

SENSORICA GEN. NOV., NEW RICANIIDAE FROM NAMIBIA (HEMIPTERA: FULGOROMORPHA)

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Abstract.— A new monotypic genus of ricaniid planthoppers (Hemiptera: Fulgoromorpha: Ricaniidae) from Namibia, *Sensorica* **gen. nov.**, is described for *S. namibiensis* **sp. nov.** (type species). Habitus, female, external and internal genital structures of the new species are described and illustrated.



Key words.— Fulgoroidea, Afrotropical Region, taxonomy, morphology, sensory pits

INTRODUCTION

The planthopper family Ricanidae Amyot et Audinet-Serville, 1843 consists of 67 genera (2.7% of the Fulgoromorpha) and covers 437 species (3.2% of the Fulgoromorpha) (Bourgoin 2021). From the Afrotropical Region 28 genera with 138 species are recorded. One of the extremely weakly known areas is Namibia, in which only 2 species were recorded: *Acroprivesa bifurcata* Stroiński, 2010 and *Lugardia mimica* Distant, 1909 (Bourgoin 2021).

MATERIAL AND METHODS

Dry pinned specimens were used for this study.

Label information of all specimens examined is provided verbatim with each line separated by a slash (/) and each label given in square brackets.

Terminology

The nomenclature of fore wing (tegmen) follows the interpretation proposed by Bourgoin *et al.* (2015) and Stroiński (2020). Antennal structures are named in accordance with Stroiński *et al.* (2011). The terminology of the genitalia follows Bourgoin (1988) and Bourgoin and Huang (1990) for the male, and Bourgoin (1993) for the female. The abdomen of the specimen examined was cut off and cleared for 30 min in a warm (50°C) 10% KOH solution with a few drops of black chlorazol (CAS No. 1937-37-7) for staining the ectodermic genital structures, based on the method introduced by Carayon (1969). Dissections and cleaning of the genital structures were carried out in distilled water. Final observations were made in glycerol using an Olympus SZH10 stereoscope microscope. The photographs of the habitus and internal structures were taken using a stereoscopic microscope Leica MZ 16 with IC3D

camera. Final images were adjusted using the Helicon 5.0 software and Adobe Photoshop.

The SEM photographs of uncoated specimens were taken in the Laboratory of Scanning Microscopy, MIZ PAS (Warsaw), using a scanning electron microscope HITACHI S-3400N under low vacuum conditions.

Measurements and abbreviations

Measurements were made with an ocular micrometer. The following measurements, ratios and their abbreviations were used in this study:

Total length – measured (in dorsal view) from head apex to tegmina apex;

A/B – width of vertex measured at anterior margin / length of vertex measured at midline;

C/E – width of frons at upper margin / length of frons at midline;

D/E – maximum width of frons / length of frons at midline;

F/B – length of pronotum at midline / length of vertex at midline;

G/F – length of mesonotum / length of pronotum at midline;

G/B+F – length of mesonotum / cumulative length of vertex and pronotum at midline;

G/H – length of mesonotum at midline / width of mesonotum between lateral angles;

I/J – length of tegmen measured from the base to the apical margin in median portion / width of tegmen measured at the widest part.

For the apical teeth for the tibial and tarsomeres parts of legs the following abbreviations are used:

alt – apical lateral teeth;

ait – apical internal teeth.

The material studied is deposited in the collection: MNHU – Museum für Naturkunde – Leibniz Institute for Research on Evolution and Biodiversity, Berlin, Germany.

TAXONOMY

Sensorica gen. nov.

(Figs 1–47)

Type species. *Sensorica namibiensis* sp. nov., by present designation and monotypy.

Etymology. The generic name *Sensorica* is the combination of the 2 words and refers to the characteristic morphological character (sensory pits on sternites) and family name Ricaniidae. Gender feminine.

Diagnosis. The genus *Sensorica* gen. nov. (Figs 1–41) is very easy to distinguish from the others genera by the following characters: frons tricarinate, carinae connected at base; mesonotum tricarinate, carinae

connected at base; tegmina semicoriaceous; hind basitarsomere with elongate-oval pad of strong, long and partly flattened setae; posterior margin of the gonoplac smooth, without teeth; upper margins of the gonoplac connected by membrane; sternites of the abdomen with sensory pits.

Description. Head with compound eyes (in dorsal view, Figs 3–4, 11–12) about as wide as mesonotum.

Vertex (Figs 3–4, 11–12, 17) transverse, distinctly wider than long at midline, with all margins well carinate; disc of vertex with incomplete median carina, visible on posterior part of disc vertex.

Frons (Figs 1–2, 9–10) with all margins well carinate; at upper margin wider than high at midline, widest at the lower part below, level of antennae; lateral margins arcuate, covering base of pedicel, not incised near the level of ocelli, margins distinctly curved to frontoclypeal suture in lower part. Frontal disc tricarinate, all carinae extending half of frons; median carina straight, reaching frontoclypeal suture; lateral carinae arcuate, connected with median in one point, around point of connection partly melted and running very close (almost parallel) to upper margin; lateral carinae, except area of connection, parallel to lateral margins; lateral carinae shorten than median; frontal disc rugose, alongside lateral carinae with 4 sensory, on each side.

Compound eyes (Fig. 13), with small callus in lower part of posterior margin. Ocelli present.

Antenna (Figs 5–6, 13): pedicel elongated, cylindrical, with functional area with trichoid sensilla type 1 and plate organs of crenellated type with U-shaped ridges surrounded by a ring of elevated spines, present at the top and on dorsal surface, on apical concavity and ventral surface; ventral area bigger than dorsal.

Clypeus (Figs 1–2, 9–10) distinctly narrower than frons, without carinae.

Thorax: pronotum (Figs 3–4, 11–12, 17) distinctly longer than vertex at midline; disc of pronotum with median carina and two lateral impressions.

Mesonotum (Figs 3–4, 11–12, 17) widely triangular, wider at lateral angles than long at midline and longer than combined length of vertex and pronotum at midline; median carina and lateral carinae present, antero-lateral carinae absent; median carina and lateral carinae connected basally; median carina reaching scutellum, lateral carinae reaching posterior margin.

Vertex, disc of pronotum and disc of mesonotum almost in same planes (Figs 5–6).

Tegmina (Figs 3–6, 15–18) semicoriaceous, weakly convex, elongately-rounded with distinct longitudinal venation and transverse veinlets.

Costal margin weakly arcuate, anteroapical angle broadly rounded, placed a bit before to claval angle, posterior margin arcuate, tornus absent. Costal area distinctly narrower than costal cell, with transverse

veinlets, ending distinctly before tip of clavus, on whole distance about same width. Costal cell distinctly wider than costal area, without transverse veinlets except single oblique and weakly visible in distal part. Basal cell elongate-oval, longer than wide. Longitudinal veins ScP+RA, MP and CuA leaving basal cell separately, veins ScP+RA and RP arising as short common stem from basal cell with first fork before first fork of MP vein; ScP+RA forking distinctly before first RP fork; MP₁₊₂ and MP₃₊₄ leaving basal by short common fork, a bit longer than ScP+RA and RP, MP₁₊₂ forking later than MP₃₊₄ fork. Cells C1 and C3 about same length.

CuA leaving basal cell by very long common stem with first fork after MP forks and distinctly after connection of claval veins Pcu+A₁.

Median cell and cubital cell with transverse veinlets; cubital cell wide. Tegmen with single apical line of transverse veinlets, apical cell a bit longer than wide and group of irregular transverse veinlets placed before level of tip of clavus and end of costal area.

Clavus closed; CuP ending at margin, claval veins Pcu and A₁ fused after the midlength of CuP vein; postero-cubital cell (end of basal and posterior part) with transverse veinlets; postcubital cell without transverse veinlets; anal cell apically with few transverse veinlets.

Hing wing (Figs 7–8) semicoriaceous, shorter than tegmina, ending before apical line of transverse veinlets of tegmina; precostal cell elongate and very narrow, ScP+R single; MP forking before posterior margin CuA fork before MP fork; both forks MP and CuA placed after middle of wing, anal lobe narrow.

Profemur shorter than protibia, mesofemur shorter than mesotibia.

Hind legs (Figs 19–21): metatibia distinctly longer than metafemur, widened at distal part; hind tibia in basal half with single lateral spine and apical row of 8 well-developed teeth (2+6) without diastema, different in size and forming irregular line; lateral spines of equal size, inner apical teeth different in size: external tooth as long as lateral spines, biggest in group of inner spines, lateral internal spine a little shorter than external inner spine; the rest inner teeth (4) same size. Basitarsomere of metatarsus longer than cumulative length of second and third tarsomere's, with asymmetrical and interrupted apical 3 teeth (2+1); two of lateral teeth different in size, external lateral spine biggest than internal lateral one, single internal spine placed near external lateral spine and distinctly smaller; median area of basitarsomere cover by elongate-oval pad of strong, long and partly flattened setae; second tarsal segment distinctly shorter than third (apical).

Male. Unknown.

Female (Figs 22–41). Abdomen: sternites with sensory pits present on sternites 4th, 5th and 6th and on all of them placed symmetrically in position and number of pits. Sternite 4th with group of 12 (6+6) sensory pits

present in median part. Sternite 5th with group of median 14 (7+7) sensory pits. Sternite 6th with group of 6 (3+3) sensory pits placed laterally alongside the posterior margin (Figs 29–32).

Pregenital sternite (Figs 29, 33) with well developed, elongately-rounded and distinctly separated lateral lobes; median part of pregenital sternite very narrow, anterior and posterior margins without any processes, weakly arcuate and parallel.

Anal tube (in lateral view, Figs 22, 34) very short, not reaching half of upper margin of gonoplac; basal part of anal tube distinctly wider than posterior one; anal opening, in dorsal and lateral view, placed slightly before midlength; anal tube (in dorsal view, Figs 24–25, 35) about square like, apically wider than basally; widened after opening; posterior margin almost straight, lateral margin arcuate; paraproct short and narrow, not extending posterior margin of anal tube and epiproct massive and long extending posterior margin of anal tube.

Gonoplac (22–29, 36–37) well developed, horse-man's pick shape like, unilobate; posterior margin of gonoplac without any teeth, smooth and thickened; membranous part of gonoplac large and fully membranous of gonoplac placed ventro-basad; gonoplac on basal half of upper margin connected by well developed membrane (Fig. 36)

Gonapophysis VIII (Fig. 38) elongate, elongate-triangular tapering apicad, in cross section „T”-shape, upper part wide with dentation on dorsal part and lateral part apically, lower part of gonapophysis VIII flattened; endogonocoxal process bit shorter than gonapophysis VIII, membranous, elongate-oval, tapering apicad with spine-like tip bearing spiniferous ornamentation and short setation on ventral margin.

Gonapophyses IX and gonospiculum bridge well developed as in Figs 39–40.

Bursa copulatrix of two pouches connected with short ductus; first pouch elongate, without cells and sclerotised ornamentation; second pouch elongate-oval, smaller than first one, without cell and ornamentation.

Spermatheca (Fig. 41) well developed; *ductus receptaculi* elongate and narrow, ribbed; *diverticulum ductus*, distinctly longer than *ductus receptaculi* with 2 parts (basal longer than apical one), with long smooth basal ductus (longer than *ductus receptaculi*), and shorter smooth narrow ductus with ovoid and smooth bulla apically.

Distribution. Africa: Namibia (Fig. 47)

***Sensorica namibiensis* sp. nov.**
(Figs 1–47)

Etymology. Specific epithet namibiensis (adjective) meanig “from Namibia”.

Description. Total length 0.39–0.41 cm.

Head. Vertex: proportion A/B = 3.77–4.00; lateral margins weakly arcuate and subparallel; anterior and posterior margin arcuate almost parallel, posterior margin elevated.

Frons: proportion C/E = 1.15–1.25; proportion D/E = 1.80–1.83; upper margin almost straight; frontoclypeal suture distinctly curved.

Thorax. Pronotum: proportion F/B = 1.28–1.38; anterior and posterior margins arcuate in median portion almost parallel.

Mesonotum: proportion G/F+B = 1.80–1.88, proportion G/F = 3.00–3.33, proportion G/H = 0.57–0.61; connection between anterolateral carinae and lateral weakly visible, all carinae elevated.

Tegmina: proportion I/J = 1.40–1.60

Hind wing: MP₁₊₂ with single terminal, MP₃₊₄ with single terminal; CuA with 4 terminals.

Coloration (Figs 1–7). Vertex black with small yellow patch in median portion on anterior margin and smaller on posterior margin medially and on lateral angles; disc of vertex on lateral side near posterior margin with small rounded patches. Upper part of frons black with narrow rust arcuate band between lateral carinae of frons and lateral margins; lower part yellow; lateral part of head in upper part black with small yellow patches between compound eyes and margin; lower part yellow; clypeus brownish. Pronotum black with yellowish median carina in median portion, lateral parts yellowish; lateral carinae of mesonotum partly yellowish; posterior margin of mesonotum with yellow areas; scutellum yellow. Legs brown. Tegmina black with yellowish highlights. Abdomen: sternites yellow, lateral lobes of pregenital sternite black; tergites dark brown; female terminalia brown; posterior margin of the gonoplaque yellow.

Type material. **Holotype**, ♀: [Namibia: Naukluff Blässkranz 6.-7.iii.2006 24°06'S/16°16'E leg. U. Göllner] – MNHU;

Paratype, ♀: [Namibia: Otiozondiupa Bistr. Omatako Ranch, 1500m 21°30'43"S/16°43'54"E Bodenfallen 1.-2.x.2003, leg J. Deckert] – MNHU.

Environmental notes. The specimens were collected at 1305 m. a.s.l and 1500 m. a.s.l. Both localities belong to Namibian savanna woodlands (= Namib escarpment woodlands) ecoregion.

Distribution. Africa: Namibia (Fig. 47).

DISCUSSION

Sensorica namibiensis gen. et sp. nov. enlarges our knowledge on the morphological disparity of the family Ricaniidae, on the diversity of their habitats and on their ecological plasticity.

The coleopterous general shape of the body with

coriaceous or semicoriaceous tegmina in family Ricaniidae is not common characters (Stroiński *et al.* 2011). The coleopterous taxa is represented by *Kruegeria* Schmidt, 1912 (South America) and *Globularica* Stroiński, Gnezdilov et Bourgoïn, 2011 (Madagascar). The genera *Pharsalus* Melichar, 1906 (South America) and Madagascan *Cyamosa* Stroiński Stroiński, Gnezdilov et Bourgoïn, 2011, *Coniunctivena* Stroiński, Gnezdilov et Bourgoïn, 2011, *Isobium* Melichar, 1906, *Nasatus* Stroiński, Gnezdilov et Bourgoïn, 2011 belongs to semicoriaceous taxa (Stroiński *et al.* 2011).

Both localities for *Sensorica namibiensis* gen. et sp. nov. from Namibia belong to Namibian savanna woodlands, also known as the Namib escarpment woodlands ecoregion. This biome covers deserts and xeric shrublands ecoregion of Namibia and Angola and has a semi-arid to arid climate (Olson *et al.* 2001).

Sensory pits as defined by Emeljanov (2001: “a small hole with horizontal seta directed inwards and diverging from its border; the length of the seta is not greater than diameter of the hole) are usually found in larvae (Gnezdilov and Wilson 2007), but they remain rare in adults and particularly exceptional on abdominal sternites. Abdominal sensory pits are well known in Cixiidae tribes Bennini and Bennarellini, and in family Achilixiidae (Wilson 1989) but they belong to complex sensorial structures, all independently evolved, on the lateral side of the abdomen. It is also recorded in family Tropicuchidae for the African genus *Fovealvus* Ghezdilov et Wilson, 2007 and also Western Australian genus *Alleloplasis* Waterhouse, 1839 (*A. darwini* Waterhouse, 1839 and *A. vespula* Fennah, 1949). In Ricaniidae, this character is recorded only in the Western Australian species *Aprivesa varipennis* Muir, 1931. Muir described them as „Abdominal sterna yellow, the fourth, fifth and sixth bearing circular depressions which are darker in colour,.. The pattern of the distribution and organization of the sensory pits on the sternites is unique for each of taxa.

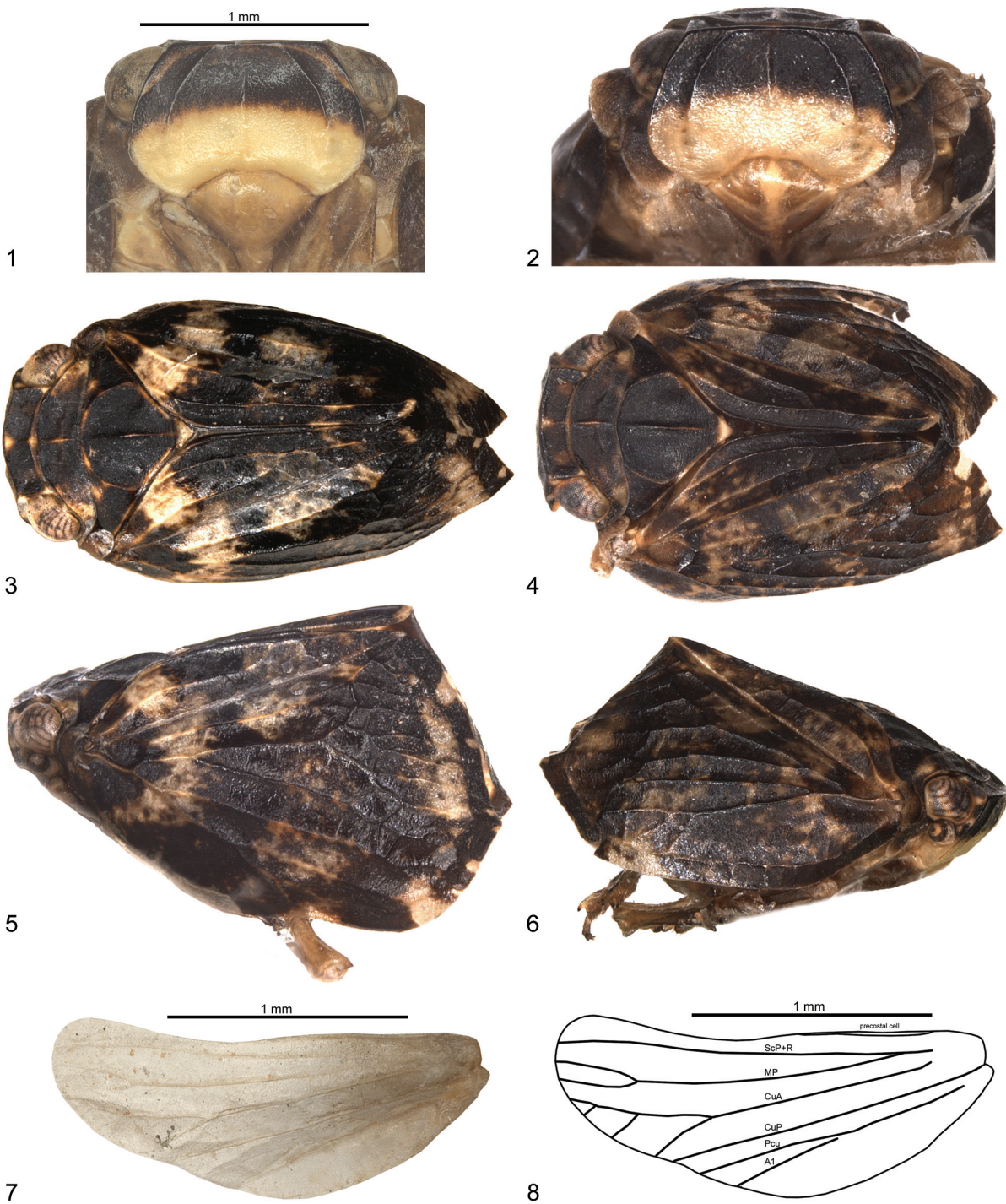
ACKNOWLEDGMENTS

I would like to thank Jürgen Deckert for the privilege of studying material from the entomological collection of Museum für Naturkunde (Berlin, Germany) as well as Prof. Thierry Bourgoïn and Dr Jacek Szwedko for constructive peer-review comments on the manuscript.

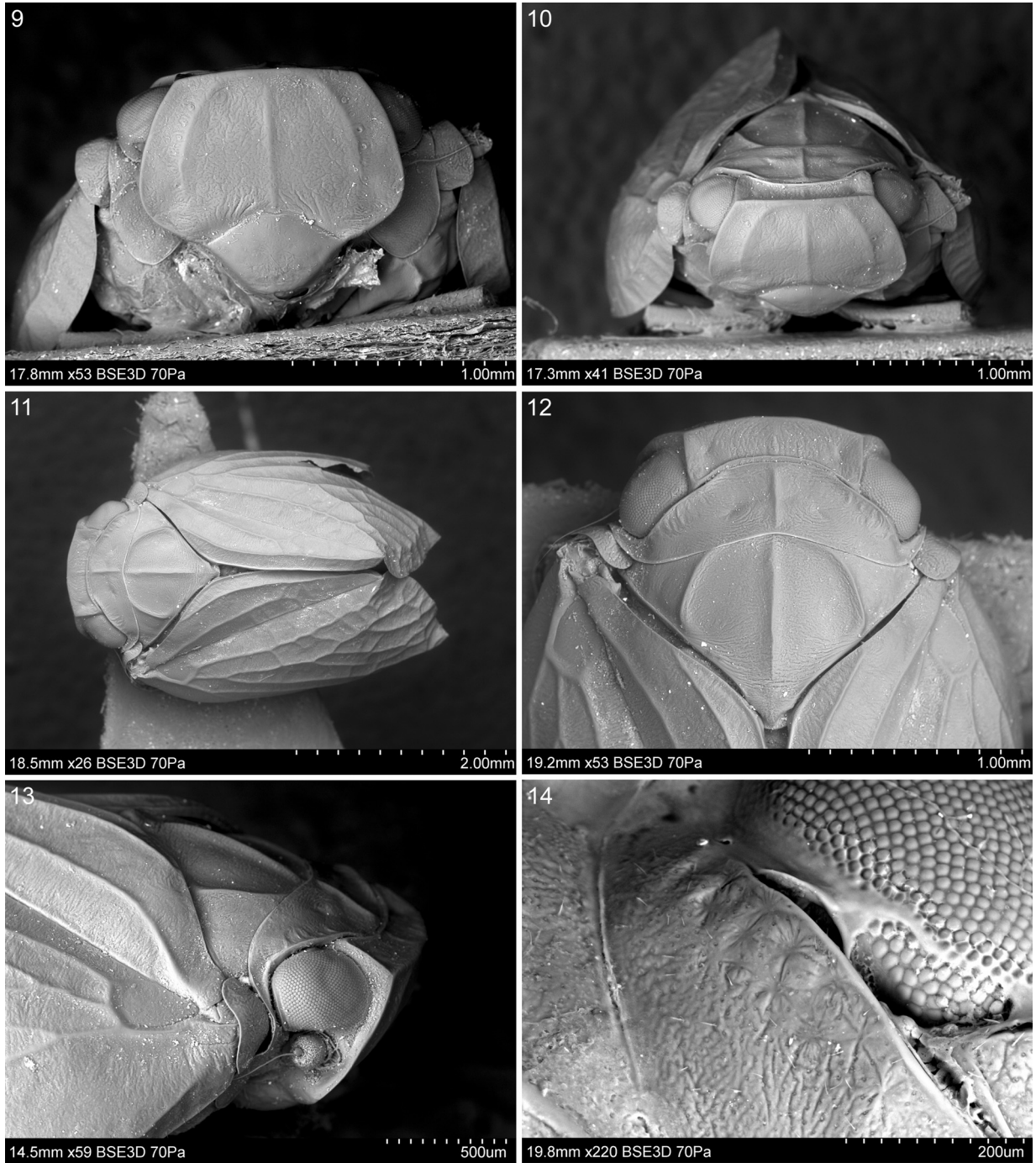
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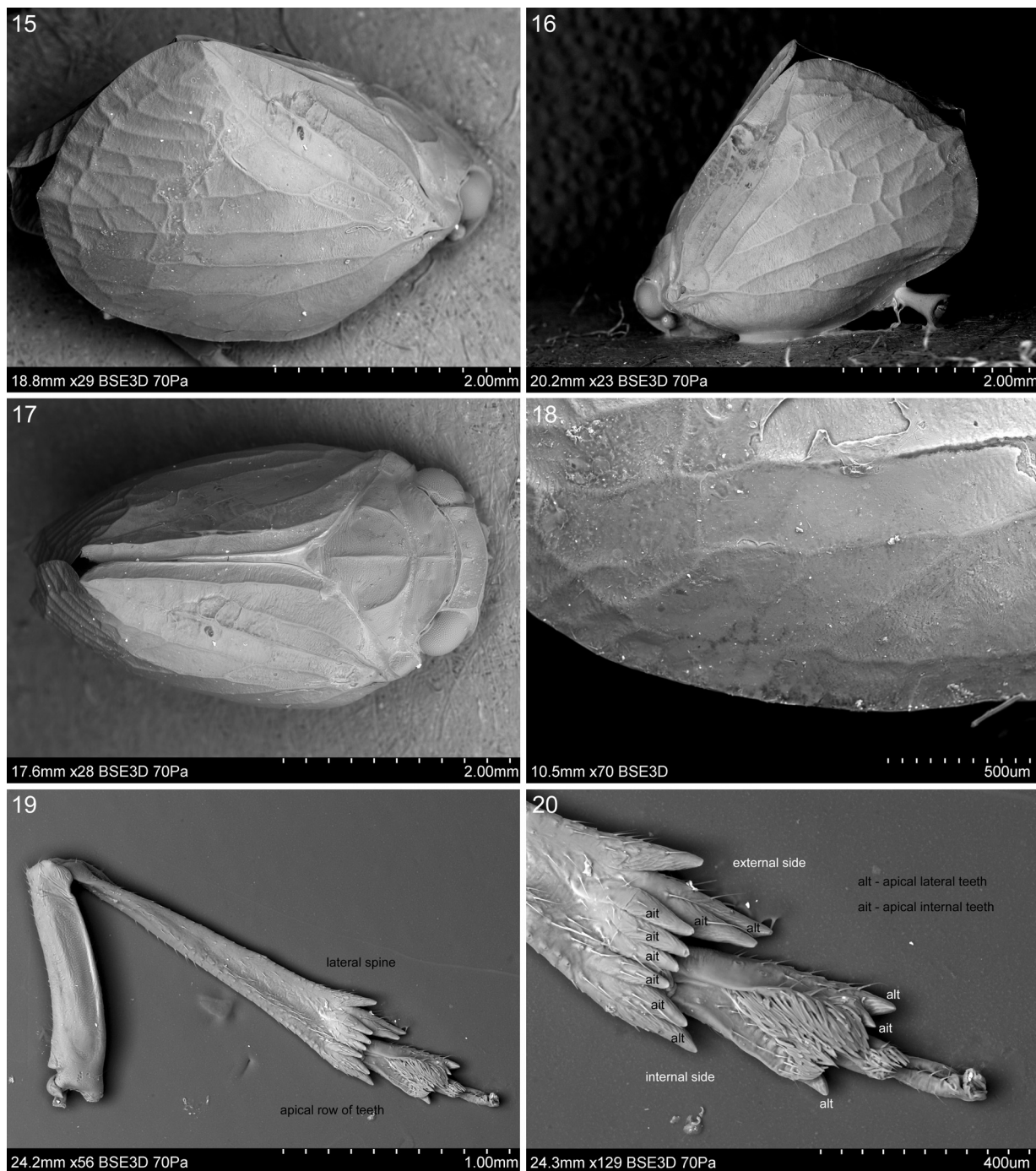
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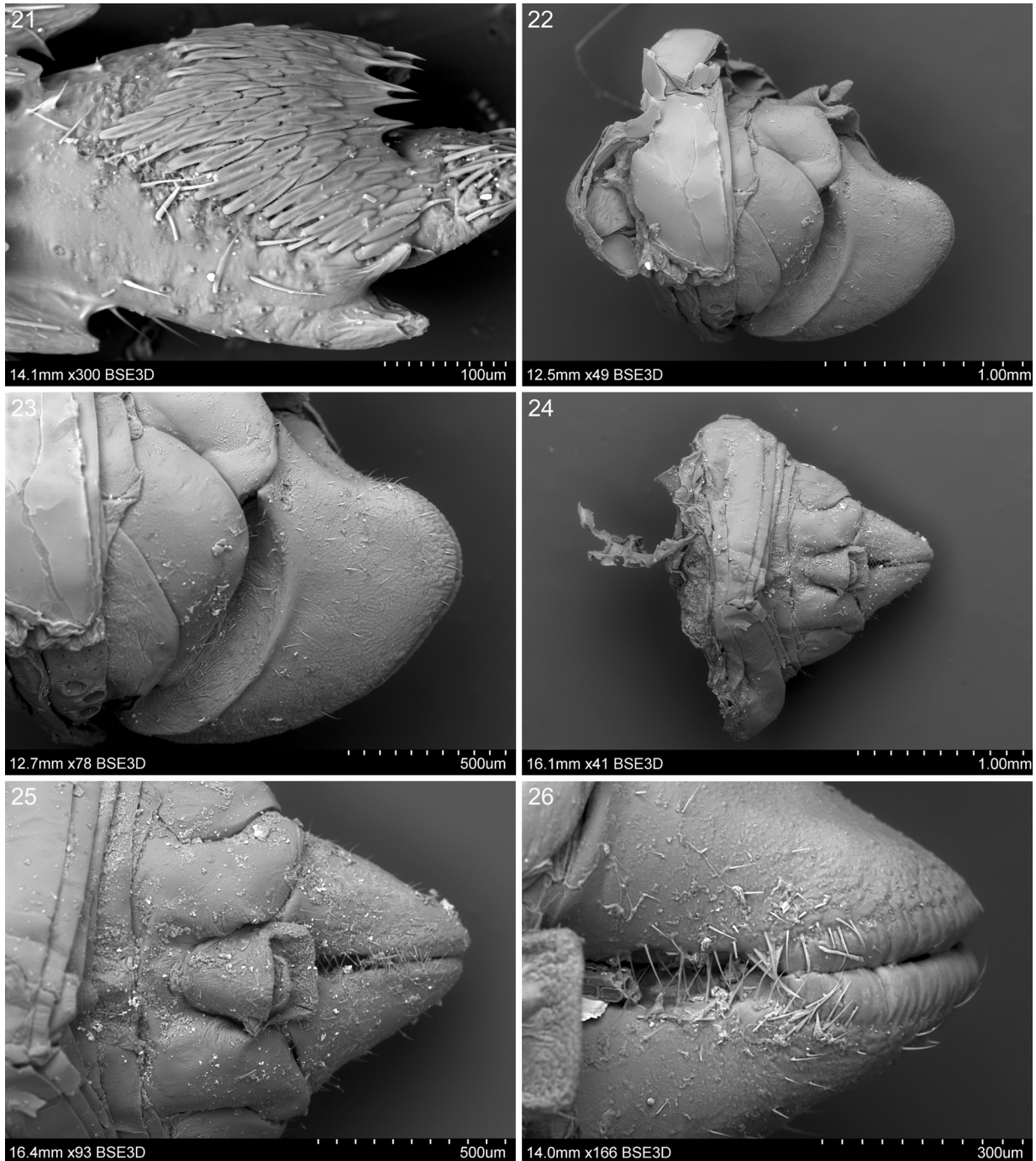
Figures 1–8. *Sensorica namibiensis* gen. et sp. nov. (1–2) Anterior part of body, frontal view; (3–4) habitus, dorsal view; (5–6) same, lateral view; (7–8) hind wing. (1, 3, 5, 6) specimen from Blass; (2, 4, 6) specimen from Bodenfall.



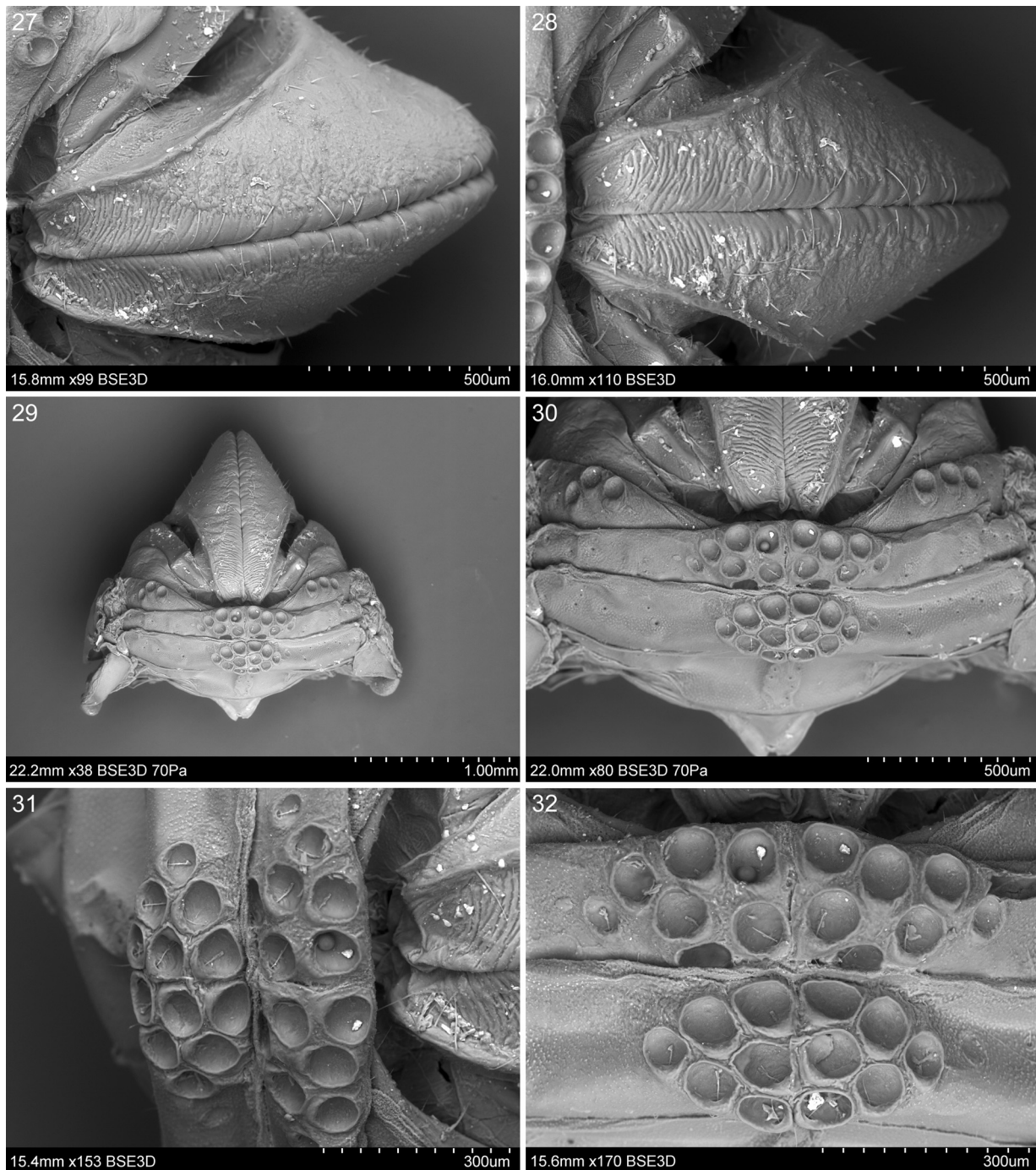
Figures 9–14. *Sensorica namibiensis* gen. et sp. nov., SEM photographs. (9) Anterior part of body, frontal view; (10) same, dorso-frontal view; (11) habitus, dorsal view; (12) anterior part of body, dorsal view; (13) same, lateral view; (14) lateral part of pronotum, dorsal view.



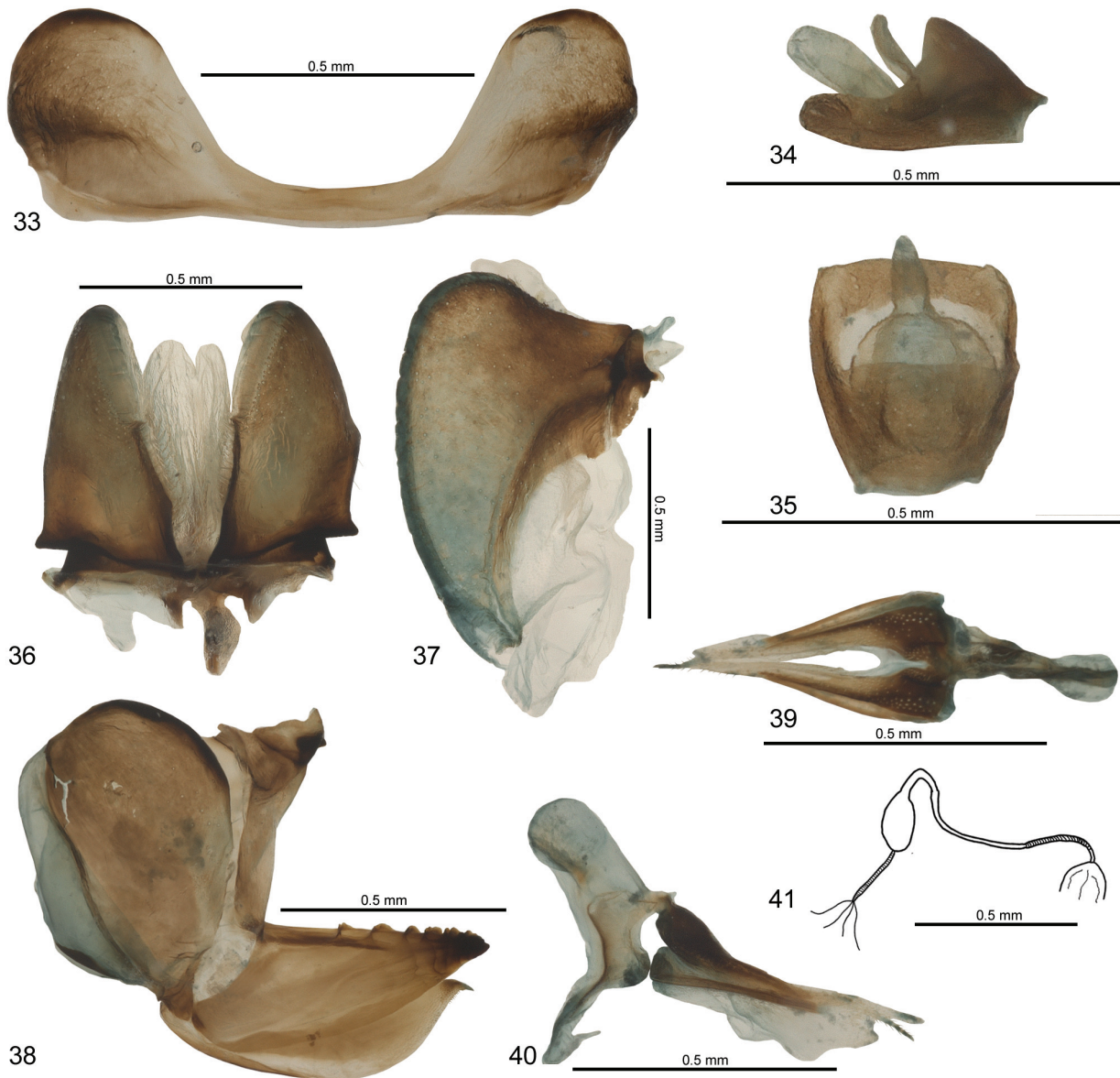
Figures 15–20. *Sensorica namibiensis* gen. et sp. nov., SEM photographs. (15–16) Habitus, lateral view; (17) same, dorsal view; (18) end of costal area; (19) hind legs, ventral view; (20) apical part of hind tibia end tarsus, ventral view.



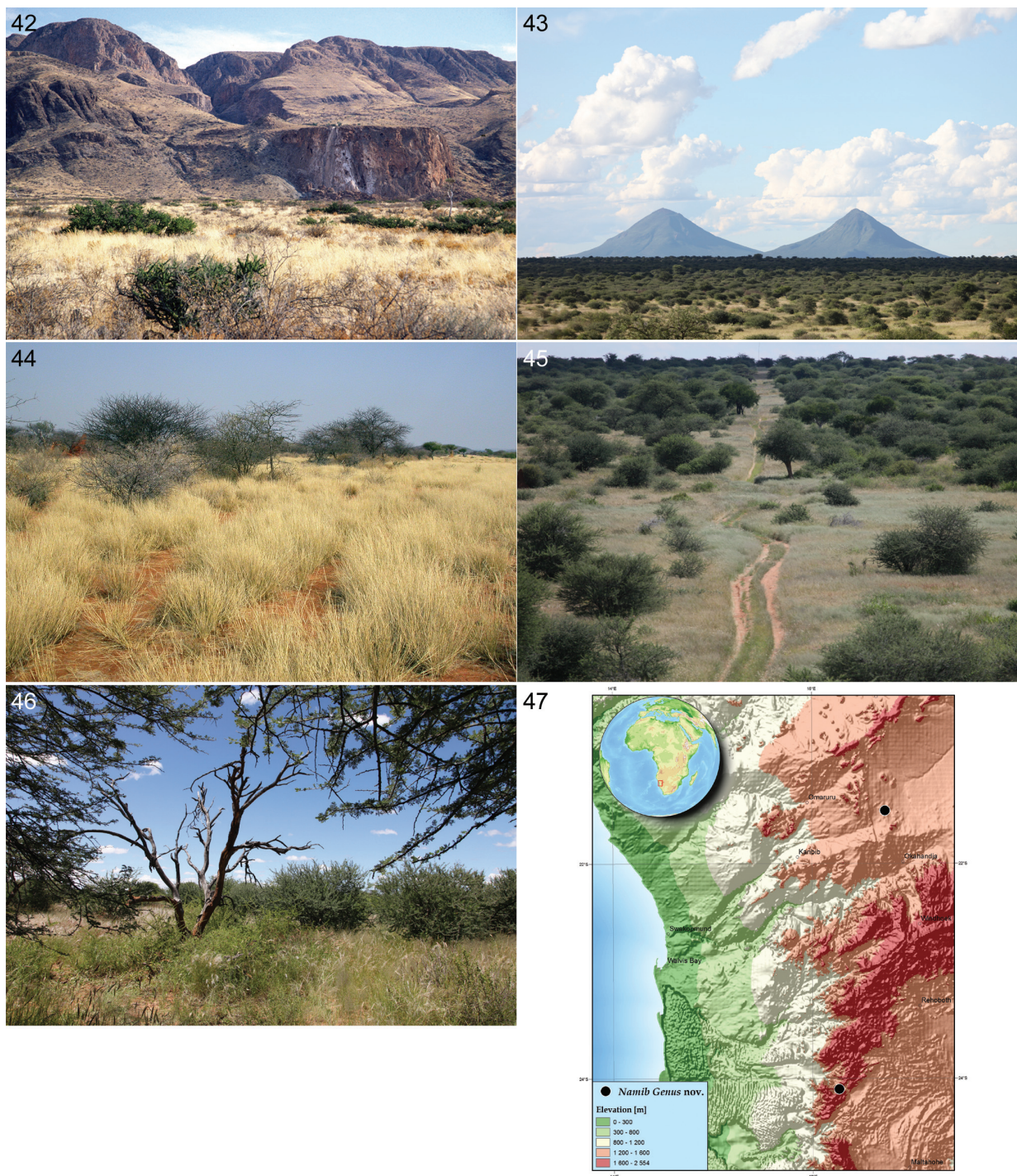
Figures 21–26. *Sensorica namibiensis* gen. et sp. nov., SEM photographs. (21) first hind tarsomere, latero-dorsal view; (22) abdomen and terminalia, lateral view; (23) gonoplac, lateral view; (24) abdomen and terminalia, dorsal view; (25) terminalia, dorsal view; (26) gonoplac, dorsal view.



Figures 27–32. *Sensorica namibiensis* gen. et sp. nov., SEM photographs. (27–28) Gonoplac: (27) ventro-lateral view, (28) ventral view; (29) abdomen and terminalia, ventral view; (30–32) sensory pits on sternites, ventral view.



Figures 33–41. *Sensorica namibiensis* gen. et sp. nov. (33) Pregenital sternite, ventral view; (34) anal tube, lateral view; (35) same, dorsal view; (36) gonoplasts with membrane, dorsal view; (37) gonoplast, lateral view; (38) gonapophysis VIII and endogonocoxal process, lateral view; (39) gonapophyses IX and gonospiculum bridge, dorsal view; (40) same, dorsal view; (41) spermatheca.



Figures 42–47. *Sensorica namibiensis* gen. et sp. nov. (42) Habitat: Namibia, Naukluft, 2002; (43–46) habitat, Namibia, Omatako Ranch: (43) 11.03.2009, (44) 04.10.2003, (45–46) 12.03.2009; (47) distribution map. Photos from the location of the specimens but taken at different times than the collected specimens. All photos by Jürgen Deckert.