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Studies on neotropical Phasmatodea IX: *Oreophoetes topoense* n. sp. — a new colorful walking-stick from central Ecuador (Phasmatodea: Diapheromeridae: Diapheromerinae: Oreophoetini)

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Abstract

Oreophoetes topoense n. sp. from Ecuador, Tungurahua Province, Rio Topo is described and illustrated for both sexes; eggs are described. It differs from all other species in the genus *Oreophoetes* Rehn, 1904, by a striking coloration and by morphological features of the insects' genitalia and eggs. Keys are provided to distinguish the four known species of *Oreophoetes* Rehn, 1904. The holotype of *Oreophoetes topoense* n. sp. is deposited in the State Zoological Collections Munich, Germany (ZSMC), paratypes in ZSMC and the private collections of the two first authors (coll. OC and coll. FH).

Key words

Phasmatodea, Diapheromerinae, Oreophoetini, *Oreophoetes topoense*, new species, Ecuador, keys

Introduction

The phasmid fauna of Ecuador is among the richest in the world: and on the eastern slopes of the Andes in particular is extremely diverse. The Phasmatodea inhabiting this area are still very poorly studied and contain a large number of new or rarely seen species. The third author (HK) collected various species along the Rio Topo in Tungurahua Province of central Ecuador and also eggs, these forwarded to the fourth author (BK) for breeding purposes. Successful breeding of some species by BK in 2008 provided adult insects; among these was an unidentified species of the peculiar genus *Oreophoetes* Rehn, 1904 (Diapheromeridae: Diapheromerinae: Oreophoetini). Careful examination of adult specimens of the captive-reared F1-generation revealed this to be an, as yet undescribed, species, now given herein: *Oreophoetes topoense* n. sp.

Rich material at hand from various localities throughout Ecuador and Peru shows the systematics of the genus *Oreophoetes* Rehn, 1904 to be highly complex and still very poorly understood. So far it contains three strikingly colorful species, all restricted to the eastern slopes of the Andes and western portions of the Amazon basin in Ecuador and Peru (Zompro 2002, Otte & Brock 2005). Since an extensive taxonomic revisional study of *Oreophoetes* is in preparation by the two first authors, the intrageneric arrangement will not be discussed in detail here: any taxonomic changes, clarifications of synonymies or descriptions of further new species and subspecies would be, premature.

Oreophoetes topoense n. sp., however, is described separately because it is widely distributed amongst European breeders, hence urgently needing a scientific name to prevent taxonomic confusion.

Abbreviations

ZSMC: Zoologische Staatssammlung, Munich, Germany
 FH: Private collection of Frank H. Hennemann, Kaiserslautern, Germany
 OC: Private collection of Oskar V. Conle, Bolsterlang, Germany
 HT: Holotype
 PT: Paratype

Genus *Oreophoetes* Rehn, 1904

Type species.—*Bacteria peruana* Saussure, 1868: 65, by original designation.

Oreophoetes Rehn, 1904: 56. Kirby, 1904: 350. Giglio-Tos, 1910: 31. Karny, 1923: 237. Hebard, 1924: 145. Bradley & Galil, 1977: 180. Clark-Sellick, 1997: 102. Clark-Sellick, 1998: 213, fig. 22g,h (egg). Brock, 1998: 302. Bragg, 2001: 639. Zompro, 2001: 53, figs 68,69 (genitalia of ♂, ♀), 122-123 (egg). Zompro, 2002: 145, figs 1 (♂), 2 (♀), 5-15 (genitalia and eggs). Zompro, 2004: 316. Otte & Brock, 2005: 236.

Allophylus Brunner v. Wattenwyl, 1907: 317 (Type-species: *Bacteria peruana* Saussure, 1868: 65, by subsequent designation of Hebard, 1924: 145). [Synonymised by Giglio-Tos, 1910: 31] Giglio-Tos, 1910: 31. Karny, 1923: 237. Hebard, 1924: 145 [Designation of type species]. Bradley & Galil, 1977: 180. Bragg, 2001: 622. Zompro, 2004: 304. Otte & Brock 2005: 236.

Bacteria, Saussure, 1868: 65 (in part). Saussure, 1870: 160, pl. 3: 12a, b (♂). Scudder, 1875: 278 (in part). Scudder, 1896: 205, 207 (in part).

Bacunculus, Giglio-Tos, 1898: 24, 25 (in part). Hebard, 1924: 145.

Heteronemia, Kirby, 1904: 348 (in part).

Distribution.— Eastern slopes of the Andes and western portions of the Amazon basin in Ecuador and Peru.

Species and subspecies included.—

1. *Oreophoetes mima* (Giglio-Tos, 1898: 25) [*Bacunculus*].

2. *Oreophoetes peruana peruana* (Saussure, 1868: 65) [*Bacteria*].

= *Bacunculus festae* Giglio-Tos, 1898: 22. [Synonymised by Giglio-Tos, 1910: 31]

= *Bacunculus festuca* Giglio-Tos, 1898: 24. [Synonymised by Giglio-



Fig. 1. *Oreophoetes peruana peruana* (Saussure, 1868), ♂, captive reared. See Plates.



Fig. 2. *Oreophoetes peruana peruana* (Saussure, 1868), ♀, captive reared (orange variety). See Plates.

Tos, 1910: 31]

= *Bacunculus* (?) *gramen* Giglio-Tos, 1898: 26. [Synonymised by Brock, 1998: 303]

3. *Oreophoetes peruana nigripes* (Scudder, 1875: 32) [*Bacteria nigripes*].

4. *Oreophoetes topoense* n. sp.

Keys to the species and subspecies of *Oreophoetes* Rehn, 1904

Some of the present synonyms (see above) are questionable and warrant further evaluation. The following provisional keys are based strictly on the original type specimens and confirmed conspecific material which, apart from other morphological features, also match with the types in regard to coloration.

Females:*

1. Antennomeres 3-20, uniformly black; mesothorax > 2× longer than head and pronotum combined 2
- Antennomeres 3-20, annulated; mesothorax 1.7× longer than head and pronotum combined *mima*
2. Apex of subgenital plate narrow and pointed (Fig. 14); abdominal segment II slightly transverse *topoense* n. sp.
- Apex of subgenital plate broad and blunt (Fig. 12); abdominal segment II wider than long *peruana peruana*
- * ♀♀ of *O. peruana nigripes* (Scudder, 1875) are not known.

Males:

1. Legs entirely black 2
- Femora only black apically *mima*
2. Body bright red with faint dark markings on abdomen (Fig. 1) *peruana peruana*
- Body (except head) mostly black 3
3. Abdomen entirely black; head with four distinct black spots dorsally (Figs 3, 4) *topoense* n. sp.
- Abdominal segments VIII-X yellow or red; no black spots on head *peruana nigripes*

Eggs:*

1. Polar area of capsule with deep transverse impression. *mima*
- Polar area of capsule at best with slight transverse impression 2
2. Capsule about as long as high (Fig. 9) *topoense* n. sp.
- Capsule distinctly longer than high (Fig. 7) *peruana peruana*
- * Eggs of *O. peruana nigripes* (Scudder, 1875) are not known.

Oreophoetes topoense n. sp. (Figs 3-6, 9, 10, 13, 14, 17, 18)

HT, ♂: ex Zucht: O. Conle 2008, F2-generation, Herkunft: C-Ecuador, Tungurahua Prov., Rio Topo 1600 m, leg. H. Käch, 2007, ex coll. O. Conle (ZSMC).

PT, ♀: ex Zucht: O. Conle 2008, F2-generation, Herkunft: C-Ecuador, Tungurahua Prov., Rio Topo 1600 m, leg. H. Käch, 2007, ex coll. O. Conle (ZSMC).

PT, 20 ♀♀, 20 ♂♂, 60 eggs: ex Zucht: O. Conle 2008, F2-generation, Herkunft: C-Ecuador, Tungurahua Prov., Rio

Topo 1600 m, leg. H. Käch 2007 (coll. OC).

PT, 3 ♀♀, 2 ♂♂, 19 eggs: ex Zucht: F. Hennemann 2008, F2-generation, Herkunft: C-Ecuador, Tungurahua Prov., Rio, Topo 1600 m, leg. H. Käch 2007 (coll. FH, No's 0661-1 to 5 & E1).

PT, 10 ♀♀, 10 ♂♂, 40 eggs: ex Zucht: F. Hennemann 2009, F3-generation, Herkunft: C-Ecuador, Tungurahua Prov., Rio, Topo 1600 m, leg. H. Käch 2007 (coll. FH, No's 0661-6 to 15 & E2).

Etymology.— The specific name "*topoense*" refers to the type locality, the Rio Topo in central Ecuador, where this new species was first collected by the third author in 2007.

Diagnosis.— This new species is closely related and very similar to *O. peruana peruana* (Saussure, 1868) and *O. peruana nigripes* (Scudder, 1875) with which it shares the uniformly black antennae of the females and entirely black legs of the males. It differs from *O. peruana peruana* by the smaller size, different coloration (dull yellow to reddish orange in *peruana peruana*, Fig. 2), distinct pale transverse median band of the profemora, shorter, slightly transverse abdominal segment II, and more pointed apex of the subgenital plate of the female (Fig. 14). Males differ from those of *O. peruana peruana* by the smaller size, less convex and posteromedially indented poculum (Fig. 18), slightly club-shaped apex of the cerci, differently shaped vomer (Fig. 18), and black scapula and body (bright red in *peruana peruana*, Fig. 1). *O. topoense* is distinguished from the male of *O. peruana nigripes* (the only sex known) by the entirely black abdomen, having four distinct black spots on the vertex and a less bulging poculum. The eggs are very similar to those of *O. peruana peruana* or *O. mimia*, but differ from the former by a broader capsule, this being, in *O. peruana peruana*, about as long as high; they differ from *O. mimia* by the less conspicuous impression of the polar-area (Figs 9, 10).

Description.—Coloration is described from live captive-reared specimens. Captive breeding for three generations has not revealed any considerable color deviation from that of the original wild-caught insects.

Female: (Figs 5, 13, 14): moderately sized (body length 55.3 to 60.1 mm) and shape rather typical for the genus (Fig. 5).

Coloration.— General color of body black with green longitudinal dorsomedian line starting on mesonotum and terminating near posterior margin of abdominal segment VII; same segments with fine longitudinal pale yellow to slightly greenish line along lateral margins. Head pale yellow to slightly greenish, with four distinct black spots on vertex and an elongate black spot in posterior portion of cheeks; anteroventral angle of head capsule with further indistinct black marking. Antennae and eyes black. Pronotum with yellow longitudinal line and broadly yellow laterally. Prosternum and profurcasternite yellow to pale green, the former black anteriorly and the latter sometimes with a few black markings in center. Meso- and metasternum black with faint yellowish longitudinal line along ventral margin. Posterior portion of meso- and metapleurae and sterna yellow to pale greenish. Coxae yellow to pale-greenish with a black marking dorsally; procoxae with a further black spot ventro-apically. Anal segment yellow with the anteromedian portion black. Abdominal sternites dull yellow to drab and each with a large but weakly defined blackish brown central marking. Subgenital plate yellowish-green with black longitudinal median line in basal half (Fig. 14); sometimes with a few indistinct black patches laterally.



Fig. 3. *Oreophoetes topoense* n. sp. ♂ PT (in OC). See Plates.



Fig. 4. *Oreophoetes topoense* n. sp. ♂ PT (in OC). See Plates.



Fig. 5. *Oreophoetes topoense* n. sp. ♀ PT (in OC). See Plates.



Fig. 6. Type locality of *O. topoense* n. sp., near the Rio Topo (Tungurahua Province, Ecuador) at 1600 m. See Plates.



Figs 7-10. Eggs of *Oreophoetes* spp. [scale = 1mm]. 7. *O. peruana peruana* (Saussure, 1868), lateral view; 8. *O. peruana peruana* (Saussure, 1868), dorsal view; 9. *O. topoense* n. sp., lateral view; 10. *O. topoense* n. sp., dorsal view. See Plates.

Cerci yellow to pale greenish with the apical portion black. Legs mostly black with knees bright yellow to pale greenish. Femora each with one distinct creamish-white transverse band postmedially; tibiae with two creamish white transverse annulations in median portion. Tarsi black with ventral surface dark brown.

Head: Ovoid and 1.3 to 1.4× longer than wide. Eyes small, slightly oval and contained more than 3× in length of cheeks. Antennae about as long as body. Antennomere III distinctly longer than scapus and pedicellus combined.

Thorax: Pronotum shorter and narrower than head, roughly rectangular and about 1.2 to 1.3× longer than wide. Mesonotum 4× longer than pronotum and 2× longer than metanotum. Metanotum 4× longer than median segment.

Abdomen: Shorter than head and thorax combined. Median segment 3× wider than long. Tergite II very slightly wider than long, III-VI about as long as wide, roughly quadrate and wider than other segments. VII slightly longer than wide and narrowing towards the posterior. VIII 1.5× longer than wide and distinctly more narrow than previous. IX slightly wider than long and roughly quadrate. Anal segment about equal in length to IX, with posterior margin broadly rounded and almost straight posteromedially. Cerci round

in cross-section, distinctly tapered towards apex and about equal in length to anal segment. Subgenital plate boat-shaped, strongly convex in medial portion and reaching about half way along anal segment; apex narrow and pointed (Figs 13,14).

Legs: Long, slender and unarmed as typical for the genus. Profemora about as long as pro- and mesonotum combined, mesofemora slightly shorter than mesonotum and metafemora, reaching to abdominal segment VII. Basitarsus slightly more than 3× the length of 2nd tarsomere.

Males: (Figs 3, 4, 17, 18) Moderately sized (body length 43.5 to 52.2 mm) with shape typical for the genus (Figs 3, 4). Much more slender than female and coloration very different.

Coloration.— General color of body and legs plain black, slightly shiny. A very few specimens show an indistinct longitudinal dorso-median and interrupted line on thorax and abdomen. Head bright red with four distinct black spots on vertex and a much smaller black spot posterolaterally. Antennae and eyes black. Pronotum with a fine red longitudinal dorsomedian line and lateral margins red. Prosternum bright red, with a distinct black spot anteromedially. Posterior portion of meso- and metapleurae and sterna bright red. Coxae red with a black marking dorsally; procoxae with a further black spot ventro-apically.

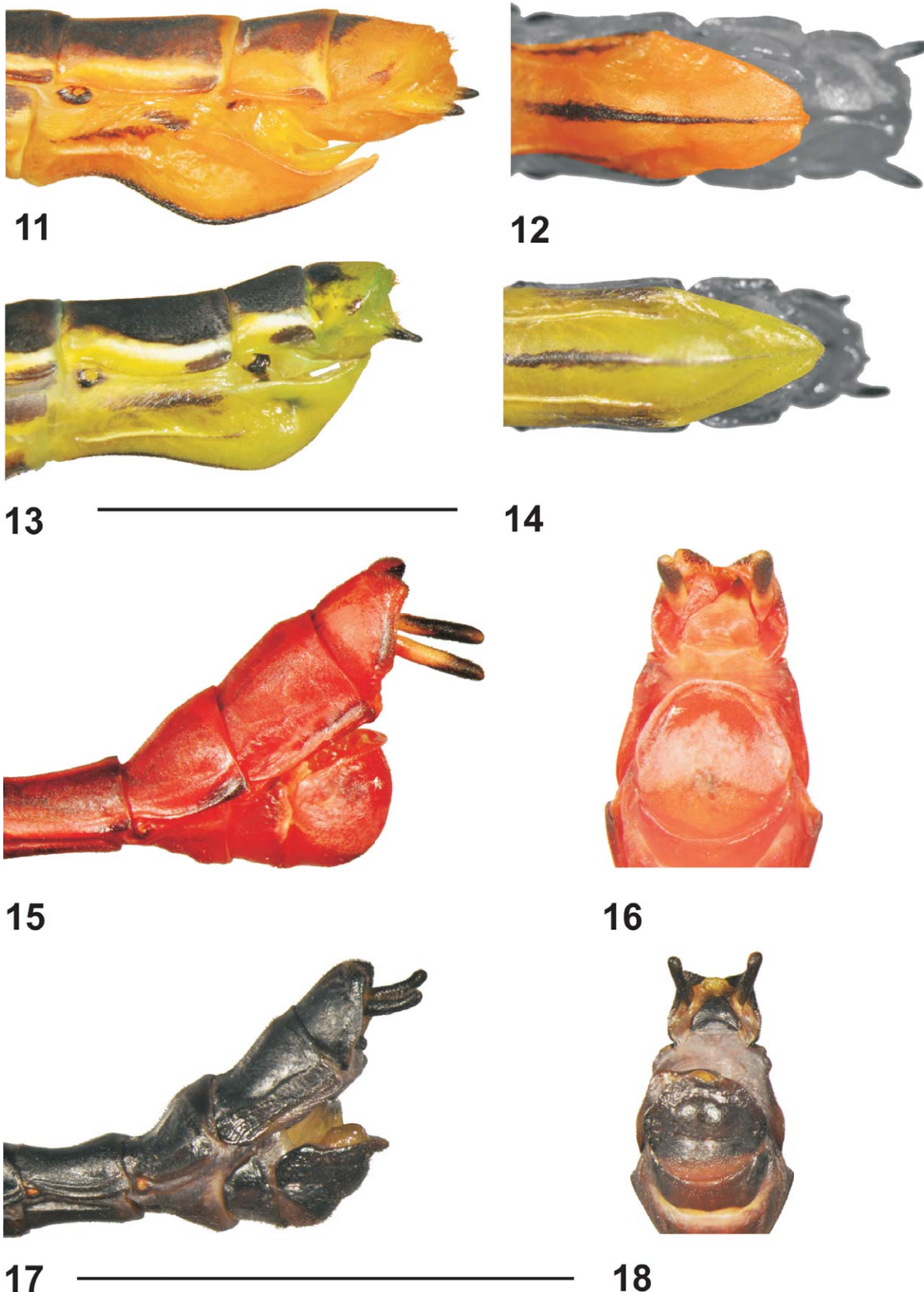
Head: As in female, but eyes relatively larger. Antennae almost 1.5× longer than body.

Thorax: Pronotum slightly narrower and shorter than head. Mesonotum 4.5 to 5× longer than pronotum and about 2× longer than metanotum. Metanotum 4× longer than median segment.

Abdomen: Shorter than head and thorax combined. Median segment about 1.5× wider than long. Tergites II-VII of uniform width, II roughly quadrate, III-VII on average 1.7× longer than wide; III and VII slightly shorter than IV-VI. VIII strongly broadened towards posterior and shorter than VII. IX-X distinctly broader than previous segments. IX with anterior margin broader than posterior margin and a little longer than VIII. Anal segment about as wide as long, strongly convex with longitudinal dorsomedian carina, and very slightly narrowed towards the posterior; posterior margin with wide triangular median excavation (Figs 17-18), the outer corners with minute teeth interoventrally. Poculum rather small and just moderately convex for the genus, hardly projecting over posterior margin of tergite IX, the posterior margin with a small median indentation (Fig.17). Cerci round in cross-section, cylindrical with the apex slightly club-like and slightly up-curving. Vomer well developed, broadly triangular and with a single median terminal hook.

Legs: All very long, slender and entirely unarmed, as typical for the genus. Profemora about as long as head, pro- and mesothorax combined; mesofemora longer than mesothorax and metafemora, reaching to abdominal segment VII or VIII. Basitarsi almost 4× longer than 2nd tarsomere.

Eggs.— (Figs 9, 10) Capsule strongly laterally compressed, lenticular and surrounded by a dorsoventral keel; about as long as high and at least 2.2× longer than wide. Capsule surface very minutely granulose and shiny; color dark brown with irregular straw patches. Micropylar plate elongate and slender, reaching from operculum almost to pol area. A short median line present. Operculum oval, slightly convex and with a small, roughly structured yellowish elevation in the center.



Figs 11-18. Apex of abdomen of *Oreophoetes* spp. [scale = 10 mm; shorter scale mark Figs 11-14, longer Figs 15-18]. 11. *O. peruana peruana* (Saussure, 1868) ♀, lateral view; 12. *O. peruana peruana* (Saussure, 1868) ♀, ventral view; 13. *O. topoense* n. sp. ♀ PT, lateral view; 14. *O. topoense* n. sp. ♀ PT, ventral view; 15. *O. peruana peruana* (Saussure, 1868) ♂, lateral view; 16. *O. peruana peruana* (Saussure, 1868) ♂, ventral view; 17. *O. topoense* n. sp. ♂ PT, lateral view; 18. *O. topoense* n. sp. ♂ PT, ventral view. See Plates.

Egg measurements.— (mm) Length 2.7 to 2.8 mm, width 1.2 to 1.3 mm, height 2.3 to 2.4 mm, length of micropylar plate 2.3 to 2.4 mm.

Comments.— Like *O. peruana peruana*, this new species has proven rather easy to rear in humid conditions and temperatures of 16–22°C. Various ferns (family Polypodiaceae) are readily accepted as alternative food-plants. The incubation time for eggs and duration of nymphal development are generally as in *O. peruana peruana*.

Table 1. Measurements [mm] of *Oreophoetes topoense* n. sp.

	HT, ♂ (ZSMC)	PT, ♂♂	PT, ♀♀
Body	45.5	43.5–52.2	55.3–60.1
Pronotum	2.5	2.4–3.0	3.2–3.5
Mesonotum	12.8	12.5–13.3	13.5–14.0
Metanotum	6.5	6.4–6.7	6.6–7.1
Median segment	1.6	1.5–1.7	1.7–1.8
Profemora	19.3	19.0–19.5	17.3–17.7
Mesofemora	15.2	14.8–15.3	13.3–13.5
Metafemora	18.6	18.3–19.8	16.9–17.1
Protibiae	22.6	22.0–22.8	19.0–20.1
Mesotibiae	17.1	16.5–17.4	14.8–15.6
Metatibiae	23.3	23.1–24.8	20.5–21.0
Antennae	68.0	64.0–70.0	55.0–61.0

Distribution.— So far only known from the type locality: central Ecuador, Tungurahua Province, Rio Topo 1600 m (Fig. 6).

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