



Erpetogomphus molossus, a new species from Sonora, Mexico (Odonata: Anisoptera: Gomphidae)

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Abstract

Erpetogomphus molossus is described from 3 male and 3 female specimens (holotype and allotype in collection of Instituto Biológico de la Universidad Nacional Autónoma de México) from the intermittent pine-oak woodland of the Yécora municipio in east-central Sonora, Mexico. Diagnostic features of the new species include the seemingly bulbous tip (in lateral view) and prominent baso-ventral process of the male cerci and the notched and denticled posteromesal corners of the female subgenital plate.

Key words: *Erpetogomphus molossus*, new species, Mexico, Sonora

Introduction

Members of the genus *Erpetogomphus* Selys, 1858, are small to medium-sized dragonflies with short legs and hyaline (or faintly flavescent) wings. They are commonly called “ringtails” due to the presence of variably pale annuli on the middle abdominal segments. Males have a clubbed abdomen; females lack a true club, although some (e.g. *Erpetogomphus compositus* Hagen in Selys) may show a slight expansion on segments 8 and 9. Detailed revision of the genus by Garrison (1994) documented a largely Neotropical distribution of the 21 species then known (in 1999, this rose to 22 with the addition of *Erpetogomphus erici* Novelo-Gutiérrez and Garrison), ranging from the northwest and mid-Atlantic United States through Mexico and Central America to northwest South America. We describe *Erpetogomphus molossus*, a new species from the Sierra Madre Occidental in east-central Sonora. It is distinct in color pattern and, especially, in the configuration of the male appendages and secondary genitalia and in that of the female subgenital plate. A prior reference, as *Erpetogomphus* sp. nov., was made to this species in Upson *et al.*, p. 39. See Figures 1–2 for individuals photographed in the field.

Erpetogomphus molossus, new species

Etymology. The name *molossus* is intended both to continue the tradition in the naming of new species of *Erpetogomphus* after snakes and to refer to this particular new species’ most conspicuous field mark: its largely black, though ringed, abdomen. The small range of *Erpetogomphus molossus* is well within the much larger range of its namesake, *Crotalus molossus*, the black-tailed rattlesnake. The common name Black-tailed Ringtail is suggested.

Specimens examined. 3♂ 3♀. **Holotype** male from Rancho Trigo Colón, 10 km S Hwy 16, Km 296, Yécora Municipio, Sonora, Mexico, 1385 m (N 28°18.593’, W 108°47.503’; date 14-IX-08; leg. R. Bailowitz, D. Danforth & S. Upson. **Allotype** female from same locality by same collectors, 16-IX-04. **Paratypes** All from same locality and collectors, 1♂ 4-IX-05, and 1♀ 16-IX-04. Holotype and allotype in collection of Instituto Biológico de la Universidad Nacional Autónoma de México, Mexico City. Paratypes in Hasbrouck Insect Collection, Arizona State University, Tempe, Arizona.



FIGURE 1. Male *Erpetogomphus molossus*, El Trigo Colón, Sonora, 9 September 2008. Photo by Doug Danforth.

Description. Male holotype (Figs. 3–7). Head. Face predominantly light turquoise in life; mandibles pale on proximal surfaces near points of articulation, grading through reddish brown to blackened tips while narrowing distally; maxillae pale throughout except tips which are darkened slightly to light brown; posterior to each lateral ocellus, a darkened tubercle with roughly a dozen long setae; vertex dark becoming paler posterior to postocellar tubercles; occiput pale, angled upward and bordered with black on front, rear and both ends; crest erect, black on each outer quarter, pale on inner half; posterior margin bilaterally sinuate, with tufts of long setae its full length; setae matte yellow apically, dark brown basally.

Prothorax. Anterior half of anterior lobe pale, arched upward and posteriad in middle two quarters; posterior half of lobe darkened to lateral extremes; dark area curving forward to include outer two quarters of lobe's anterior half; proceeding laterad, outer quarters first excavate, then secondarily arched; anterior margin of middle lobe folded forward and down; middle lobe itself divided into pale, bluntly pointed halves meeting mesally; lateral extremes of lobe defined by a shallow ridge angling posterolaterad, then directly laterad. Outside these ridges, lobe pale dorsally, medium brown anteriorly; posterior lobe gracefully arched and pale darkening through reddish brown ultimately to black on posterior margin; margin thickened, rolled and setose.

Pterothorax. Raised middorsal thoracic carina turquoise (in life) becoming dark brown at middorsal prominence or anterior extreme of antealar crest; middorsal carina (postmortem) bordered laterally by respective halves of dark brown middorsal stripe; sides of anterior surface of pterothorax marked by very thick, inverted “7s” of bright turquoise (yellow, postmortem) in lower frontal area; crossbars of “7s” extended to include collar; dark brown antehumeral and humeral stripes fused at bottom, top and 3/4 point leaving between them an inverted turquoise “exclamation mark;” lateral area of thorax uniformly bright green except for faint and narrow brown stripe running along metapleural suture.

Legs. Coxae and trochanters variably mottled between straw-colored and drab green; femora pale proximally, outer surfaces grading through reddish brown to black distally; tibiae and tarsi black.



FIGURE 2. Female *Erpetogomphus molossus*, El Trigo Colón, Sonora, 9 September 2008. Photo by Doug Danforth.

Wings. Hyaline with trace of amber at extreme bases; costal veins pale yellowish out to proximal point of pterostigmata; pterostigmata dark brown dorsally, medium brown ventrally; remainder of venation black; Left side antenodal crossveins number as follows: LFW 13, LHW 12. In LFW, first and fifth antenodal crossveins thickened; in LHW, first and sixth crossveins thickened; in each wing, reinforcement gained from thickening enhanced by costal veins' precise alignment with similarly thickened subcostal veins behind them; postnodal crossveins number: LFW 10, LHW 10; beyond slanted braceveins, pterostigmata subtended by 3.5 and 4.3 cells in LFW and LHW, respectively. In LFW, 7 paranal cells, with 3 supplementary marginal cells behind them; second anal interspace of LHW has single full-width cell next to anal vein. Posterior to this, second row has 2 cells; anal triangle of LHW shows common male *Erpetogomphus* complement of 3 large cells arced around single smaller cell near middle of triangle's mesal margin.

Abdomen. Dark brown to black in ground color, with pale turquoise dorsal stripe (becoming matte yellow postmortem); stripe partial on S1, full on S2, thinner and with progressively greater interruptions on S3–6; S7 broadly banded with off white in basal 2/3; S8 with obscure, pale, basal mark on dorsum; margins of auricles on S2 show line of small, regularly spaced black denticles; S1–3 show pale ventrolateral areas; basal annuli of S4–6 confluent with pale dorsal stripe and, in lateral to ventrolateral areas, extended posteriad in vague boomerang shape; in same segments, obscure, slightly pale streaks aligned along, and just above, ventrolateral carina; S7 pale in basal 2/3, black in apical 1/3; supplementary transverse carina black laterally conjoined with semicircular, black lateral spot in basal quarter; S8–10 black dorsally with incomplete, red-brown basal rings dorsally and dorso-laterally; S8–10 also show irregular, pale, basolateral patches, those of S10 more strongly reddish brown; a further reddish brown dorso-apical patch present on S10; sternites of S3–6 and basal 3/4 of S7 black.

Hamules. Anterior hamule light brown at base turning black and terminating in robust C-shaped structure open posteriad and comprising more than half total length of hamule; proximal branch of "C" thickly blunted, even squared off; middle section thick, shallowly curved, tapering distally to form thin, sickle-shaped, almost fully

recurved (180°) distal branch of “C”. Posterior hamule thick, pale, setose and half again as long as anterior hamule; at base, initially projecting away from abdomen, then angling posteriad and tapering to bluntly rounded, broadly blackened tip armed with prominent tooth originating at and recurving forward from point clearly posterior to true apex of hamule.



FIGURE 3. Head, thorax and basal abdominal segments of holotype male.

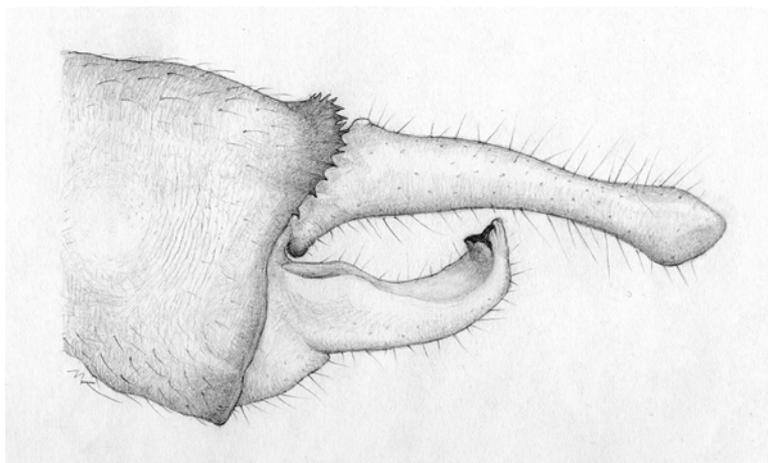


FIGURE 4. Lateral view of terminal appendages of holotype male.

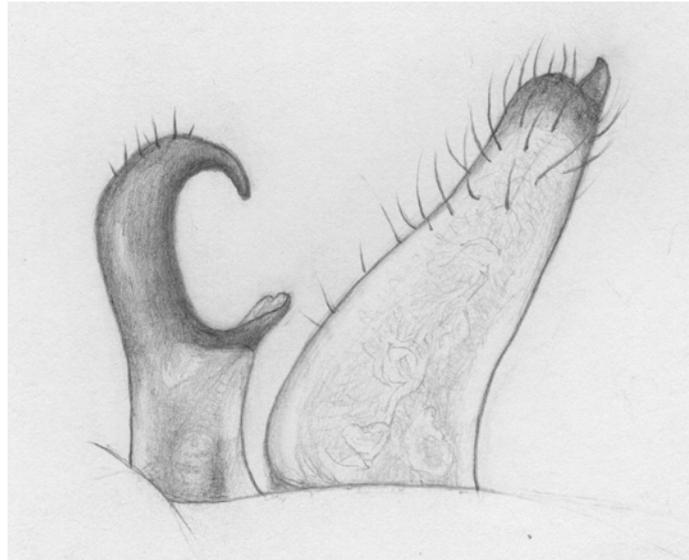


FIGURE 5. Lateral view of anterior and posterior hamules of a paratype male.

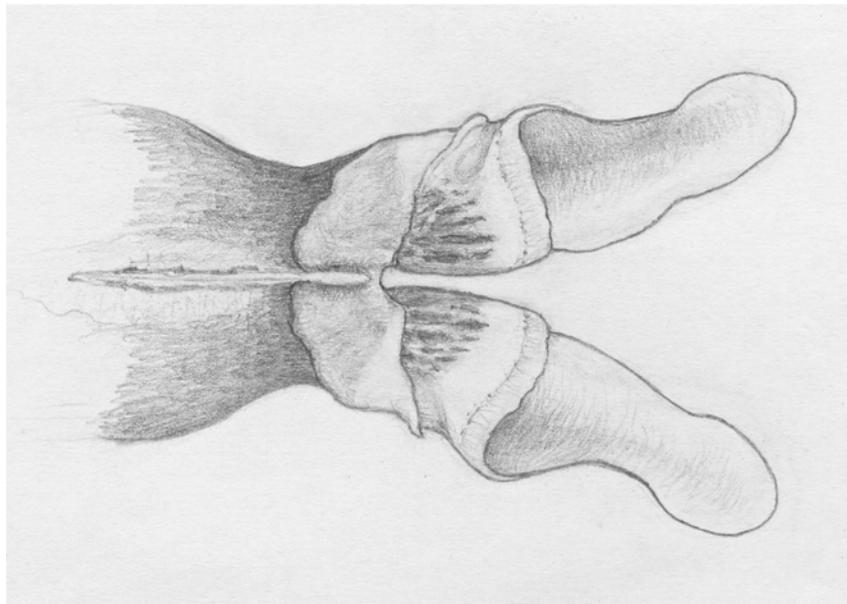


FIGURE 6. Ventral view of penis segment 4 of a paratype male.

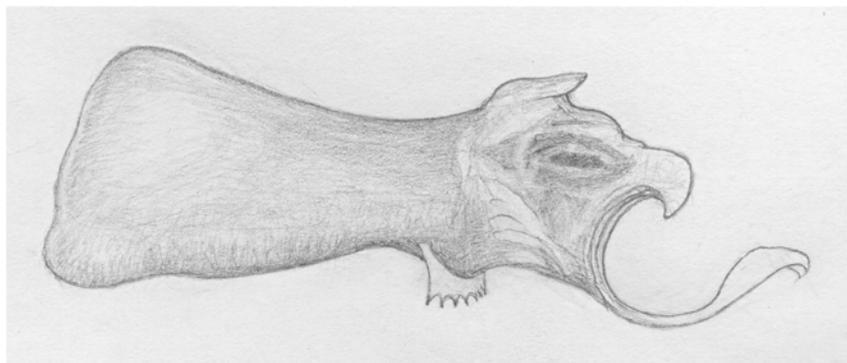


FIGURE 7. Lateral view of penis segment 4 of a paratype male (shown in conventional “upside down” aspect, i.e. ventral surface at top).



FIGURE 8. Head of allotype female, in frontal view.



FIGURE 9. Head of a paratype female, in dorsal view.

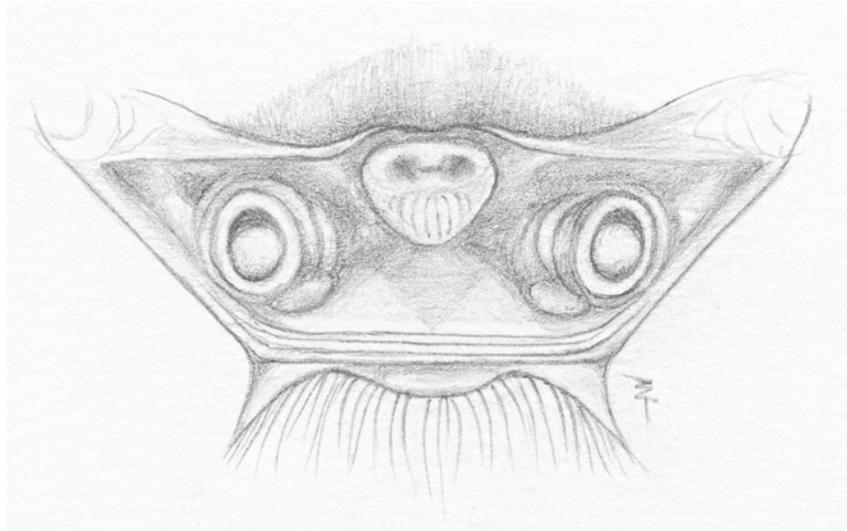


FIGURE 10. Vertex and occiput of allotype female.

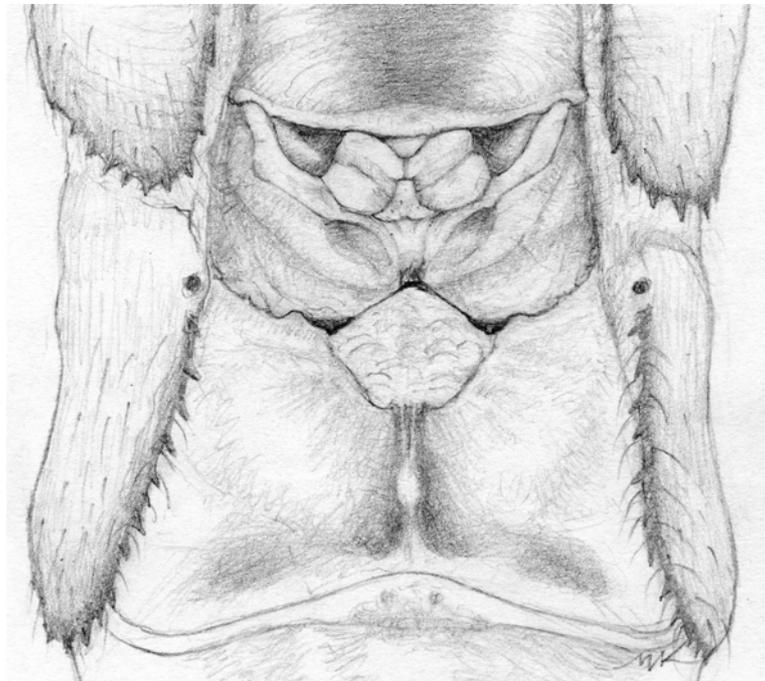


FIGURE 11. Ventral view of subgenital plate of allotype female.

Penis (vesica spermalis). Terminal segment of penis lacks prepuce. Paratypes each with small, lateral lobes bearing 5–7 minute denticles along dorsal margins; in holotype, lobe is collapsed at base leaving number of denticles obscured; membranous hood broadly excavate posteriad, fully exposing subcuticular membrane and much of pebbled tissue at base; cornua wide, widely separated and divergent, terminating in rounded, expanded, scoop-like tips flared incipiently outward; avisible swelling along mesal margin and a more pronounced swelling along lateral margin; length of segment 4, including cornua, twice width of segment.

Terminal appendages. Cerci off-white to yellowish; in lateral view, narrowed and slightly arched in middle, but not angulate; beyond middle, cerci widen, culminating in rounded, bulbous tips; in posterior view, tips slant diagonally down and in and are cupped, not bulbous, on inner surfaces; cercus with prominent, decumbent, dark-tipped and blunt, basoventral process; epiproct dark and slightly elevated dorsally at 1/3 point, reaching to half length of cercus; despite being upturned to roughly 100°, epiproct truncated, falling well short of intersecting cercus; apical margin of each tip shallowly rounded and armed just below lateral corner with prominent, black tooth projecting forward.

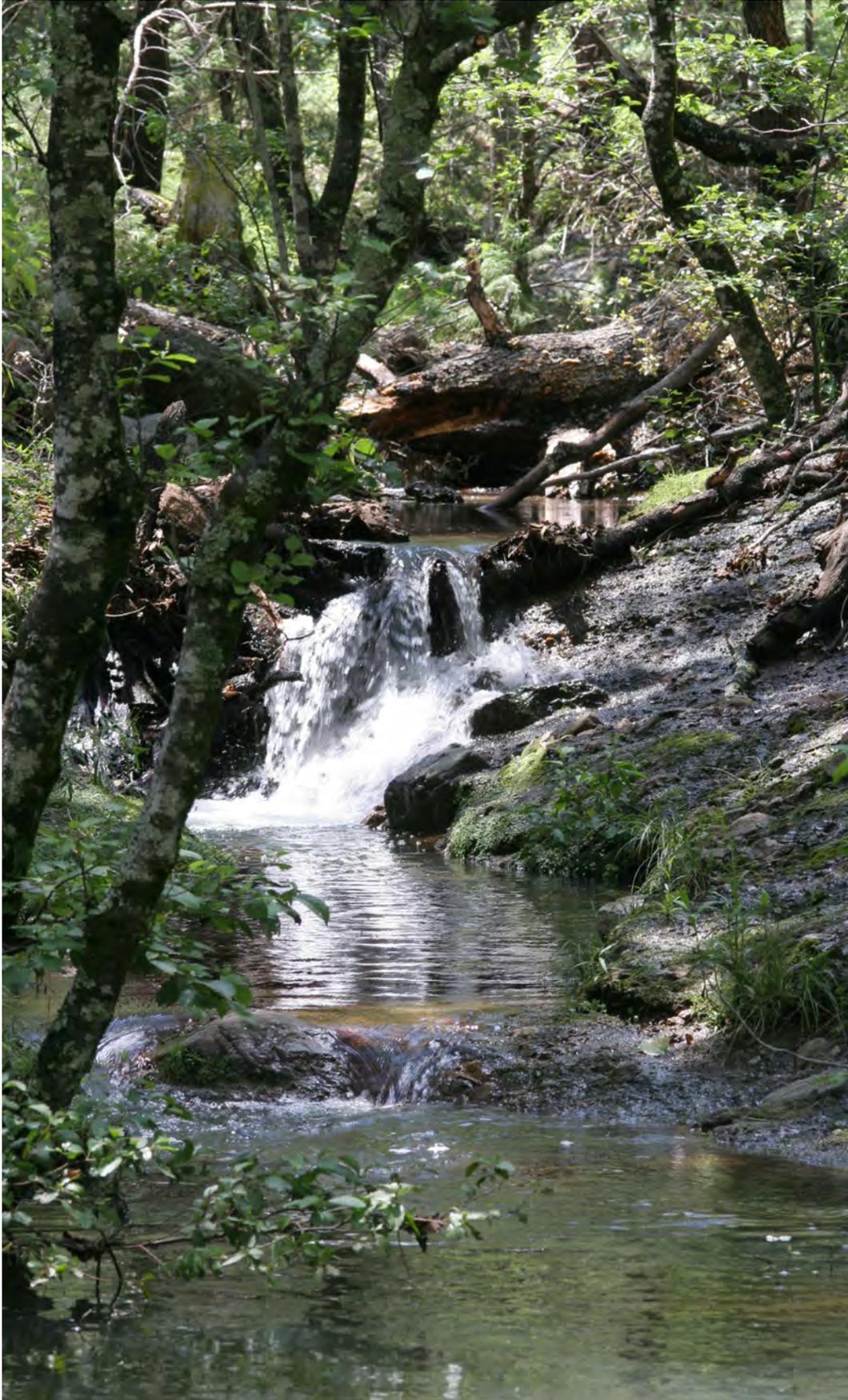


FIGURE 12. Habitat of *Erpetogomphus molossus*, El Trigo Colón, Sonora, 4 September 2005. Photo by Doug Danforth.

Measurements (in mm). Total length 47, abdomen 35, FW 33, HW 31.

Female allotype (Figs. 8–11). **Head.** Face muted turquoise blue-green with darkened, fan-shaped area centered upon and radiating forward from postfrons base. Between postfrons base and vertex a pronounced trough crosses head in a straight line between compound eyes; path of trough tangential to rear of antenna bases and to front of median ocellus, deepening to noticeable pits anterolateral to median ocellus; posterior to lateral ocelli, low-lying but well defined tubercles present; posterior surface of vertex mostly smooth, though broadly and shallowly recessed into triangular, basin-like shapes; on incline nearing occiput, vertex strongly wrinkled across entire width. Occiput greatly reduced from dimensions typical of male, inclined to near vertical and best seen in anterior view; sinuously curved, arcing forward and inward from behind eye and becoming temporarily visible, from above, at innermost point of eye; at its forward extreme, occiput arcs to rear becoming clearly convex; crest elevated, light yellow mesally, dark laterally, fringed with golden setae; postocciput large, drab yellow.

Thorax, legs, and wings. Similar to male.

Abdomen. Mostly black with thin, pale, blue dorsal stripe through S3, rusty through anterior half of S7; S3–7 with pale, basal annuli, incomplete dorsally, thin but thickening above ventrolateral carina and elongated to rear as a boomerang shape abutting transverse supplementary carina; S7 similar, yet transitional, with regular and entire apical annulus rusty in color; S8 and S9 also with rusty apical annuli, but lacking pale basal annuli; ventrolateral area of each abdominal segment with pale markings posterior to transverse lateral carina; these vary from thin streaks to thickened, mottled patches and, in terminal segments, show rusty tinges; appendages also rusty; cerci thick at bases, tapering straightly and evenly to darkened, acuminate tips; paraproct robust. In ventral view, sternite of S1 similar in olive-gray color to lateral areas of tergum above; from halfway point of S2 through full length of S7, sternites almost entirely black, hastate with narrow ends pointed to rear; sternite of S8 black only in apical half; those of S9 and S10 partially darkened, though not black.

Subgenital plate. Mesal margins of bifid subgenital plate fused in anterior 50%, then diverging at $\pm 100^\circ$ to each other, terminating at darkened, slightly thickened posteromesal corners armed with a tight cluster of minute denticles; median cleft, as measured between darkened corners, equals approximately 40% of total width of plate; a small, shallow notch immediately outside each corner; outer margins of plate curve gently, but irregularly, forward approaching their lateral extremes; surfaces and posterior margins of plate slightly wavy and lying anterior to a thickened, raised and costate, roughly Y-shaped postlamellar ridge.

Measurements. Total length 48 mm, abdomen 35 mm, FW 37 mm, HW 35 mm.

Variation. Measurements of holotype and two additional males as follows: total length 47–48 mm; abdomen 36–37 mm; FW 32–33 mm; HW 31–32 mm.

Flavescence found in wings of both sexes, generally faint, often absent altogether. Two cells usually present in second row of second anal interspace of HW, one cell in some individuals. Venation pattern within anal triangle inconsistent; 3 larger cells usually in an arc around smaller cell on mesal margin; some individuals lack smaller cell in one or both HW.

Male epiproct tips also variable; tips of holotype male asymmetrically rounded in posterior view; tips of other individuals slightly angulate and varying between nearly smooth and irregularly and minutely jagged, as though gnawed off; 5–7 denticles on margin of lateral lobes of penis (6 most common); 5–9 denticles along margin of auricle.

Females examined show little variation, beyond extent of darkening on posteromesal corners of subgenital plate; total length 48–49 mm.

Discussion

Garrison's phylogenetic analysis (1994: 177–181) indicated that males of all known *Erpetogomphus* species share the synapomorphic character of “gently...to strongly dorsally curved, non-divergent epiprocts.” These species were then separated into the *E. ophibolus*, *E. eutainia* and *E. crotalinus* groups. The first two of these groups present few points of similarity with *E. molossus* and, therefore, suggest no recent shared ancestry. Rather, *E. molossus* groups among the 13 species of Garrison's *E. crotalinus* Group in all of which the males' vesica lacks a prepuce. Secondly, it would seem to group to a great degree with his similarly named *E. crotalinus* Subgroup, comprising 8 species: *E. designatus*, *E. sipedon*, *E. lampropeltis*, *E. crotalinus*, *E. heterodon*, *E. compositus*, *E. boa* and *E. cophias*, the males of which all (except in *E. designatus*) show a shortened lateral lobe on vesica segment 4. In a personal communication (2011), Garrison has also indicated that *E. molossus* shares with *E. boa* and *E.*

cophias the character of “partially hyaline apical lobes of the vesica.” Among females, the general configuration of the subgenital plate, though not perhaps of the more minute details, is also superficially consistent with the placement of *E. molossus* in the *E. crotalinus* Subgroup.

One recurring problem, however, complicates this conclusion. In his paper (p. 178), Garrison states that he has “not been totally successful in resolving several of the terminal clades, due to (the) high degree of apparent homoplasies.” He points out further, in specific reference to the secondary genitalia of the males in the *E. crotalinus* Subgroup, “a bewildering complex of character reversals for some characters” (p. 178). The basoventral process, or tooth, on the cercus of *E. molossus* males may constitute an example of one of these phenomena. Its precise function is difficult to determine with certainty but may be to serve as a “stop” guarding against harmful downward flexion of the cercus. Within Garrison’s *E. ophibolus* Group, four of the five then known males (the male of *E. agkistrodon* was unknown) show a buttress-like development at the cercus base. In contrast, the cercus of the male of a fifth species, *E. tristani*, is developed ventrally into a prominent and sharpened, decumbent tooth entirely free of the cercus base. Four additional species (*E. leptophis* in the *E. eutainia* Group, *E. liopeltis* and *E. bothrops* in the *E. elaps* Subgroup, and *E. heterodon* in the *E. crotalinus* Subgroup) show a visible swelling on the ventral surface just posterior to the true base of the cercus. In none of these, however, does this structure approach the combination of length, bluntness and robustness typifying the same structure in *E. molossus*. Despite its much greater prominence, the similar point of origin suggests that this process in *E. molossus* may be homologous with the less expressed “swelling” on the cerci of the other four species while being functionally a homoplasy (a convergence of unrelated characters) with the basoventral “tooth” on the cercus of the only distantly related *E. ophibolus* Group.

E. molossus departs widely from the species in the *E. ophibolus* Group if we consider, for example, the latter group’s posterior hamules (tapered and pointed, but without recurved apical teeth), the overall configuration of the cercus (dorsal lobe and/or decumbent terminal process prominent) and, especially, the extreme recurvature of the epiproct (exceeding 180° in some). In the genus as a whole, the epiproct is said by Garrison to be recurved upward to “at least 110 degrees (p. 177).” In *E. molossus*, this curvature is approximately 100°.

Even if imperfectly, the preponderance of individual traits combine to ally *E. molossus* with the *E. crotalinus* Group and with the *E. crotalinus* Subgroup. Most, but not all, species in this subgroup share some close structural similarities with (eight species) based primarily on the respective presence or absence of an elongated lateral lobe on penis segment 4. Most, but not all, species in the *E. crotalinus* Subgroup share some close structural similarities with *E. molossus*. These include the anterior and posterior hamule configuration, small and denticled lateral lobes (except in *E. designatus*) and, among females, the general configuration of the subgenital plate. These similarities notwithstanding, other clearly anomalous characters of *E. molossus* (such as the unique cercus and epiproct tips) suggest to us that this new species might best be placed, at least provisionally, in its own monotypic subgroup within the larger *E. crotalinus* Group.

Habitat, behavior and distribution. *Erpetogomphus molossus* is, to date, known only from the pine-oak-forested mountainous terrain in the southeast quarter of the Yécora municipio very close to the Sonora/Chihuahua border. The type locality and that of all specimens examined is one (Fig. 12) of several small, unnamed streams feeding El Aguaje, an only slightly larger stream approximately 15 km SE Yécora at an elevation of 1385 m. The streams are spring-fed and heavily canopied. At least three comparably sized streams in the immediate area harbor populations of *E. molossus*. It has also been found to the northeast along a small drainage to the Cienega Camilo, some 6 km ENE of the village of Kipor and 16 km ENE of the town of Maycoba.

Males perch typically on sunlit rocks and twigs close to the water’s surface. Females were encountered perching on weed and shrub tips just outside the riparian corridor. Records, so far, are from early to mid-September, although a more extended adult flight season is presumed.

Four species of *Erpetogomphus* (*E. bothrops*, *E. compositus*, *E. elaps* Selys and *E. lampropeltis natrix* Williamson and Williamson) have been recorded commonly from Sonora. An additional fifth Sonora species, *Erpetogomphus crotalinus* (Hagen in Selys), was reported in June 1987 (obs. B. Kondratieff, cited also by Garrison, 1994, p. 229). We know of no further Sonora records of this species since 1987, although records exist from Arizona’s Cochise County (coll. Minter Westfall, see Garrison, 1994, p. 229) *Erpetogomphus molossus*, thus, becomes the sixth species of the genus known to occur in Sonora. Of these six, three currently inhabit the east-central uplands of the state. These are *E. elaps*, *E. lampropeltis* and *E. molossus*; *E. bothrops* occurs nearby in the western portion of the Yécora municipio though at lower elevation. The Sonora species are compared in Table 1.

TABLE 1.

Character	<i>E. bothrops</i>	<i>E. elaps</i>	<i>E. lampropeltis natrix</i>	<i>E. molossus</i>
total length (approx.)	44 mm	42 mm	50 mm	48 mm
hindwing length (approx.)	26 mm	25 mm	32 mm	31 mm
ground color of anterior of thorax	green	green	pale blue-green	bright turquoise
humeral stripe	humeral stripe and antehumeral stripe prominent but not connected	vestigial, reduced to upper 1/3 of humeral suture	thick humeral and antehumeral stripes usually connected at top, bottom and 3/4 point	thick humeral and antehumeral stripes usually connected at top, bottom and 3/4 point
lateral thoracic pattern	thin brown stripes on interpleural and metapleural sutures often interrupted or, at times, absent	unstriped	two thin brown lateral stripes	one thin, faint brown stripe on metapleural suture
number of full-width cells in second anal interspace	two	two	two	usually one, sometimes two
shape of cerci	tapering evenly to downcurved, somewhat forcipate and toothed tips; basoventral process present but shallow	straight, no narrowing; tip rounded	abrupt downward angle at 2/3 length; tip pointed	narrow in middle, tip bulbous in lateral view; very large decumbent process at base
length of epiproct	intersecting cerci at 80% of their length	half length of cerci	90% length of cerci	half length of cerci
shape of epiproct	smoothly upturned, narrowed and elongated to chiseled or bidentate tips	smoothly upturned, narrowed and elongated to obliquely chiseled tips, untoothed	smoothly upturned, rounded and divergent at tips, untoothed	upturned to irregular truncated tips; black tooth projecting forward from outer margin before each tip
abdomen color and pattern	S1-6 with pale dorsal stripes diminishing in length; S3-6 with black lateral stripe, S4-6 with pale basal annuli; club dark above, golden brown laterally	S3-6 dark; light blue-green dorsally, diminishing to rear; each segment with blue basal annulus; S7 mostly white; club rusty, slightly darkened above	S3-6 dark laterally, some white above, more below, each with pale basal annulus; S7 white on basal half; club mostly rust-colored	S3-6 black with white basal annuli; S7 mostly white on basal half; club mostly black
female vulvar lamina	anteromesal points slightly fused; posteromesal corners darkened but untoothed; lateral margins convex	narrow, blunt, widely separate; mesal margin concave	anteromesal points just touching, not fused	anteromesal arcs fused; posteromesal corners darkened, minutely toothed; adjacent margin excavate

Acknowledgements

A hearty thank you goes to several unknown miners who chanced to be in a Yécora restaurant at the same time that we were. They convinced us to visit the set of spring-fed creeks including El Aguaje which in turn led to the discovery of this new species. As always, thanks to Dennis Paulson who was present with us at its discovery and who, for several years, has good naturedly egged us on to describe and name this species. Our thanks go also to Rosser Garrison whose friendship and advice have benefited us greatly over the last ten years or so, and whose 1994 work on *Erpetogomphus* has been a constant and valued reference for us. The drawings for this description were provided by Mimi Kamp, to whom we offer our appreciation and our thanks.

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