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A review of the genus *Esakiella* CHINA, 1932 (Insecta: Heteroptera: Helotrephidae) in Madagascar, with descriptions of five new species

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Abstract

Five new species of the Afrotropical helotrephid genus *Esakiella* CHINA, 1932 are described from Madagascar: *Esakiella gereckei* sp.n., *E. goldschmidti* sp.n., *E. starmuehlneri* sp.n., *E. acuminata* sp.n., and *E. madli* sp.n. *Esakiella eremita* (HORVÁTH, 1899) and *E. milloti* POISSON, 1951 are redescribed based on types or topotypical specimens. *Esakiella eremita* f. *didyi* POISSON, 1951 is redescribed and raised to species level; a lectotype is designated. An identification key to the Madagascan Helotrephidae is provided. Some ecological parameters of the habitats of several species are noted for the first time.

Key words: Helotrephidae, *Esakiella*, new species, taxonomy, lectotype designation, ecology, Madagascar.

Zusammenfassung

Aus Madagaskar werden fünf neue Arten der afrotropischen Helotrephiden-Gattung *Esakiella* CHINA, 1932 beschrieben: *Esakiella gereckei* sp.n., *E. goldschmidti* sp.n., *E. starmuehlneri* sp.n., *E. acuminata* sp.n. und *E. madli* sp.n. *Esakiella eremita* (HORVÁTH, 1899) und *E. milloti* POISSON, 1951 werden auf Basis des Studiums der Typen oder topotypischen Materials redeskribiert. *Esakiella eremita* f. *didyi* POISSON, 1951 wird wiederbeschrieben und in den Artrang erhoben; ein Lectotypus wird festgelegt. Ein Bestimmungsschlüssel für die madegassischen Helotrephidae wird vorgeschlagen. Einige ökologische Parameter der Habitate mehrerer Arten werden erstmals bekannt gemacht.

Introduction

The genus *Esakiella* CHINA, 1932 has an Afrotropical distribution. Eleven species and six subspecies are described from the African mainland, and two species and one subspecies are described from Madagascar (POLHEMUS 1990). We add further five species from Madagascar and the nearby island St. Marie. At present, all species of *Esakiella* must be regarded as regional endemics.

Published knowledge on the genus *Esakiella*, especially on the Madagascan taxa, is very little. The single type specimen of *Esakiella eremita* (HORVÁTH, 1899), a male from "Madagascar: Antongil Bay. (Mus. Hung.)", was described in the genus *Helotrephes* STÅL, 1860. Describing the second known species of the family (after *Helotrephes semiglobosus* STÅL, 1860 from China), HORVÁTH (1899) concentrated on general family

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characteristics, colour, and size, which makes the description inadequate for modern taxonomical studies. KIRKALDY (1899, 1904) and ESAKI & CHINA (1927) listed *Helotrephes eremita*, without providing new information. A first redescription of *Helotrephes eremita*, was provided by ESAKI & CHINA (1928); it was not based on the type, but on a female "from the Fairmaire collection, collected by Perrier in Madagascar". The type specimen was reported to be lost by ESAKI & CHINA (1928) and POISSON (1951b), but it has been found in the Natural Science Museum Budapest upon our request. There is no proof that the specimen from the Fairmaire collection is *E. eremita* indeed, and the redescription contains only two useful characteristics, i.e., illustrations of the colour pattern of the cephalonotum and of the sternal carinae; however, the first characteristic agrees neither with HORVÁTH's (1899) original description nor with the type. CHINA (1932, 1935) correctly transferred *eremita* to his new genus *Esakiella*. ESAKI & CHINA's (1928) illustration of the cephalonotum was repeated by POISSON (1951b), so that we can assume that the male from his collection (from the environment of Tananarive) has a similar pattern. (In our material we have no specimen which agrees with this colour pattern of the cephalonotum.) POISSON (1951b) illustrated the male genitalia of *E. eremita* (?) for the first time and he describes a new "form", *E. eremita* f. *didyi* POISSON, 1951. Based on our studies of the type material, this "form" is a distinct species.

The second described Madagascan species of *Esakiella* is *E. milloti* POISSON, 1951a, which was described in the new subgenus *Esakielloides* POISSON, 1951a. Both taxa were described as new for a second time by POISSON (1951b). *Esakiella milloti* is a very characteristic species, but we cannot follow the subgeneric differenciation based on POISSON's (1951a, b) diagnosis. The sternum 7 of the female is similar to that of other species from Madagascar and also to that of the type species of *Esakiella*, *E. hancocki* CHINA, 1930 from Uganda. Further, the genitalia of the males display a wide variation of characteristics and can be sorted to larger groups only in a thorough analysis of all species from Africa and Madagascar. Therefore, we do not follow the subgeneric division of *Esakiella* in the present study, but divide the Madagascan species into three relatively small species groups without consideration of the African taxa.

Esakiella clearly belongs to the tribus Helotrephini. At a first glance, *Esakiella* seems to be relatively well defined. However, the definition may be mainly based on a combination of plesiomorphic characteristics. When studying the diagnosis by CHINA (1932) it should be kept in mind that China's definition of *Helotrephes* referred to species which were later transferred to *Hydrotrephes*. *Esakiella* differs from *Helotrephes* in the absence of median carinae on sterna 4 - 6 and from *Hydrotrephes* s.str.(!) in the structure of the meso- and metasternal carina and narrow genal plates. However, there are presently no clear generic differences between *Esakiella* and *Heterotrephes* ESAKI & MIYAMOTO, 1959 (= *Hydrotrephes mirus* and *H. sarawakensis* groups, sensu ZETTEL 2000), which both may represent, together with the new genus *Ascetotrephes* POLHEMUS & POLHEMUS (2003), the most ancestrial clades in Helotrephini.

There is a fourth helotrephid species described from Madagascar: *Pseudohydrotrephes moramongae* POISSON, 1956 has been described from a single male from "Sandrangato, Moramonga" [= Prov.Toamasina, Moramanga, route d'Anosibe n'Ala ca. km 26 - 27, Sandrangato] and also belongs to the tribus Helotrephini. No material is available for this study. The original description (POISSON 1956) is inadequate: Male genitalia are not illustrated. POISSON's (1956) figure 17D shows the abdominal sternites, which are com-

pletely symmetrical; if this is correct, and the type is indeed a male, this characteristic would be unique in Helotrephidae. Further, judging from figure 16A, *P. moramongae* is a relatively flat species. The position of the cephalonotal suture, the emarginated lateral margins of the pronotum (both in dorsal aspect of the specimen, see POISSON 1956: fig. 16A, B), and the colour pattern as illustrated in figures 16A, 16B, and 17A is unique in Madagascan helotrephids, as is the wide emargination of the pronotal plate (see POISSON 1956: fig. 18) and the relatively long second metatarsomere (see POISSON 1956: fig. 17C).

Material and methods

All specimens examined are dry-mounted and glued on card labels. Examination of external structures was carried out by use of a LEICA Wild M10 stereo-microscope (max. 108 × magnification), examination of male terminalia by use of a OLYMPUS BX40 microscope (max. 400 × magnification) and of female terminalia by use of a LEICA Wild M3C "Kombistereo"-microscope. Drawings were made by using a camera lucida. Aedeagi and parameres are illustrated in right-hand view. The female abdominal sternum 7 (subgenital plate) is figured in ventral view. In all drawings the pilosity is omitted. After examination, genitalia were glued on card labels (usually on which the specimen is glued).

Terminology follows MAHNER (1993), PAPÁČEK et al. (1988), and ZETTEL (2000). The statement, whether a specimen is "brachypterous" (= hind-wing-micropterous) or macropterous, is made after external examination according to the development of the hemelytron (without or with claval and embolar suture); exact state of the hind wings, i.e. brachy- or micropterous (sensu PAPÁČEK et al. 1989), was not examined.

Materials are referred to by citation of the original labels. Each label is marked with ""; the backslash sign \ indicates a break in a line. Red labels bearing the word "Holotypus" or "Paratypus", the name of the species, and the authors' names are attached to new type specimens; these labels are not cited. Material is deposited in the collections listed below.

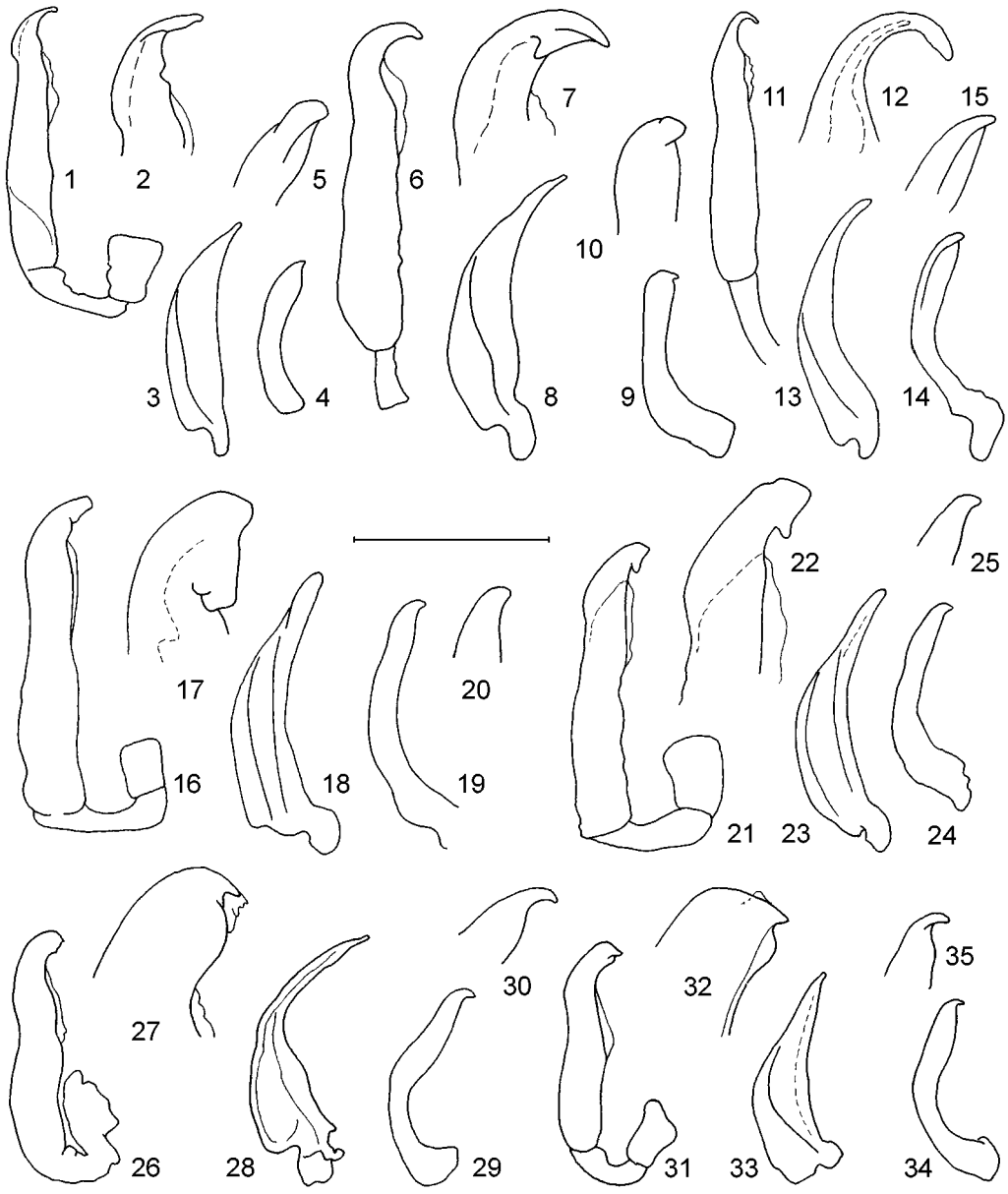
Acronyms of repositories:

MTMB	Magyar Természettudomanyi Múzeum, Budapest, Hungary
NHMW	Naturhistorisches Museum in Wien, Vienna, Austria
NMNH	National Museum of Natural History, Washington, U.S.A.
UBCB	University of South Bohemia, Coll. Miroslav Papáček, České Budejovice, Czech Rep.
ZMUC	Zoological Museum, University Copenhagen, Denmark

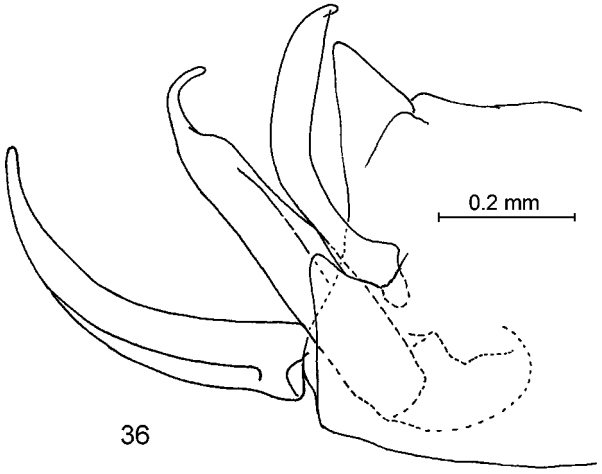
Key to the Helotrephidae of Madagascar

1 Pronotal plate with very wide emargination; mesoscutellum brilliant black and strongly contrasting with yellow hemelytra; second metatarsomere ca. 1.2 times as long as first. ..... ***Pseudohydrotrephes moramongae***
Note: The interpretation of this species is based on the original description by POISSON (1956).

– Pronotal plate with short and shallow emargination (Figs. 45 - 52); mesoscutellum not strongly contrasting with hemelytra; second metatarsomere shorter than first. ..... ***Esakiella* 2**



Figs. 1 - 35: Genitalia of males of *Esakiella* spp., right aspect: (1 - 5) *E. eremita*; (6 - 10) *E. gereckei* sp.n.; (11 - 15) *E. didyi* (specimen from Antananarivo); (16 - 20) *E. goldschmidti* sp.n.; (21 - 25) *E. starmuehlneri* sp.n.; (26 - 30) *E. milloti*; (31 - 35) *E. acuminata* sp.n.; (1, 6, 11, 16, 21, 26, 31) aedeagus; (2, 7, 12, 17, 22, 27, 32) apex of aedeagus in larger magnification: (3, 8, 13, 18, 23, 28, 33) left paramere; (4, 9, 14, 19, 24, 29, 34) right paramere; (5, 10, 15, 20, 25, 30, 35) apex of right paramere in larger magnification. (scale bar = 0.5 mm, except: 5, 10, 15, 20, 25, 30, 35: scale bar = 0.25 mm; 2, 7, 12, 17, 22, 27, 32: scale bar = 0.125 mm).



Figs. 36: Genitalia of the male lectotype of *E. didyi*, in situ, from microscopic slide prepared by R.A. Poisson.

2 Male (unknown in *E. madli* sp.n.). **3**
– Female (unknown in *E. starmuehlneri* sp.n.). **9**

3 Left paramere slender, distally strap-like or strongly folded (Figs. 13, 28, 36)..... **4**
– Left paramere broad, distally strongly tapered (Figs. 3, 8, 18, 23, 33). **5**

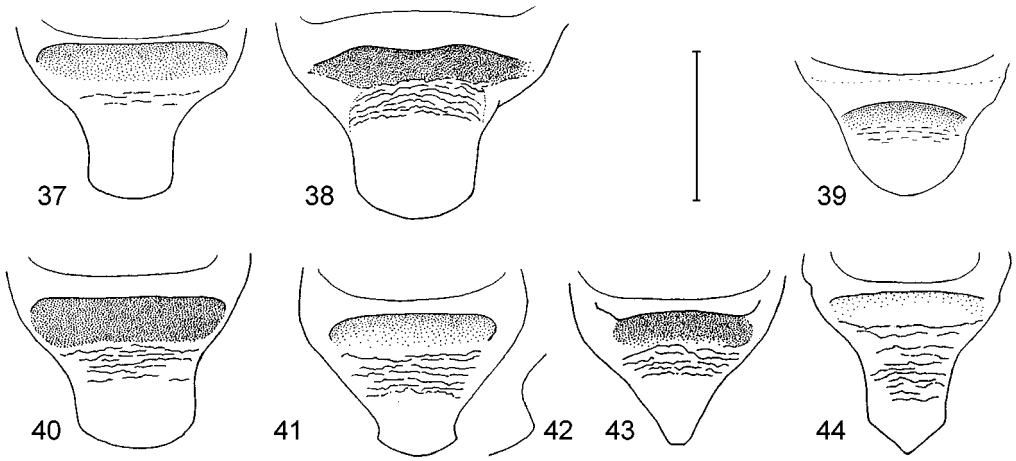
4 Aedeagus apically stout and rounded and with tiny, serrate carina (Figs. 26, 27), posterobasally with distinct fold. ..... ***E. milloti***
– Aedeagus with slender apex without serrate carina (Figs. 11, 12, 36), and posterobasally without distinct fold. ..... ***E. didyi***

5 Aedeagus with very characteristic apex, with concave posterior margin (Figs. 31, 32), and with indistinct posterobasal fold. ..... ***E. acuminata* sp.n.**
– Aedeagus with very different apex, without (or with hardly) concave posterior margin (Figs. 1, 6, 16, 21), and usually with distinct posterobasal fold (indistinct in *E. eremita*). **6**

6 Apical lamina of aedeagus strongly twisted, in lateral view anterior margin of apex strongly concave (Figs. 2, 7). **7**
– Apical lamina of aedeagus weakly twisted, in lateral view anterior margin of apex hardly concave (Figs. 17, 22). **8**

7 Apex of right paramere relatively slender (Figs. 4, 5); metasternal carina anteriorly straight, carina of sternite 3 relatively short (Fig. 53); body length 2.5 - 3.0 mm. ..... ***E. eremita***
– Apex of right paramere relatively broad (Figs. 9, 10); metasternal carina anteriorly convex, carina of sternite 3 prolonged (Fig. 54); body length 3.2 mm. ... ***E. gereckei* sp.n.**

8 Maximum width of right paramere in distal third (Fig. 24); apex of aedeagus as in Fig. 22; posterior corner of metasternal carina obtuse (Fig. 57); body length 2.75 mm. ..... ***E. starmuehlneri* sp.n.**
– Maximum width of right paramere in middle of length (measured without articulation) (Fig. 19); apex of aedeagus as in Figure 17; posterior corner of metasternal carina triangular, somewhat elevated (Fig. 56); body length 2.85 - 3.10 mm. ..... ***E. goldschmidti* sp.n.**



Figs. 37 - 44: Subgenital plates of females of *Esakiella* spp., ventral view: (37) *E. eremita*; (38) *E. gereckei* sp.n.; (39) *E. didyi*; (40) *E. goldschmidti* sp.n.; (41, 42) *E. milloti* (42: detail of posterolateral outline of distal lobe; (43) *E. acuminata* sp.n.; (44) *E. madli* sp.n.; scale bar = 0.5 mm, (except 0.125 mm in Fig. 42). Dotted area indicates black or brownly pigmented and ventrally domed anterobasal part of the sclerite; density of dots corresponds with level of pigmentation; transverse stripes posterior of dotted area indicate rough part of the sclerite.

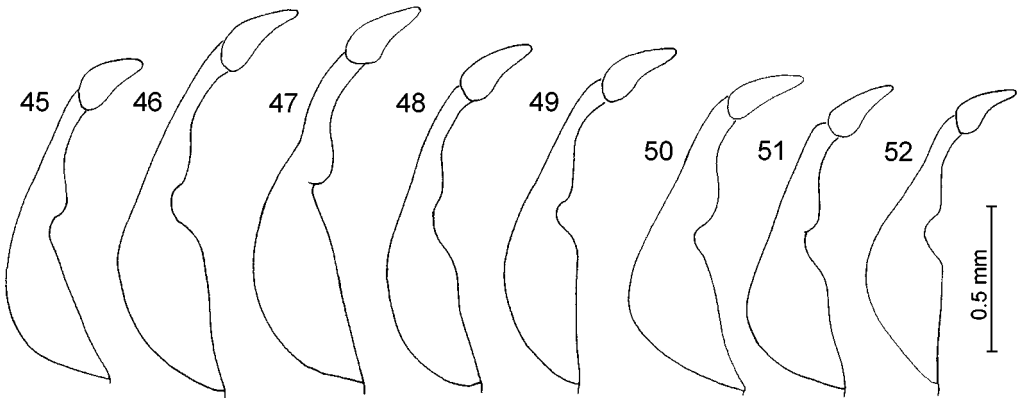
9 Subgenital plate with distal lobe triangular, with apex acute or narrowly rounded (Fig. 43). ..... ***E. acuminata* sp.n.**
– Subgenital plate with distal lobe longer than wide and approximately pentagonal, with apex approximately rectangular (Fig. 44). ..... ***E. madli* sp.n.**
– Subgenital plate with distal lobe not longer than wide, with posterior margin truncate or broadly convex (Figs. 37 - 41). **10**

10 Posterior lobe of subgenital plate evenly convex, even without indication of posterolateral corners (Fig. 39). ..... ***E. didyi***
– Posterior lobe of subgenital plate with more or less distinct (often rounded) posterolateral corners (Figs. 37, 38, 40, 41). **11**

11 Posterior lobe of subgenital plate between evenly convex posterior margin and slightly concave lateral margin with pronounced corners (Figs. 41, 42). ..... ***E. milloti***
– Posterior lobe of subgenital plate with straight sides and rounded corners (Figs. 37, 38, 41). **12**

12 Metasternal carina anteriorly convex, carina of sternite 3 strongly prolonged (Fig. 54); body length 3.3 mm. ..... ***E. gereckei* sp.n.**
– Metasternal carina anteriorly straight, carina of sternite 3 rhomboid and short (Figs. 53, 55); body length less than 2.7 - 3.1 mm. **13**

13 Hind corners of posteriomedial lobe of subgenital plate very obtuse (Fig. 40); metasternal carina anteriorly convex (Fig. 55). ..... ***E. goldschmidti* sp.n.**
– Hind corners of posteriomedial lobe of subgenital plate more distinct (Fig. 37); metasternal carina anteriorly relatively straight (Fig. 53). ..... ***E. eremita***



Figs. 45 - 52: Genal and pronotal plate (ventrolateral aspect) of brachypterous specimen of *Esakiella* spp.: (45) *E. eremita*; (46) *E. gereckei* sp.n.; (47) *E. didyi*; (48) *E. goldschmidti* sp.n.; (49) *E. starmuehlneri* sp.n.; (50) *E. milloti* sp.n.; (51) *E. acuminata* sp.n.; (52) *E. madli* sp.n.

Auxiliary key to the Helotrephidae of Madagascar, based exclusively on external characteristics of both sexes (brachypterous morph)

1 Pronotal plate with very wide emargination; mesoscutellum brilliant black and strongly contrasting with yellow hemelytra; second metatarsomere ca. 1.2 times as long as first. ..... ***Pseudohydrotrephes moramongae***

– Pronotal plate with short and shallow emargination (Figs. 45 - 52); mesoscutellum not strongly contrasting with hemelytra in colour; second metatarsomere shorter than first. ..... genus ***Esakiella*** **2**

2 Eye index (minimum distance between eyes : maximum eye width) 2.3 - 2.6 (Figs. 62, 63). **3**

– Eye index (minimum distance between eyes : maximum eye width) 2.8 - 3.6 (Fig. 61). **5**

3 Rostral segment 4 ca. 2.7 times as long as segment 3; head with continous blackish medial stripe (Fig. 63); rostrum and bases of legs yellowish brown. ..... ***E. madli*** **sp.n.**

– Rostral segment 4 ca. 2.0 times as long as segment 3; head with pair of broad, blackish or brown longitudinal stripes along inner eye margins (Fig. 62), with or without brown central mark in anterior half; rostrum and bases of legs blackish. **4**

4 In average smaller, body length 2.2 - 2.5 mm, width 1.64 - 1.80 mm; posterior half of pronotum yellowish with numerous small brown, mostly confluent marks. .... ***E. acuminata*** **sp.n.**

– In average larger, body length 2.5 - 2.7 mm, width 1.74 - 1.86 mm; posterior half of pronotum mainly dark brown, with few yellowish areas. ..... ***E. milloti***

5 Rostral segment 4 ca. 1.9 - 2.2 times as long as segment 3. ..... **6**

– Rostral segment 4 ca. 2.5 - 2.8 times as long as segment 3. ..... **7**

6 Posterior corner of metasternal carina obtuse, hardly elevated (Fig. 56); rostral segment 4 ca. 1.9 times as long as segment 3. ..... ***E. starmuehlneri*** **sp.n.**

– Posterior corner of metasternal carina triangular, somewhat elevated (Fig. 56); rostral segment 4 ca. 2.2 times as long as segment 3. ..... ***E. goldschmidti* sp.n.**

7 Carina of sternite 3 strongly developed and prolonged, apex of metasternal carina consisting of long spine (Fig. 54). ..... ***E. gereckei* sp.n.**

– Carinae of sternite 3 and metasternum less developed (Figs. 53, 55). .... ***E. eremita*** and ***E. didyi***

***Esakiella eremita* group** (see Discussion)

***Esakiella eremita* (HORVÁTH, 1899)** (Figs. 1 - 5, 37, 45, 53, 61)

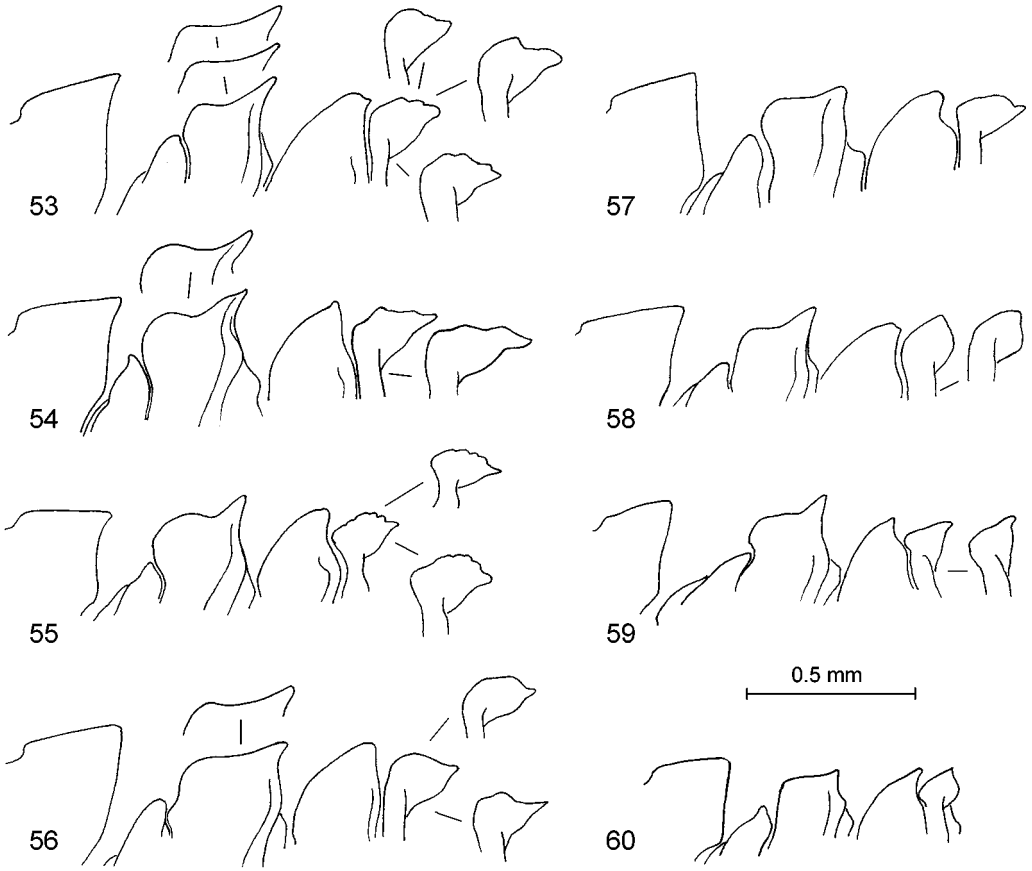
Helotrephes eremita HORVÁTH, 1899: 256; KIRKALDY1899: 108; KIRKALDY 1904: 129; ESAKI & CHINA 1927: 281; CHINA 1932: 271 (to be transferred to *Esakiella*?).
? *Helotrephes eremita*: ESAKI & CHINA 1928: 142.
? *Esakiella eremita*: CHINA 1935: 593.
? *Esakiella eremita eremita*: POISSON 1950: 681; POISSON 1951a: 13; POISSON 1951b: 112.
Esakiella eremita eremita: POLHEMUS 1990: 59.

Material examined: holotype (brachypterous male) of *Esakiella eremita*: "Madagascar\ Antongil B.\ Mocquerys", "eremita H.\ det. Horváth", "TYPUS", "Helotrephes\ eremita Horv", "coll.\ Hungarian Nat. Hist.\ Museum, Budapest" (MTMB); **additional material examined:** 1 ♂ (brachypterous) "Madagascar", "Esakiella\ eremita Horv.", "China\ det.", "Poisson to\ Drake Coll.\ 1979", genitalia slide mounted on squared cardbord with transparent plastic part in centre, on extra pin repeating the last three labels (NMNH); 2 ♂♂, 2 ♀♀ (brachypterous), 3 nymphs (nymphs not considered in this study) "Madagascar\ Route Ivohibe 700\ J.Millot rec. IX.50", "Poisson to\ Drake Coll.\ 1979" (NMNH); 1 ♂ (brachypterous) "Madagascar: Antsiranana\ Antalaha, Marofototra\ spring stream 1, right affl.\ R.Fandramanana,180m, 2.XI.2001\ Gerecke & Goldschmidt (132)" (NHMW); 1 ♂ (brachypterous) "Madagascar: Fianarantsoa\ Andrambovato, large cascade\ 3 km E from village\ 820 m, 20.VIII.2001\ Gerecke & Goldschmidt (37)" (NHMW); 1 ♀ (brachypterous) "Madagascar: Antsiranana\ Andapa, right affl. R.\ Ambendrana, downstr. large\ cascade, 660 m, 11.XI.2001\ Gerecke & Goldschmidt (147)" (NHMW); 1 ♂ (brachypterous), 1 ♂ (macropterous) "MADAGASCAR C.\ 6.-10.I.1998, Ranomafana\ (pr. Fianarantsoa)\ P. Pacholátko leg." (UBCB, NHMW).

Notes on type specimen: The holotype of *E. eremita* is a male, not a female, as stated by HORVÁTH (1899); before dissection, the terminalia were deeply inserted between the hemelytra, partly covered by the legs, and difficult to see.

Description of brachypterous male: body size: length 2.5 - 3.0 mm, width 1.74 - 2.09 mm; brownish yellow, dorsum strongly, but variably, marked with blackish brown; head (Fig. 61) behind eyes dark, between eyes extending with two more or less broad stripes, frequently leaving only midline (anteriorly) and eye margins yellow, anterior part of head with black middle stripe or spot; pronotum with blackish anterior and posterior margin, latter individually dissolved in several large marks, disk of pronotum individually with additional small brownish marks; mesoscutellum and hemelytra with blackish base, other areas mottled with yellow and brown, in most specimens brown portions dominating, apex of mesoscutellum and distal lateral margins of hemelytra uniformly yellow; venter yellowish to dark brown; legs and antennae yellowish; rostrum brown.

Cephalonotum with rectangular posterior corners, in dorsal aspect with slightly concave lateral margins; head with densely set (distances mostly shorter than diameter) punctures, which laterally fused to rugulae, hardly shining except on narrow midline, where



Figs. 53 - 60: Ventral carinae of *Esakiella* spp. (venter turned upward, right view; with variations of carinae of metasternum and sternite 3): (53) *E. eremita*; (54) *E. gereckei* sp.n.; (55) *E. didyi*; (56) *E. goldschmidti* sp.n.; (57) *E. starmuehlneri* sp.n.; (58) *E. milloti* sp.n.; (59) *E. acuminata* sp.n.; (60) *E. madli* sp.n.

spaces between punctures bearing sparse micropunctures in large specimens; anterior part of head bearing a few transverse, usually distinct rugae; disk of pronotum with punctures of same size as on head, with distances 1 - 3 times their diameter, along hind margin more densely set, with distances 1 - 2 times their diameter, along sides very densely set and mostly fused to rugulae; cephalonotal suture deeply sinuate; pronotal plate anteriorly long and slender, with shallow, roundish incision (Fig. 45); eye index: 2.9 - 3.3; fourth rostral segment 2.6 times as long as segment 3 (lacking in holotype); mesoscutellum 1.05 times as long as wide; mesoscutellum and hemelytron with punctures distinctly larger than on cephalonotum; distances of punctures on mesocutellum 0.5 - 1.5 times their diameter (anteriorly smaller than posteriorly), on hemelytron less; spaces between punctures on hemelytron mostly wrinkled, especially on sides, not or slightly micropunctured.

Ventral carinae (Fig. 53): prosternal carina with acute posterior corner, posterior edge nearly straight; mesosternal carina low, acute; metasternal carina anteriorly straight and parallel with body axis, posteriorly with ventrocaudad elevated spine; carina of sternite 3 distally weakly produced, more or less birdhead-shaped; abdominal segments strongly asymmetrical.

Aedeagus (Figs. 1, 2) long and straight, with basal fold weakly developed, with hook-shaped apex consisting of posterior bow and anteriad directed lamellar tip, in apical view this lamina relatively slender, with minute tooth on left side; left paramere (Fig. 3) broad, distally evenly tapered to rounded apex, subapically with short row of short setae; right paramere (Figs. 4, 5) much shorter than left paramere, in distal half slightly widened, in apical part evenly narrowed to acute apex and moderately curved.

Description of brachypterous female: body size: length 2.7 - 3.1 mm, width 1.92 - 2.10 mm; eye index: 3.1 - 3.2; most characteristics as in brachypterous male; abdomen symmetrical; sternite 6 with hind margin straight; subgenital plate (Fig. 37) with squared distal lobe, this deeply impressed mediobasally, with straight, parallel sides, with evenly convex hind margin, with posterior corners obtuse, with distinct basal transverse inner ridge medially straight and laterally with caudally oriented terminal parts.

Description of macropterous male: body size: length 2.55 mm, width 2.08 mm; eye index: 2.8; colour relatively dark; cephalonotum dark brown, with yellow lateral margins, yellow semi-circular mark on anterior part of head, and three transverse marks forming interrupted band in middle of pronotum; mesoscutellum and hemelytron only with some small yellow marks, shape of cephalonotum similar as in brachypterous morph, except small, indistinct elevations close to posterolateral corner; hemelytron with well developed embolar and claval sutures.

Macropterous female: unknown.

Comparative notes: *Esakiella eremita* is most similar to *E. gereckei* sp.n., from which it differs in the characteristics mentioned in the key and in the comparative notes of *E. gereckei* sp.n.

Distribution: Prov. Antsiranana: Andapa; Marofototra. – Prov. Toamasina: S Antongil Bay (near Mananara). – Prov. Fianarantsoa: Ranomafana; Andrambovato; Ivohibe road (see VIETTE 1991).

Habitats: spring stream at 180 m a.s.l.; water temperature 21.5 °C; conductivity 29 µS/cm; – stream at large cascade at 820 m a.s.l.; water temperature 15.4 °C; conductivity 38 µS/cm; – stream below large cascade at 660 m a.s.l.; water temperature 22.6 °C; conductivity 9 µS/cm (Gerecke & Goldschmidt, pers. comm.).

***Esakiella gereckei* sp.n.** (Figs. 6 - 10, 38, 46, 54)

Holotype (brachypterous male): "Madagascar: Fianarantsoa\ Madiorano, stream crossing\ railroad at km 51.2\ 650 m, 18.VIII.2001\ Gerecke & Goldschmidt (31)" (NHMW); **paratype:** 1 ♀ (brachypterous), same label data as holotype (NHMW).

Description of brachypterous male: body size: length 3.1 mm, width 2.11 mm; brownish yellow, dorsum strongly marked with blackish brown; head behind eyes dark, between eyes extending with two very broad stripes, only leaving midline anteriorly yellow, anterior part of head with broad black middle stripe; pronotum with blackish anterior

and posterior margins, which are connected submedially; mesoscutellum blackish with yellow apex; hemelytra blackish brown, with reduced yellowish marks in posterior two thirds, with distal lateral margins and apices yellow; venter yellowish to dark brown; legs and antennae yellowish; rostrum dark brown.

Cephalonotum with rectangular posterior corners, in dorsal aspect with slightly concave lateral margins; head with densely set punctures (distances mostly shorter than diameter), hardly shining except on narrow midline, where spaces between punctures bearing sparse micropunctures; apex of head bearing a few transverse rugae; disk of pronotum with punctures in average slightly smaller than on head, with distances 1 - 2 times their diameter, along hind margin more densely set, with distances 1 - 1.5 times their diameter, along sides very densely set and partly fused to rugulae; cephalonotal suture deeply sinuate; pronotal plate anteriorly long and slender, with shallow incision (Fig. 46); eye index: 3.2; fourth rostral segment 2.6 times as long as segment 3; mesoscutellum 1.1 times as long as wide; mesoscutellum and hemelytron with punctures distinctly larger than on cephalonotum; distances of punctures on mesocutellum 0.5 - 1.5 times their diameter (anteriorly smaller than posteriorly), on hemelytron smaller; spaces between punctures on hemelytron without micropunctures, laterally partly wrinkled.

Ventral carinae (Fig. 54): prosternal carina with acute posterior corner, posterior edge nearly straight; mesosternal carina low, acute; metasternal carina anteriorly convex, posteriorly with long, ventrocaudad directed spine; carina of sternite 3 with caudally directed process; abdominal segments strongly asymmetrical.

Aedeagus (Figs. 6, 7) long and straight, with basal fold distinct, with shortly hook-shaped apex consisting of posterior bow and anteriad directed lamellar tip, in apical view this lamina relatively slender, with minute tooth on left side; left paramere (Fig. 8) relatively broad, distally evenly tapered to rounded apex, subapically with short row of short setae; right paramere (Figs. 9, 10) shorter than left paramere, in distal half slightly widened, in apical part suddenly narrowed to acute apex and strongly curved.

Description of brachypterous female: body size: length 3.3 mm, width 2.16 mm; eye index: 3.3; most characteristics as in brachypterous male; colour slightly lighter; ventral carina of sternite 3 even more extended; abdomen symmetrical; sternite 6 with hind margin straight; subgenital plate (Fig. 38) with squared distal lobe, this deeply impressed mediobasally, with straight, parallel sides, with evenly convex hind margin, with posterior corners very obtuse, inner ridge with two submedial anteriad convex bows.

Macropterous morph: unknown.

Comparative notes: *Esakiella gereckei* sp.n. is closely related to *E. eremita*. Both species agree well in most characteristics, and the genitalia of the males are very similar (comp. Figs. 1 - 5 and 6 - 10). The main difference is found in the apex of the right paramere, which in *E. gereckei* sp.n. is more twisted and wider than in *E. eremita* (comp. Figs. 4 and 9). In *E. gereckei* sp.n. the apex of the aedeagus is more twisted and wider than in *E. eremita* (apical view). The aedeagus of *E. gereckei* sp.n. has a distinct posterobasal fold, which is only slightly developed in *E. eremita.* Externally, *Esakiella gereckei* sp.n. differs from *E. eremita* in larger size and in the shape of the median carinae of the metasternum and of sternum 3 (comp. Figs. 53 and 54); the last characteristic is more pronounced in the female paratype (additions in Fig. 54).

Distribution: Prov. Fianarantsoa: Madiorano.

Habitat: stream; water temperature 15.9 °C; conductivity 27 µS/cm (Gerecke & Goldschmidt, pers. comm.).

Etymology: Named in honour for Dr. Reinhard Gerecke (University of Tübingen), who collected the type series and numerous other specimens of *Esakiella* in Madagascar.

Esakiella didyi Poisson, 1951, stat.n. (Figs. 11 - 16, 36, 39, 47, 55)

Esakiella eremita f. *didyi*: Poisson 1950: 681 (nomen nudum).
Esakiella eremita f. *didyi* Poisson, 1951b: 113; Polhemus 1990: 59.
Esakiella eremita didyi: Poisson 1951a: 13 (nomen nudum); Polhemus 1990: 59.

Material examined: lectotype (brachypterous male, present designation) and one **paralectotype** (brachypterous female) "Didy\ M. 47", "E. eremita\ didyi Poiss.", "Esakiella\ eremita Horv.\ f. didyi nov.", "Poisson to\ Drake Coll. \ 1979"; genitalia of lectotype mounted on extra slide: "Esakiella\ eremita\ ♂ didyi\ Didy \ M.47" (NMNH); **additional material examined:** 1 ♂ (brachypterous) "Madagascar: Antananarivo\ Anjozorobe, Ranonisoanavola larger stream E main mountain\ chain, 1200 m, 23.VII.2001\ Gerecke & Goldschmidt (12)" (NHMW).

Notes on type specimens and new status: The syntype series of *Esakiella eremita* forma *didyi* consists of one male and one female, not of two males as stated by Poisson (1951b). The genitalia of the male are embedded on a slide and have been deposited separately from the specimen, but specimens and slide agree in labeling, so that we have no doubt that they belong to each other. Poisson (1951b) stated several differences between his new form and a specimen of *E. eremita*, whose species identity presently cannot be confirmed. In fact, *E. didyi* is very similar to the true *E. eremita* in colour pattern and several external characteristics, but differs clearly in the genitalia of the male and in the subgenital plate of the female.

Following ICZN Article 45.6.4. (International Commission on Zoological Nomenclature 1999) the forma *didyi* Poisson, 1951 is of subspecific rank and as such an available name. Polhemus (1990) catalogued *didyi* as a subspecies (without explanation); we raise the taxon to species level.

Although the syntypes are very similar in the characteristics of the dorsum, it should be verified in more material that male and female are conspecific. Therefore we designate the male as the lectotype, because its genitalia are most characteristic and the original description by Poisson (1951b) is based on the male sex. The venter of the lectotype is partly destroyed and important characteristics of the metasternal carina are missing.

Description of brachypterous male: body size: length 2.8 - 2.9 mm, width 1.94 - 2.10 mm; brownish yellow, dorsum strongly marked with dark brown; head behind eyes dark, between eyes extending with two broad stripes, leaving only midline (anteriorly) and narrow stripes along eye margins yellow, anterior part of head with black middle stripe; pronotum with blackish anterior and posterior margin, the latter dissolved in several large marks, disk of pronotum with additional small brownish marks; mesoscutellum and hemelytra with blackish base, other parts with numerous brown marks which are more or less confluent; distal lateral margins of hemelytra uniformly yellow; venter yellowish to dark brown; legs and antennae yellowish; rostrum brown.

Cephalonotum with rectangular posterior corners, in dorsal aspect with hardly concave lateral margins; head with densely set (distances mostly shorter than diameter) punctures, which laterally fused to rugulae, hardly shining except on narrow midline, where spaces between punctures bearing sparse micropunctures; anterior part of head bearing a few transverse, distinct rugae; disk and hind margin of pronotum with punctures of same size as on head, with distances 0,5 - 1,5 times their diameter, along sides very densely set and mostly fused to rugulae; cephalonotal suture deeply sinuate; pronotal plate anteriorly long and slender, with shallow incision (Fig. 47); eye index: 2.9; fourth rostral segment 2.5 - 2.8 times as long as segment 3; mesoscutellum 1.0 times as long as wide; mesoscutellum and hemelytron with punctures distinctly larger than on cephalonotum, distances of punctures 0.5 - 1 times their diameter; spaces between punctures on hemelytron mostly wrinkled, especially on sides, not or hardly micropunctured.

Ventral carinae (Fig. 55): prosternal carina with acute posterior corner, posterior edge nearly straight; mesosternal carina low, acute; metasternal carina (lacking in lectotype) anteriorly slightly convex, posteriorly with short, ventrocaudad elevated spine; carina of sternite 3 distally weakly produced, more or less birdhead-shaped, with more or less distinct small teeth along ventral margin; abdominal segments strongly asymmetrical.

Aedeagus (Figs. 11, 12, 36) long and nearly straight, with basal fold indistinct, with very characteristic slender, evenly curved apex, without distinct apical lamella, in apical view slender, without minute tooth on left side; left paramere (Fig. 36) relatively slender, distally slender and subparallel, evenly curved to acute apex (somewhat broader and less curved in specimen from Antananarivo; see Fig. 13), subapically with short row of short setae; right paramere (Fig. 36) much shorter than left paramere, in distal half nearly straight and parallel, then suddenly tapered to small, acute tip (distally slightly more slender in specimen from Antananarivo; Figs. 14, 15).

Description of brachypterous female: body size: length 2.9 mm, width 2.04 mm; eye index: 3.0; most characteristics as in brachypterous male; abdomen symmetrical; sternite 6 with hind margin straight; subgenital plate (Fig. 39) with weakly separated distal lobe, this moderately impressed mediobasally, with straight, converging sides continuous with evenly convex hind margin (without corners), with distinct basal transverse inner ridge evenly bowed.

Macropterous morph: unknown.

Comparative notes: The male genitalia, especially the apex of the aedeagus (Figs. 12, 36) and the shape of the left paramere (Figs. 13, 36), as well as the evenly rounded distal lobe of the subgenital plate of the female (Fig. 39) are unique within the genus and do not indicate a close relationship with *E. eremita*. The male from Antananarivo (in NHMW) differs slightly from the lectotype in the width of both parameres (difficult to determine in the embedded parameres of the lectotype) and in a slightly shorter rostrum, but these differences are presently regarded to be within variability of the species.

Distribution: Prov. Toamasina: ca. 48 km SE of Ambatondrazaka, Andranomandevy (= Didy), ca. 1000 m (VIETTE 1991). – Prov. Antananarivo: Anjozorobe.

Habitat: large stream at 1200 m a.s.l.; water temperature 13.2 °C; conductivity 58 µS/cm (Gerecke & Goldschmidt, pers. comm.).

***Esakiella goldschmidti* sp.n.** (Figs. 16 - 20, 40, 48, 56)

Holotype (brachypterous male): "Madagascar: Antananarivo\ Ankaratra, Res. Manjakatompo \ left affl. Riv. Mahiavona E\ M. Mantsina, 1750 m, 8.X.2001\ Gerecke & Goldschmidt (107)" (NHMW); **paratypes:** 1 ♀ (brachypterous), same label data as holotype (NHMW); 1 ♂ (brachypterous) "Madagascar: Antananarivo\ Ankaratra, Res. Manjakatompo\ left branch of affl. to statn\ piscicole, 1770 m, 9.X.2001\ Gerecke & Goldschmidt (110)" (NHMW).

Description of brachypterous male: body size: length 2.9 - 3.1 mm, width 1.94 - 2.05 mm; brownish yellow, dorsum strongly marked with blackish brown; head behind eyes dark, between eyes extending with two very broad stripes, leaving only midline anteriorly yellow, anterior part of head with broad black middle stripe; pronotum with blackish anterior and posterior margins connected laterally and submedially; meso-scutellum and hemelytra with blackish base, other areas mottled with yellow and brown, distal part of mesoscutellum and distal lateral margins of hemelytra uniformly yellow; venter yellowish to dark brown; legs and antennae yellowish; rostrum dark brown.

Cephalonotum with rectangular posterior corners, in dorsal aspect with slightly concave lateral margins; head with densely set punctures (distances mostly shorter than diameter), which laterally fused to rugulae, not shining, on narrow midline spaces between punctures with numerous micropunctures; transverse rugae in anterior part of head indistinct; disk of pronotum with punctures slightly larger than those on head, with distances 1 - 2 times their diameter, along hind margin more densely set, with distances 0.5 - 2 times their diameter, along sides very densely set and largely fused to rugulae; cephalonotal suture deeply sinuate; pronotal plate anteriorly long and slender, with shallow incision (Fig. 48); eye index: 3.0 - 3.2; fourth rostral segment 2.2 times as long as segment 3; mesoscutellum 1.1 times as long as wide; mesoscutellum and hemelytron with punctures distinctly larger than on cephalonotum, distances of punctures 0.5 - 2 times their diameter (anteriorly smaller than posteriorly), spaces between punctures more or less wrinkled, especially anteriorly and on sides, not or hardly micropunctured.

Ventral carinae (Fig. 56): prosternal carina with acute posterior corner, posterior edge straight; mesosternal carina low, acute; metasternal carina anteriorly straight and parallel with body axis, posteriorly with caudad directed, slightly ventrad elevated spine; carina of sternite 3 posteriorly with small tip; abdominal segments strongly asymmetrical.

Aedeagus (Figs. 16, 17) long, with slightly anteriad curved distal part, with basal fold distinct, with apical lamella twisted and well visible in lateral view, in apical view appearing triangular, with minute tooth on left side; left paramere (Fig. 18) distally evenly tapered to narrowly rounded apex, subapically with short row of short setae; right paramere (Figs. 19, 20) slightly shorter than left paramere, in distal half evenly narrowed to acute apex, this very little curved.

Description of brachypterous female: body size: length 3.0 mm, width 2.11 mm; most characteristics as in brachypterous male; colour lighter, e.g., mesoscutellum yellow except base; eye index: 3.6; median carina of sternite 3 with longer tip; abdomen symmetrical; sternite 6 with hind margin straight; subgenital plate (Fig. 40) with squared distal lobe, this deeply impressed mediobasally, with straight, parallel sides, with strongly convex hind margin, with posterior corners very obtuse, with basal transverse inner ridge medially straight.

Macropterous morph: unknown.

Comparative notes: *Esakiella goldschmidti* sp.n. is relatively closely related to *E. eremita* and *E. gereckei* sp.n., but differs from these species strongly in the apex of the aedeagus (Fig. 17), which resembles that of *E. starmuehlneri* sp.n. (Fig. 22). Females of *E. eremita*, *E. gereckei* sp.n., and *E. goldschmidti* sp.n. are only distinguishable in minor details of the sternal carinae (comp. Figs. 53, 54, and 56) and of the postero-medial lobe of the subgenital plate (comp. 37, 38, and 40), which should be checked in more specimens, as well as the large eye index (3.6) of the female of *E. goldschmidti* sp.n., which may be diagnostic.

Distribution: Prov. Antananarivo: Massif de l'Ankaratra, Manjakatompo.

Habitats: stream at 1750 m a.s.l.; water temperature 14.1 °C; conductivity 3 µS/cm; – stream at 1770 m a.s.l.; water temperature 14.2 °C; conductivity 4 µS/cm (Gerecke & Goldschmidt, pers. comm.).

Etymology: Named in honour for Dr. Tom Goldschmidt (University of Tübingen), who collected the type series and numerous other specimens of *Esakiella* in Madagascar.

***Esakiella starmuehlneri* sp.n.** (Figs. 21 - 25, 49, 57)

Holotype (brachypterous male): "Madagascar C.\ 1958\ l. F. Starmühlner\\ FM100/ 26.7.1958\ Antsampandrano\ Ankaratra-Gebirge [= Mountains], Quellbach [spring-feeded streamlet]", "Esakiella\ eremita\ Horv. [in Poisson's hand writing]" (NHMW).

Description of brachypterous male: body size: length 2.8 mm, width 1.83 mm; brownish yellow, dorsum strongly marked with brown; head posteriorly brown, anteriorly yellow with brown central mark surrounded by yellow; pronotum brown with yellow marks transversely arranged in middle of length; mesoscutellum brown except lateral margins; hemelytra mottled with yellow and brown, brownish parts dominating; venter yellowish to brown; legs, antennae and rostrum yellowish.

Cephalonotum with rectangular posterior corners, in dorsal aspect with concave lateral margins; head mainly rugulous and matt, along midline with densely set punctures (distances mostly shorter than diameter), spaces between punctures with micropunctures or fine rugulation; transverse rugae in anterior part of head indistinct; disk of pronotum with punctures slightly larger than those on head, with distances ca. 1 - 2 times their diameter, along hind margin more densely set, with distances 0.5 - 1.5 times their diameter, along sides very densely set and largely fused to rugulae; cephalonotal suture deeply sinuate; pronotal plate anteriorly long and slender, with relatively shallow, roundish incision (Fig. 49); eye index: 3.0; fourth rostral segment 1.9 times as long as segment 3; mesoscutellum 1.05 times as long as wide; mesoscutellum and hemelytron with punctures distinctly larger than on cephalonotum, distances of punctures ca. 0.5 - 1.5 times their diameter (anteriorly smaller than posteriorly), on hemelytron spaces between punctures more or less wrinkled, anteriorly granulate.

Ventral carinae (Fig. 57): prosternal carina with acute posterior corner, posterior edge straight; mesosternal carina low, acute; metasternal carina anteriorly approximately straight and parallel with body axis, posteriorly acute, not spine-like; carina of sternite 3 posteriorly with small tip; abdominal segments strongly asymmetrical.

Aedeagus (Figs. 21, 22) long, straight, with basal fold very distinct, with apical lamella twisted and well visible in lateral view, in apical view very narrow, with minute tooth visible in lateral view; left paramere (Fig. 23) distally evenly tapered to acute apex, subapically with short row of short setae; right paramere (Figs 24, 25) distinctly shorter than left paramere, in distal half slightly widened, then evenly narrowed to acute apex, this very little curved.

Brachypterous female and **macropterous morph:** unknown.

Comparative notes: *Esakiella starmuehlneri* sp.n. is closely related to *E. goldschmidti* sp.n., which has a similarly modified apex of the aedeagus (see and compare Figs. 17 and 22), but differs further in the shape of the right paramere, in the apex of the metasternal carina (comp. Figs. 56 and 57), and in the length of the rostrum.

Distribution: Prov. Antananarivo: Massif de l'Ankaratra, Antsampandrano (near Faratsiho), near mount Nanokely (ca. 2100 m), near Nanokely forest station (STARMÜHLNER 1962).

Habitat: Spring-fed streamlet, ca. 20 - 30 cm wide and 5 - 10 cm deep, water velocity ca. 30 cm/sec, water temperature 18 - 20 °C at 13 - 15 h, bottom with stones, banks with herbs partly floating in the water (STARMÜHLNER 1962).

Etymology: Named in honour for the Austrian zoologist, Prof. Dr. Ferdinand Starmühlner (University of Vienna), who carried out early limnological studies in Madagascar.

***Esakiella milloti* group** (see Discussion)

***Esakiella milloti* POISSON, 1951** (Figs. 26 - 30, 41, 42, 50, 58)

Esakiella (*Esakielloides*) *milloti*: POISSON, 1950: 681 (nomen nudum).
Esakiella (*Esakielloides*) *milloti* POISSON, 1951a: 15; POISSON 1951b: 115 (second description); POLHEMUS 1990: 60.

Material examined: syntypes and/or topotypical material: 1 ♂, 4 ♀♀ (brachypterous) "Lac M. [Millot] 47\ Tritivia [= Tritriva]", "Esakiella\ milloti Poiss." (ZMUC, NHMW).

Notes on material: All five specimens in ZMUC were undissected before our study. POISSON (1951a) based his description on seven specimens (four males and three females), of which at least one male and one female must have been dissected by him to make drawings of the genitalia of the male and the subgenital plate of the female. It is obvious that Poisson had more specimens than the syntypes, as was the case with *Limnotrephes stuckenbergi* POISSON, 1960 (see PAPÁČEK & ZETTEL 2003), and that only some of the specimens in ZMUC might be syntypes, or all must be regarded as non-type specimens from the type locality.

Description of brachypterous male: body size: length 2.5 mm, width 1.74 mm; dorsum brownish yellow and strongly marked with dark brown; head yellow, in posterior half with broad, inverted-U-shaped mark, its sides nearly along inner eye margin, and with small, brownish mark anteromedially; pronotum predominately dark brown, but a large half-ovate mark anteromedially, lateral margins, and some small irregular marks in posterior half yellow; mesoscutellum, and hemelytra brownish yellow with numerous small, mostly confluent brown marks; lateral margins of hemelytra yellow; venter of

head and thorax yellowish brown, of abdomen blackish; legs yellowish brown with blackish base; antenna yellowish; rostrum blackish.

Cephalonotum with rectangular posterior corners, in dorsal aspect with slightly concave lateral margins; head with large, densely set punctures (distances slightly shorter to slightly longer than diameter), not shining, on midline spaces between punctures with microsculpture; transverse rugae in anterior part of head distinct; disk of pronotum between punctures shining, punctures of same size as those on head, with distances 0.5 - 1.5 times their diameter, along sides very densely set and largely fused to rugulae; cephalonotal suture deeply sinuate; pronotal plate anteriorly short and stout, with roundish, relatively shallow incision (Fig. 50); eye index: 2.5; fourth rostral segment 2.0 times as long as segment 3; mesoscutellum 1.0 times as long as wide; mesoscutellum and hemelytron with punctures slightly larger than on cephalonotum, distances of punctures much smaller than their diameter, spaces between punctures with microsculpture.

Ventral carinae (Fig. 58): prosternal carina with acute posterior corner, posterior edge nearly straight; mesosternal carina low, acute; metasternal carina anteriorly convex, posteriorly with posteroventrad directed spine; carina of sternite 3 small, rhomboid; abdominal segments strongly asymmetrical.

Aedeagus (Figs. 26, 27) long and undulate, with anteriad curved distal part, with basal fold distinct, with apical part well visible in lateral view, with tiny, serrate apical carina, in apical view apex appearing narrow triangular, with minute tooth; left paramere (Fig. 28) wide at base, then suddenly and strongly tapered, narrow and subparallel in distal half, with narrowly rounded apex, subapically with short row of short setae; right paramere (Figs. 29, 30) slightly shorter than left paramere, slender, undulate, in distal half subparallel, distally tapered to acute, moderately curved apex.

Description of brachypterous female: body size: length 2.5 - 2.7 mm, width 1.80 - 1.86 mm; most characteristics as in brachypterous male; eye index: 2.5 - 2.6; abdomen symmetrical; sternite 6 with hind margin straight; subgenital plate (Figs. 41, 42) broad, subtriangular, with distal lobe weakly separated, with concave posterolateral margins and convex hind margin forming approximately rectangular hind corners, with basal transverse inner ridge medially bowed, laterally strongly curved caudad.

Macropterous morph: unknown.

Comparative notes: The male of *E. milloti* sp.n. is characterized by the extremely slender, folded distal part of the left paramere (Fig. 28) and by the apex of the aedeagus (Fig. 27), which is, however, similar in *E. acuminata* sp.n.; the female by the unique shape of the distal lobe of the subgenital plate (Figs. 41, 42). *Esakiella milloti* is most closely related to *E. acuminata* sp.n. (see Comparative notes of that species).

Distribution: Prov. Antananarivo: 18 km W of Antsirabe, Lac Tritriva (VIETTE 1991).

Habitat: unknown.

***Esakiella acuminata* sp.n.** (Figs. 31 - 35, 43, 51, 59, 62)

Holotype (brachypterous male): "Madagascar: Antsiranana\ M. d'Ambre, Joffreville\ R. de Manques in Reserve\ Fonteray, 550 m, 17.XI.2001\ Gerecke & Goldschmidt (154)" (NHMW); **paratypes:** 2 ♂♂, 3 ♀♀

(brachypterous), same label data as holotype (NHMW, UBCB); 2 ♀♀ (brachypterous) "Madagascar: Antsiranana\ M. d'Ambre, Joffreville\ R. Antomboka downstr. large\ cascade, 850 m, 21.XI.2001\ Gerecke & Goldschmidt (165)" (NHMW).

Description of brachypterous male: body size: length 2.2 - 2.4 mm, width 1.64 - 1.76 mm; dorsum yellow and strongly marked with blackish brown; head (Fig. 62) in posterior half with broad, inverted-U-shaped mark, its sides nearly along inner eye margin, a small, brownish mark anteromedially in some specimens; pronotum, mesoscutellum, and hemelytra with numerous small, mostly confluent marks; pronotum anteriorly with large, half-ovate, yellow area; lateral margins of pronotum and hemelytra yellow; venter of head and thorax yellowish brown, of abdomen blackish; legs yellowish brown with blackish base; antenna yellowish; rostrum blackish.

Cephalonotum with rectangular posterior corners, in dorsal aspect with slightly concave lateral margins; head with large, densely set punctures (distances shorter than diameter), not shining, on midline spaces between punctures with numerous micropunctures; transverse rugae in anterior part of head distinct; disk of pronotum between punctures shining, punctures of same size as those on head, with distances 0.5 - 1.5 times their diameter, along sides very densely set and largely fused to rugulae; cephalonotal suture deeply sinuate; pronotal plate anteriorly short and stout, with roundish, relatively shallow incision (Fig. 51); eye index: 2.5 - 2.6; fourth rostral segment 2.0 times as long as segment 3; mesoscutellum 1.0 times as long as wide; mesoscutellum and hemelytron with punctures slightly larger than on cephalonotum, distances of punctures much smaller than their diameter, spaces between punctures with microsculpture.

Ventral carinae (Fig. 59): prosternal carina with acute posterior corner, posterior edge nearly straight; mesosternal carina low, acute; metasternal carina anteriorly convex, posteriorly with posteroventrad directed spine; carina of sternite 3 small, subtriangular, posteroventrally with small tip; abdominal segments strongly asymmetrical.

Aedeagus (Figs. 31, 32) long and undulate, with anteriad curved distal part, with basal fold distinct, with apical part well visible in lateral view, with tiny apical carina, in apical view apex appearing lanceolate with sharp tip, without tooth on left side; left paramere (Fig. 33) wide, distally slightly tapered to broadly rounded apex (with minute sharp corner anteriorly), subapically with short row of short setae; right paramere (Figs. 34, 35) slightly shorter than left paramere, slender, undulate, in distal half subparallel, distally tapered to acute, curved apex.

Description of brachypterous female: body size: length 2.3 - 2.5 mm, width 1.68 - 1.80 mm; most characteristics as in brachypterous male; eye index: 2.3 - 2.5; abdomen symmetrical; sternite 6 with hind margin straight; subgenital plate (Fig. 43) posteriorly narrow, triangular, with distal lobe not clearly separated, swollen basally and weakly impressed medially, with basal transverse inner ridge medially bowed and laterally with anteriad directed terminal parts.

Macropterous morph: unknown.

Comparative notes: This species is very distinct from all other species in both sexes. The male can be easily recognized by the shape of the aedeagus (Fig. 31) and the female by the apically pointed to narrowly rounded subapical plate (Fig. 43). Both sexes can be easily distinguished from most species described above by the relatively large eyes (eye

index: 2.3 - 2.6), but which are of similar size in *E. madli* sp.n. with very different colour pattern on head and longer rostrum segment 4, and *E. milloti* with different colour pattern on the pronotum. In most external characteristics and in the apex of the aedeagus *E. acuminata* sp.n. is very similar to those of *E. milloti* and closely related to it.

Distribution: Prov. Antsiranana: Montagne d'Ambre National Park.

Habitats: stream at 550 m a.s.l.; water temperature 21.9 °C; conductivity 25 µS/cm; – stream below large cascade at 850 m a.s.l.; water temperature 20.0 °C; conductivity 20 µS/cm (Gerecke & Goldschmidt, pers. comm.).

Etymology: *acuminatus* (Latin adjective) meaning "narrowed", referring to the characteristic shape of the sternum 7 of the female.

***Esakiella madli* group** (see Discussion)

***Esakiella madli* sp.n.** (Figs. 44, 52, 60, 63)

Holotype (brachypterous female): "MADAGASCAR:Ste.Marie\ Foret de Kalalao\ 18.11.1993,l.M.Madl" (NHMW).

Description of brachypterous female: body size: length 2.4 mm, width 1.61 mm; dorsum yellowish, strongly marked with blackish brown; head (Fig. 63) with continuous, broad, blackish median stripe, which is nearly solid except some light brownish areas at midline, and with short, broad transverse branches to inner eye margin, so that head mark approximately broadly cross-shaped; pronotum at anterior margin medially with one small and sublaterally with a pair of large solid blackish marks, between them a solid yellow, approximately M-shaped area; posterior part of pronotum, mesoscutellum, and hemelytra with numerous small brownish marks, mostly confluent on pronotum, mostly separated from each other on mesoscutellum and hemelytra; base of mesoscutellum with transverse, medially interrupted blackish stripe; venter yellowish brown; legs and antennae yellowish; rostrum brown.

Cephalonotum with rectangular posterior corners, in dorsal aspect with slightly concave lateral margins; head with very densely set punctures (distances much shorter than diameter), not shining, on midline spaces between punctures without micropunctures; transverse rugae in anterior part of head distinct; disk of pronotum with punctures of same size as those on head, with distances 1 - 2 times their diameter, along hind margin more densely set, with distances 0.5 - 2 times their diameter, along sides very densely set and partly fused to rugulae; cephalonotal suture deeply sinuate; pronotal plate anteriorly relatively short, with roundish, rather shallow incision (Fig. 52); eye index: 2.3; fourth rostral segment 2.7 times as long as segment 3; mesoscutellum 0.95 times as long as wide; mesoscutellum and hemelytron with punctures hardly larger than on cephalonotum, distances of punctures 0.5 - 1.5 times their diameter (anteriorly smaller than posteriorly), spaces between punctures more or less wrinkled, especially anteriorly and on sides, not micropunctured.

Ventral carinae (Fig. 60): prosternal carina with slightly acute posterior corner, posterior edge straight; mesosternal carina low, acute; metasternal carina anteriorly slightly convex, posteriorly with small, hardly elevated apex; carina of sternite 3 small, rhomboid.

Figs. 61 - 63: Colour pattern of cephalonotum of *Esakiella* spp., frontal aspect: (61) *E. eremita*; (62) *E. acuminata* sp.n.; (63) *E. madli* sp.n. (Matthias Buch pxt.)

Abdomen symmetrical; sternite 6 with hind margin slightly concave; subgenital plate (Fig. 44) with relatively narrow distal lobe with parallel sides and approximately triangularly shaped apex, with basal transverse inner ridge slightly bowed, with transverse rugulae on ventral surface extended to basal part of distal lobe.

Brachypterous male and **macropterous morph:** unknown.

Comparative notes: *Esakiella madli* sp.n. is a highly domed species with very large eyes, and in these characteristics similar to *E. acuminata* and *E. milloti*. *Esakiella madli* sp.n. distinctly differs from these two species in the relative lenghts of rostal segment 3 and 4 (2.7 instead of 2.0), in the shape of the abdominal sternum 7 (Fig. 44), in the weakly pronounced posterior corner of the metasternal elevation (Fig. 60), and in the colour pattern of the head. The relationship of this species can only be clarified by finding the male.

Distribution: Prov. Toamasina: Ile Sainte Marie, Forêt de Kalalao.

Etymology: Dedicated to Michael Madl, Austrian hymenopterist and Madagascar traveller, who discovered this species.

Discussion

At present we can recognize three groups of *Esakiella* species in Madagascar:

The ***Esakiella eremita* group** contains fairly domed, usually large species with relatively small eyes (eye index 2.8 - 3.6) (Fig. 61), long or short rostrum (ratio segment 4 : segment 3 = 1.9 - 2.8), two very wide, brown, hardly separated patches between eyes (Fig. 61), anteriorly long and slender pronotal plate (Figs. 45 - 49), large and more or less birdhead-shaped medial carina of sternite 3 (Figs. 53 - 57), and more or less squared to rounded distal lobe of the subgenital plate of the female (Figs. 37 - 40; unknown in *E. starmuehlneri*). This group contains two species pairs, *E. eremita* + *E. gereckei* and *E. goldschmidti* + *E. starmuehlneri*, and one isolated species, *E. didyi*.

The ***Esakiella milloti* group** contains more highly domed, small species with relatively large eyes (eye index 2.3 - 2.6) (Fig. 62), short rostrum (ratio segment 4 : segment 3 = 2.0), two widely separated brown stripes between eyes (Fig. 62), anteriorly short and stout pronotal plate (Figs. 50, 51), small medial carina of sternite 3 (Figs. 58, 59), modified, relatively narrow distal lobe of the subgenital plate of the female (Figs. 41, 43), and typically modified apex of the aedeagus (Figs. 26, 31). It contains only *E. milloti* and *E. acuminata*.

The ***Esakiella madli* group** contains *E. madli* only, which is at present only known in the female sex. This is a highly domed species with large eyes (eye index 2.3) (Fig. 63), long rostrum (ratio segment 4 : segment 3 = 2.7), a cross-shaped dark mark on the head (Fig. 63), anteriorly short pronotal plate (Fig. 52), small medial carina of sternite 3 (Fig. 60), and a long and narrow, approximately pentagonal distal lobe of the subgenital plate (Fig. 44).

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