

**Redescription of the Madagascan endemic
genus *Anoano* with a new synonymy
(Hemiptera: Heteroptera: Pentatomidae)**

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Abstract. The Madagascan endemic genus *Anoano* CACHAN, 1952 (Hemiptera: Heteroptera: Pentatomidae: Pentatominae: Triplatygini) is redescribed. Based on the study of primary types, one valid species and one junior synonym are recognized: *Anoano pronotalis* CACHAN, 1952 = *A. milloti* Schouteden, 1954, syn. nov. A lectotype of *A. pronotalis* is designated. The male and female genitalia of *A. pronotalis* are described for the first time

Key words. Heteroptera, Pentatomidae, Pentatominae, *Anoano*, morphology, genitalia, taxonomy, lectotype designation, new synonymy, Madagascar

Introduction

The genus *Anoano* was established by CACHAN (1952) to accommodate a single species – *A. pronotalis* CACHAN, 1952. This genus was originally included in the endemic Madagascan tribe Triplatygini, currently comprising three genera – *Anoano*, *Triplatyx* Horváth, 1904 (including six species), and *Tricompastes* CACHAN, 1952 (one species) (CACHAN 1952; KMENT 2008, 2011). Later, SCHOUTEDEN (1954) described an additional species of *Anoano*, *A. milloti* Schouteden, 1954. No later authors have published information on the genus except KMENT (2008), who included *Anoano* in his key to the genera of Triplatygini, and figured the external scent efferent system of the metathoracic scent glands.

Material and methods

In quoting the labels of the type specimens, a slash (/) is used to divide data on different rows of one label, double slash (//) is used to divide data on different labels, authors' comments are given in square brackets [], and the following abbreviations are used: hw = handwritten, p = printed.

The specimens examined are deposited in the following collections:

- BMNH Natural History Museum, London, United Kingdom;
MNHN Muséum national d'Histoire naturelle, Paris, France;
NHMW Naturhistorisches Museum Wien, Vienna, Austria.

Measurements in the paper were taken from dry-mounted specimens under a MBS-10 stereomicroscope using an ocular micrometer. The following dimensions were measured: body length (from apex of mandibular plates to apex of membrane), head length (from apex of mandibular plates to anterior margin of pronotum), head width (maximum width across eyes), interocular width (between inner margins of compound eyes), length of each antennal segment (maximum lengths), pronotum length (medially in most exposed view), pronotum width (maximum width between processes on humeral angles), scutellum length (medially from base to apex), scutellum width (maximum width at base), and abdomen width (maximum width approximately at half-length).

Dissections of genitalia and all line drawings were made under a Leica MZ75 stereomicroscope with a camera lucida. For the study of genitalia, specimens were softened in distilled water, and the male pygophore or female abdomen were removed under the stereomicroscope using sharp pincers, then put into concentrated solution of KOH and heated until the solution started to boil. After the KOH treatment, the pygophores/abdomens were washed in distilled water and dissected under the stereomicroscope. The dissected phalli and spermathecae were subsequently stored in plastic microvials with glycerol attached to the same pin as the specimen. The general morphological terminology follows mostly TSAI et al. (2011); parts of the thoracic scent efferent system of the metathoracic scent glands are named in accordance with KMENT & VILÍMOVÁ (2010).

Results

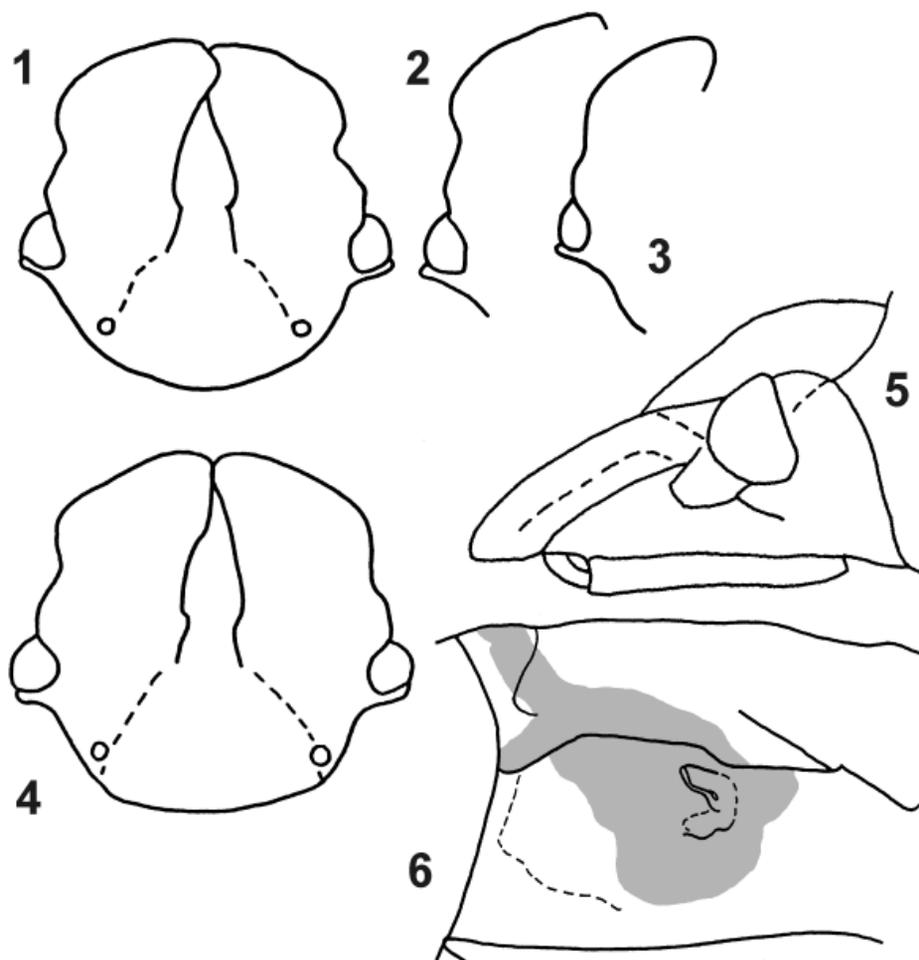
Anoano Cachan, 1952

(Figs. 1–31)

Anoano Cachan, 1952: 373, 376. Type species: *Anoano pronotalis* Cachan, 1952, by original designation.

Anoano: KMENT (2008): 545 (key to genera of Triplatygini), 556 (figure of external scent efferent system of the metathoracic scent gland).

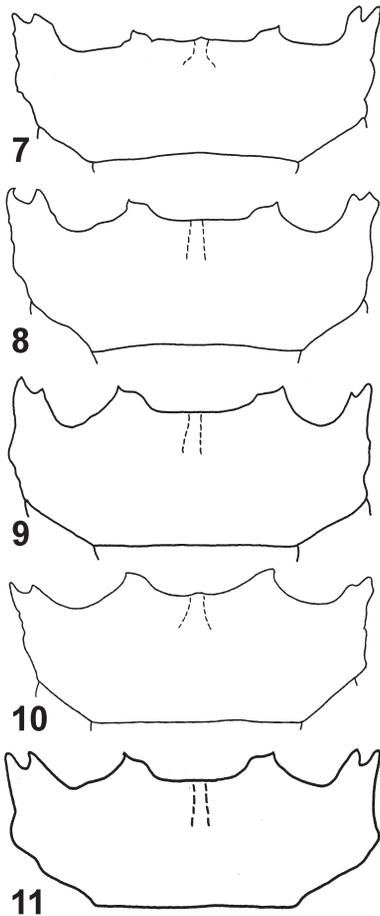
Redescription. Structure. *Head* strongly sloping downwards (Fig. 14), approximately as long as wide, with lateral sides before eyes directed anteriorly, more or less insinuated; anterior margin widely arcuate, very slightly incised apically against apex of clypeus (Figs. 1–4); head behind eyes rounded and convex, sunken into concave anterior margin of pronotum. Mandibular plates foliaceous, flattened, long and wide, meeting (Fig. 4) or overlapping (Fig. 1) in front of clypeus, more or less depressed medially; clypeus slender, narrowing, and closing anteriorly, convex (Figs. 1, 4). Frons convex. Compound eyes small, each approximately half of its width protruding from head outline; temples behind eyes narrow, nearly reaching (Fig. 4) to slightly surpassing the eye laterally (Figs. 1–3). Ocelli small, situated posteriorly and medially behind eyes at posterior margin of head (Figs. 1, 4). Antenniferous tubercle small, situated ventrally beneath mandibular plate (Figs. 5, 14), not visible from above (Figs. 1–4). Antenna slender, antennal segments ordered from shortest to longest: $I < IIa \leq IIb < III \leq$



Figs. 1–6. *Anono pronotalis* Cachan, 1952: 1–4 – head, dorsal view (1 – ♂, lectotype, Ambovombe; 2 – ♀, paratype, Vohibory; 3 – ♂, Bas Mangoky; 4 – ♀, holotype of *A. milloti*); 5 – head, lateral view; 6 – meso- and metapleuron (from KMENT 2008). Not to scale.

IV; segment I cylindrical, shortest and stoutest; segment IIa cylindrical, slender; segment IIb cylindrical, slightly thickening towards apex; segments III and IV spindle-shaped. Bucculae long and low, rectangular anteriorly, rounded posteriorly (Fig. 5). Labial segment I as high as bucculae, short, not surpassing posterior margin of bucculae; labial apex reaching between metacoxae.

Pronotum strongly transverse. Anterior pronotal margin deeply, arcuately concave; antero-lateral angles truncated, slightly pointed laterally; lateral margins deeply concave, carinated; humeral angles each with a strong process produced antero-laterally and markedly dorsally, apically bifid, with small concave incision between both tips directed anteriorly (Figs. 7–13,



Figs. 7–11. *Anoano pronotalis* Cachan, 1952, variability of pronotum: 7 – ♂, lectotype, Ambovombe; 8 – ♀, Anjahantelo; 9 – ♂, Bas Mangoky; 10 – ♀, paralectotype, Vohibory; 11 – ♀, holotype of *A. milloti*. Not to scale.

Legs short; femora stout, slightly flattened dorso-ventrally, profemur widest around its middle, narrowing towards base and apex, meso- and metafemur widening towards apex, widest subapically; tibiae slightly shorter than femora, their dorsal surface flattened, protibia stoutest, metatibia most slender; tarsomere 2 shortest, tarsomere 3 longest, as long as tarsomeres 1 and 2 combined.

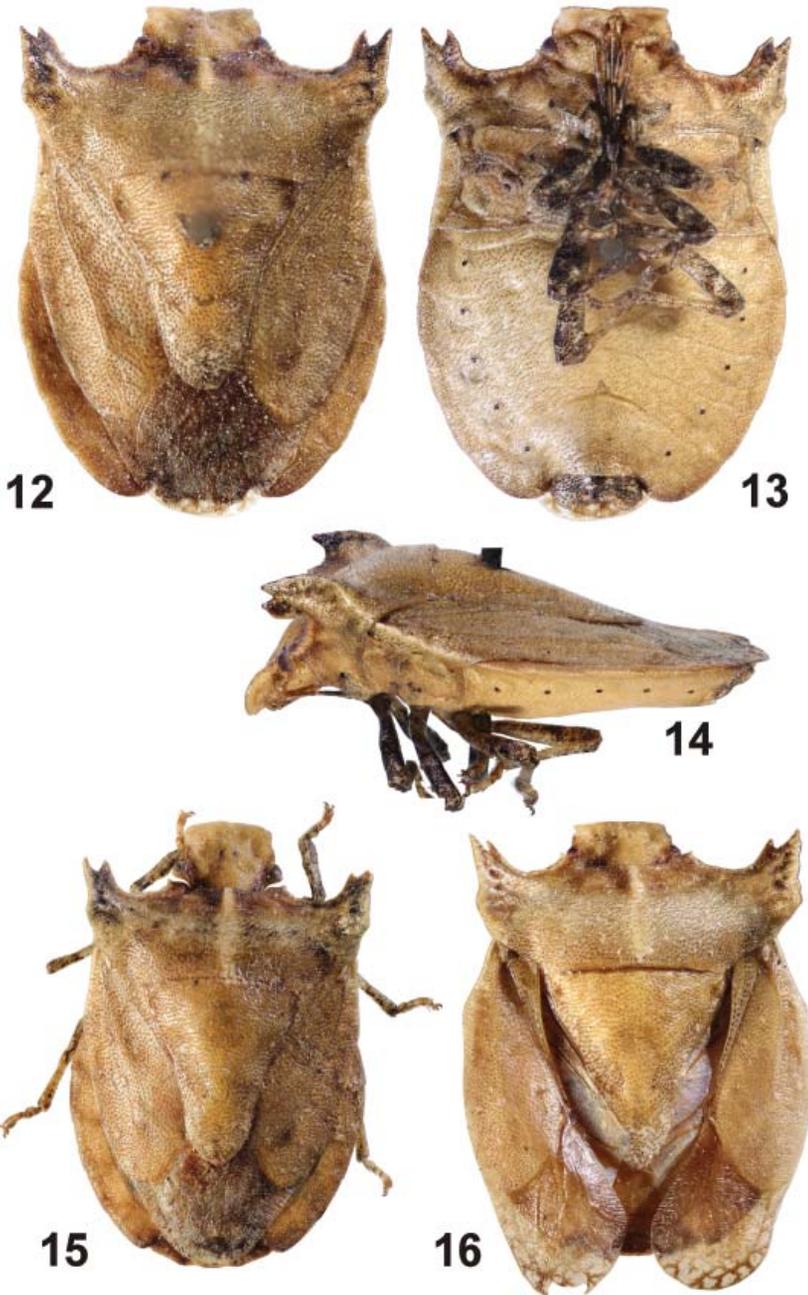
Abdomen about as wide as pronotum across humeral angles (ratios pronotum width : abdomen width e.g., 4.6 : 4.5; 4.7 : 4.7; 3.8 : 4.0) (Figs. 12, 15). Connexivum wide, fully exposed; postero-lateral angles of laterotergites not produced, hardly protruding from arcuate

15–16); humeral angles posteriorly rather straight, subparallel, slightly convergent towards base of pronotum, postero-lateral pronotal margins running straight towards base of scutellum; posterior margin of pronotum straight (Figs. 7–11). Anterior part of pronotum nearly flat, sloping towards head, bearing a distinct, elevated, impunctate ridge medially, very slightly depressed laterad of the ridge; posterior part of pronotum slightly convex (Figs. 7–12, 15–16).

Scutellum slightly narrower at base than at its median length; lateral margins slightly concave medially; apex not reaching postero-lateral angles of corium, rounded (Figs. 12, 15). Disc of scutellum weakly convex, regularly sloping towards margins (Figs. 14).

Hemelytra. Clavus narrow, with 4–5 rows of punctures at widest part (anteriorly), and short, reaching only base of lateral insinuation of scutellum (Fig. 12). Corium slightly widening behind base, widest approximately in its basal fourth, then narrowing distally; distal angle rounded, distinctly surpassing scutellar apex in rest (Figs. 12, 15–16). Membrane widely rounded apically, reaching about apex of abdomen (Figs. 12, 15–16).

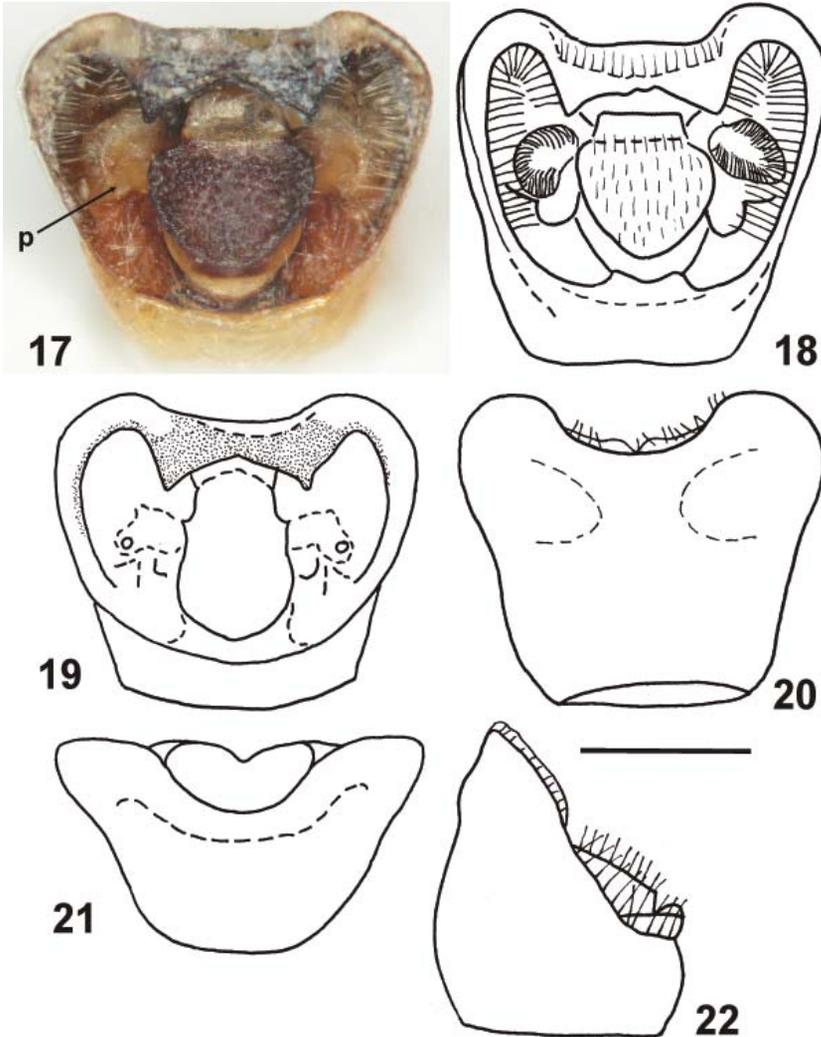
Thoracic pleura and sterna. Pro-, meso-, and metasterna with deep furrow between coxae. Ostiole situated approximately in median third of metapleuron width, small, rounded, directed laterad, accompanied by a short, elevated spout; small periostolar depression posteriad of spout, delimited posteriorly by a short and low ridge; evaporatorium large, developed both on meso- and metapleuron, gyrification hardly developed, but evaporatorium with scattered deep punctures. Metathoracic spiracle very narrow (Figs. 6, 13).



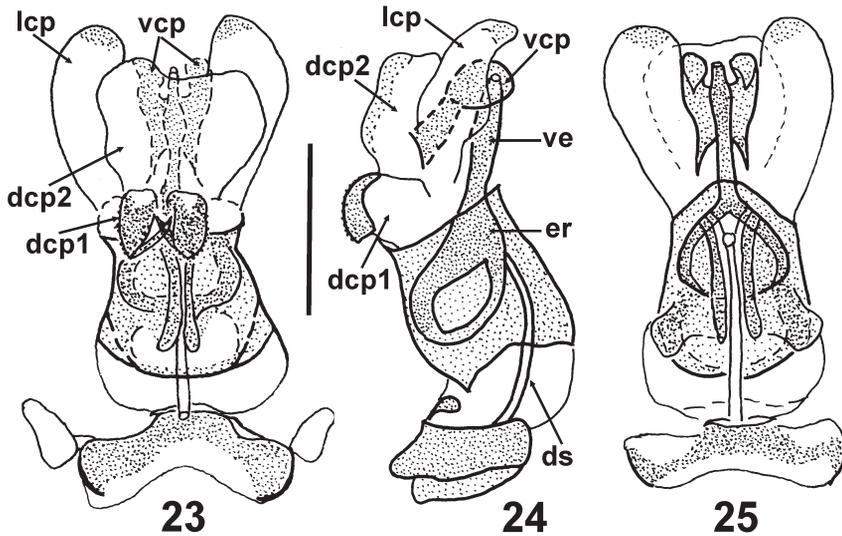
Figs. 12–16. *Anoano pronotalis* Cachan, 1952: 12–14 – ♂, lectotype, Ambovombe (12 – dorsally, 13 – ventrally, 14 – laterally; body length 6.6 mm); 15 – ♀, Anjahantelo (7.3 mm); 16 – ♀, holotype of *A. milloti* (8.2 mm).

outline of connexivum. Postero-lateral angles of abdominal segment VII widely rounded in male (Figs. 12–13), slightly angulate in female (Fig. 15). Abdomen evenly convex ventrally (Fig. 13), sternite III deeply and narrowly depressed medially.

Male genitalia. Ventral wall of pygophore large, slightly depressed laterally beneath ventral rim and postero-lateral angles (Figs. 20–22); infolding of ventral rim turned dorsally, with shallow, obtusangulate incision medially, its apices subrectangular, directed anterolaterally



Figs. 17–22. *Anoano pronotalis* Cachan, 1952, pygophore (17, 19–22 – ♂, Bas Mangoky; 18 – ♂, paralectotype, Vohibory): 17–18 – dorsal view of intact pygophore; 19 – dorsal view of dissected pygophore; 20 – ventral view; 21 – posterior view; 22 – lateral view. Lettering: p – paramere. Scale: 0.5 mm.



Figs. 23–25. *Anoano pronotalis* Cachan, 1952, phallus (δ , Bas Mangoky): 23 – dorsal view; 24 – lateral view; 25 – ventral view. Lettering: dcp1–2 – dorsal conjunctival processes 1 and 2, ds – ductus seminalis, er – endophallic reservoir, lcp – lateral conjunctival processes, vcp – ventral conjunctival processes, ve – vesica. Scale: 0.5 mm.

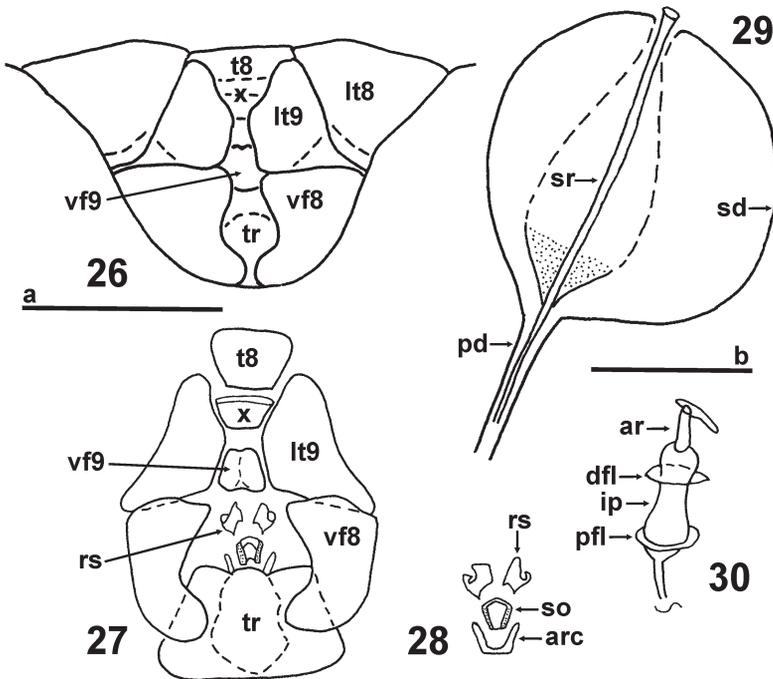
(Figs. 17–19); infolding of dorsal rim of pygophore narrow, infoldings of lateral rim well-developed, surrounding a pair of small circular paramere socket (Figs. 17–19); posterior aperture of genital chamber directed dorsally (Fig. 19); postero-lateral angles of pygophore ear-shaped, rounded, posteriorly distinctly surpassing posterior margin of pygophore (Figs. 17–19). Parameres reduced to strongly desclerotised, very thin, membranous, fan- or auricle-shaped structures with densely fimbriate margins (easy to destroy by KOH treatment) (Figs. 17–18). Proctiger large, conical in outline, dorsally slightly concave (Figs. 17–18).

Phallus (Figs. 23–25) with phallosome short and stout, barrel-shaped, constricted subapically; conjunctiva with four pairs of processes: a pair of small, sclerotized dorsal processes (dcp1) at the extreme base of conjunctiva each provided with a sharp, narrow prolongation apically; a pair of dorsal processes (dcp2) greatly fused along midline and therefore forming a single large, apically slightly concave, posteriorly directed dorsal lobe; a pair of elongate, apically slightly sclerotized, posteriorly directed lateral processes (lcp); and a pair of strongly sclerotized and basally largely fused ventral processes (vcp) closely associated with the vesica (ve), terminating in a pair of lobes apically; endophallic reservoir (er) large, occupying most of inner lumen of phallosome; vesica rather straight, directed posteroventrad, apically truncated, heavily sclerotized.

Female genitalia. External female terminalia as in Figs. 26–28. Valvifers VIII (vf8) deeply insinuated medially, triangulin (tr) bearing a large, smooth, and round median gibbosity visible externally between valvifers VIII when at rest. Laterotergites IX (lt9) produced posteriad.

Dorsal wall of gynatrium with a sclerite surrounding spermathecal orifice (so), a rather thin arcus (arc) (*sensu* SCHAEFER 1968; = anterior thickening of vaginal intima), and a pair of so-called ring sclerites (rs) not forming enclosed ring, sclerites being only coiled along their vertical axis (Fig. 28). Spermathecal dilation (Fig. 29: sd) large and globular (Fig. 29) of the single examined female damaged, figured after reconstruction, therefore Fig. 29 possibly slightly inaccurate in some details; distal invagination of spermathecal duct (“sclerotized rod”, distimedial part of spermathecal dilation) strongly widened, spindle-shaped (reconstructed portion indicated by dashed line), its inner duct thin, tubular, of nearly uniform diameter in its entire length. Intermediate part (Fig. 30: ip) of spermatheca well-developed, provided with relatively narrow proximal (pfl) and distal flanges (dfl), apical receptacle (ar) very small, tubular, bearing a single curved process apically (Fig. 30).

Differential diagnosis. *Anoano* differs from the related genus *Triplatyx* by the following combination of characters: i) body more elongated, pale ochraceous; ii) head lacking anteocular



Figs. 26–30. *Anoano pronotalis* Cahan, 1952 (♀, Anjahantelo): 26–27 – external female genitalia (26 – intact, 27 – dissected and macerated); 28 – detail of sclerites of the wall of gynatrium; 29 – spermathecal dilation (reconstruction of damaged part by dashed line); 30 – intermediate part and apical receptacle of spermatheca. Lettering: ar – apical receptacle, arc – arcus; dfl – distal flange, ip – intermediate part, lt8–9 – laterotergites VIII–IX, pd – proximal duct of spermatheca, pfl – proximal flange, rs – ring sclerite, sd – spermathecal dilation, so – sclerite surrounding spermathecal orifice, sr – sclerotised rod, t8 – tergite VIII, tr – triangulin; vf8–9 – valvifers VIII–IX, x – segment X. Scales: a – 1 mm (for 26–28), b – 0.5 mm (for 29–30).

spine; iii) humeral angles of pronotum markedly produced anteriorly, narrowing, and usually with bifid apex; iv) scutellum dorsally flat, without a hump; v) lateral margins of laterotergites straight, unarmed; vi) valvifers VIII medially deeply insinuated. In *Triplatyx* the body is shorter and wider, brown; head bears one antecular spine on each side; humeral angles of pronotum are produced laterad and less markedly anteriorly, wide and with widely rounded to nearly quadrangular apex; scutellum often bears a dorsal hump; lateral margins of laterotergites are more or less sinuate; and valvifers VIII medially straight. The third genus of the tribe Triplatyini, *Tricompastes* (monotypic, type species *T. gigas* Cahan, 1952) markedly differs from both *Anoano* and *Triplatyx* especially by its very large body (length 17–22 mm) and lateral margins of each laterotergite provided with two sharp triangular projections (see also the key provided by KMENT (2008)).

Etymology. CACHAN (1952) did not mention the etymology and did not specify the gender of the generic name *Anoano*. The name is probably derived from the Malagasy noun *anoano*, having three common meanings: i) ‘praise, blessing’; ii) ‘a species of field-bug’, and iii) ‘a guess, anything done at random’ (RICHARDSON 1885), but certainly it is derived neither from Latin nor from Greek word, therefore Article 30.2 of ICZN (1999) must be applied to determine its gender for the purpose of nomenclature. It is not possible to deduce the gender of the generic name by indication from its combination with the adjectival species-group name of the single originally included nominal species (*A. pronotalis*) under Article 30.2.3, because this adjective takes the same form in combinations with both masculine and feminine generic names. Therefore, the gender has to be treated as masculine according to Article 30.2.4.

Anoano pronotalis Cahan, 1952

(Figs. 1–31)

Anoano pronotalis Cahan, 1952: 375–376, pl. XI: fig. 4 (description, figures).

Anoano milloti Schouteden, 1954: 6–7 (description). **New synonym.**

Type locality. *Anoano pronotalis*: Madagascar, Toliara Province, Androy Region, Ambovombe (here restricted by lectotype designation); *A. milloti*: Madagascar.

Type material examined. *Anoano pronotalis*: LECTOTYPE (here designated): ♂ (Figs. 1, 7, 12–14), ‘MUSEUM PARIS / MADAGASCAR / RÉGION DE L’ANDROY / AMBOVOMBE / D’ J. DECORSE 1901’ [p, white label] // ‘fév. & mars / 1901’ [p, white label] // ‘MUSEUM PARIS’ [p, white label] // ‘♂’ [p, white label] // ‘LECTOTYPUS / ANOANO / PRONOTALIS / Cahan, 1952 / des. P. KMENT 2011’ [p, red label] (MNHN). The specimen is pinned through scutellum.

PARALECTOTYPES: ♂ (Fig. 18), ‘TYPIS’ [p, pink label] // ‘Vohibory / M. Abadie’ [hw] / (reverse) ‘I. S. Madagascar’ [p, white label] // ‘I. S. Madagascar [p] / Le. 20. Mai / 1941’ [hw, white label] // ‘MUSEUM PARIS’ [p, white label] // ‘Anoano / pronotalis / Cahan’ [hw, white label] // ‘♂’ [p, white label] // ‘PARALECTOTYPUS / ANOANO / PRONOTALIS / Cahan, 1952 / des. P. KMENT 2011’ [p, red label] (MNHN). The specimen, originally pinned through pronotum, is currently glued on a rectangular card, pygophore is detached and glued to the same piece of card). – ♀ (Figs. 2, 10), ‘TYPIS’ [p, pink label] // ‘Vohibory / M. Abadie’ [hw] / (reverse) ‘I. S. Madagascar’ [p, white label] // ‘I. S. Madagascar [p] / Le. 20. Mai / 1941’ [hw, white label] // ‘Anoano / pronotalis / Cahan’ [hw, white label] // ‘MUSEUM PARIS’ [p, white label] // ‘Anoano / pronotalis / n. sp. / Cahan det.’ [hw, white label] // ‘♀’ [p, white label] // ‘PARALECTOTYPUS / ANOANO / PRONOTALIS / Cahan, 1952 / des. P. KMENT 2011’ [p, red label] (MNHN). The specimen is pinned through pronotum; pronotum and the rest of thorax partly detached and glued together.

Anoano milloti: HOLOTYPE: ♀ (Figs. 4, 11, 15), ‘Fairmaire / Madagascar’ [hw, white label] // ‘HOLOTYPUS’ [p, pink label with black frame submarginally] // ‘Anoano / cachani / Type Schout.’ [hw, white label] // ‘HOLOTYPUS

/ *ANOANO* / *MILLOTI* / Schouteden, 1954 / labeled P. KMENT 2011' [p, red label] // 'ANOANO / PRONOTALIS / Cachan, 1952 / det. P. KMENT 2012 [p, white label]' (NHMW). The specimen is glued on a piece of card, left pro- and mesotarsus, left hind leg (femur glued on the card), right fore and middle leg tibiae and tarsi missing, hemelytra outstretched.

Additional material examined. MADAGASCAR: ♀ (Figs. 8, 15, 26–30), 'Madagascar Sud / Anjahantelo près / Amboasary [p] iii.1969 [hw] / Vadon et Peyrieras' (MNHN). – ♂ (Figs. 3, 9, 17, 19–25), Morombe Region: 'Station Agric / Bas Mangoky [p]' // 'Institut Scientifique Madagascar [p]', G. M. Day 1963 det., P. Kment revid. (MNHN). – ♂, 'I.R.S.M / Madagascar Ouest / Vohibory / Mai 1941 Abadie' [hw, white label] // 'Anoano / pronotalis / Cachan / Cachan det. [hw, white label]' // 'Brit. Mus. / 195[p]1-379 [hw, white label]' (BMNH). Specimen damaged, abdomen pinned upside down. According to label data the specimen belongs to the same series as both paralectotypes and the labels are handwritten by Cachan; however, the identification label states 'Anoano pronotalis Cachan Cachan det.' instead of 'Anoano pronotalis n. sp. Cachan det.' as on types, and CACHAN (1952) explicitly noted that all syntypes are deposited in MNHN. Therefore, the BMNH specimen is not considered a paralectotype.

Redescription. *Colour* (Figs. 12–16). Basic coloration pale ochraceous; posterolateral margins of head, and anterior and lateral margins of pronotum slightly darker, brownish; eyes dark brown; antennal segments II–V and most of labium dark brown to black; median ridge anteriorly on pronotum whitish; median sternal furrow, abdominal spiracles, and apices of claws black. Legs, humeral angles, and pygophore covered with dense dark punctures, the dark colour here and there spreading on interspaces, so these parts appearing as more or less dark with pale spots. Membrane translucent with more or less distinct dark brown reticulation along posterior margin (Fig. 16).

Puncturation. Body densely covered with concolorous to dark punctures dorsally, dark punctures concentrated especially along anterior and lateral pronotal margins, sometimes forming a pair of small symmetrical spots at base of scutellum (Figs. 12, 15, 16). Head base, pleura, hypocostal lamina, legs, pygophore, and female terminalia covered with large, coarse, concolorous to dark brown punctures. Abdominal venter covered with smaller, shallow, nearly concolorous punctures (Fig. 13).

Pilosity. Body bare except for antennae and tibiae bearing short semierect setae. Pygophore bearing long erect setae on lateral rim and short setae on dorsal surface of proctiger and outer portion of ventral rim (Figs. 17, 18, 22).

Structure. See the generic redescription.

Measurements (minimum – maximum; mm). Males (n = 4; lectotype of *A. pronotalis* in parentheses): Body length 5.8–6.7 (6.6); head: length 1.5–1.65 (1.7), width 1.65–1.8 (1.7), interocular width 1.3–1.35 (1.35); length of antennal segments: I – 0.35–0.35 (0.35), II – 0.4–0.4 (0.4), III – 0.4–0.5 (0.5), IV – 0.6–0.6 (0.6), V – 0.6–0.6 (0.6); pronotum: length 1.5–1.8 (1.7), width 3.8–4.8 (4.75); scutellum: length 2.5–2.9 (2.75), width 2.2–2.7 (2.5); abdomen: width 4.0–4.85 (4.75).

Females (n = 3; holotype of *A. milloti* in parentheses): body length 7.3–8.3 (8.2 up to posterior margin of abdomen); head: length 1.55–1.95 (1.95), width 1.8–1.9 (1.9), interocular width 1.45–1.55 (1.55); length of antennal segments: I – 0.3–0.35 (–), II – 0.4–0.5 (0.5), III – 0.5–0.5 (0.5), IV – 0.6–0.6 (–), V – 0.7–0.7 (–); pronotum: length 1.7–1.9 (1.9), width 4.7–5.6 (5.6); scutellum: length 2.9–3.4 (3.3), width 2.6–3.0 (3.0); abdomen: width 4.7–5.55 (5.55).

Variation. The seven specimens examined differ in the body measurements, intensity of the body coloration, the colour of the punctation (especially the intensity of the dark colours, e.g., the posterior portion of pronotum may be paler in some specimens), the shape of the

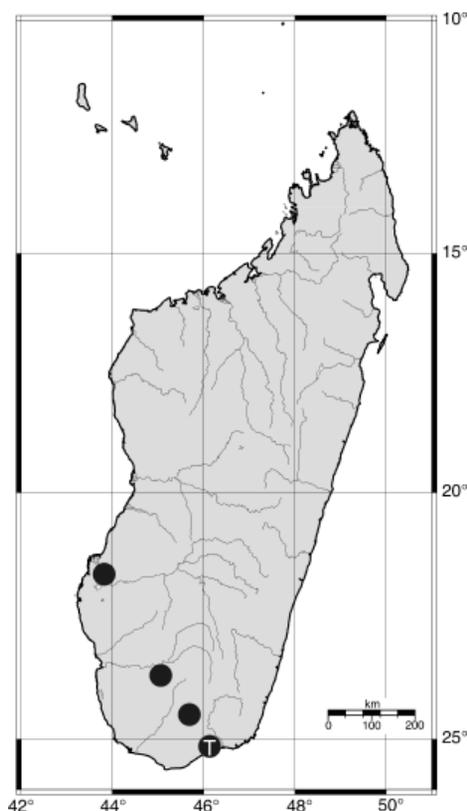


Fig. 31. Distribution of *Anono pronotalis* Cachan, 1952 (T – type locality).

head outline (the lateral insinuation more or less deep; see Figs. 1–4), and especially in the shape of the humeral pronotal angles, which differ in all specimens examined, usually also on the left and right side of the same specimen (see Figs. 7–13, 15–16).

Biology. Unknown.

Distribution. The species is known from grassland areas of southern and south-western Madagascar (Fig. 31). It is interesting to note that on three of the four localities *A. pronotalis* co-occurs with *Triplatyx dubius* Jensen-Haarup, 1931, and the type locality, Ambovombe, is also the type locality of *T. bilobatus* Cachan, 1952 (CACHAN 1952; KMENT 2008, 2011).

Taxonomy. SCHOUTEDEN (1954) distinguished his *A. milloti* from *A. pronotalis* by the following two characters: i) abdominal spiracles black, and ii) membrane with distinctly dark brown reticulation externally. He further mentioned that the margins of the head of *A. milloti* are less incised than those of *A. pronotalis* on figures by CACHAN (1952: Fig. 344, Pl. XI: fig. 4), and the humeral angles of the pronotum are of different structure. However, all specimens of *A. pronotalis* have black abdominal spiracles (a character not mentioned in the original description), and the dark reticulation

on the membrane as well as the outline of the head and the shape of the humeral angles are highly variable among specimens examined (see above). Therefore, *A. milloti* fits well within the variation range of *A. pronotalis*, and is regarded here as its junior synonym.

Acknowledgements

I am obliged to Igor Malenovský (Moravian Museum, Brno) for translation of the French descriptions, to Dominique Pluot-Sigwalt and Eric Guilbert (MNHN), Mick Webb (BMNH), and Herbert Zettel (NHMW) for loans of the specimens under their care and kind assistance during my stays in Paris, London, and Vienna, and to Dávid Rédei (Hungarian Natural History Museum, Budapest) and Jocelia Grazia (Departamento de Zoologia, Universidade Federal do Rio Grande do Sul, Porto Alegre) for many valuable comments on the manuscript. My stay at MNHN was partly covered by the SYNTHESYS project FR-TAF-1820 (Revision of selected genera of Madagascar Pentatomidae (Heteroptera)). The preparation of this manu-

script received financial support from the Ministry of Culture of the Czech Republic to the National Museum, Prague (DKRVO MK-S 760/2012 OVV).

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