5-23.0; AB 12.2-16.3; HF 3.2-4.0; MWH 4.0-4.6; CA 1.4-1.7; LS on abdominal segment 6, 0.2-0.3; on 7, 0.3-0.4; on 8, 0.35-0.45; on 9, 0.4-0.5.

**ECOLOGY.** — Habitat similar to that described for *E. bothrops*. Emergences were recorded in the laboratory as follows: Morelos, Río Sabinos, 25-VII-1997 to 4-VIII-1997 at 1315 h and 1408 h; those from Michoacán emerged on 22-VI-1998 at 0623 h (Cupatitzio) and on 21-VI-2002 at 1750 h (V. Victoria).

### *ERPETO GOMPHUS EUTAINIA* CALVERT

Figures 2c, 9, 10c, 11-13

**M a t e r i a l.** — 1 exuviae last instar larva (♂, reared), 5 last instar larvae (3♂, 2♀), 21 young instar larvae. MEXICO: Morelos; Vicente Aranda, Río Amacuzac, 12-II-1983, S. Ibáñez leg.; 7-V-1983, G. Cardozo leg.; 16-III-2001, R. Novelo leg.; — Tehuixtla, Río Amacuzac, 14-III-1998, 23-V-2001, R. Novelo leg.; — Puebla; Petlacotla, Río San Marcos, 20°24'24"N, 97°54'54"W (180 m asl), 30-IV-1991, R. Novelo leg.; — deposited at IEXA, IORI and KT.

**DESCRIPTION.** — Larva yellow to reddish yellow, exuviae yellowish, body finely granulose, hairy at sides.

**H e a d.** — Mostly as described for *E. bothrops* except: Densely covered with claviform setae, including antennae. Third antennomere (Fig. 2c) flattened on dorsal and ventral surfaces, three times longer than its widest part, sides slightly convex, with a dense brush of claviform setae to each side, and immediately below a ventrolateral row of sparse long setae; fourth antennomere a hemispherical rudiment. Internal branch of right mandible with seven cusps; internal branch of left mandible with eight blunt cusps. Lateral margins of prementum with short stiff setae on basal 0.50, without submarginal small serrulations. Ligula almost straight (Fig. 11), poorly developed, its apical margin with 16-18 serrations and abundant piliform setae.

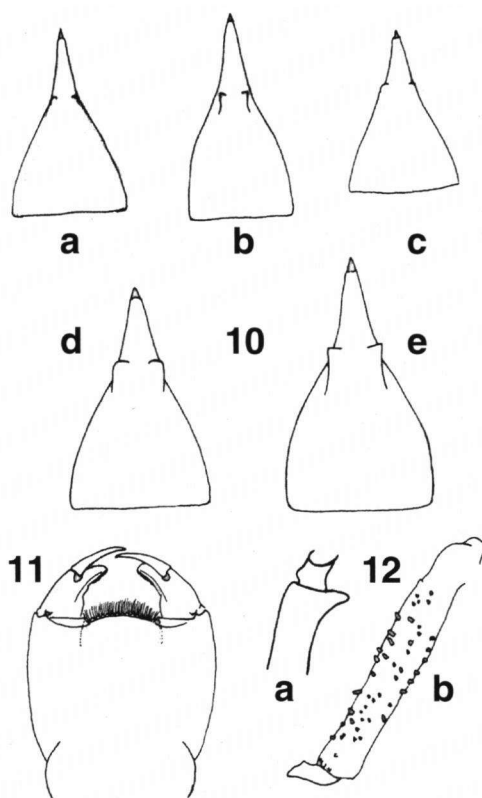
**T h o r a x.** — As in *E. bothrops* except: Legs yellow, only a subbasal dark ring on metafemora; anterior surface of protibiae hairy, with high and coarse tubercles (Fig. 12b).

**Abdomen.** — Mostly pale, with a pair of brown dots on midline of tergites 4-6, a tenuous, basal, transverse, brown stripe on tergite 6. Dorsal protuberances well developed on abdominal segments 2-9, high and vertical on 2-3, slightly diminishing in height and gradually slanting on 4-7, almost horizontal and enlarged caudally on 8-9 (Fig. 9). Lateral margins of 2-6 densely setose, 7-10 spiny and setose; lateral spines on 7-9, those on 7 small, half as long as those on 8-9 (Fig. 13). Sternites setose-granulose, as described for *E. bothrops* except: Sternite 8 divided in five plates (Fig. 13). Male gonapophyses absent, vestigial on female. Caudal appendages yellow, uniformly colored, other features as in *E. bothrops* except: Paraproct with abundant minute spines on lateral and ventral surfaces; in ventral view, internal margin with abundant short setae. Size proportions: Epiproct 1.0, cercus 0.94, paraproct 0.94.

**Measurements (mm).** — TL 17.0-19.5; AB 10.4-13.4; HF 2.9-3.1; MWH 4.1-4.2; CA 1.4-1.5; LS on 7, 0.1; on 8, 0.2; on 9, 0.2-0.3.

**Remarks.** — One specimen showed the laterosternites of abdominal segment 8 incompletely subdivided, giving the appearance of sternite 8 divided into only three plates.

**ECOLOGY.** — As stated for *E. bothrops*. Only one specimen was reared but time of emergence was not recorded. Larvae of *E. eutainia* coexist with those of *E. bothrops* and *E. elaps* at Tehuixtla and Vicente Aranda, Morelos State.



Figs 10-12. Details of the morphology of *Erpetogomphus* larvae: (10) male epiproct: a = *bothrops*; b = *elaps*; c = *eutainia*; d = *compositus*; e = *designatus*; — (11-12) *eutainia*: (11) prementum, dorsal view; — (12) protibia: a = detail of the apex of right protibia, internal view; — b = left protibia, anterolateral view, showing the rough tubercles (long setae omitted).

*ERPETOGOMPHUS LIOPELTIS* GARRISON

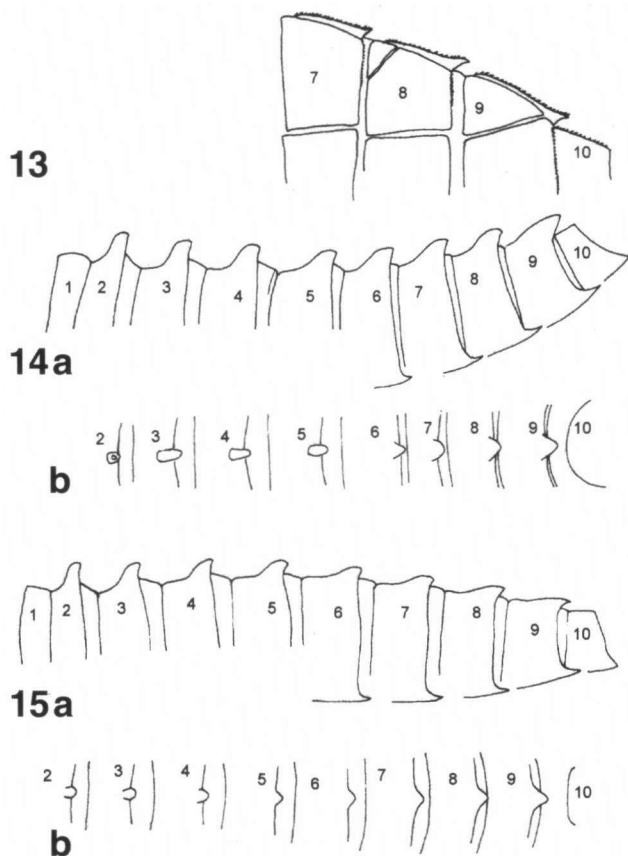
Figures 2d, 3c-d, 14

**Material.** — 39 last instar larvae (17♂, 22♀), 8 exuviae (5♂, one reared, 3♀), 5 young instars. MEXICO: Hidalgo; Pemuxtitla, Río Zacuala, 20°51'03"N, 98°45'56"W (1000 m asl), 22-IV-1984, J. Peña leg.; 26-VII-1986, 8-IV-1994, 10-III-1994, 23-VII-1994, 18-IV-1998, R. Novelo leg.; — Otonogo, Río Tlaltepingo, 20°56'05"N, 98°43'51"W (740 m asl), 24-IV-1984, R. Novelo leg.; — Calnali, 20°53'50"N, 98°35'00"W (920 m asl), 19-IV-2001, R. Novelo leg.; — Puebla; Petlacotla, Río San Marcos (180 m asl), 17-VII-1990, R. Novelo leg.; — deposited in IEXA, IORI and KT.

**DESCRIPTION.** — Larvae yellow-brown to reddish-brown, exuviae light brown, body finely granulose, hairy at sides.

**Head.** — As in *E. bothrops* except: Bare areas with a brown tint. Third antennomere as in *E. elaps*, although almost 3 times longer than its widest part (Fig. 2d). External branch of right mandible with four obtuse cusps, the ventral one with a small, conical cuspid; internal branch with four cusps, the central ones very small (Fig. 3d). Internal branch of left mandible with 5-6, low, obtuse cusps (Fig. 3c).

**Thorax.** — As in *E. bothrops* except: Synthorax mostly reddish-brown, metakatepisternum yellowish. Legs yellow except: An in-



Figs 13-15. Details of the abdomen of *Erpetogomphus* larvae: (13) ventral view of the left side of abdominal segments 7-10 of *eutainia*, showing the lateral spines and the laterosternite 8 subdivided; — (14) *liopeltis*; — (15) *viperinus*; a = left lateral view; — b = dorsal view.



complete subapical dark ring on pro- and mesofemora, metafemora reddish yellow with a subapical dark ring, apices yellow. Anterior surfaces of protibiae setose and tuberculate, as in *E. eutainia*, although tubercles smaller.

**A b d o m e n.** — As in *E. bothrops* except: Abdominal segments 6-10 slightly darker than preceding ones; tergite 6 with an irregular, transverse, central dark spot, which sometimes takes the shape of two triangles united at midline, and with their apices directed caudad. Dorsal protuberances well developed on 2-9, almost vertical on 2, then gradually slanting caudad (Fig. 14). Lateral spines on 6-9, acutely pointed, their tips red and divergent on 6-7, directed caudad on 8-9, increasing in length and robustness rearwardly. Caudal appendages yellow to reddish yellow; male's epiproct with a pair of tubercles at basal 0.70. Size proportions: Epiproct 1.0, cercus 0.94, paraproct 0.94.

**M e a s u r e m e n t s** (mm). — TL 21.7-24.1; AB 13.7-16.0; HF 3.5-4.1; MWH 4.6-5.3; CA 1.4-1.7; LS on abdominal segment 6, 0.20-0.30; on 7, 0.30-0.40; on 8, 0.40-0.50; on 9, 0.40-0.50.

**ECOLOGY.** — Larvae inhabit coarse sand banks, and also at the interface of sand and gravel. One larva emerged, at 1836 h on 8-IV-1994.

### ERPETO GOMPHUS VIPERINUS SELYS

Figures 2e, 15

**M a t e r i a l.** — 6 exuviae last instar larva (2♂, 4♀, reared), 8 last instar larvae (6♂, 2♀). MEXICO: Veracruz; Tlapacoyan, Puente Tomata, Rio Bobos, 19°55'31"N, 97°13'16"W (450 m asl), 14-VIII-1996, 12/13-VII-2002, R. Novelo leg.; — deposited in IEXA, IORI and KT.

**DESCRIPTION.** — Larvae and exuviae yellow-brown, body finely granulose, hairy at sides.

**H e a d.** — As described for *E. bothrops* except: Third antennomere slightly flattened ventrally, 3.3 times longer than its widest part, internal margin straight, the external one slightly convex (Fig. 2e); fourth antennomere conical. Internal branch of right mandible with six cuspids, the central ones the smaller; internal branch of left mandible with five blunt cuspids. Prementum as in *E. bothrops*.

**T h o r a x.** — As in *E. bothrops*.

**A b d o m e n.** — Tergite 6 similar to that of *E. liopeltis*, other features as described for *E. bothrops* except: Dorsal protuberances well developed on abdominal segments 2-9, that on 2 vertical and the highest, then gradually slanting backwardly 3-6, low on 7-9 (Fig. 15). Lateral margins of 2-9 and basal half of 10 with abundant, long, delicate setae, and with minute spines on apical half on 6, and all the way on 7-10 which increase gradually in size and number caudad. Lateral spines well developed on 6-9, acutely pointed, slightly divergent on 6-7, those on 9 the largest. Posterior margins of tergites 2-9 with abundant, minute, acute spines; that on 10 smooth. Caudal appendages as in *E. bothrops* except: Epiproct brown on basal 0.70, remainder yellow, apex reddish; cercus yellow, apex reddish; paraproct with a lateral row of short reddish spines; in ventral view, yellowish brown

on basal 0.40, remainder yellow, apex reddish.

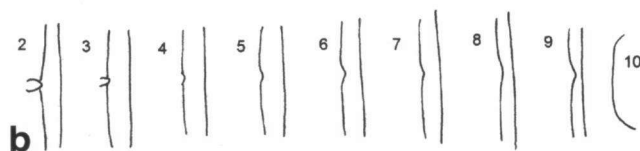
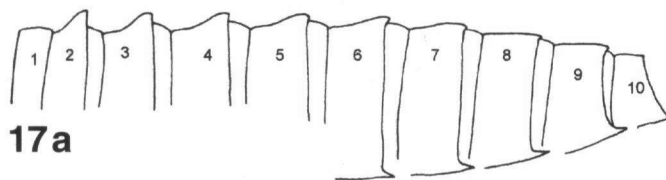
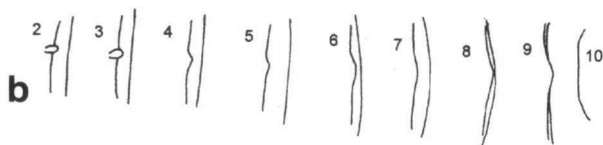
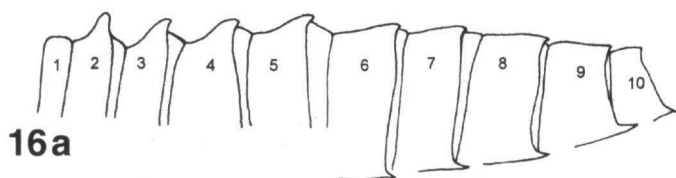
**Measurements (mm).** — TL 19-22.2; AB 12-14.5; HF 3.5-3.7; MWH 4.3-4.8; CA 1.5-1.6; LS on abdominal segment 6, 0.2-0.3; on 7, 0.3-0.35; on 8, 0.4; on 9, 0.4-0.5.

**ECOLOGY.** — Larvae were found in a wide, shallow, open stream, inhabiting fine sand banks mainly at stream's edge. Emergence was recorded for one male at 0610 h on July 14, 2002; the remainder of the specimens emerged early in the morning from July 17-24, 2002, although times were not recorded.

Larvae of the following species have been described by other authors. Here I provide some details not mentioned previously, in order to make them comparable to those described in this paper.

*ERPETO GOMPHUS COMPOSITUS* Hagen in Selys

Figures 2f, 10d, 16, 20a



Figs 16-17. Larval abdomen: (16) *Erpetogomphus compositus*; — (17) *E. designatus*; a = left lateral view; — b = dorsal view.

HAGEN, H. 1885.  
*Trans. Am. ent. Soc.*  
12: 256.

**Material.** —  
2 penultimate? instar  
larvae (♂, ♀). USA:  
Arizona; Phoenix,  
Maricopa Co., X-  
-1975, B. Adams leg.;  
in IEXA.

**Head.** —  
Third antennomere mainly scaly,  
but with long setae along lateral  
margins, 3.3  
times longer than  
its widest part,  
slightly flattened  
ventrally, internal  
side straight, external one slightly  
convex (Fig. 2f).  
Mandibles as in  
*E. bothrops*.

**Abdomen.**  
— Dorsal protuber-

berances well developed on abdominal segments 2-4, rudimentary on 5-9, that on 2 the highest (Fig. 16). Lateral spines on 6-9, with small spines on their external margins. Sternites 1-9 as in *E. bothrops*. Posterior margin of segment 10 smooth. Male epiproct with a pair of dorsal tubercles at basal 0.66, the apices of these tubercles rounded (Fig. 10d).

**Measurements** (mm). — Length of lateral spine on abdominal segment 6, 0.2; on 7, 0.3; on 8, 0.4; on 9, 0.45.

### ERPETO GOMPHUS CROTALINUS (Hagen in Selys)

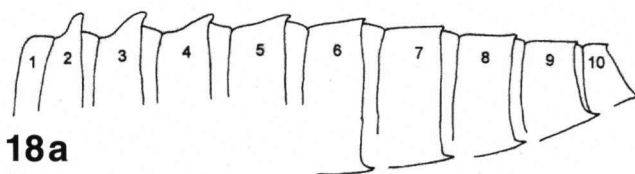
Figures 2g, 18

NOVELO-G., R. &  
E. GONZÁLEZ-S.,  
1991. *Folia ent. mex.*  
81: 150.

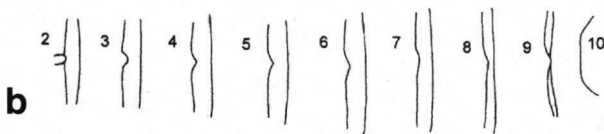
**Material.** — 2  
last instar larvae (♀).  
MEXICO: Durango;  
La Michilia, arroyo El  
Temazcal, 23°35'34"N,  
104°03'43"W (2010 m  
asl), 12-XII-1987, E.  
González, R. Novelo  
leg.; in IEXA.

**Head.** —  
Third antenno-  
mere mainly scaly  
but with abun-  
dant long setae  
on lateral and api-  
cal margins, 3.3  
times longer than  
its widest part,  
slightly flattened  
ventrally, internal  
side straight, ex-  
ternal one slightly  
convex (Fig. 2g).  
Mandibles as in  
*E. bothrops*.

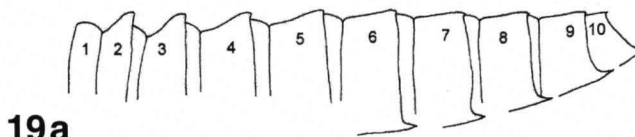
**Abdomen.** —  
As in *E. compositus*  
except: dorsal



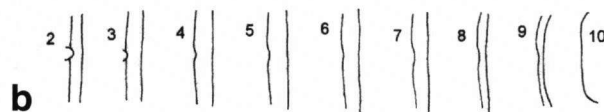
18a



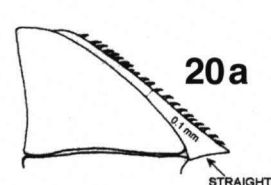
b



19a

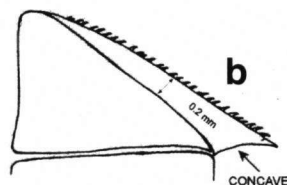


b



20a

STRAIGHT



b

CONCAVE

Figs 18-20. Larval abdomen: (18) *Erpetogomphus crotalinus*; — (19) *E. lampropeltis natrix*; a = left lateral view; — b = dorsal view; — (20) detail of the left lateral spine of abdominal segment 9: a = *E. compositus*; b = *E. designatus*.

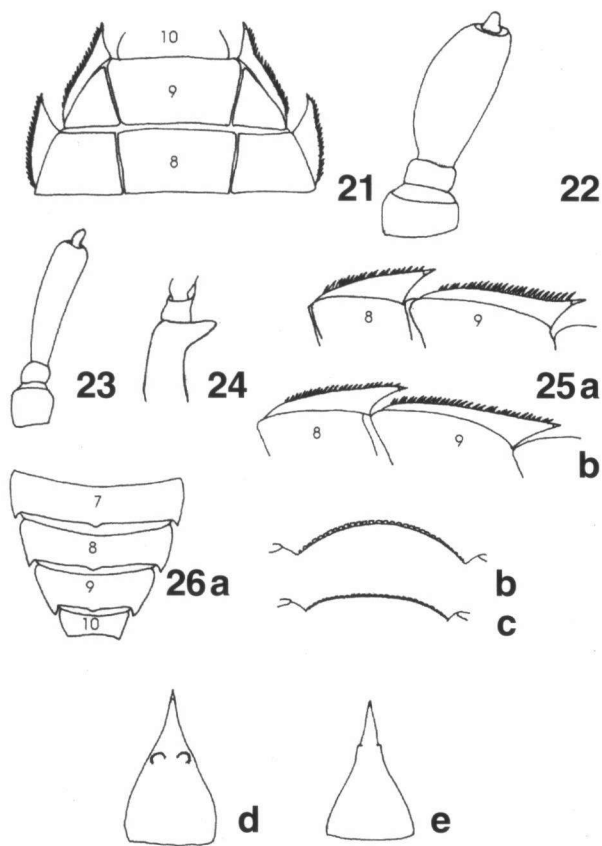
protuberance on 4 low, on 5-6 vestigial, wanting on 7-9 (Fig. 18).

Measurements (mm). — Length of lateral spine on 6, 0.3; on 7, 0.4; on 8, 0.5; on 9, 0.5.

*ERPETOGOMPHUS DESIGNATUS* Hagen in Selys

Figures 2h, 10e, 17, 20b

HAGEN, H., 1885. *Trans. Am. ent. Soc.* 12: 255.



Figs 21-26. Details of the morphology of *Erpetogomphus* larvae: (21) ventral view of abdominal segments 8-10, *sabaleticus*; — (22) left antenna, dorsal view, *agkistrodon*; — (23) left antenna, dorsal view, *ophibolus*; — (24) apex of right protibia, *erici*; — (25) lateral spines of abdominal segments 8-9: a = *tristani*; — b = *constrictor*; — (26) *boa* (a, b, d), *cophias* (c, e): a = dorsal view of abdominal segments 7-10 showing the short and not strongly acute lateral spines; b, c = dorsal view of ligula (piliform setae omitted); d, e = dorsal view of male epiproct.

Material. — 2 last instar larvae (♂, ♀), 8 exuviae (4♂, 4♀). USA: Tennessee; Hawkins Co., Holston River, 23-V-1979, W.M. Dennis leg. (larvae) in KT. Texas; — Uvalde Co., Nueces River, Park Chalk Bluff, 12-VII-2001, K.J. Tennesen leg. (3 exuviae) in KT; — Edwards/Real Co., Nueces River, Hwy. 55 S of Barksdale, 13-VII-2001, K.J. Tennesen leg.; (5 exuviae) in KT and IEXA.

Head. — Third antennomere as in *E. crocotalinus* (Fig. 2h). Mandibles as in *E. bothrops*.

Abdomen. — Dorsal protuberances well developed on segments 2-4, rudimentary on 5-9, those on 2-3 the highest (Fig. 17). Lateral spines on 6-9, with small spines on their external margins. Sternites 1-9 as in *E. bothrops*. Posterior margin of segment 10 smooth. Male epiproct with a pair of dorsal tubercles at basal 0.66, the apices of these tu-

bercles acute forming a right angle (Fig. 10e).

Measurements (mm). — Length of lateral spine on 6, 0.4; on 7, 0.5; on 8, 0.5; on 9, 0.6.

***ERPETOGOMPHUS LAMPROPELTIS NATRIX* Williamson & Williamson**

Figures 2i, 19

NOVELO-G., R. & E. GONZÁLEZ-S., 1991. *Folia ent. mex.* 81: 154.

Material. — 2 exuviae (reared). MEXICO: Durango; La Michilia, arroyo Corralitos, 15-IV-1987, E. González, R. Novelo leg.; in IEXA.

Larvae mostly as in *E. crotalinus* except: dorsal protuberances wanting on abdominal segments 5-9.

Measurements (mm). — Length of lateral spine on 6, 0.25; on 7, 0.4; on 8, 0.4; on 9 0.4.

## DISCUSSION

Most of the larvae here described are similar in many features, except *E. eutainia* Calvert which is notoriously different. This species is easily separable from the others by the following combination of features: Head densely covered with claviform setae; 3rd antennomere flattened dorsoventrally; 4th antennomere a hemispherical rudiment; ligula poorly developed, almost straight; lateral spines on abdominal segments 7-9, and sternite 8 divided into five plates. By all these features, the larva of *E. eutainia* is more closely related to the *ophibolus*-group than the *crotalinus*-group (sensu GARRISON, 1994), particularly with *E. agkistrodon* Garrison and *E. erici* Novelo (cf. NOVELO-GUTIÉRREZ, 2002). However, the presence of abdominal dorsal protuberances well developed on caudal segments (7-9), that on 9 the largest, relates *E. eutainia* larva to those of *E. constrictor* Ris, *E. tristani* Calvert, *E. ophibolus* Calvert and *E. sabaleticus* Williamson (cf. NOVELO-GUTIÉRREZ, 2002).

The larva of *E. bothrops* Garrison is distinguished from other larvae of the *crotalinus*-group described here mainly by having the third antennomere parallel-sided, a clear autoapomorphy of this species. Likewise, based on general body features, mainly those of the abdomen, I consider the *E. bothrops* larva more related to the *crotalinus*-subgroup than to the *elaps*-subgroup (sensu GARRISON, 1994).

The larvae of *E. liopeltis* Garrison and *E. viperinus* Selys show a close relationship mainly in general stature, maculation, mandibles with obtuse teeth on external branches, abdominal dorsal protuberances well developed on 2-9, and length and shape of lateral spines on abdominal segments 6-9. Finally, the larva of *E. elaps* appears as intermediate between the *liopeltis-viperinus* and *bothrops* + *crotalinus* subgroups (sensu GARRISON, 1994).

A KEY TO THE KNOWN LARVAE OF *ERPETOOGOMPHUS*

- 1 Sternite 8 divided into five plates (Fig. 13) ..... 2
- 1' Sternite 8 divided into three plates (Fig. 21) ..... 7
- 2 Lateral spines only on abdominal segments 7-9; third antennomere flattened dorsoventrally, two or three times longer than its widest part (Fig. 22) ..... 3
- 2' Lateral spines on abdominal segments 4-9 or 5-9; third antennomere cylindric, claviform, 4-5 times longer than its widest part (Fig. 23) ..... 5
- 3 Dorsal protuberances well developed on tergites 2-9 (Fig. 9); third antennomere densely scaly at sides, three times longer than its widest part; fourth antennomere as in Fig. 2c; burrowing hooks on pro- and mesotibiae moderately developed (Fig. 12a) ..... *eutainia*
- 3' Dorsal protuberances well developed on 2-4, reduced on 5-6, rudimentary on 7-9; third antennomere densely scaly and with long, stiff setae on sides, two times longer than its widest part; fourth antennomere as in Fig. 22; burrowing hooks on pro- and mesotibiae well developed (Fig. 24) ..... 4
- 4 Endemic from Xalapa and Coatepec (Veracruz State, Mexico) ..... *agkistrodon*
- 4' Endemic from the Northern Mountain Range in Hidalgo State and Tlapacoyan in Veracruz State, Mexico ..... *erici*
- 5 Tergites 8-10 covered with minute spiniform setae (apices acute) ..... *ophibolus*
- 5' Tergites 8-10 appearing granular, covered with scale-like setae (apices rounded or truncate) .. 6
- 6 Lateral spines on abdominal segments 4-9 (minute on 4), those on 6-9 divergent, lateral keels on 6-9 with a row of large spines (Fig. 25a); Costa Rica and Panama ..... *tristani*
- 6' Lateral spines on abdominal segments 5-9 (small on 5), those on 6-9 convergent, lateral keels on 6-9 with a row of short spines (Fig. 25b); Mexico to Costa Rica ..... *constrictor*
- 7 Lateral spines on abdominal segments 4-9, those on 6-9 large and robust, strongly keeled, (Fig. 21) and with a row of stout, sharply-pointed spines on their external margin; dorsal protuberances on tergites 2-9, those on 7-9 the largest, those on 4-5 the smallest; Panama, Colombia and Venezuela ..... *sabaleticus*
- 7' Lateral spines on abdominal segments 6-9 or 7-9; dorsal protuberances on tergites 2-9 variable but those on 7-9 never the largest ..... 8
- 8 Lateral spines on 7-9 short and not strongly acute (Fig. 26a) (sometimes a vestigial spine on 6 on *E. cophias*) ..... 9
- 8' Lateral spines well developed on 6-9, strongly acute (Fig. 1) ..... 10
- 9 Ligula moderately developed and convex (Fig. 26b); dorsal tubercles of male's epiproct at basal 0.60; width of epiproct immediately after these tubercles 0.5 mm in mature larvae (Fig. 26d); lateral spines only on 7-9 ..... *boa*
- 9' Ligula poorly developed and almost straight (Fig. 26c); dorsal tubercles of male's epiproct at basal 0.70; width of epiproct immediately after these tubercles 0.25 mm in mature larvae (Fig. 26e); lateral spines usually on 7-9, sometimes on 6 (vestigial) ..... *cophias*
- 10 Dorsal protuberances on tergites 2-9 well developed and raised (Figs 14-15) ..... 11
- 10' Dorsal protuberances well developed on tergites 2-4, 2-5 or 2-6, remainder rudimentary (not raised but extended caudad), vestigial (slightly extended caudad as small triangles in lateral or dorsal view) or wanting ..... 12
- 11 Dorsal protuberances on 7-9 high, as in Fig. 14 ..... *liopeltis*
- 11' Dorsal protuberances on 7-9 low, as in Fig. 15 ..... *viperinus*
- 12 Third antennomere parallel-sided, of the same width throughout, five times longer than wide (Fig. 2a); dorsal protuberances well developed on 2-4, low on 5, rudimentary on 6-9 (Fig. 7) .... *bothrops*
- 12' Third antennomere with the internal side straight or nearly so, the external one slightly convex, 3-3.6 times longer than its widest part (Figs 2b,d-i) ..... 13

- 13 Dorsal protuberances high on 2-4 or 2-5, low on 6, rudimentary (extending caudad) on 7-9 (Figs 8, 16-17) ..... 14
- 13' Dorsal protuberances high on 2-3, low on 4, remainder vestigial or wanting (Figs 18-19) .... 16
- 14 Maximum width of head in full-grown larvae 4-4.6 mm; third antennomere 3.6 times longer than its widest part; male's epiproct, in dorsal view, with tubercles not surpassing the lateral margins of epiproct (Fig. 10b); dorsal protuberances as in Fig. 8; Mexico and Guatemala ..... *elaps*
- 14' Maximum width of head in full-grown larvae 4.9-5.0 mm; third antennomere 3-3.3 times longer than its widest part; male's epiproct, in dorsal view, with tubercles surpassing the lateral margins of epiproct (Figs 10d-e ); USA and Mexico ..... 15
- 15 Lateral keel of segment 9, in ventral view, 0.1 mm wide at middle (Fig. 20a), inner margin of lateral spine on 9 straight; dorsal tubercles of male's epiproct rounded at apex (Fig. 10d); dorsal protuberances of abdomen as in Fig. 16 ..... *compositus*
- 15' Lateral keel on segment 9, in ventral view, 0.2 mm wide at middle (Fig. 20b), inner margin of lateral spine on 9 concave; dorsal tubercles of male's epiproct angulated at apex (Fig. 10e); dorsal protuberances of abdomen as in Fig. 17 ..... *designatus*
- 16 Dorsal protuberances high on 2-3, low on 4, vestigial on 5-6, wanting on 7-9 (Fig. 18) ..... *crotalinus*
- 16' Dorsal protuberances high on 2-3, low on 4, wanting on 5-9 (Fig. 19) ..... *lampropeltis natrix*

Larvae unknown: *elaphe*, *heterodon*, *leptophis*, *schausi* and *sipedon*.

#### ACKNOWLEDGEMENTS

I thank CESAR V. ROJAS-GOMEZ for the information about geographical coordinates of the collecting localities. JOSÉ A. GÓMEZ-ANAYA scanned and composed the illustrations. Special thanks are due to Drs R. W. GARRISON (Azusa, CA) and K. J. TENNESSEN (Wautoma, WI) for their generous donation of larvae of *E. compositus* and exuviae of *E. designatus*, respectively. Also, thanks are due to Dr S. W. DUNKLE (Plano, TX) for his criticism and comments on the final manuscript.

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