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Eppelsheimius: Revision, Distribution, Sister Group Relationship (Staphylinidae, Oxytelinae)

LEE H. HERMAN[1]

ABSTRACT

Eppelsheimius is a small genus of beetles that occurs in arid regions from northern Africa to southwestern Asia. The species share characters with *Planeustomus, Manda,* and *Bledius.* Evidence is presented that *Bledius* and *Eppelsheimius* are sister groups. The genus has two species, *E. pirazzolii* and *E. miricollis,* that are distinguished by many characters. Both species are variable. The genus and species are described and illustrated and their distributions described. One species, *E. persicus,* is newly synonymized with *E. pirazzolii.*

INTRODUCTION

The present paper was stimulated by a search for the sister group of *Bledius.* Earlier, but without supporting characters, Herman (1970, p. 354) presented two groups of genera as the sister group of *Bledius.* One of these groups, the *Carpelimus* lineage, includes *Carpelimus, Apocellagria, Trogactus, Thinodromus, Xerophygus, Ochthephilus, Mimopaederus, Teropalpus, Pareiobledius* and *Blediotrogus*; the other, the *Thinobius* lineage, includes *Thinobius, Sciotrogus,* and *Neoxus.* My own subsequent studies and those of others (Hammond, 1975, 1976; Newton, 1982) have pointed to a number of inadequacies in my phylogeny of the Oxytelinae (Herman, 1970, p. 354). One problem, the relationship of *Bledius* to *Epplesheimius,* is addressed herein; some others are discussed in a forthcoming paper on *Bledius* (Herman, in prep.). Ultimately, several rearrangements in the classification of the Oxytelinae will be required.

Eppelsheim (1885) described *pirazzolii* in *Oncophorus.* A second species, *miricollis,* was added by Fauvel (1898); both were from Tunisia. In 1915, *Oncophorus* was discovered to be a homonym of a genus of Mallophaga and a genus of "worms" of indeterminate placement. Bernhauer (1915) published a replacement name, *Eppelsheimius,* and a few years later Champion (1919), unaware of Bernhauer's change, proposed *Oncogenys* to supersede *Oncophorus.* Koch in a series of papers (1934, 1936, 1937) established the occurrence of the genus in many parts of northern Africa east to Iraq. *Eppel-*

[1] Curator, Department of Entomology, American Museum of Natural History.

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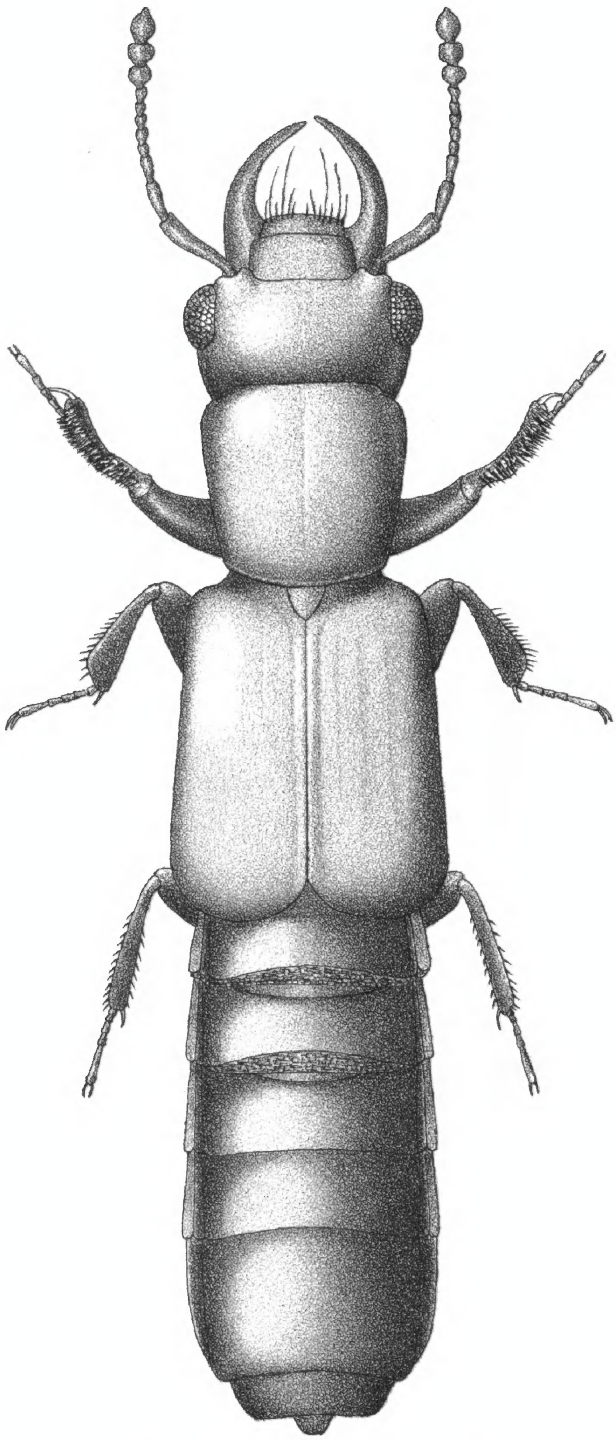


FIG. 1. *Eppelsheimius pirazzolii.*

sheimius was reported in southwestern Iran when Scheerpeltz (1958) described a third species, *persicus*. The genus was redescribed by Herman (1970, p. 369).

TABLE 1
Polarity of Some Character States of the Oxytelinae

Character	Plesiomorphic	Apomorphic
Labral setae	Short, slender	Long, stout (figs. 23, 36)
Hypopharynx	Apical lobe entire	Apical lobe bifid
Mandibular mola	Well developed	Reduced, nearly absent
Antennae	Not geniculate	Geniculate (fig. 26)
Gular sutures	Separated	Confluent (fig. 30)
Neck	Present, broad	Absent (figs. 1, 14, 41)
Clypeus	Large, at same level as dorsum	Narrow, depressed below level of dorsum
Eyes	Restricted to side of head	Extend onto ventral surface of head
Protibiae	Slender	Expanded (fig. 6)
Dorsal seta of epipharyngeal lobe	Absent	Present (figs. 23, 36)
Elytral suture	Straight	Dehiscent (fig. 1)

When Eppelsheim described the genus he placed it near *Manda* (cited as *Acrognathus*) and *Planeustomus* (cited as *Compsochilus*) because of unspecified similarities. Herman (1970, p. 355) found support for this hypothesis in the presence in the three genera of elongate, membranous epipharyngeal lobes (fig. 23).

Although I said (Herman, 1970, p. 355) that the species of *Eppelsheimius* share the enlarged, membranous, epipharyngeal lobes with *Manda* and *Planeustomus,* dissection of the species of *Eppelsheimius* reveals that only *E. pirazzolii* has enlarged lobes (figs. 10, 11, 23); *miricollis* has shorter but well-developed lobes (fig. 36). However, the epipharyngeal lobes of the species of the three genera do have apically bifurcate or multifurcate cuticular processes and the labrum of each has long stout labral setae (figs. 23, 36). Both of these features seem to be derived but I find no others that the three genera share.

Manda and *Planeustomus* share a narrow clypeus that is depressed below the level of the dorsum, eyes that extend onto the ventral surface of the head, reduction to near absence of the mandibular mola, and the bifid apical lobes of the hypopharynx. The first two of these four states are unique in the family. *Manda* and *Planeustomus* are a well-defined and supported group.

Eppelsheimius and *Bledius* share six derived features: confluent gular sutures (fig. 30), absence of a neck (fig. 1), expanded protibiae (fig. 6), a dorsal seta on the epipharyngeal lobe (figs. 23, 36), dehiscent elytra (fig. 1), and geniculate antenna (fig. 26; first segment elongate and the second segment posteriorly flexile on first). Some of these characters are found in other oxyteline genera but not in the combination found for *Bledius* and *Eppelsheimius.* The polarity of the character states given in table 1 was derived by their relative distribution in other subfamilies, particularly the Omaliinae, Piestinae, and Osoriinae. The apical lobe of the hypopharynx is entire, the mandibular mola well developed, the clypeus large and at the same level as the dorsum, the eyes restricted to the side of the head, the antennae normal (not geniculate), the gular sutures separated, the neck broad and weakly developed, the protibiae slender, the dorsal seta of the epipharyngeal lobe absent, and the elytral suture straight in most of the genera of the Osoriinae, Piestinae, and Omaliinae. Variation from these conditions in the Oxytelinae are derived (table 1).

No other genera of the Oxytelinae have the expanded protibiae. The configuration of the confluence of the gular sutures as found in *Bledius* and *Eppelsheimius* (fig. 30) is also found in the genera of the *Carpelimus* and *Thinobius* lineages (see Herman, 1970, p. 354). Dehiscent elytra are found in *Thinobius* and in some species of *Platystethus.* Species of *Coprophilus* and one of *Manda* lack a neck. Geniculate antennae are found only in *Bledius* and *Eppelsheimius.* The dorsal epipharyngeal seta is found in one species of *Manda.*

The hypothesis that *Eppelsheimius* is the sister taxon of *Bledius* rather than of *Manda* and *Planeustomus* is supported by the fact

that it shares six apomorphic features with *Bledius* but only two with the two other genera. Except as noted in the preceding paragraph, *Eppelsheimius* shares no other apparently derived features with other genera that are not shared by most genera of the subfamily. This hypothesis along with the relationship of *Eppelsheimius* and *Bledius* to other oxyteline genera is discussed further in a paper dealing with the phylogeny of *Bledius* (Herman, in prep.). The present paper is a first step toward understanding the relationships of the species of *Bledius* and of the genus to other genera of the subfamily. Many questions remain. What is the sister group to *Bledius* and *Eppelsheimius*? How are other genera, such as *Aploderus, Pareiobledius, Blediotrogus,* and *Xerophygus,* that share some derived characters with *Bledius* and *Eppelsheimius* related to them? What are the relationships of the genera of the *Carpelimus* and *Thinobius* lineages to *Bledius* and *Eppelsheimius* and to other genera of the subfamily? These and similar problems are beyond the scope of the present paper.

Based on similarities to *Bledius,* that is the expanded protibiae, the absence of a neck, and the subcylindrical body, I expect that species of *Eppelsheimius* make burrows in the soil. *Eppelsheimius,* as does *Bledius,* may use their elongate mandibles to excavate burrows. The absence of a neck permits the greater range of movement needed to pick up and deposit sand. The presence of a neck restricts the degree of rotation of the head. The expanded protibiae are not used by *Bledius* to construct a burrow, and it is unlikely that *Eppelsheimius* uses them in that way. Species of both genera may use them to facilitate agile movement in the burrow.

If *Eppelsheimius* and *Bledius* are sister taxa, several interesting comparisons can be made. *Bledius* has 420 species found in nearly all parts of the world. They burrow into the soil adjacent to fresh and saline water of rivers, lakes, ponds, and the ocean; some live in temporarily wet soil that is separated from standing water. They feed on algae. *Bledius* is highly variable anatomically; the degree of variation permits recognition of many species groups based on numerous characters. These groups often have more characters separating them than do some genera of the Oxytelinae. The species within each group may be extremely difficult to distinguish (Herman, 1972, 1976, in press, and in prep.).

By contrast, although *Eppelsheimius* might share the saline habitat with *Bledius,* it has a more restricted geographical and ecological distribution and is a relatively minuscule genus. However, the two species of *Eppelsheimius* are separated by as many characters as are some species groups of *Bledius.* This divergence in *Eppelsheimius* coupled with the intraspecific variation leads me to wonder whether the two species actually represent complexes of subtly distinguishable species. I was unable to detect discrete variation within the two recognized species with samples available to me.

Information on the habitat of species of *Eppelsheimius* has not been published or included on the specimen labels. Since all the localities from which the species have been taken are near salt water—either near the sea or near inland salt lakes, flats, and marshes it is probable that they live in saline habitats. Although the species have been collected only near salt marshes of northern Africa, along the coasts of the Mediterranean and Red seas, and at a few probably saline habitats in Saudi Arabia, Iraq, Iran, and the USSR (fig. 2), they are likely to occur near the salt lakes and salt marshes that are found across arid parts of Asia to China. The species are attracted to light.

In addition to querying the extent of the geographical range, further collection can determine where the species live, whether they make burrows, and if so how, what they eat, where the larvae live, and what their anatomical features are. The collection sites of *Eppelsheimius* are widely scattered (fig. 2) but near the Chott Djerid, a large salt marsh in Tunisia, 141 of the 217 specimens studied were collected. Chott Djerid would be an appropriate place to try to answer the preceding questions and perhaps others.

ACKNOWLEDGMENTS AND ABBREVIATIONS

Specimens used in this study were borrowed from the individuals and institutions

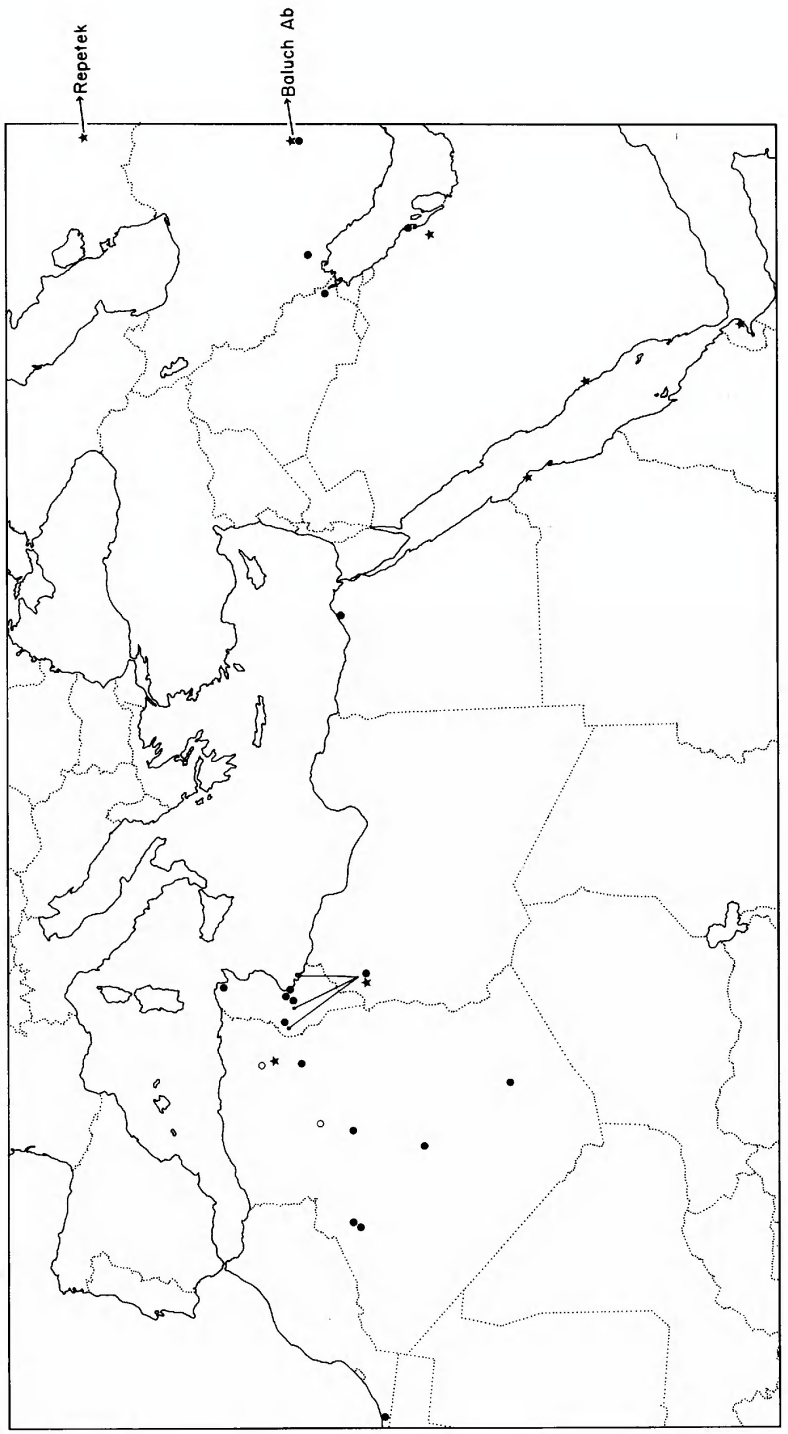


FIG. 2. Map of northern Africa, southern Europe, and the Middle East showing the distribution of *Eppelsheimius pirazzolii* (dots and open circles) and *E. miricollis* (stars). Open circles indicate record for *pirazzolii* taken from the literature but for which specimens were not examined. Repetek, USSR, and Baluch Ab, Iran are localities that are east of the limits of this map.

listed below. Abbreviations preceding the name of each institution are used in the text to indicate the location of specimens. The name of the person who lent the material follows the name of the institution. I gratefully thank them for their assistance. I especially thank Dr. Heinrich Schönmann, who lent types, Miss Beatrice Brewster, who translated articles from French and German, and Miss Joan Whelan, who took the scanning electron micrographs.

AMNH, American Museum of Natural History.
BMNH, British Museum (Natural History), London; Mr. Peter Hammond.
FMNH, Field Museum of Natural History, Chicago; Dr. Larry Watrous.
HCC, Dr. H. Coiffait, Toulouse.
IRSN, Institut Royal des Sciences Naturelles, Brussels; Dr. Léon Baert.
MGF, Museum G. Frey, via. Dr. Gerhard Scherer.
MHMV, Naturhistorisches Museum Wien, Vienna; Dr. Heinrich Schönmann.
MNHN, Muséum National d'Histoire Naturelle, Paris; Miss Nicole Berti.
MSNM, Museo Civico di Storia Naturale, Milano; Dr. Carlo Leonardi.
MTC, Marc Tronquet, Paris.
NHMB, Naturhistorisches Museum Basel, Basel; Dr. M. Brancucci.

EPPELSHEIMIUS BERNHAUER
Figures 1–49

Eppelsheimius Bernhauer, 1915, p. 270. Scheerpeltz, 1958, pp. 14–17. Herman, 1970, p. 369. TYPE SPECIES: *Eppelsheimius pirazzolii* (Eppelsheim).
Oncophorus Eppelsheim, 1885, p. 46; preoccupied. TYPE SPECIES: *Oncophorus pirazzolii* Eppelsheim.
Oncogenys Champion, 1919, p. 154. TYPE SPECIES: *Oncogenys pirazzolii* (Eppelsheim).

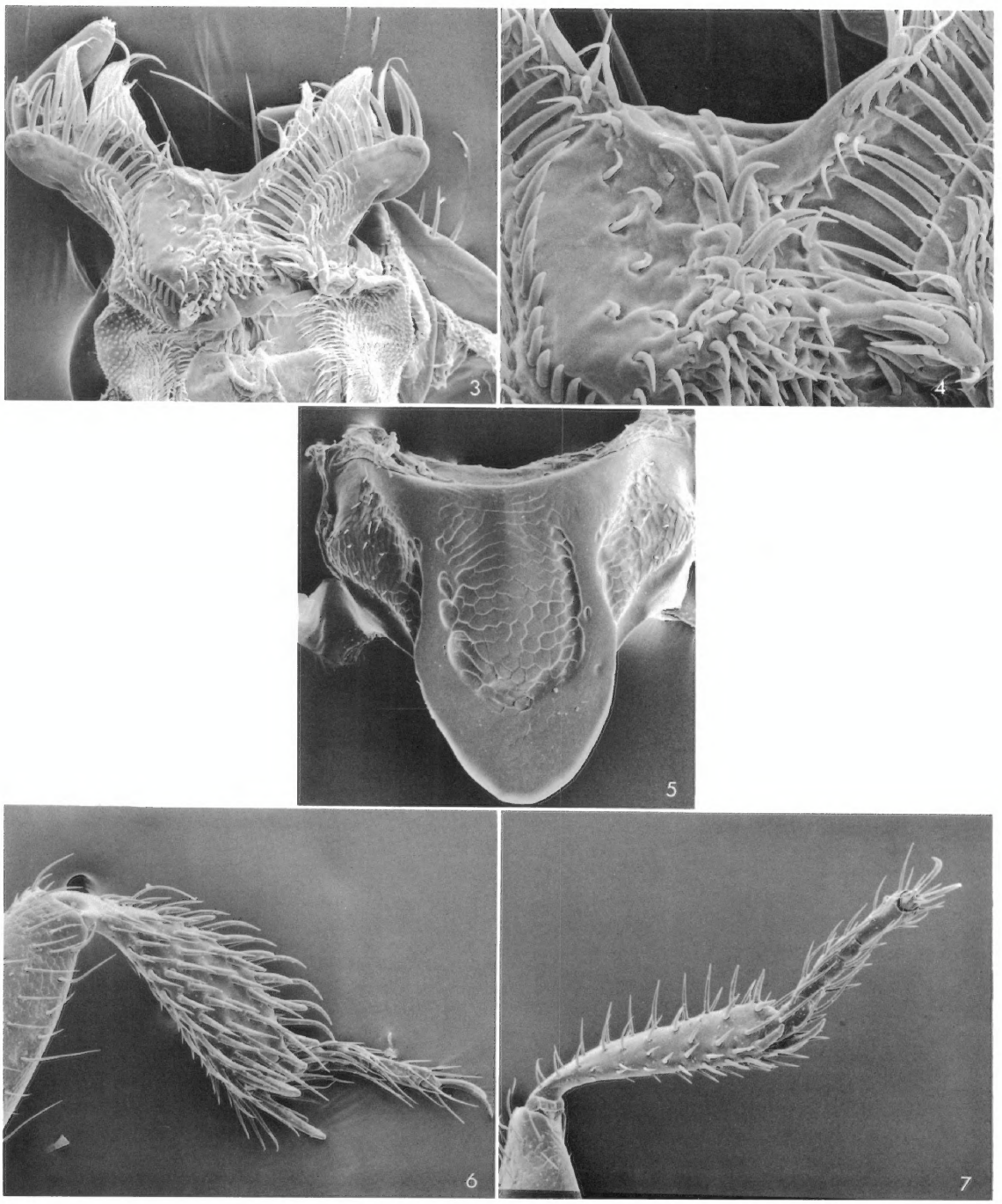
DIAGNOSIS: *Eppelsheimius* is separated from other genera of the Oxytelinae by the presence of an epistomal suture (fig. 14), geniculate antennae (fig. 26), open procoxal fissure (figs. 12, 46), spiniform submental processes (figs. 13, 16, 42, 45), confluent gular sutures (fig. 30), dehiscent elytra suture (fig. 1), absence of elytral epipleural ridges, presence of five tarsomeres, and expanded, spinous protibiae (fig. 6).

The genus is similar to *Bledius* in form and shares with it many characters. Except for the presence of five tarsomeres and the submental processes the diagnostic features cited in the preceding paragraph are found in all or some of the species of *Bledius*. The species of *Eppelsheimius* are more "loosely constructed" than are those of *Bledius*. The mesotibia of *Bledius* has two rows of spinelike setae; that of *Eppelsheimius* has one row of elongate setae among the scattered ones. The postprocoxal lobe is larger in *Bledius* than in *Eppelsheimius*. The genital appendages of the females of *Bledius* consist of a pair of elongate, flattened sclerites; those of *Eppelsheimius* are paired, elongate, transversely divided (into a coxite and a valvifer) and compressed (fig. 33).

DESCRIPTION: Length 3.1 to 6.8 mm.

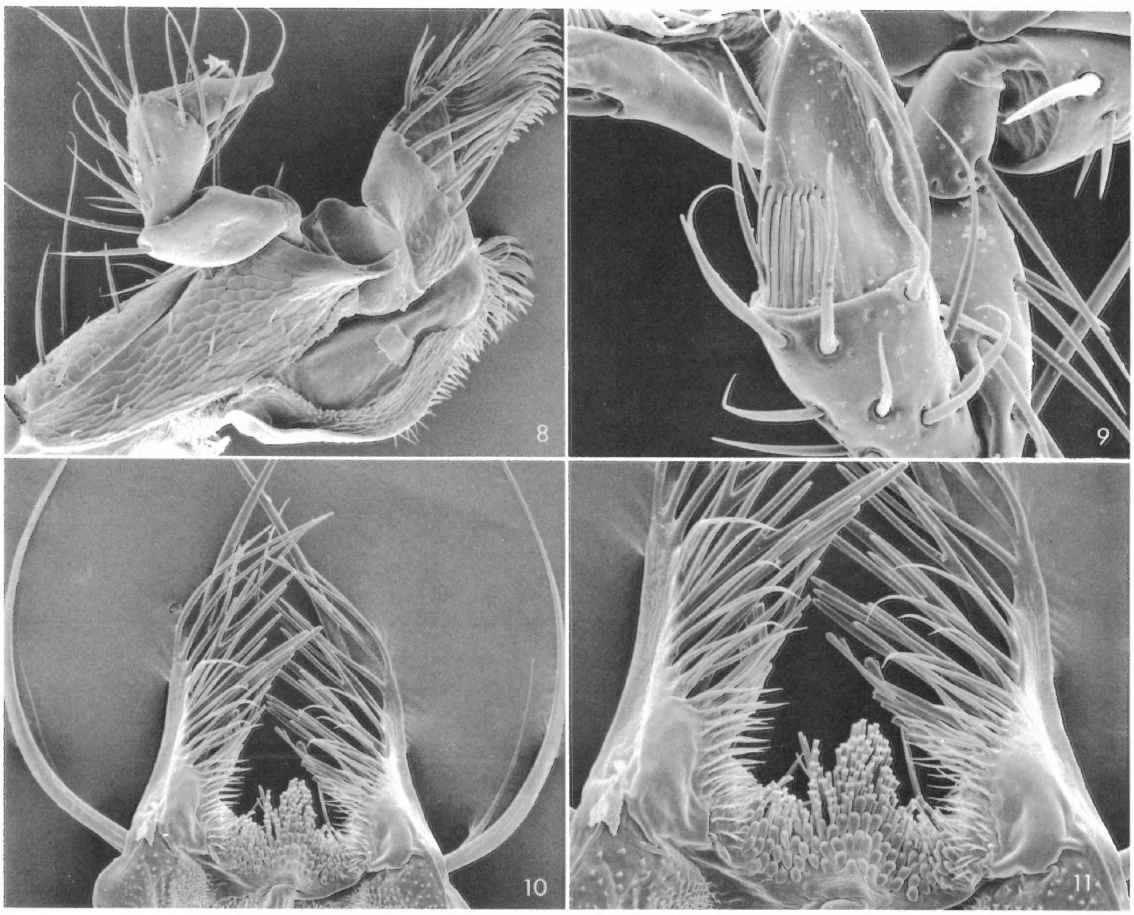
Color pale to dark reddish brown with yellowish brown elytra. Form slender and subcylindrical. Body sparsely pubescent.

Head (figs. 14, 41) sparsely pubescent and punctate; lateral margins gradually convergent from eyes toward base; neck absent, postocular transverse groove absent. Clypeal length variable. Epistomal suture straight; suture approximately even with anterior margin of supra-antennal ridge. Eyes (figs. 14, 41) slightly to moderately protruding from sides of head, not extending onto ventral surface. Supra-antennal ridge small. Anterior and dorsal tentorial arms present. Antenna (fig. 26) with first segment elongate and geniculate; segments 9, 10, and 11 expanded to form loose, well-defined club. Gular sutures (fig. 30) confluent for most of length, sutures sharply divergent at base. Submentum (figs. 13, 16, 42, 45) with short to long, slender to stout spiniform process on anterior lateral edge. Labium (fig. 21) with trapezoidal mentum; palpal segments subequal. Hypopharynx as in figures 3 and 4. Labrum (figs. 23, 36) fused, without midlongitudinal fissure; surface polished and with long, stout setae near anterior margin; posterior margin with long, posteriorly directed, internal strut on lateral edge; ventroposterior median surface with triangular internal strut. Epipharynx (figs. 23, 36) with short to long membranous, anteriorly directed lobe; lobe with long, slender, apically bifurcate process on mesial margin; epipharyngeal lobe with long, stout setae near base of dorsal surface. Maxilla as in fig-



FIGS. 3–7. *Eppelsheimius pirazzolii*. 3. Hypopharynx, 270×. 4. Hypopharynx, 674×. 5. Scutellum, 220×. 6. Protibia and tarsus, 105×. 7. Metatibia and tarsus, 121×.

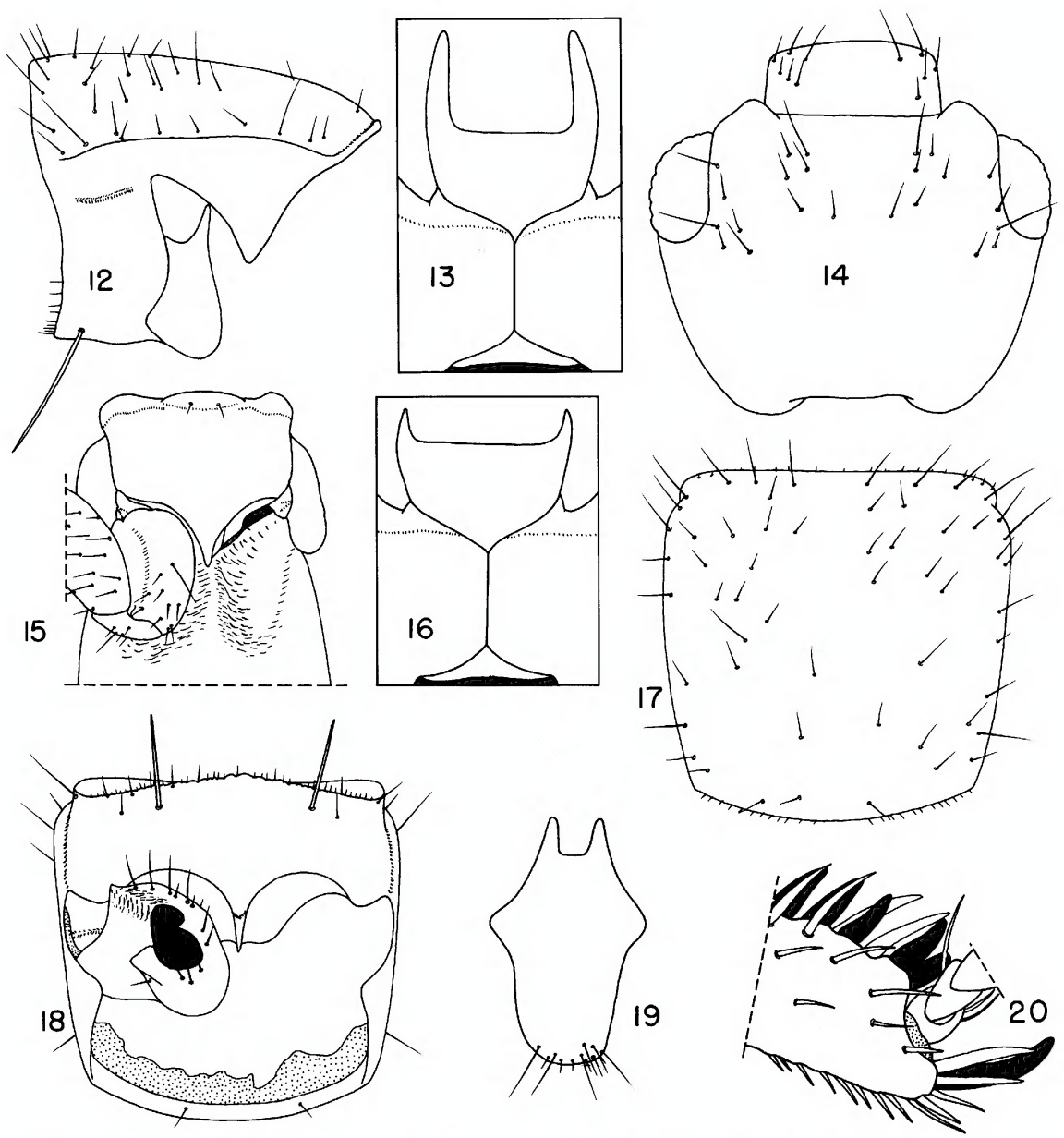
ure 8; fourth segment of maxillary palpus stout (fig. 9); galea (figs. 27, 35) with row of stout spinelike setae on dorsal surface; stipes (figs. 22, 38) with short to long spine on anterior margin of dorsal surface. Mandibles (figs. 25, 47) edentate, long, curved mesially, and



FIGS. 8–11. *Eppelsheimius pirazzolii.* 8. Maxilla, 206×. 9. Maxillary palpus, fourth segment, partially collapsed, 479×. 10. Epipharynx, ventral surface, 156×. 11. Epipharynx, ventral surface, 491×.

touching at apices when closed, but not crossing.

Pronotum (figs. 17, 44) longer than wide; lateral margins gradually curved to nearly straight or strongly sinuous with bulge near basal third; surface sparsely pubescent and punctate with shallow midlongitudinal groove. Pronotal lateral marginal bead present (fig. 12) or absent (fig. 46). Prohypomeron impressed anterior to coxae; postprocoxal portion present as small (fig. 46) to large (fig. 12) lobe. Protergosternal (figs. 12, 46) suture evident as weak ridge. Procoxal fissure present and widely open (figs. 12, 46). Protrochantin exposed. Prosternum (fig. 18) with long, stout setae anterior to procoxae; setigerous pit absent. Prosternal intercoxal process (figs. 12, 46) elongate, carinate and ventroposteriorly directed; ventral edge straight. Scutellum with apex slightly exposed to concealed under pronotum; surface with elongate oval impression (fig. 5). Elytra elongate; suture dehiscent (fig. 1); posterior margin without membranous lobe; epipleural ridge absent; surface sparsely punctate and pubescent and without longitudinal striae. Mesosternal (fig. 15) process short to moderately long and extending between coxae; process broad and tapered to acute apex. Mesocoxae (fig. 15) separated by mesosternal process and broad, rounded metasternal ridge. Mesendosternite (fig. 28) with expanded blunt apex; lateroposterior arm absent. Metendosternite (fig. 29) with long, narrow stalk and furcal arms;

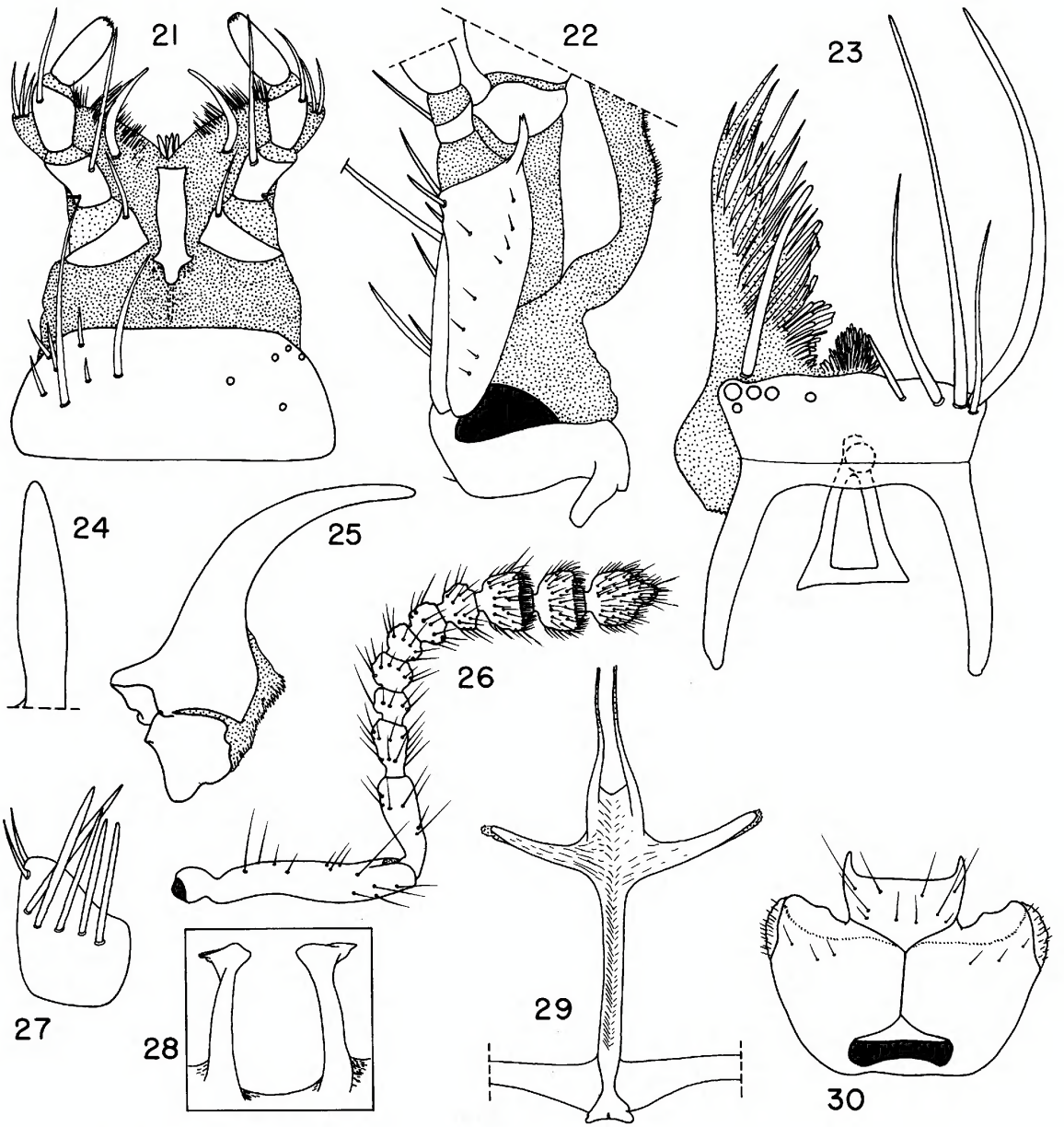


FIGS. 12–20. *Eppelsheimius pirazzolii.* 12. Prothorax, lateral view. 13. Submentum and gular region, male. 14. Head. 15. Pterothorax, ventral view. 16. Submentum and gular region, female. 17. Pronotum. 18. Prothorax, ventral view, left coxa removed. 19. Sternum IX, male. 20. Protibia, apex.

furcal arms sclerotized and anterolaterally directed; anterior tendons close to one another and arising from elongate median stalk.

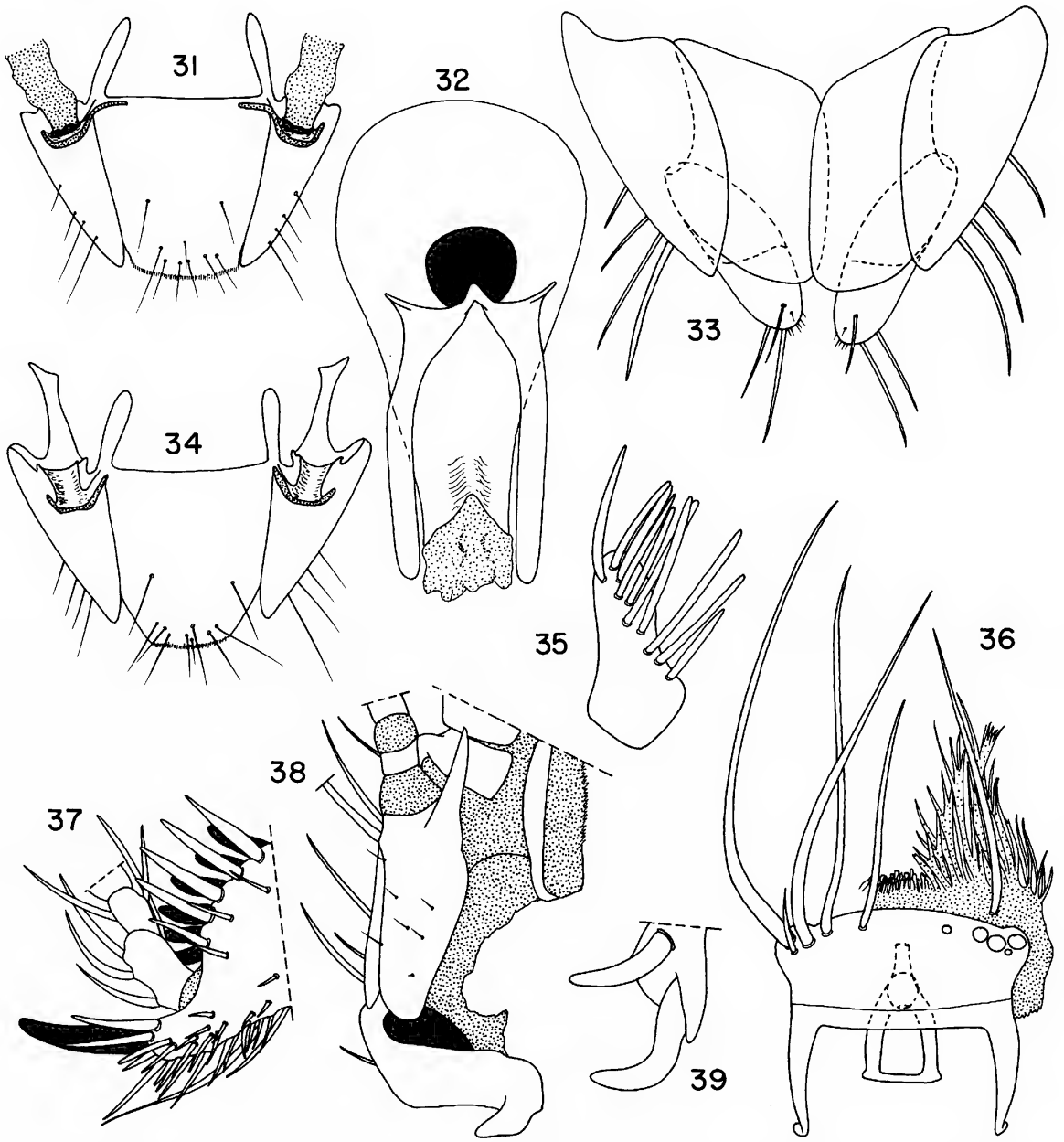
Procoxae broad and strongly expanded. Protibiae (fig. 6) strongly expanded; posterior surface with numerous spinelike setae and other stout setae; apex with pair of thick, spinelike setae (figs. 20, 37). Mesotibiae with one row of, and many scattered, elongate setae. Tarsal formula 5-5-5.

Abdomen with pair of elongate narrow sclerites (sternite I?) anterior to sternite II. Sternite II well developed; midlongitudinal carina absent. Terga without basolateral



FIGS. 21–30. *Eppelsheimius pirazzolii.* 21. Labium. 22. Maxilla, palps, galea, and lacinia removed. 23. Labrum, epipharyngeal lobe removed from right side and setae from left. 24. Mandible, lateroapical view. 25. Mandible, dorsal view, left. 26. Antenna. 27. Galea, dorsal surface, apical setigerous brush removed. 28. Mesendosternite. 29. Metendosternite. 30. Head, ventral view.

ridges. Tergum VII with fringe on posterior margin. Tergum VIII with posterior margin broadly and feebly emarginate. Segments II to VII each with one or two pairs of laterosternites. Tergum X (figs. 31, 34) nearly divided dorsally by tergum X, each half connected by narrow, sclerotized strap anterior to tergum X; strap fused to middle of anterior margin of tergum X; opening for abdominal glands with membranous dorsal surface. Ter-



FIGS. 31–34. *Eppelsheimius pirazzolii.* 31. Segments IX and X, dorsal view, female. 32. Aedeagus, dorsal view. 33. Segments IX and X, ventral view, female. 34. Segments IX and X, dorsal view, male.
FIGS. 35–39. *Eppelsheimius miricollis.* 35. Galea, dorsal surface, apical setigerous brush removed. 36. Labrum, epipharyngeal lobe removed from left and setae removed from right. 37. Protibia, apex. 38. Maxilla, palps, galea, and lacinia removed. 39. Protibia, spinelike setae of posterior apex.

gum IX of male (fig. 34) with long struts on anterior margin of ventromedial edges. Sternum IX of male flattened and of variable shape (figs. 19, 43). Tergum IX (fig. 31) of female with struts on anterior margin of ventromedial edge. Coxites ovoid and flattened (fig. 33). Valvifers flattened and of irregular shape (fig. 33). Stylus absent (fig. 33).

TABLE 2
Measurements (in Millimeters) for *Eppelsheimius pirazzolii*

	Width of head	Interocular width	Pronotal width at anterior margin	Pronotal length	Head width / Interocular width	Head width / Pronotal width
pirazzolii						
(All specimens, excluding type of *persicus*) (N = 40)	0.76[a] 0.04[b] (0.65–0.84)[c]	0.56 0.03 (0.48–0.63)	0.56 0.04 (0.55–0.76)	0.68 0.04 (0.57–0.77)	1.36 0.03 (1.30–1.41)	1.16 0.02 (1.10–1.21)
(Type)	0.81	0.61	0.69	0.74	1.33	1.17
(Iranian specimen)	0.78	0.57	0.65	0.68	1.37	1.20
persicus						
(Type)	0.72	0.50	0.58	0.60	1.44	1.24

[a] Mean; [b] standard deviation; [c] range.

Aedeagus (fig. 32) trilobed. Parameres stout, elongate and unmodified. Median lobe broad basally and with acute apex.

Spermatheca (fig. 40) membranous; spermathecal gland present.

DISTRIBUTION: *Eppelsheimius* is known from Morocco eastward across northern Africa to Buchara (fig. 2).

Eppelsheimius pirazzolii (Eppelsheim)
Figures 1–34; Table 2

Oncophorus pirazzolii Eppelsheim, 1885, p. 47. Fauvel, 1902, p. 73. (Type locality: Tunis, Tunisia.)

Eppelsheimius pirazzolii (Eppelsheim): Bernhauer, 1915, p. 270. Koch, 1934, p. 35; 1936, pp. 119, 134; 1937, p. 229. Scheerpeltz, 1958, pp. 14–16.

Eppelsheimius persicus Scheerpeltz, 1958, p. 14. (Type locality: Iran, Sultanabad. Type in Naturhistorisches Museum, Wien.) NEW SYNONYM.

DIAGNOSIS: *Eppelsheimius pirazzolii* can be separated from *miricollis* by the pointed mandibular apex (figs. 24, 25), long clypeus (fig. 14), presence of a pronotal lateral marginal bead (fig. 12), long postprocoxal lobe (fig. 12), and presence of two pairs of paratergites per abdominal segment. Numerous other characters that differentiate the two species are given in the description.

DESCRIPTION: Length 3.6 to 5.1 mm.

Color pale to dark reddish brown with yellowish brown elytra. Head black to pale reddish brown. Prothorax dark reddish brown to pale reddish brown. Elytra yellowish brown with pale reddish brown infusions along suture. Abdomen dark reddish brown to pale reddish brown; segments VII to X usually darker than anterior segments. Legs and antennae reddish brown.

Dorsum of head with moderately strong to weak ground sculpturing and surface shining dully to polished; pubescence (fig. 14) moderately dense. Head (fig. 14) moderately strongly convergent toward base. Clypeus less than 1.5 times wider than long (fig. 14); surface sparsely pubescent. Eyes protruding slightly from head (fig. 14). Submentum (figs. 13, 16) with anteriorly directed, straight process on each side; males (fig. 13) with long processes, female (fig. 16) with short processes. Maxilla with short anteriorly directed process on dorsal surface of stipes (fig. 22); galea with short row of five spiniform setae (fig. 27). Mandible (figs. 24, 25) tapered to apical point. First segment of antenna moderately sinuate in lateral view; segments 9, 10, 11 nearly cylindrical in cross section.

Pronotum with feeble ground sculpturing and moderately shining or without ground sculpturing and polished; surface (fig. 17) with moderately dense pubescence. Pronotum (fig. 17) with lateral margins gradually convergent from anterior angles to basal angles; lateral margin nearly straight to subsinuate; pronotum widest near anterior margin. Pronotal lateral marginal bead present (fig. 12); postprocoxal lobe present and moderately long (fig. 12). Protergosternal suture evident as feeble ridge. Prosternal intercoxal process short and extending between coxae (fig. 12).

Protibia (fig. 20) with short apical process anterior to thick curved apical spinelike seta. Mesosternal intercoxal process (fig. 15) moderately long and tapered apically; apex acute. Elytra with moderately dense short pubescence; surface without long setae.

Abdomen moderately densely pubescent. Abdominal segments II to VII each with two pairs of paratergites.

Male. Tergum IX (fig. 34) with slender anteriorly directed struts on dorsomedian edge; dorsal surface with pair of moderately long and slender, anteriorly directed struts on anterior margin. Sternum IX (fig. 19) broad, with pair of anteriorly directed lobes on anterior margin.

Female. Tergum IX without struts (fig. 31) on dorsomedian edge. Tergum X with moderately long and slender, anteriorly directed strut on anterior margin.

SEXUAL DIMORPHISM: The males have longer submental processes (fig. 13) than the females (fig. 16).

VARIATION: In spite of the description of an Iranian specimen of *pirazzolii* as a new species (Scheerpeltz, 1958), there is relatively little notable variation, certainly less than for *miricollis*. The characters used by Scheerpeltz are found widely in the species and in different combinations. Some of the variation of size is shown in table 2.

SYNONYMY: *Eppelsheimius persicus,* described by Scheerpeltz (1958) from one specimen, was the second report of the genus from the region of the southern border of Iran and Iraq (Koch, 1937). Until Koch's citation the genus was known from Algeria, Tunisia, Egypt, and French Somaliland (specimens from the last locality are *E. miricollis*). Scheerpeltz, possibly impressed by the magnitude of the geographical disjunction, sought characters that would distinguish the Iranian specimen from other species of the genus. With only one Iranian specimen and perhaps few of *pirazzolii* (only six were seen from the Scheerpeltz collection), it was inevitable that little consideration would be given to variation. All the characters that purport to distinguish *persicus* and *pirazzolii* can be bridged by specimens of *pirazzolii*. Although the types of *persicus* and *pirazzolii* can be distinguished by characters cited by Scheerpeltz (relative size of the eyes, antennal segments 2 and 3, pronotal, cephalic and elytral width, pronotal length and cephalic punctation and sculpturing), other specimens have these characters in a variety of combinations. Scheerpeltz indicates that the eyes of *persicus* are larger and bulge (laterally) more than the eyes of *pirazzolii*. To evaluate this I measured the width of the head across the eyes and the interocular width and made a ratio of the two, dividing the head width by the interocular width (table 2). The higher the resulting number, the more bulging the eyes. The head width/interocular width of *persicus* is 1.44. I measured 40 specimens of *pirazzolii* and included specimens from all localities. The range for head width is 0.65 to 0.84 mm., for interocular width 0.48 to 0.63 mm., and the ratio is 1.30–1.41. The head-interocular ratio is 1.40 to 1.41 for five specimens from five localities. The only other specimen known from Iran has a ratio of 1.37; the specimen from Iraq has a ratio of 1.38. The type of *persicus* does in fact have more bulging eyes but only barely.

Another character that is easily analyzed is the width of the head compared with the width of the anterior pronotal margin. Dividing the width of the head by the width of the pronotum gives a figure of 1.24 for *persicus* and a range of 1.10 to 1.21 for 40 specimens of *pirazzolii*. Four specimens from four localities (including the second Iranian locality) have a ratio larger than 1.20; many others are near 1.20. The head of *persicus* is relatively wider and the pronotum relatively narrower than specimens of *pirazzolii,* but again only slightly. In absolute measurements, *persicus* falls near the upper part of the range of variation seen for *pirazzolii*.

The characters used by Scheerpeltz are variable in *pirazzolii* and not greatly different in *persicus*. Further collecting, particularly from Iran and Iraq, probably will reveal sufficient variation to bridge the gap more definitively. I therefore regard *persicus* and *pirazzolii* to be conspecific.

Parenthetically, the holotype of *persicus* is a female, not a male as indicated by Scheerpeltz. Although I did not dissect the holotype, the coxites of the genital segment can be seen without dissection. The submental processes are short, as they are in other females of *pirazzolii*.

TABLE 3
Measurements (in Millimeters) for *Eppelsheimius miricollis*

	Width of head	Pronotal width at anterior margin	Pronotal width at widest	Pronotal length	Head width / Pronotal width at anterior margin
Large form	1.17[a] 0.04[b]	0.87 0.04	0.95 0.04	1.02 0.04	1.35 0.02
(N = 10; Tunisia)	(1.11–1.23)[c]	(0.82–0.94)	(0.90–1.01)	(0.98–1.07)	(1.29–1.38)
Intermediate form	0.96 0.02	0.71 0.02	0.80 0.03	0.87 0.03	1.36 0.03
(N = 5; Iran)	(0.93–0.98)	(0.67–0.72)	(0.75–0.84)	(0.84–0.91)	(1.33–1.42)
Small form	0.81 0.06	0.62 0.04	0.68 0.03	1.77 0.04	1.32 0.04
(N = 4; throughout range)	(0.71–0.91)	(0.57–0.68)	(0.63–0.72)	(0.69–0.82)	(1.26–1.41)

[a] Mean; [b] standard deviation; [c] range. The numbers are in the same sequence throughout the table.

HABITAT AND DISTRIBUTION: The species is known from Morocco across north Africa to Egypt then again in southeastern Iraq and southwestern and south-central Iran (fig. 2, see Material Examined).

None of the specimens have habitat data associated with them; a few specimens were collected at light. All the localities from which the species was collected were at or near saline habitats.

MATERIAL EXAMINED: 170 specimens.

Africa: (Type of *pirazzolii*; 1 female MHMV.) **Algeria:** Touggourt (1 MNHN), May 1898, L. Vareilles (1 BMNH), 7/2/29, A. Schatzmayr (1 BMNH; 2 MSNM), Levasseur (1 BMNH); Tidikelt, In Salah, central Sahara, April 24–30, 1912, Hartert and Hilg (1 BMNH); Massif du Hoggar, Peyerimhoff (4 MHMV); Oasis Beni-Abbes, sur Oranesado, J. Mateu (3 HCC); Beni Abbes, 4/5/65, R. Gauthier, at light (1 MNHN), April 13, 1963, J. Mateu, at light (1 MNHN), July 23, 1969 (1 MNHN); Zerhamra, northwest Sahara, 60 Km de [word illegible] Atlas, May 1961, F. Pierre (2 MNHN); M'Guebra, April 1887 (1 MNHN); El Golea (2 MNHN). **Egypt:** Mariut [Maryut], April 26, 1932, Priesner (1 MSNM; specimen missing head and prothorax). **Iran:** Sultanabad [=Soltanabad], Bodemeyer (Type of *persicus*; MHMV); Balout Chab lut [=Baluch Ab, about 100 km. NE Bam],[2] March 9, 1969, F. Pierre (1 MNHN). **Iraq:** Basra, April 1, 1936, Frey (1 MGF). **Morocco:** Tenouchan, November 3, 1971, H. Coiffait (10 HCC). **Saudi Arabia:** Dammam [Ad Dammam], May 18, 1976, W. Buettiker (1 NMMB). **Tunisia:** Bel Assel: (1 MNHN); Chott de Tozeur (1 MNHN); Tozeur, G. C. Champion (1 FMNH; 1 MHMV; 73 BMNH), May 1954, R. Demoflys (5 MTC; 5 AMNH); Kebili (3 IRSN), April 1887 (1 MNHN), R. Demoflys (10 MTC; 5 AMNH); Gabes (1 IRSN); Matmata, May 1939, R. Demoflys (1 HCC); Tunis (5 BMNH); El Hamma, May 1939, R. Demoflys (8 MTC; 2 AMNH); Kriz, April 1949, R. Demoflys, (1 MTC); DJ [Djebel]; Tebaga, May 1939, R. Demoflys (6 MTC); Zarzis, March 1950, R. Demoflys (2 MTC).

[2] The location of Baluch Ab was provided by Ms. N. Berti who contacted F. Pierre, the collector.

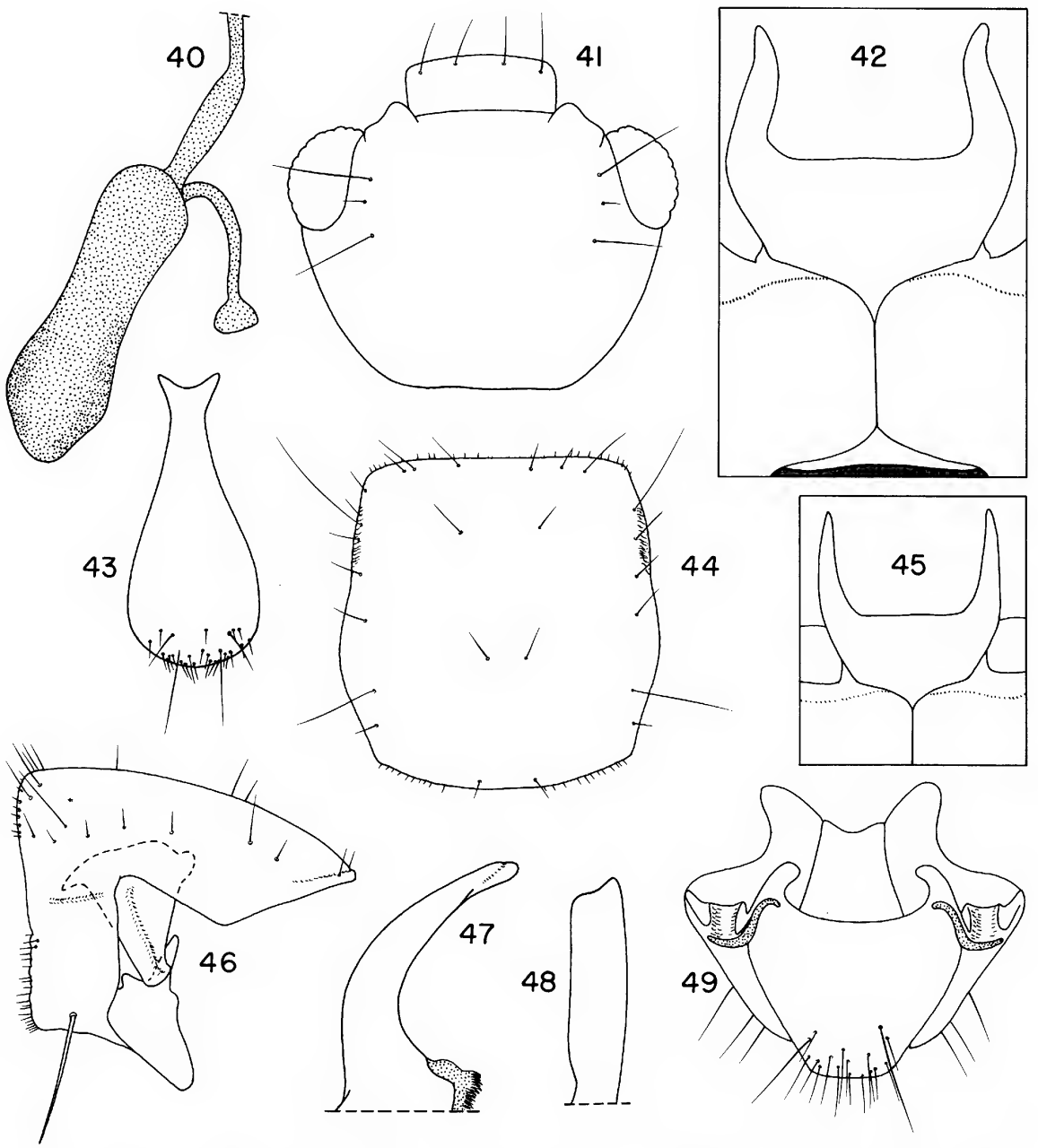
Eppelsheimius miricollis (Fauvel)

Figures 2, 35–49; Table 3

Oncophorus miricollis Fauvel, 1898, p. 96. Fairmaire, 1892, p. 79 (cited as *pirazzolii*). Fauvel, 1902, p. 73. (Type locality: I have not examined the type. In the original description two localities, "Province de Constantine" and "Tunisie," are cited.)

Eppelsheimius miricollis (Fauvel): Koch, 1934, p. 35; 1936, pp. 119, 134. Scheerpeltz, 1958, pp. 15–16.

DIAGNOSIS: *Eppelsheimius miricollis* can be separated from *pirazzolii* by the truncate, flattened mandibular apex (figs. 47, 48), short clypeus (fig. 41), absence of a pronotal lateral marginal bead (fig. 46), short postprocoxal lobe (fig. 46), and presence of one pair of



FIGS. 40–49. *Eppelsheimius miricollis*. 40. Spermatheca. 41. Head. 42. Submentum and gular region, large form. 43. Sternum IX, male. 44. Prothorax. 45. Submentum and gular region, small form. 46. Prothorax, lateral view. 47. Mandible, dorsal view, left. 48. Mandible, lateroapical view. 49. Segments IX and X, dorsal view, male.

paratergites per abdominal segment. Many other characters given in the description differentiate the species.

DESCRIPTION: Length 3.1 to 6.8 mm.

Color pale to dark reddish brown with yellowish brown elytra. Head and prothorax pale reddish brown, head paler than prothorax. Elytra yellowish brown with pale reddish

brown infusions along suture. Abdomen reddish yellow to reddish brown to dark reddish brown. Legs and antennae pale reddish brown.

Dorsum of head with feeble ground sculpturing and surface strongly shining to polished on central portion; lateral region adjacent to eye with strong ground sculpturing and dully shining; pubescence sparse (fig. 41). Head strongly convergent toward base (fig. 41). Clypeus more than 2 times wider than long (fig. 41); surface sparsely pubescent. Eyes (fig. 41) protruding moderately strongly from head. Submentum (figs. 42, 45) with anteriorly directed, sinuate (fig. 42) to straight (fig. 45) process on each side. Maxilla with long, anteriorly directed process on dorsal surface of stipes (fig. 38); galea with long row of 10 spiniform setae (fig. 35). Mandible (figs. 47, 48) tapered to blunt, emarginate apex. First segment of antenna strongly sinuate in lateral view; segments 9, 10, 11 compressed in cross section.

Pronotum with feeble ground sculpturing, surface polished; surface sparsely pubescent (fig. 44). Pronotum with lateral margins sinuous and widest just behind middle (fig. 44). Pronotal lateral marginal bead absent (fig. 46); postprocoxal lobe present and small (fig. 46). Protergosternal suture evident as feeble ridge. Prosternal intercoxal process long and extending between coxae (fig. 46). Protibia with long apical process (fig. 37) anterior to thick curved apical spinelike seta (fig. 39). Mesosternal intercoxal process short and tapered apically; apex acute to rounded. Elytra with sparse short pubescence; surface with a few, scattered long setae.

Abdomen sparsely pubescent. Abdominal segments II to VII each with one pair of paratergites.

Male. Tergum IX (fig. 49) with broad anteriorly directed struts on dorsomedian edge; dorsal surface with pair of short, broad, anteriorly directed struts on anterior margin; sternum IX (fig. 43) broad posteriorly, tapered anteriorly, then expanded near anterior margin; anterior margin with pair of anterolaterally directed lobes.

Female. Tergum IX without strut on dorsomedian edge. Tergum X with short, broad, anteriorly directed strut on anterior margin.

SEXUAL DIMORPHISM: None.

VARIATION: The size and several structures are notably variable. Table 3 describes some of the variation of size.

The species varies from 3.1 to 6.8 mm. long. The head width is 0.71 to 1.23 mm., and the pronotal length 0.69 to 1.07 mm. The largest individuals (5.5 to 6.8 mm. long) are from Zarzis and Kebili (Tunisia), intermediate ones are from Iran. The smallest individuals (3.1 to 4.9 mm. long) are found at many localities including Zarzis, Tunisia. At Zarzis four specimens, two of the large form and two of the small, were collected in October 1946; attached to them is the same handwritten label: "B-3380." All these specimens were presumably collected together. Other than size and the form of the submental processes, nothing separates them.

The form of the submental process varies from strongly sinuous (fig. 42) to straight (fig. 45). The large form has the sinuous processes, the small ones the straight ones. However, some of the small and intermediate specimens have weakly sinuous processes.

The mesosternal intercoxal process has an acute apex in most specimens of the large form, one has a blunt apex. The intercoxal process of the small form has a blunt apex, a few have an acute apex.

Specimens from most localities have a dark reddish brown abdomen; specimens from Obock, French Somaliland and Al Qunfudhah, Saudi Arabia have a reddish yellow abdomen.

HABITAT AND DISTRIBUTION: *Eppelsheimius miricollis* is known from 10 localities scattered from Algeria to Iran, the Soviet Union, and French Somaliland (fig. 2; see Material Examined). A few specimens were collected at light. *Eppelsheimius miricollis* and *E. pirazzolii* probably live in similar saline habitats; both species were collected at three localities in Tunisia and one in Iran.

DISCUSSION: The variation is sufficiently great as to suggest the possibility that *E. miricollis* is two species. At Zarzis and Kebili, Tunisia, seven specimens of a large form with sinuous submental processes were collected (see Variation). Two other specimens, much smaller and with straight submental processes were collected from Zarzis with two of the larger form. At all of the other localities the

specimens are small or intermediate between the two forms. The occurrence of a few specimens that seem to bridge the gaps between the large and small forms supports the hypothesis that *E. miricollis* is one variable species, not two. Further collecting with an emphasis on long series will permit testing of this idea. As of this writing only 45 specimens have been examined.

A specimen from Repetek, Buchara, although lacking a head and pronotum, can be identified by the presence of only one pair of paratergites per abdominal segment which is characteristic of *E. miricollis.*

MATERIAL EXAMINED: 45 specimens.

Algeria: Chott Melrhir, May 1891 (6 MHMV; 1 FMNH; small form). **French Somaliland:** Obock, G. Hardy (6 MNHN; small form). **Iran:** Balout Chab lut [=Baluch Ab, about 100 km. NE Bam],[2] March 9, 1969, F. Pierre (5 MNHN; intermediate form). **Saudi Arabia:** Hofuf, April 19, 1977, W. Buettiker (1 BMNH; 3 NHMB; small form); near El Gumfuda [=Al Qunfudhah], March 1936, R. C. M. Darling, at light (1 BMNH; small form). **Sudan:** Mersa Halaib, January 1, 1933, Priesner (1 MSNM). **Tunisia:** Kebili, May 1952, R. Demoflys (4 MTC; 3 AMNH; large form); Tozeur, May 1954, R. Demoflys (1 MTC; small form); Zarzis, October 1946 (4 MTC; large and small forms), December 1950 (1 MTC; large form), R. Demoflys. **U.S.S.R.:** *Buchara:* Repetek, April 1900, F. Hauser (1 FMNH; small form; head and prothorax missing).

In addition to the preceding specimens, I have studied one with the following data: Gr. Balachan, Dschebell, 1898, F. Hauser (FMNH). Dschebell is most probably Djebel for Mountain, the remainder is obscure. Two other specimens are labeled: Dschebell (MHMV).

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