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REDISCOVERY OF *TETRAOLYTTA GERARDI* (PIC) (COLEOPTERA: MELOIDAE), AN ENIGMATIC BLISTER BEETLE FROM BRAZIL: REDESCRIPTION AND TAXONOMIC PLACEMENT

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Abstract.—The monotypic genus *Tetraolytta* Pic, endemic to southern Brazil, has remained virtually unknown since its description. Previously assigned to the subfamily Meloinae near the genus *Lytta* Fabricius, the examination of the holotype of *T. gerardi*, its type species, as well as recently collected material, clearly shows the genus belongs to the Tetraonycinae close to *Tetraonyx* Latreille. This paper includes a redescription of *Tetraolytta gerardi* and a discussion of its position relative to the other genera of Tetraonycinae. The species is recorded developing in the nests of the bee *Monoeca haemorrhoidalis* (Smith) (Apidae).

Key Words: taxonomy, *Tetraolytta*, Tetraonycinae, Neotropics

The monotypic *Tetraolytta* Pic has remained one of the most poorly known taxa of Meloidae in the New World. Pic (1919) described the type species, *Lytta gerardi* Pic, from a single specimen, without providing details on its distribution (assumed to be from South America) and referred it to a new subgenus *Tetraolytta*. With only Pic's original description available, Denier, in a series of papers, proposed varying and confusing taxonomic treatments of *Tetraolytta*. Considering the name inappropriately formed, he originally introduced an unnecessary replacement name, *Picella* Denier. Although initially continuing to treat *Picella* as a subgenus (Denier 1933a: 37, note 1), in the same paper (p. 47) and a subsequent contribution (Denier 1933b) he elevated it to a genus close to *Lytta* Fabricius. Then, in his catalogue (Denier 1935), he used the correct name, *Tetraolytta*, but returned it as a subgenus of *Lytta*. Finally upon examining a specimen of *T. gerardi* from southern Brazil and impressed by its distinctiveness and lycid-like phenotype, Denier (1940) again elevated *Tetraolytta* to genus level. Although not discussing its taxonomic placement in that paper, it is clear that Denier continued to consider *T. gerardi* as related to *Lytta* (Meloinae: Lyttini). The systematic position of *Tetraolytta* has remained questionable. Pinto and Bologna (1999) suspected a relationship to the Tetraonycinae, but continued to treat the genus as a lyttine pending further study.

Until now, only Pic and Denier had examined specimens of *T. gerardi*. We have now had the opportunity to study recently collected material from southern Brazil, as well as its type, thereby allowing us to confirm our previous

suspicions of tetraonycine affinity. Herein we redescribe and figure *Tetraolytta gerardi*, formally transfer the species to the Tetraonycinae, and discuss its placement within the subfamily. The host of *Tetraolytta*, previously unknown, also is recorded.

Material Examined

The redescription of the monotypic *Tetraolytta* is based primarily on the male holotype of its type species deposited in the Pic Collection (Muséum National d'Histoire Naturelle, Paris, France). The type is well preserved except for absence of both hind tarsi. The holotype has the following labels: (a) "72" (small, square, light blue, printed). (b) "*Tethaonyx* (sic!) sp. desiré" (rectangular, white, handwritten by Pic). (c) "type" (small, rectangular, white, handwritten by Pic). (d) "TYPE" (rectangular, red, printed, not contemporary). (e) "? *Lytta Petaini* Pic" (rectangular, white, handwritten by Pic). (f) "sg. *Tetraolytta* Pic" (rectangular, white, handwritten by Pic). One of us (MAB) added the following label: (g) "*Tetraolytta gerardi* (Pic), M. Bologna det. 2003." The name *gerardi* was used upon description of the species (Pic 1919) but evidently never physically applied to the type.

Six additional specimens of this species also were studied. Collection data are as follows: Brazil (Paraná); Mananciais da Serra Reserve; Piraquara; 25°29′S, 48°59′W (1,029 m); 24-ix/29-x-2005; Armadilha de Emergencia 1, Area A; Léo Correia da Rocha Filho, collr. Beetles were collected as they emerged from the nests of the wild bee, *Monoeca haemorrhoidalis* (Smith) (Apidae). These specimens are deposited in the Bologna Collection, Università degli Studi "Roma Tre," Rome, and the Department of Entomology Research Museum, University of California, Riverside.

Taxonomic Treatment

Subfamily Tetraonycinae

Tetraonycinae, a strictly New World subfamily, now includes four genera: *Meloetyphlus* Waterhouse 1872, *Opiomeloe* Selander 1985, *Tetraolytta* Pic 1919, *Tetraonyx* Latreille 1805, all placed in a single tribe, Tetraonycini (synonym: Meloetyphlini Borgmeier 1937).

Diagnosis.—*Adult:* Maxillary galea unmodified. Pronotum with lateral margins of disk abruptly declivant to lateral surfaces. Tarsal claws without teeth, consisting of two curved blades of subequal width. Tarsi with penultimate segment generally as wide as long, that on at least foretarsus usually bilobed and wider than long. Male with sternum VII (5th visible) emarginate; sternum IX Y-shaped, relatively short; tergum IX consisting of two lateral tergites. Male genitalia with gonostyli fused only at base and to varying degree with gonocoxal piece; aedeagus with a single apically placed dorsal hook present or not; endophallic hook present and robust

First instar larva: Phoretic. Navicular. Head capsule with internal phragma at midline. Labial palpi absent. Spiracles of abdominal segment I greatly enlarged, projecting above surface, pedunculate. Larvae of only *Tetraonyx* and *Meloetyphlus* are known (MacSwain 1956, Bologna and Pinto 2001).

Comments.—Placement of Tetraonycini within Meloidae has varied. It usually has been treated as a tribe of Nemognathinae (Selander 1983, 1985), or a distinct subfamily (MacSwain 1956, Pinto and Bologna 1999). A recent phylogenetic study of the family based largely on first instar larval morphology (Bologna and Pinto 2001) supports subfamily status and hypothesizes a sister group relationship to Nemognathinae.

The short, bilobed tarsomeres distinguish adult Tetraonycinae from other subfamilies, except some species of the

primitive Eleticinae. Structure of the male genitalia and claws further distinguishes them from the Nemognathinae (Selander 1965). The internal cephalic phragma, absence of labial palpi, and structure of the first abdominal spiracles separate tetraonycine first instar larvae from all other Meloidae (MacSwain 1956, Bologna and Pinto 2001).

Meloetyphlus, *Opiomeloe* and *Tetraolytta* are monotypic; *Tetraonyx* is a large genus with 102 species (Selander 1983, Selander and Martinez 1984, Selander and Selander 1992). The subfamily is primarily Neotropical with relatively few *Tetraonyx* reaching the southern Nearctic (Selander 1983, 1985; Pinto and Bologna 1999). *Tetraonyx* has never been revised and most species are unknown to current workers. The only key to species, published over 120 years ago (Haag-Rutenberg 1879), is not only outdated but was incomplete at its inception (Selander 1983).

Genus *Tetraolytta* Pic 1919

Lytta (*Tetraolytta*) Pic 1919: 3; Denier 1935: 163. Type species: *Lytta* (*Tetraolytta*) Pic, by monotypy.

Picella Denier 1933a: 37 note 1 (as subgenus), p. 47 (as genus); 1933b: 237–8, 241 (as genus). Unnecessary replacement name (obj. jun. syn. of *Tetraolytta*).

Tetraolytta: Denier 1940: 802; Pinto and Bologna 1999: 592.

Diagnosis.—Elongate, moderately slender, superficially resembling Lycidae. Primarily black except orange laterally on pronotum and basal section of elytra. Head distinctly wider at eyes than at tempora, tempora not inflated; frons distinctly concave with a large smooth elongate bulla medially. Eyes large, immediately behind antennal sockets and above base of mandibles. Antenna not clavate, elongate, c. 0.7× elytral length in male, segments relatively broad, length of III–X not exceeding c. 2× segment width; XI distinct, elongate, twice as long as I and III, respectively in male, abruptly narrowed near midlength in both sexes; sexes varying slightly in segment proportions but otherwise antennae not dimorphic. Elytra planate somewhat widened posteriorly. Hind wings fully developed. First tarsomere of middle and hind legs elongate, length of metatarsomere I c. 1/2 length of entire tarsus. Aedeagus with one hook positioned at apex; endophallic hook well sclerotized.

Tetraolytta gerardi (Pic 1919) (Figs. 1–9)

Lytta (*Tetraolytta*) *gerardi* Pic 1919: 3; Denier 1935: 163.

Tetraolytta gerardi: Denier 1940: 802; Pinto and Bologna 1999: 592.

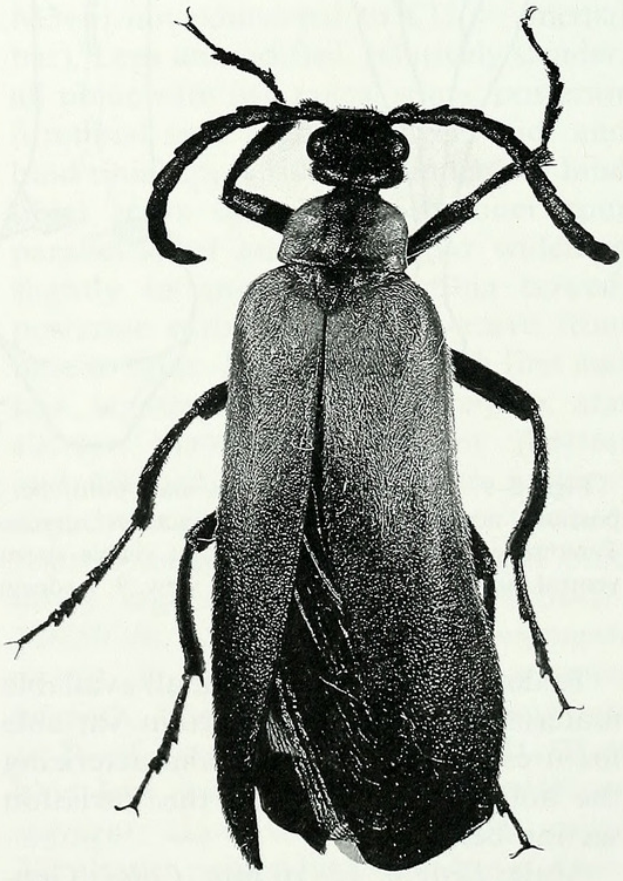
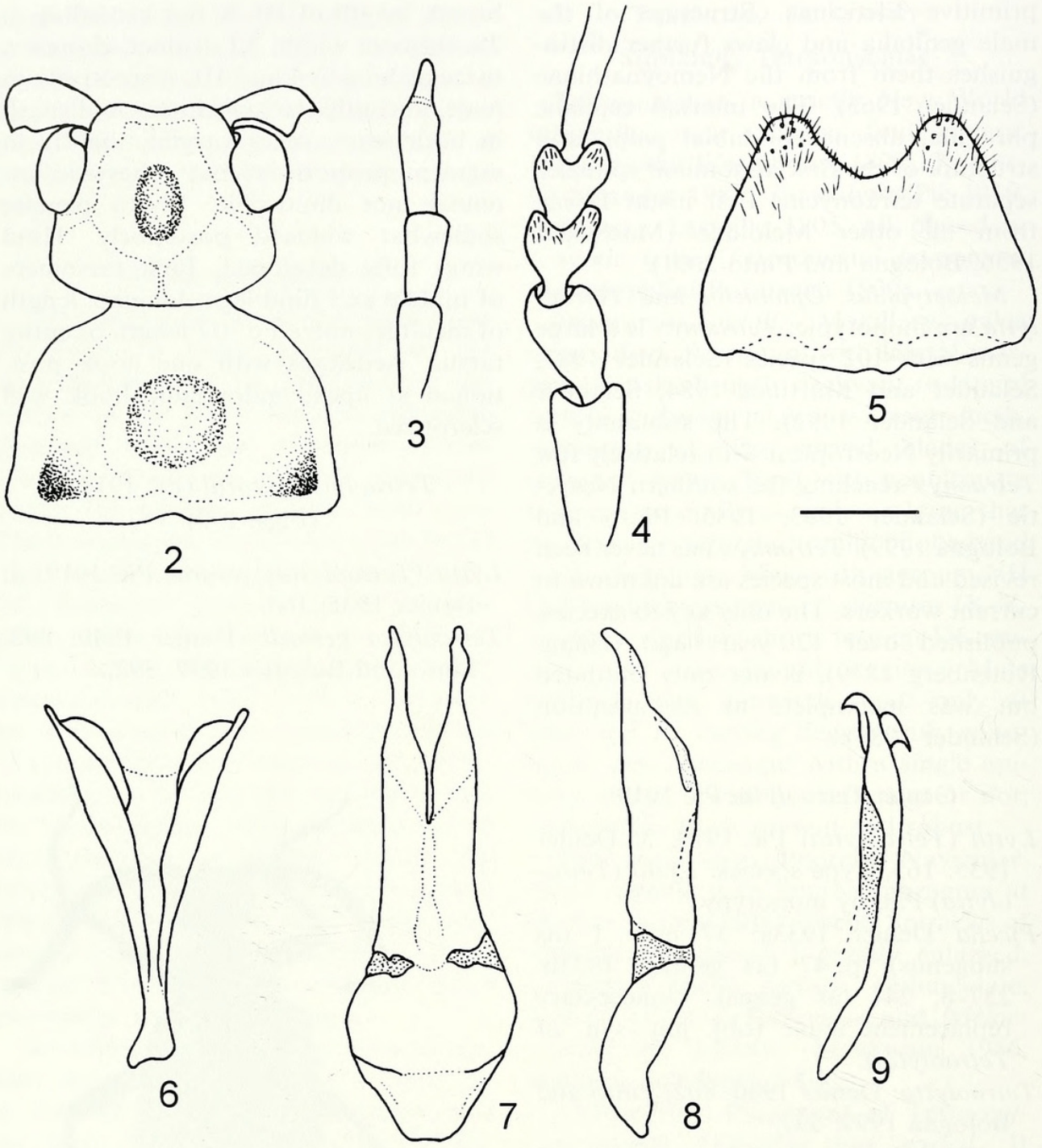


Fig. 1. *Tetraolytta gerardi*, female.



Figs. 2–9. *Tetraolytta gerardi*, male holotype. 2, Head and pronotum, dorsal view (densely stippled portions near center of both structures represent elevated areas). 3, Last three antennomeres. 4, Tarsomeres I–IV of foreleg. 5, Last visible sternum. 6, Sternum IX, spiculum gastrale. 7, Gonostyli, ventral view. 8, Gonostyli, lateral view. 9, Aedeagus, lateral view. Bar = 1.0 mm (2), or 0.5 mm (3–9).

Redescription.—Based on all available material. The states of certain variable features including those characterizing the holotype are given in the Variation section below.

Male. *Length:* 15–16 mm. *Color:* Generally black with considerable orange coloration on pronotum and elytra. Black or dark brown except apical margin of labrum orange, clypeus with a subapical transverse orange to light brown band, maxilla, labium and gular area varying from dark to orange brown; pronotum orange with a broad percur-

rent black medial stripe, width of stripe equal to or slightly greater than greatest scutellar width, stripe tapering posteriorly or not; scutellum black; forecoxa, prosternum, meso- and metapleural areas varying from dark to orange brown; elytra orange at anterior 1/2, black posteriorly, black coloration extending further anteriorly along suture and orange coloration narrowly extending posteriorly along lateral margin to a varying degree but never more than 1/2 length of black section; hind wing dark brown except subhyaline at basal 1/5. Vestiture relatively dense and moderately elongate dorsally but not obscuring cuticle, setation color generally as that of underlying cuticle (black or orange) with some mismatching on pronotum, scutellum and base of elytra. *Head* (Fig. 2): Distinctly narrower than pronotum (0.7–0.8× as wide), 0.8× as long as wide, width at tempora 0.9× greatest width at eyes; eye large, notched in dorsal 1/2, placed immediately behind antennal sockets; clypeus and labrum somewhat reclinate to head capsule; labrum extending well beyond 1/2 length of mandible, slightly emarginate; head capsule densely punctate, punctures small, less dense on vertex and occiput than on frons, vertex and frons moderately concave, with an elongate, moderately large levigate bulla on frons between eyes; frons more distinctly concave below eyes, elevated laterally and overlapping base of antennae; occiput with narrow longitudinal furrow at middle; mandible strongly curved at apical 1/2; palpi unmodified. Antenna elongate (Fig. 3), relatively robust; length/width of segments I–XI = 1.6, 0.6, 1.6, 1.9, 1.8, 2.1, 2.2, 2.0, 2.2, 2.2, 4.4; length of III subequal to I, segments IV–X each slightly longer than III, XI c. 2× length of III and I, respectively, XI abruptly narrowed from basal 0.6 to apex. *Thorax:* Pronotum (Fig. 2) subhexagonal, broad, c. 1.3× width of head at eyes, 0.66–0.70 as long as wide, widest at base, lateral margins of disk subparallel, very slightly sinuate and broadly ridged from base to anterior 1/3, then abruptly rounded and convergent to apex; disk usually with dense and relatively small punctures, highly uneven, middle area elevated, convex, lateral areas depressed, most distinctly so in basal 2/3, with a relatively deep suboval depression on each side connected via a transverse furrow near basal margin; lateral surfaces of pronotum almost perpendicular to disk, smooth, without punctures or setation. Scutellum broadly linguiform, with a shallow sulcus along midline, apex weakly emarginate. Mesosternum posteriorly depressed and sub-triangularly elongate; mesepisterna and metasternum wide. Elytra slightly widened posteriorly, discal surface relatively planate, surface rugulose. Hind wing as in *Tetraonyx frontalis* Chevrolat, 1833 (Kaszab 1959, fig. 56) except M2 (= RP) only extending c. 1/2 as far into radial field, and A1 (= M3+4) not connected to CU (= medial bar). Legs unmodified, relatively slender; all tibiae with two apical spurs, posterior foretibial spur slightly longer, mid- and hind tibial spurs subequal in length, hind tibial spurs spatulate with inner spur parallel sided and outer spur widening slightly to apex. Middle tibia bowed, posterior surface slightly concave from base to apex. Tarsi (Fig. 4) with first and last segments relatively elongate and slender, penultimate segment shortest and bilobed, antepenultimate segment slightly longer and more weakly bilobed; relative length of fore-, mid- and hind tarsal segments as follows:17/9/7/6/15, 12/6/4/3/8, 25/8/5/14; all tarsal segments except I with light colored setation beneath, these most dense on segments II–IV of fore- and midlegs and II–III of hind legs, relatively sparse on ultimate segment; claws strongly curved, apical 2/5 almost perpendicular to base. *Abdomen:* Sternum VII (5th visible) with

posterior margin broadly, shallowly emarginate; sternum VIII moderately emarginate (Fig. 5). Tergum IX consisting of a pair of well-developed, setose, lateral tergites; sternum IX (spiculum gastrale) (Fig. 6) Y-shaped, with a very short base, c. 0.7× as long as gonoforceps (Figs. 7–8). Gonostyli c. 1.7× length of gonocoxal piece, divided in apical 1/2, fused medially with gonocoxal piece, each gonostylus narrow, sinuate in outline, inflated immediately below apex (Fig. 7). Aedeagus (Fig. 9) 0.8× length of gonoforceps, with a single, relatively small dorsal hook apically, and a robust and pointed ventral endophallic hook.

Female. Non-genitalic features as in male except antennal segments III–XI more robust (Fig. 1), less elongate; length/width of segments I–XI: 2.0, 0.6, 1.3, 1.3, 1.4, 1.6, 1.7, 1.8, 1.8, 1.7, 3.0; XI only c. 1.5× length of I. Sternum VII (5th visible) not noticeably emarginate posteriorly; sternum VIII only slightly emarginate. Tergum IX as in males. Gonocoxites stout, relatively short, shorter than styli, gonostyli c. 5× as long as wide, curving slightly toward midline and widening slightly to apex.

Variation.—Minor variation between holotype and other specimens as follows: (a) gula, maxillae, labium and postocciput orange brown in type; these areas darker brown in other specimens; (b) color of prosternum, mesopleura and forecoxae orange brown in type; these areas vary from orange brown to brown in more recently collected material; (c) head punctation fine and sparse in type, whereas finely but densely punctuate in other specimens; (d) in the type the pronotal setae are yellow and sparse on the black area at middle of disk; these setae are black in the other specimens. The latter difference may be attributable to fading over time in the type.

Geographic distribution.—Southern Brazil; states of Paraná (see Material Examined) and Rio de Janeiro (Denier 1940).

Hosts.—Larvae associated with *Monoeca haemorrhoidalis* (Apidae); adult host plants unknown.

Discussion

The examination of recently collected material as well as the holotype of *Tetraolytta gerardi* supports transfer of this enigmatic species to the Tetraonycinae. Earlier placement in Meloinae was prompted by phenetic similarity to South American lyttine genera, i.e., *Megalytta* Selander. However the bilobed tarsal segments and fusion of the gonostyli with the gonocoxal piece in males alone are two tetraonycine synapomorphies separating *Tetraolytta* from all Meloinae.

Among the four genera of Tetraonycinae, *Tetraolytta* is most easily separated from *Meloetyphlus* and *Opiomeloe*. The latter two are characterized by Selander (1965, 1985). Wing and eye structure is distinct in these taxa. *Meloetyphlus* lacks eyes, and has strongly abbreviated elytra and vestigial hind wings (Selander 1965). In *Opiomeloe* compound eyes are present but are relatively small and clearly separated from the base of the mandibles, and its hind wings are abbreviated, narrow, with reduced venation and unfolded (Selander 1985). *Tetraolytta* is most similar to *Tetraonyx*. Characters separating *Tetraolytta* from the vast majority of *Tetraonyx* include those that provide *Tetraolytta* its phenetic similarity to lycid beetles, specifically the more elongate, narrower body form, the longer and heavier antennae with well-separated segments, and the more planate and posteriorly expanded elytra. This contrasts with most *Tetraonyx* species which are robust beetles with considerably shorter often subclavate antennae with closely appressed segments, and convex, posteriorly tapering elytra. Other distinct

differences in *Tetraolytta*, include the considerably longer and apically narrowed antennal segment XI, the smooth frontal bulla on the head, and the apically rounded lateral margins of the pronotal disk.

When discussing the possible tetraonycine affinity of *Tetraolytta gerardi*, Pinto and Bologna (1999) suggested a relationship to *Tetraonyx distincticollis* Pic 1916, a Brazilian species constituting the monotypic subgenus *Paratetraonyx* Kaszab, 1958. This purported relationship was based on comparisons from the literature. Upon examination of specimens of *T. distincticollis*, including the type (Muséum National d'Histoire Naturelle), we find little in common with *T. gerardi*. The only noteworthy similarity is the elongate first tarsomere of the middle and hind legs. In both species tarsomere I of the hind leg is subequal to half the entire tarsal length. This segment generally is considerably shorter in *Tetraonyx*. Although likely to be a derived feature, the lack of correspondence in other traits suggests convergence. Interestingly, both species have been collected together, parasitizing the same species of bee (L. Correia da Rocha Filho and J. Rozen, personal communication.).

Of greater interest are the two *Tetraonyx* species *T. superbus* Pic 1915 and *T. lycoides* Selander and Martinez, 1984, also assumed to be lycid mimics. In these species, as in *Tetraolytta gerardi*, the elytra are flared posteriorly which provides much of the lycid phenotype. Unfortunately both are known from single female specimens which we have not studied. Both species are separated from *T. gerardi* by color pattern, pronotal dimensions and size, and antennal structure. Unlike *T. gerardi*, both *Tetraonyx* have yellow markings on the legs and head. Furthermore, in *T. superbus* the elytra are costate; and in *T. lycoides* the head is divergent above the eyes and widest at the tempora, and the margins of the pronotal disk are not rounded at its apical third. Yet, *T. lycoides* at least, has certain interesting similarities to *T. gerardi*. In both species the antennae are decidedly atypical of *Tetraonyx*; they are longer, heavier, narrowing somewhat toward the apex, and in *T. lycoides*, subserrate. Also segment XI, although longer in *T. gerardi*, is abruptly narrowed distally in both species. Head and pronotal structure suggest that these similarities are convergent. General anatomy associates *T. lycoides* with Haag-Rutenberg's (1879) group A, whereas *Tetraolytta* is phenetically more similar to his group C.

Tetraolytta is inadequately separated from *Tetraonyx* at present. Only color pattern combined with the cephalic bulla, relatively narrow tempora, and anteriorly rounded pronotal disk margins will separate it from all *Tetraonyx* species known to us. Consequently, *Tetraolytta* may eventually be shown to be a derived lineage of *Tetraonyx* and that genus recognition renders the latter paraphyletic. We are not aware of any derived features of *Tetraonyx* that differentiate it from the other tetraonycine genera. Because *Tetraonyx* is such a large and poorly known genus it is impossible at present to provide a strong argument for or against generic separation of *Tetraolytta*. The same can be said for recognition of *Meloetyphlus* and *Opiomeloe*, the two other tetraonycine genera which may also be derived from *Tetraonyx* (see Selander 1985). Pending a better understanding of *Tetraonyx* diversity and a phylogenetic analysis of the subfamily we continue to tentatively recognize all four genera as distinct.

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