

SHORT COMMUNICATION

First record of the genus *Stenogiffardia* (Auchenorrhyncha: Cicadellidae) from Madagascar, with description of a new species and a key to species

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Abstract. *Stenogiffardia bifurca* sp. nov. is described from a series of specimens collected in the former Antananarivo, Fianarantsoa, and Toliara Provinces of Madagascar. This is the first record of the genus *Stenogiffardia* Evans, 1977 (Hemiptera: Cicadellidae: Deltocephalinae) from Madagascar, which is now the third genus of the tribe Chiasmini known from the island. The distribution of *Stenogiffardia* is analyzed and an identification key to species is given. *Stenogiffardia elongata* Evans, 1977 is removed from synonymy with *S. parvula* (Kirkaldy, 1906).

Key words. Hemiptera, Cicadomorpha, Membracoidea, Deltocephalinae, Chiasmini, leafhopper, morphology, taxonomy, transoceanic distribution, Madagascar

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Introduction

During a field trip to Madagascar in January 2011 organized by the association “Naturevolution” for the study of nature of the Makay Massif (GNEZDILOV 2015), a series of specimens representing a new species of the genus *Stenogiffardia* Evans, 1977 was collected in the former Antananarivo, Fianarantsoa, and Toliara Provinces (Figs 1–4), together with other materials of Auchenorrhyncha which are mostly still unidentified. So far, only the paper on subbrachypterous Ricaniidae (Fulgoroidea) has been published based partly on specimens from this expedition (STROIŃSKI et al. 2011). The new species described below is from the subfamily Deltocephalinae of the family Cicadellidae, which is an extremely diverse and species-rich group of leafhoppers (ZAHNISER & DIETRICH 2013), well represented in all kinds of biotopes in Madagascar, including urban areas.

The genus *Stenogiffardia* Evans, 1977 belongs to the grass-specialist tribe Chiasmini Distant, 1908, distributed worldwide and represented by 21 genera with 316 species (ZAHNISER & DIETRICH 2015). The genus was erected by EVANS (1977) to accommodate *Stenogiffardia elongata* Evans, 1977, described from Queensland in Australia. *Phrynophyes parvula* Kirkaldy, 1906 was recognized as a

senior synonym of *S. elongata* by FLETCHER & CONDELLO (1993), and retained in *Stenogiffardia*. EMELJANOV (2002) described another monotypic genus *Doraturella*, with *Doraturella spica* Emeljanov, 2002 from Mali as the type species. However, soon after *Doraturella* was placed in synonymy under *Pratura* Theron, 1982 (ZAHNISER 2008), erected for two South African species – *Pratura graminea* Theron, 1982 and *P. acuminata* (Naudé, 1926) (THERON 1982). In the same paper, ZAHNISER (2008) described one more species, *P. ceylona* Zahniser, 2008, from Sri Lanka. Finally, *Pratura* and *Doraturella* were synonymized with *Stenogiffardia* by ZAHNISER (2012). Thus, the genus *Stenogiffardia* currently comprises five species distributed in Australia, Sri Lanka, Mali, and South Africa. *Stenogiffardia* has not been known from Madagascar. Below I describe a new species of this genus from central and southwestern Madagascar and remove *S. elongata* from synonymy.

Material and methods

Photographs were taken using a Leica MZ9.5 stereo-microscope and a Leica DFC 490 camera. Images were produced using Helicon Focus v. 6.7.1 and Adobe Photoshop software. The genital segments of the specimens examined were macerated in 10% KOH and figured in





Figs 1–4. Collecting sites of *Stenogiffardia bifurca* sp. nov. in Madagascar. 1 – Antananarivo; 2 – surroundings of Ranohira; 3 – sand bed of the Mangoky River; 4 – forest in the Makay Massif.

glycerine jelly (Brunel Micro Ltd, UK) using the Leica MZ9.5 stereomicroscope with a camera lucida.

Morphological terminology follows ANUFRIEV & EMELJANOV (1988).

The type series of the species described below is divided between the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia (ZIN) and the Muséum national d'Histoire naturelle, Paris, France (MNHN).

Taxonomy

Stenogiffardia Evans, 1977

Stenogiffardia Evans, 1977: 116. Type species. *Stenogiffardia elongata* Evans, 1977, by original designation.

Pratura Theron, 1982: 21. Synonymized with *Stenogiffardia* by ZAHNISR (2012): 173.

Doraturella Emeljanov, 2002: 662. Synonymized with *Pratura* by ZAHNISR (2008): 6 and with *Stenogiffardia* by ZAHNISR (2012): 173.

Stenogiffardia bifurca sp. nov.

(Figs 5–18, 20, 24, 25)

Type locality. Madagascar, former Fianarantsoa Province, Ranohira, 22°33.434'S 45°24.944'E.

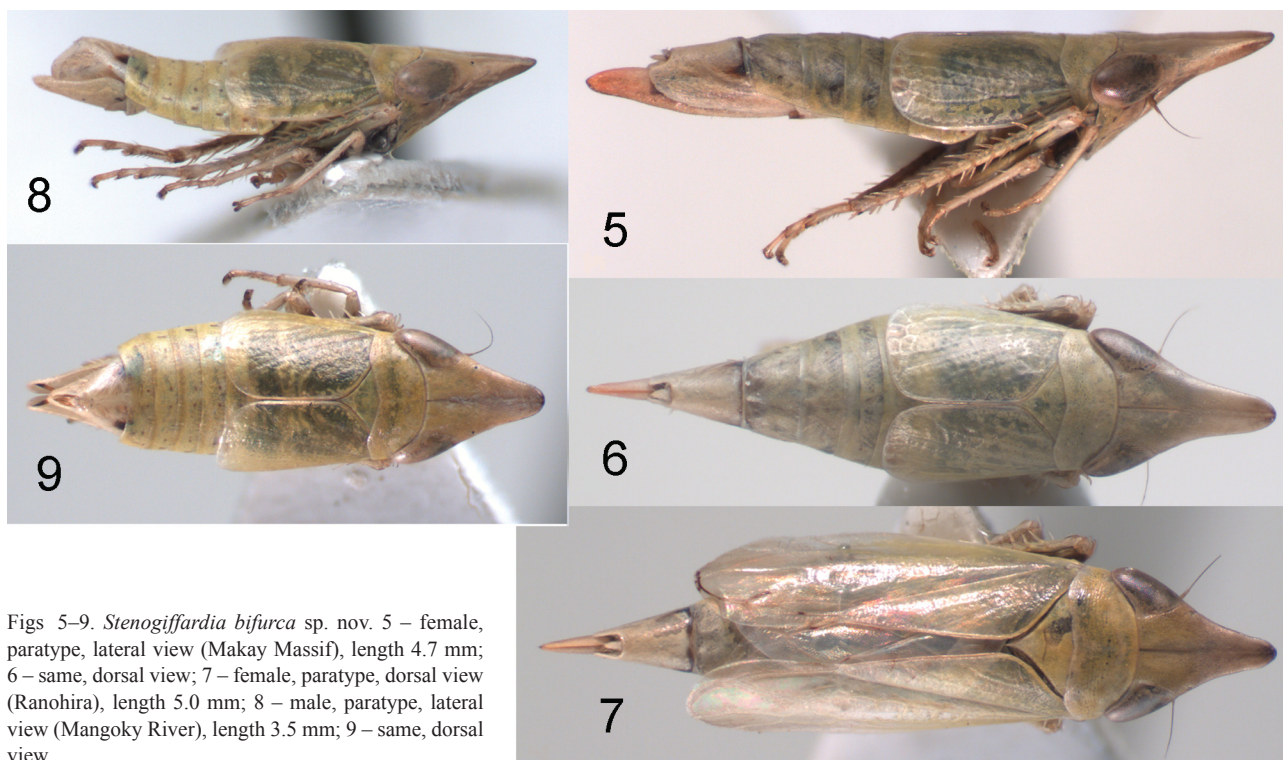
Type material. HOLOTYPE: ♂, 'Madagascar, Fianarantsoa / Province, Ranohira / 22°33.434'S 45°24.944'E / 08.i.2011, V. M. Gnezdilov // sweeping of grasses including *Cynodon dactylon*' (ZIN, dry-mounted, glued on a card label). PARATYPES: 2 ♀♀, same data as the holotype (ZIN);

1 ♂, 'Madagascar, Antananarivo / 18°54.753'S 47°31.318'E / 06.i.2011, V. M. Gnezdilov // sweeping of grasses along the street' (MNHN); 1 ♂, 'Madagascar, Toliar Province / 21°41.001'S 45°08.777'E / Mangoky River, 08.i.2011 / V. M. Gnezdilov // sweeping *Cephalostachium* sp. on sandy coast' (ZIN); 3 ♀♀, 'Madagascar, Toliar Province / Massif du Makay / 21°35.759'S 45°06.811'E / 12.i.2011, V. M. Gnezdilov // sweeping vegetation in dry forest' (ZIN – 2 ♀♀, MNHN – 1 ♀); all specimens dry-mounted, glued on card labels.

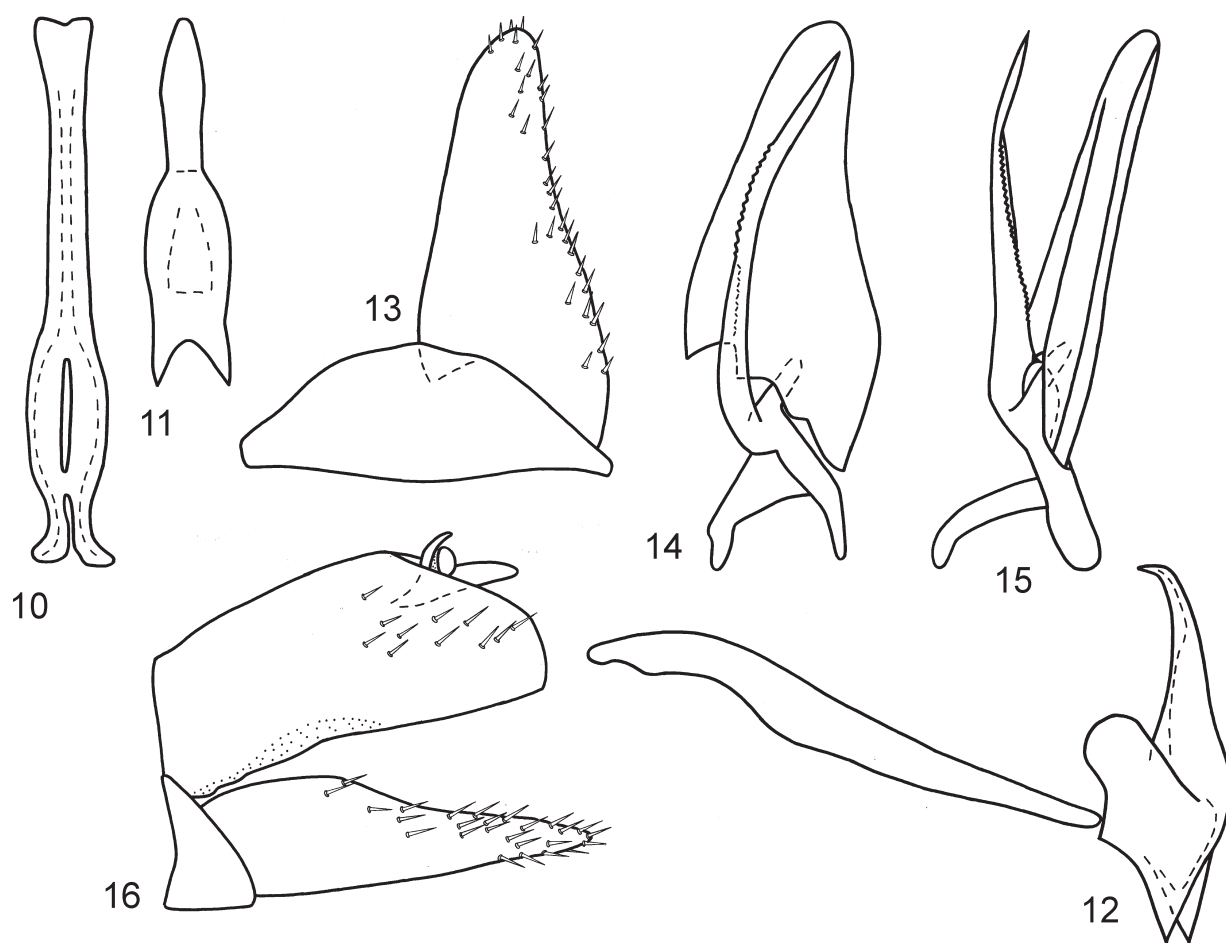
Description. Measurements. Total body length: males 3.5–3.7 mm, females 4.7–5.0 mm.

Coloration. General coloration yellowish green (Figs 5–9). Apex of vertex with a brown spot. Frons light brown in some specimens. Ocelli black. Rostrum, thorax from below, coxae, fore and middle femora, except for apices, and anterior margins of hind femora black. Abdominal sternites III–IV (sometimes III–VI) medially black in females. Abdominal sternites III–IX black, except laterally and posteriorly, in males. Female sternum VII with a wide dark brown median stripe in some specimens. Pygofer basally on dorsal side with a pair of black triangular spots in males and with a dark brown to black transverse stripe and pair of triangular spots in females. Socles of setae on apices of hind tibiae and first and second metatarsomeres dark brown. Claws dark brown. Apices of styles black.

Structure. Head elongate, narrowing apically, with rounded apex (in dorsal view) (Figs 6, 7, 9, 20). Vertex



Figs 5–9. *Stenogiffardia bifurca* sp. nov. 5 – female, paratype, lateral view (Makay Massif), length 4.7 mm; 6 – same, dorsal view; 7 – female, paratype, dorsal view (Ranohira), length 5.0 mm; 8 – male, paratype, lateral view (Mangoky River), length 3.5 mm; 9 – same, dorsal view.



Figs 10–16. *Stenogiffardia bifurca* sp. nov., holotype, male genitalia. 10 – connective, dorsal view; 11 – aedeagus, ventral view; 12 – aedeagus and connective, lateral view; 13 – genital valve and subgenital plates, ventral view; 14 – subgenital plate with style, dorsal view; 15 – same, lateral view; 16 – anal tube, pygofer, genital valve, and subgenital plates, lateral view.

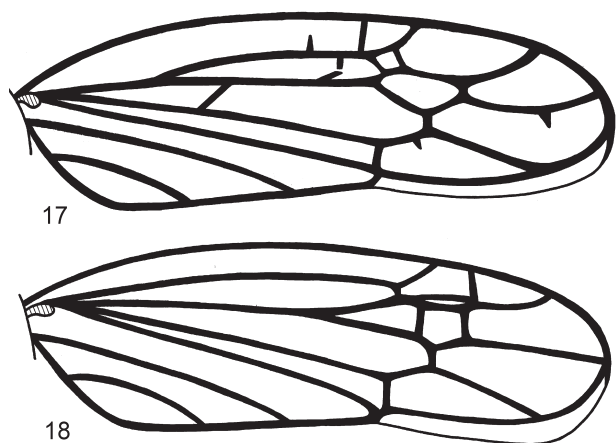


Fig. 17–18. *Stenogiffardia bifurca* sp. nov., paratype, submacropterous female, fore wings. 17 – right fore wing; 18 – left fore wing. Length of the wings 2.2 mm.

twice (in males) or 2.5 times (in females) as long as wide between eyes, with a weak groove reaching the level of ocelli. Frons without median carina. Rostrum short, apical segment cylindrical. Brachypterous or submacropterous. In brachypterous specimens, fore wings reaching hind margin of tergite V; hind wings oval, rudimentary, half as long as fore wings (Figs 5, 6, 8, 9). In submacropterous female, fore wings reaching hind margin of tergite VIII; hind wings almost as long as fore wings (Fig. 7). Fore wing with 5 apical cells and 3 anteapical cells. In a single submacropterous female examined, right and left fore wings slightly differ in venation: R 1–2, r-m 1–2, M 2–3, im 1–2, m-cua 1–2, CuA 2 (Figs 17, 18). Hind femora with 2 + 1 + 1 (in one female 2 + 1 + 1 + 1) macrosetae apically.

Male genitalia (Figs 10–16). Anal tube small. Pygofer lobe with caudal margin at nearly right angle and microsetae nearby (Fig. 16). Genital valve nearly triangular. Subgenital plates as long as pygofer, narrowing apically, with rounded apices and microsetae (Figs 13, 16). Connective

long, with stem as long as arms (Figs 10, 12). Style with straight, acuminate apex, sharp tooth near the base and a spiraling row of denticles extending subapically (Figs 14, 15). Aedeagus with ventral side strongly bifurcate, evident in caudal view (Figs 11, 12).

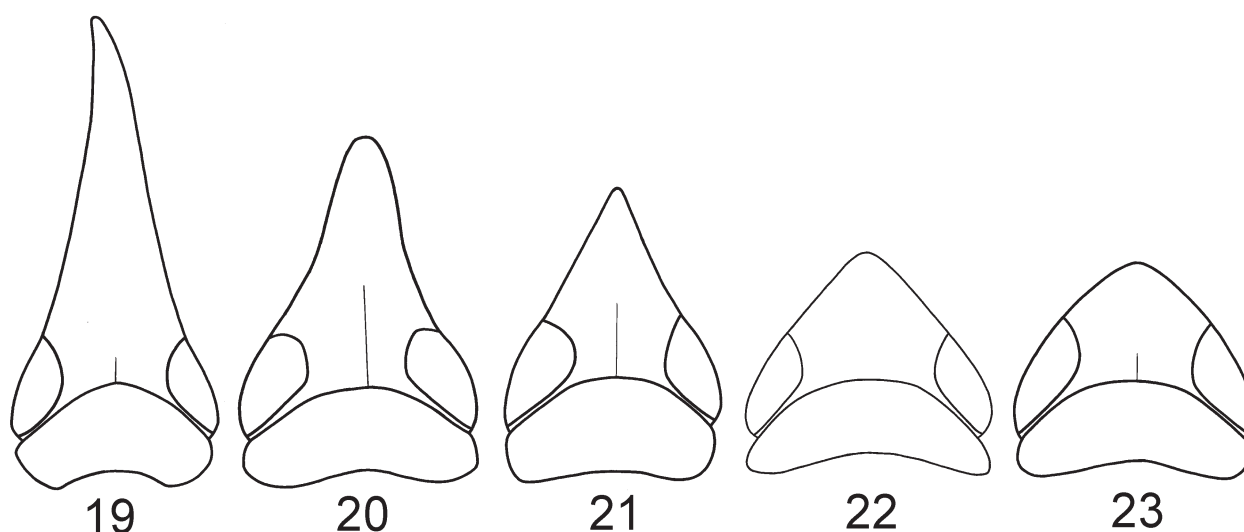
Female genitalia (Figs 5–7, 24, 25). Ovipositor protruding far beyond pygofer apex (Figs 5–7). Hind margin of sternite VII convex medially, with two concavities on either side (Figs 24, 25). Brachypterous specimens with a small tooth in each concavity (Fig. 24).

Diagnosis. Aedeagus strongly bifurcate ventrally. Style with straight, acuminate apex.

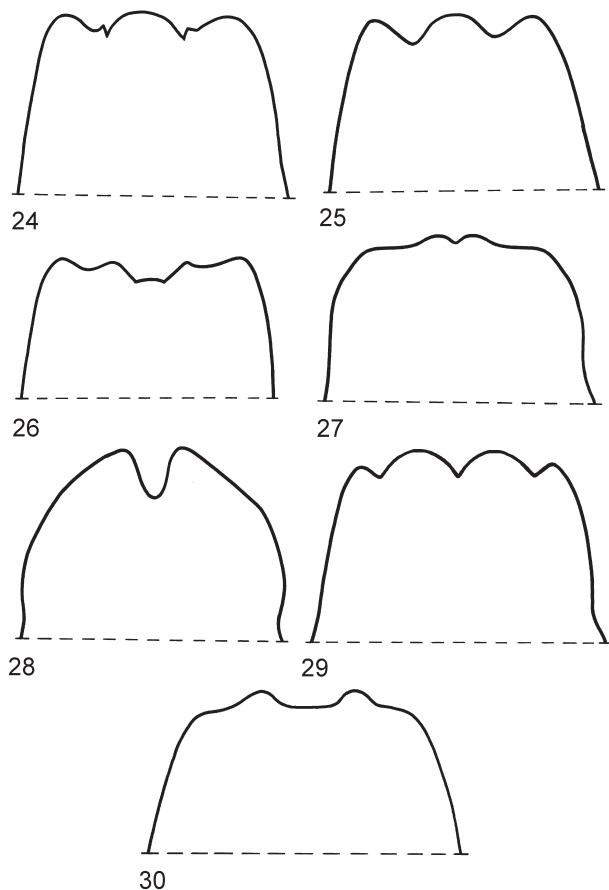
Etymology. The species name is derived from the Latin adjective *bifurcus* – two-pronged, referring to the furcation of the ventral side of the aedeagus.

Key to species of *Stenogiffardia*

- 1 Head strongly produced (Figs 19–21). 2
- Head weakly produced (Figs 22, 23). 5
- 2 Vertex rather acuminate apically (Figs 19, 21). 3
- Vertex rather rounded apically (Fig. 20). 4
- 3 Vertex 3.5 times as long as wide between eyes (Fig. 19). Frons with median carina in its apical part (EVANS 1977: fig. 12B). Total length of female (from apex of vertex to apex of ovipositor) 7.0–8.6 mm. *S. elongata* Evans, 1977
- Vertex 2–3 times as long as wide between eyes (Fig. 21). Frons lacking median carina (KIRKALDY 1906: Pl. XXII, fig. 3). Total length of female (from apex of vertex to apex of ovipositor) 6.2 mm. *S. parvula* (Kirkaldy, 1906)
- 4 Style with apex straight (Fig. 14). Aedeagus strongly bifurcate ventrally (Figs 11, 12). Female sternite VII with hind margin convex medially (Figs 24, 25). *S. bifurca* sp. nov.
- Style with apex bent (EMELJANOV 2002: fig. 4). Aedeagus not bifurcate ventrally (EMELJANOV 2002: fig. 8).



Figs 19–23. *Stenogiffardia* spp., female head and pronotum. 19 – *S. elongata* Evans, 1977, holotype (after EVANS 1977, modified); 20 – *S. bifurca* sp. nov., paratype; 21 – *S. parvula* (Kirkaldy, 1906) (after ZAHNISER 2012, modified); 22 – *S. acuminata* (Naudé, 1926) (after NAUDÉ 1926, modified); 23 – *S. ceylona* (Zahniser, 2008), paratype (after ZAHNISER 2008, modified).



Figs 24–30. *Stenogiffardia* spp., female sternite VII. 24 – *S. bifurca* sp. nov., paratype, brachypterous specimen; 25 – same, paratype, macropterous specimen; 26 – *S. spica* (Emeljanov, 2002), paratype; 27 – *S. parvula* (Kirkaldy, 1906) (after ZAHNISR 2012, modified); 28 – *S. ceylona* (Zahniser, 2008), paratype (after ZAHNISR 2008, modified); 29 – *S. graminea* (Theron, 1982) (after THERON 1982, modified); 30 – *S. acuminata* (Naudé, 1926) (after NAUDÉ 1926, modified).

- Female sternite VII with hind margin concave medially (Fig. 26). ***S. spica*** (Emeljanov, 2002)
- 5 Hind margin of female sternite VII with a deep notch medially (Fig. 28). ***S. ceylona*** (Zahniser, 2008)
- Hind margin of female sternite VII with a wide but shallow concavity or a weak notch medially (Figs 29, 30). 6
- 6 Hind margin of female sternite VII with a wide concavity medially (Fig. 30). Total length of female (from apex of vertex to apex of ovipositor) 3.0 mm. ***S. acuminata*** (Naudé, 1926)
- Hind margin of female sternite VII with a weak notch medially (Fig. 29). Total length of female (from apex of vertex to apex of ovipositor) 4.2–4.7 mm. ***S. graminea*** (Theron, 1982)

Discussion

The synonymization of *Stenogiffardia elongata* (Evans, 1977) with *Phrynophyes parvula* Kirkaldy, 1906 proposed by FLETCHER & CONDELLO (1993) seems unconvincing as females of these taxa illustrated by KIRKALDY (1906: Pl.

XXII, figs 1–3), EVANS (1977: figs 12 A–C), and ZAHNISR (2012: figs 7, 8) differ from each other in the shape and length of the head – females of *S. elongata* (Fig. 19) have the vertex distinctly longer than those of *S. parvula* (Fig. 21); the apex of vertex of *S. elongata* is also curved and the frons bears a median carina apically (EVANS 1977: figs 12 A, B). The taxa also differ in their body length (KIRKALDY 1906, EVANS 1977). Thus, until the male genitalia of *S. elongata*, preferably from its type locality (Richmond, Queensland), are studied and compared with those of *S. parvula*, the lectotype of which was illustrated by FLETCHER & CONDELLO (1993: figs 11–16), I suggest to treat both species names as valid.

Unfortunately, the male genitalia of *S. acuminata*, described after a single female (NAUDÉ 1926), have not been illustrated either. In the shape of vertex, *S. acuminata* (Fig. 22; NAUDÉ 1926: pl. V, fig. 2a) is very close to *S. graminea* (THERON 1982: fig. 37), but these species can be easily separated by the shape of the female sternite VII (Figs 29, 30). Apparently, ZAHNISR (2008: fig. 13) illustrated *S. acuminata* under the name of *Pratura graminea*. Also, *S. acuminata* seems to be the smallest species in the genus, as NAUDÉ (1926) mentioned 3.0 mm for the length of the type female, while the females of other *Stenogiffardia* spp. are larger than 4.0 mm. A further study is needed to make the taxonomic status of these two South African species more clear.

In the elongate but apically rounded vertex, *Stenogiffardia bifurca* sp. nov. (Fig. 20) is close to *S. spica* (EMELJANOV 2002: figs 1–2). However, in the straight apical part of styles (Figs 14, 15), *S. bifurca* sp. nov. resembles *S. parvula* (FLETCHER & CONDELLO 1993: fig. 13). The other *Stenogiffardia* spp. have styles with bent apices (THERON 1982: fig. 45; EMELJANOV 2002: fig. 4; ZAHNISR 2008: fig. 3). On the other hand, *S. bifurca* sp. nov. is well distinguished within the genus in its strongly bifurcate base of aedeagus ventrally (Figs 11, 12) and the convex hind margin of female sternite VII medially, with a slight difference in the shape between brachypterous and submacropterous specimens (Figs 24, 25). Other *Stenogiffardia* spp. have the base of aedeagus rounded, lacking processes ventrally (THERON 1982: fig. 41; FLETCHER & CONDELLO 1993: figs 14–15; ZAHNISR 2008: fig. 8), and the hind margin of female sternite VII with a medial notch or concavities (Figs 26–30).

The tribe Chiasmini includes many brachypterous and flightless species; most genera are confined to particular biogeographic regions (ZAHNISR & DIETRICH 2015). So far, only two genera of Chiasmini – *Exitianus* Ball, 1929 and *Nephotettix* Matsumura, 1902 – have been known from Madagascar (GHAURI 1968, ROSS 1968, ZAHNISR 2008). The finding of *Stenogiffardia bifurca* sp. nov. in Madagascar once again raises the question on the distribution of predominantly brachypterous and flightless insect taxa in various biogeographic regions across oceanic barriers – in this case, the Mozambique Channel, as other species of *Stenogiffardia* are known from South Africa and Mali, or even the Indian Ocean – based on the straight apices of the style, *S. bifurca* sp. nov. might be

closely related to *S. parvula* from Australia. The origin and diversification of Chiasmini was assumed to happen when the major landmasses had already separated; thus, dispersal, rather than vicariance by the shifting of tectonic plates and separation of major landmasses, is more likely to explain the present global distribution of the tribe (ZAHNISR & DIETRICH 2015). A long-distance trans-Atlantic dispersal from Africa into South America was hypothesized by ROSS (1968) to explain the origins of the New World *Exitianus* species and it also received the most support from the analyses by ZAHNISR & DIETRICH (2015). Similarly, the presence of macropterous species of the genera *Exitianus* and *Nephrotettix* in Madagascar may be easily explained by a long-distance dispersal by wind from Africa. A similar scenario may also work for *Stenogiffardia* spp. which are apparently polymorphic for the wing length, with submacropterous females already known for *S. elongata* (EVANS 1977: fig. 12C) and *S. bifurca* sp. nov. (Fig. 7). Such submacropterous specimens can perhaps fly for a long distance carried by wind. Alternatively, any members of *Stenogiffardia* may have reached Madagascar with plant rafts carried by ocean currents from the continents or may have even been introduced by humans with any cargo from a still undiscovered source in Asia, Africa or Australia. Human impact has recently been hypothesized to explain the wide range of distribution for some other Deltocephalinae (Eupelicini, Paradorydiina) known from the Mediterranean, Arabian Peninsula, Africa, and Indian subcontinent (GNEZDILOV 2019). Apparently, *S. bifurca* sp. nov. has a wide range of host plants as it was collected in different biotopes, such as from a lawn in the city of Antananarivo, in grasslands, on a sandy river bed, and in the vegetation of the lower tier of dry forest (Figs 1–4); potential host plants are grasses including *Cynodon dactylon* (L.) Pers. and *Cephalostachium* sp. Such a wide host-plant range may have facilitated colonization of new habitats.

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