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Descriptions of the Patagonian species of the subgenus *Trichohelea* of *Forcipomyia*, with a key to the Neotropical species (Diptera: Ceratopogonidae)

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The following two new species of *Forcipomyia* (*Trichohelea*) collected in the *Nothofagus* patagonian forest are described and illustrated: *F.* (*T.*) *sayhuequei* from the province of Chubut in Argentina and Llanquihue in Chile, and *F.* (*T.*) *tehuelche* from the Argentinean province of Santa Cruz. Based on the examination of the types, the previously known species *Lasiohelea shannoni* Ingram and Macfie is recognized as a junior synonym of *Forcipomyia limnetis* Ingram and Macfie, and the species is redescribed and illustrated. A key to recognition of females and males of the 14 Neotropical species of the subgenus is included.

KEYWORDS: *Trichohelea*, *Forcipomyia*, Ceratopogonidae, Patagonia.

Introduction

Forcipomyia Meigen is a large and extremely diverse genus of Ceratopogonidae, worldwide in distribution and diverse in morphology and habitat preference, including many species which are important pollinators of cocoa in tropical and subtropical areas.

The subgenus *Trichohelea* Goetghebuer is presently known through 51 extant species from all the major biogeographic regions of the world (Borkent and Wirth, 1997). In their Neotropical catalogue of the Ceratopogonidae, Borkent and Spinelli (2000) mentioned 13 species for the region, only the following two inhabiting Patagonia: *F.* (*T.*) *limnetis* Ingram and Macfie, and *F.* (*T.*) *shannoni* (Ingram and Macfie).

As a result of a project devoted to the study of the genus *Forcipomyia* in Patagonia, specimens of two unnamed species of the subgenus *Trichohelea* were collected, which are herein described and illustrated. Additionally, based on the examination of the types in the Natural History Museum in London, *Lasiohelea*

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shannoni is recognized as a junior synonym of *Forcipomyia limnetis*, and the species is redescribed and illustrated.

Material and methods

Dissected specimens were slide mounted in Canada balsam and examined, measured and drawn using a binocular compound microscope with attached camera lucida. Illustrations are mainly based on types, and those of the new species are deposited in the collection of the Department of Entomology, Museo de la Plata, Argentina (MLPA). The remaining specimens examined, except as noted, are also deposited in MLPA.

General ceratopogonid terminology follows that of Downes and Wirth (1981). For special terms and recognition of subgenera of *Forcipomyia*, as well as for a good diagnosis of the subgenus *Trichohelea*, see Debenham (1987). Three abbreviation terms are used in the text: antennal ratio (AR) is the ratio of combined lengths of last five flagellomeres to the preceding eight; costal ratio (CR) is obtained by dividing length of costa by wing length, measuring both from the level of the basal arculus of the wing; tarsal ratio (TR) is obtained by dividing length of basitarsus by length of second tarsomere.

Subgenus *Trichohelea* Goetghebuer

Apelma Kieffer, 1919: 64 (preoccupied by Billberg, 1820 [Coleoptera]). Type species: *Apelma auronitens* Kieffer (= *Trichohelea tonnoiri* Goetghebuer) designation by Macfie, 1940: 16.

Trichohelea Goetghebuer, 1920: 39. Type species: *Trichohelea tonnoiri* Goetghebuer, by original designation.

Forcipomyia (*Neoforcipomyia*) Tokunaga, in Tokunaga and Murachi, 1959: 200. Type species: *Ceratopogon pectinunguis* de Meijere, by original designation; Saunders, 1964: 473 (diagnosis).

Forcipomyia (*Trichohelea*): Wirth and Messersmith, 1971: 15 (subgeneric position; revision of the nearctic species).

Neotropical species and known distribution

Forcipomyia aeronautica Macfie: Venezuela to French Guiana.

Forcipomyia baueri Wirth: USA (Florida, Maryland, Arizona), Mexico (Baja California, Sonora, Sinaloa, Veracruz).

Forcipomyia danaisi (Floch and Abonnenc): Venezuela.

Forcipomyia goniognatha Wirth and Messersmith: USA (Arizona, Kansas, Texas), Mexico (Baja California, Sonora).

Forcipomyia intrepida Macfie: Peru (Iquitos).

Forcipomyia leptognatha Wirth and Messersmith: USA (Arizona, Iowa, Kansas), Mexico (Sonora).

Forcipomyia limnetis Ingram and Macfie: Argentina (Rio Negro, Neuquen), Chile (Osorno) (figure 24).

Forcipomyia macheti Clastrier and Legrand: French Guiana.

Forcipomyia mexicana Wirth: USA (Arizona), Mexico (San Luis Potosi).

Forcipomyia opilionivora (Lane): Brazil (São Paulo).

Forcipomyia roubaudi Clastrier and Delécolle: French Guiana.

Forcipomyia sayhuequei sp. n.: Argentina (Chubut), Chile (Llanquihue) (figure 24).
Forcipomyia tehuelche sp. n.: Argentina (Santa Cruz) (figure 24).
Forcipomyia trinidadensis Saunders: Trinidad.

Key to Neotropical species of the subgenus *Forcipomyia* (*Trichohelea*)

1 Females (*F. aeronautica, F. baueri, F. danaisi, F. goniognatha, F. intrepida, F. leptognatha, F. limnetis, F. macheti, F. mexicana, F. opilionivora, F. roubaudi, F. sayhuequei, F. tehuelche, F. trinidadensis*) 2
– Males (*F. goniognatha, F. leptognatha, F. limnetis, F. tehuelche*) 15

2 Costa extending to two-thirds of total wing length . . . *F. opilionivora* (Lane)
– Costa barely produced beyond half of total wing length (if costal ratio 0.62, tarsal claws bifid from the base). 3

3 Flagellomere 8 elongated, nearly as long as flagellomere 9; AR 0.90; third palpal segment very slender . . . . . *F. danaisi* (Floch and Abonnenc)
– Flagellomere 8 distinctly shorter than flagellomere 9; AR 1.48–2.50; third palpal segment stout 4

4 Tarsal claws simple, not bifid 5
– Tarsal claws bifid 13

5 Flagellomeres 1–8 very short, laterally expanded; AR 2.40–2.50 6
– Flagellomeres 1–8 nearly as long as greatest breadth; AR 1.48–1.78 7

6 Third palpal segment with proximal sensory pit . . . . . *F. intrepida* Macfie
– Third palpal segment with distal sensory pit . . *F. macheti* Clastrier and Legrand

7 Tarsal claws slender, as long as or slightly longer than fifth tarsomere 8
– Tarsal claws stouter, shorter than fifth tarsomere 9

8 Tarsal claws slightly curved; legs pale brown; halter creamy white . . . . . *F. trinidadensis* Saunders
– Tarsal claws deeply curved; legs dark brown; halter dark brown . . . . . *F. aeronautica* Macfie

9 Mandible with rounded apex 10
– Mandible tapering to pointed apex 12

10 Tarsal claws with basal tooth; halter knob dark brown 11
– Tarsal claws without basal tooth; halter knob white . . . . . *F. baueri* Wirth

11 Mandible with 15 teeth; third palpal segment slightly swollen with small, deep sensory pit . . . . . *F. mexicana* Wirth
– Mandible with 21 teeth; third palpal segment greatly swollen with large, shallow sensory pit . . . . . *F. roubaudi* Clastrier and Delécolle

12 Maxilla abruptly bent on distal portion . . *F. goniognatha* Wirth and Messersmith
– Maxilla straight on distal portion . . . *F. leptognatha* Wirth and Messersmith

13 Tarsal claws bifid at extreme apex; CR 0.55; third palpal segment with deep sensory pit 14
– Tarsal claws bifid from the base; CR 0.62; third palpal segment with shallow sensory pit . . . . . *F. sayhuequei* sp. n.

14 Scutum dark brown with narrow pale longitudinal admedian stripes; legs dark brown . . . . . *F. limnetis* Ingram and Macfie
– Scutum brown, without admedian stripes; legs pale brown . . *F. tehuelche* sp. n.

15 Aedeagus stout with rounded blunt tip, without distal processes 16
– Aedeagus tapering to pointed tip, with distal processes 17

16 Gonocoxite 3 times longer than broad; basal arch extending to half of total length; lateral arms of parameres strongly divergent . . . . *F. limnetis* Ingram and Macfie

– Gonocoxite 2.2 times longer than broad; basal arch extending to one-third of total length; lateral arms of parameres parallel . . . *F. leptognatha* Wirth and Messersmith

17 Sternite 9 with narrow, shallow caudomedian excavation; aedeagus tapering to pointed tip, with a pair of subapical, very short, lateral pointed processes . . . . . *F. tehuelche* sp. n.

– Sternite 9 with broad, deep caudomedian excavation; aedeagus with a median process split distally forming an elongated forked process projecting well beyond distal portion . . . . . *F. goniognatha* Wirth and Messersmith

Forcipomyia* (*Trichohelea*) *limnetis Ingram and Macfie, 1931
(figures 1–9)

Forcipomyia (*Apelma*) *limnetis* Ingram and Macfie, 1931: 169 (male; Argentina).

Forcipomyia (*Trichohelea*) *limnetis*: Wirth, 1974: 12 (in catalogue to Neotropical species; subgeneric position); Spinelli and Wirth, 1993: 27 (in list of Argentinean species); Borkent and Wirth, 1997: 49 (in catalogue to world species); Borkent and Spinelli, 2000: 23 (in catalogue to Neotropical species).

Forcipomyia limnetis: Spinelli, 1998: 325 (in list of Argentinean species).

Lasiohelea shannoni Ingram and Macfie, 1931: 171 (*Lasiohelea*; female; Argentina). **New synonymy**.

Forcipomyia (*Trichohelea*) *shannoni*: Wirth, 1974: 12 (in catalogue to Neotropical species; comb.); Spinelli and Wirth, 1993: 27 (in list of Argentinean species); Borkent and Wirth, 1997: 50 (in catalogue to World species); Borkent and Spinelli, 2000: 23 (in catalogue to Neotropical species).

Forcipomyia shannoni: Spinelli, 1998: 325 (in list of Argentinean species).

Diagnosis

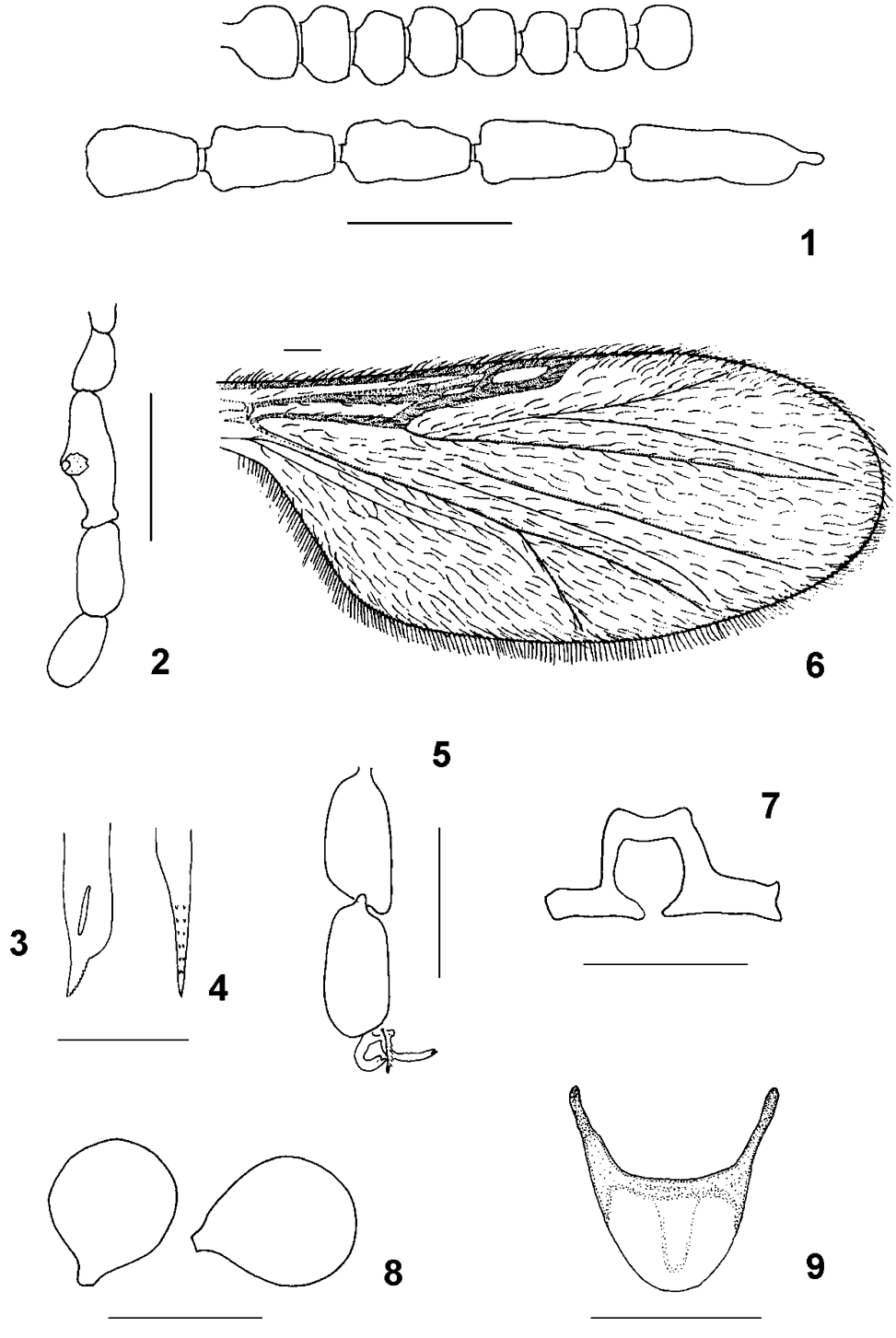
A medium-sized, brown species; flagellomeres 1–8 distinctly broader than long; third segment of maxillary palpi swollen, sensory pit deep opening by a small pore; CR 0.55; tarsal claws equal, small, bifid at extreme apex; female genital sclerotization open, subquadrangular; two pyriform spermathecae; aedeagus stout, basal arch extending to half of total length; parameres inverted U-shaped, lateral arms strongly divergent.

Female

Wing. Length 1.23 mm (1.08–1.34, $N=4$); breadth 0.56 mm (0.50–0.60, $N=4$).

Head. Dark brown. Vertex pilose. Eyes bare, contiguous by a distance equal to diameter of three ommatidia. Flagellum of antenna (figure 1) with flagellomeres 1–8 distinctly broader than long; 9–12 elongated, cylindrical, approximately 2.3 times longer than greatest breadth; distal flagellomere slightly longer than 9–12; AR 1.69 (1.54–1.82, $N=4$). Palpus (figure 2) with third segment nearly as long as the combined length of fourth and fifth segments, with deep sensory pit opening by a small rounded pore; PR 1.91 (1.75–2.06, $N=4$). Mandible (figure 3) abruptly tapering to pointed apex, armed with 10 very small teeth. Maxilla (figure 4) straight, tapering to pointed tip, with six pairs of minute teeth.

Thorax. Scutum dark brown, with narrow pale longitudinal admedian stripes, prescutellar area paler; scutellum pale brown, with approximately 20 strong setae and 15 slender ones. Legs brown, densely covered by hairs; prothoracic TR 2.02 (1.93–2.07, $N=4$), mesothoracic TR 1.98 (1.93–2.00, $N=4$), metathoracic TR



FIGS 1–9. *Forcipomyia limnetis* Ingram and Macfie. (1–8) Female. (9) Male. (1) Flagellum. (2) Maxillary palpus. (3) Mandible. (4) Maxilla. (5) Fourth and fifth tarsomeres and claws. (6) Wing. (7) Genital sclerotization. (8) Spermathecae. (9) Aedeagus. Scales: 0.05 mm.

2.02 (1.92–2.12, $N=4$). Claws (figure 5) short, stout and curved, bifid at extreme apex; empodium well developed. Wing (figure 6) densely covered with dark macrotrichia, more abundant on anterior margin; a small pale area situated immediately distad to the second radial cell; first radial cell almost obliterated, second radial cell well developed; CR 0.55 (0.52–0.57, $N=4$). Halter whitish.

Abdomen. Pale brown. Genital sclerotization (figure 7) open, subquadrangular. Two well-sclerotized, pyriform spermathecae (figure 8), subequal, measuring 0.056×0.046 mm and 0.050×0.042 mm, necks 0.004 mm.

Male

Similar to female with the usual sexual differences. Hind tarsal ratio 1.70.

Genitalia. Sternite 9 aproximately half as long as broad, with broad caudomedian excavation; tergite 9 short, with conspicuous, hairy apicolateral processes; sternite 10 spiculate anteriorly. Gonocoxite narrow, three times longer than broad; gonostylus nearly straight, slender, as long as gonocoxite. Aedeagus (figure 9) triangular, stout with rounded blunt tip; basal arms slender, strongly sclerotized; basal arch extending to half of total length; distal portion lightly sclerotized. Parameres highly sclerotized, inverted U-shaped, lateral arms strongly divergent.

Distribution

In subantarctic forest of northern Patagonia (Neuquen and Río Negro provinces in Argentina, Osorno in Chile) (figure 24).

Types

Holotype ♂ of *Forcipomyia limnetis* (slide in Canada balsam), holotype ♀ of *Lasiohelea shannoni* (pinned), Argentina, Río Negro Prov., Lake Correntoso, 18–25 November 1926, F. and M. Edwards. In the Natural History Museum, London (both examined during the present study).

Other specimens examined

Argentina, Río Negro Prov., Lake Correntoso, 1♀, 18–25 November 1926, F. and M. Edwards (paratype of *L. shannoni*, slide in Canada balsam in the Natural History Museum, London); Neuquen Prov. Stream Pedregoso and provincial route No. 67 (5 km W of El Portezuelo), 3 February 1986, G. Spinelli, 1♀; Río Negro Prov., 'Nahuel Huapi' National Park, Stream Chall-Huaco, 26 January 1988, G. Spinelli, 1♀; 'Nahuel Huapi' National Park, Lake Guillelmo, 24 February 1994, G. Spinelli, 1♀. Chile, Osorno, Pucatrihue, 1 December 1992, G. Spinelli, 1♀.

Discussion

The study of the types of *Lasiohelea shannoni* (female) and *Forcipomyia limnetis* (male), both with identical collecting data, reveals that their differences obey two usual sexual differences within species of the subgenus *Forcipomyia* (*Trichohelea*), representing thus, the two sexes of a single species.

The original description and illustrations of *F. limnetis* are very accurate except for the aedeagus, which shows lower basal arch and broader apex. Ingram and

Macfie (1931) report a metathoracic TR 'about 2.4' for *L. shannoni*. Perhaps they measured this feature from the slide-mounted paratype, which shows the second tarsomere of the hind leg somewhat folded, being the measure most probably overestimated. On the other hand, the pinned holotype is in excellent condition, and shows a metathoracic TR only slightly longer than 2.00.

Females of this species are barely distinguishable from those of *F.* (*T.*) *tehuelche* sp. n. The males, however, differ by the following genital characters: caudomedian excavation of sternite 9 broad (narrow in *tehuelche*), aedeagus with basal arch extending to one-half of total length and without distal process (extending to one-tenth of total length, with a distinctive distal process in *tehuelche*), and lateral arms of parameres strongly divergent (subparallel in *tehuelche*).

Forcipomyia* (*Trichohelea*) *sayhuequei sp. n.
(figures 10–17)

Diagnosis

A large-sized, dark brown species; flagellomeres 1–8 nearly as long as broad; sensory pit of third palpal segment shallow, open by a broad pore; tarsal claws stout, bifid from the base; second radial cell very elongated, CR 0.61; anterior margin of genital sclerotization rounded.

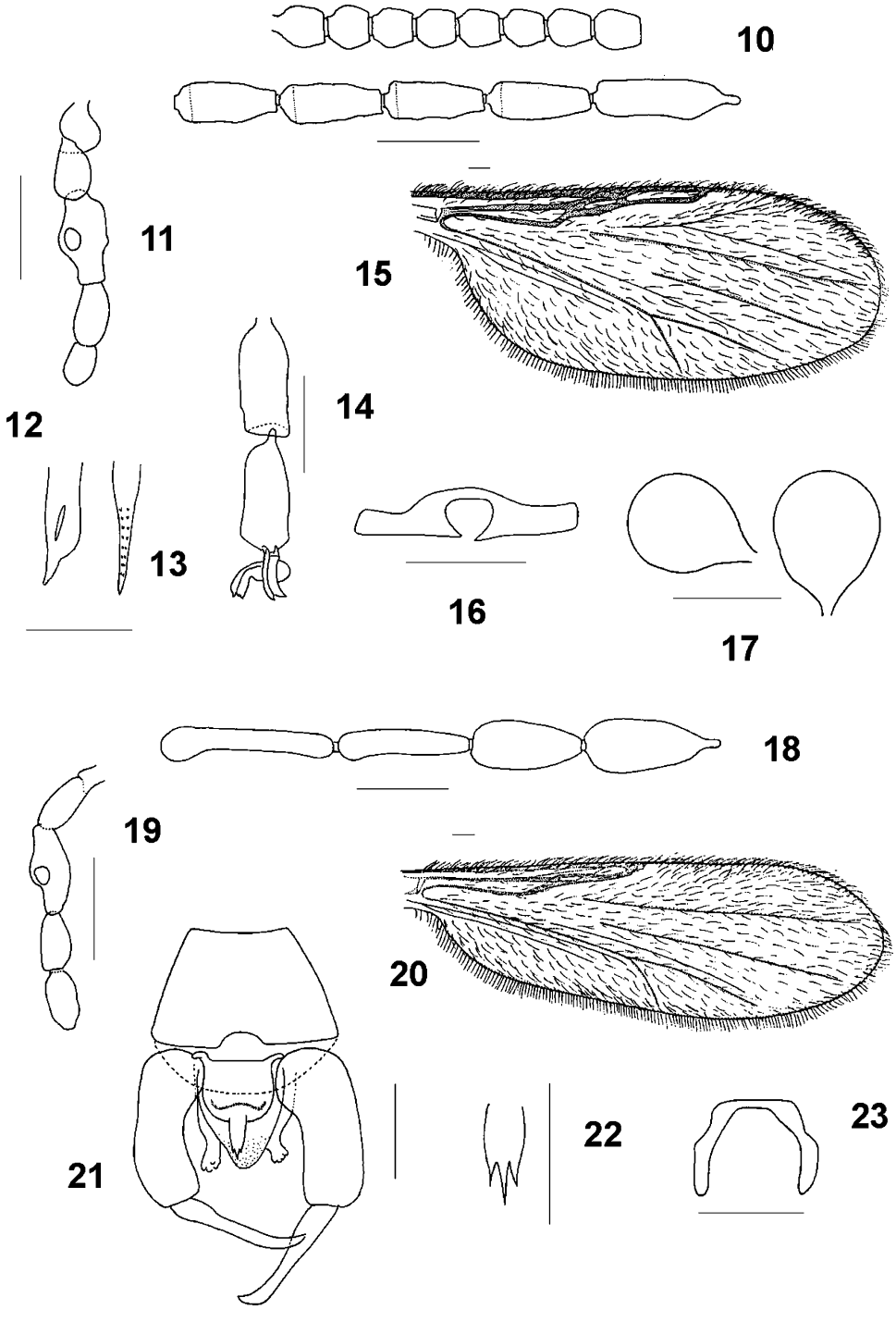
Female

Wing. Length 1.44 mm (1.38–1.50, $N=8$); breadth 0.65 mm (0.62–0.68, $N=8$).

Head. Dark brown. Vertex pilose. Eyes bare, contiguous by a distance equal to diameter of five ommatidia. Flagellum of antenna (figure 10) with flagellomeres 1–8 nearly as long as broad; 9–12 elongated, cylindrical, approximately 2.6 times longer than greatest breadth; distal flagellomere slightly longer than 9–12, with a short process; AR 1.67 (1.62–1.75, $N=8$). Palpus (figure 11) brown, third segment slightly shorter than the combined length of fourth and fifth segments, slightly swollen at mid-portion, with a shallow sensory pit opening by a broad, rounded pore; fifth segment shorter and narrower than fourth; PR 2.13 (1.93–2.43, $N=8$). Mandible (figure 12) with apex strongly sclerotized, bearing 10 minute teeth. Maxilla tapering to pointed tip (figure 13), with eight pairs of minute teeth.

Thorax. Scutum dark brown, humeral areas slightly paler; scutellum pale brown, with 20 strong setae and 10–12 slender ones. Legs uniformly brown, densely covered by hairs; prothoracic TR 1.96 (1.87–2.00, $N=8$), mesothoracic TR 1.92 (1.81–2.00, $N=7$), metathoracic TR 2.28 (2.11–2.44, $N=8$). Claws (figure 14) stout, curved, 0.3 times as long as fifth tarsomere, bifid from the base; empodium well developed. Wing (figure 15) densely covered with macrotrichia, especially on anterior margin; a small pale area situated immediately distad to the second radial cell; two radial cells well formed, the first one narrow, second elongated; medio-cubital fork proximad to the level of end of costa; CR 0.62 (0.61–0.63, $N=8$). Halter whitish.

Abdomen. Brown, pilose. Genital sclerotization (figure 16) open, anterior margin rounded. Two pyriform, strongly sclerotized spermathecae (figure 17), subequal, measuring 0.046×0.040 mm and 0.046×0.038 mm, necks 0.010 mm.



FIGS 10–23. (10–17) *Forcipomyia* (*T.*) *sayhuequei*, female. (18–23) *Forcipomyia* (*T.*) *tehuelche*, male. (10) Flagellum. (11) Maxillary palpus. (12) Mandible. (13) Maxilla. (14) Fourth and fifth tarsomeres and claws. (15) Wing. (16) Genital sclerotization. (17) Spermathecae. (18) Flagellomeres 10–13. (19) Maxillary palpus. (20) Wing. (21) Genitalia (parameres removed). (22) Tip of aedeagus. (23) Parameres. Scales: 0.05 mm.

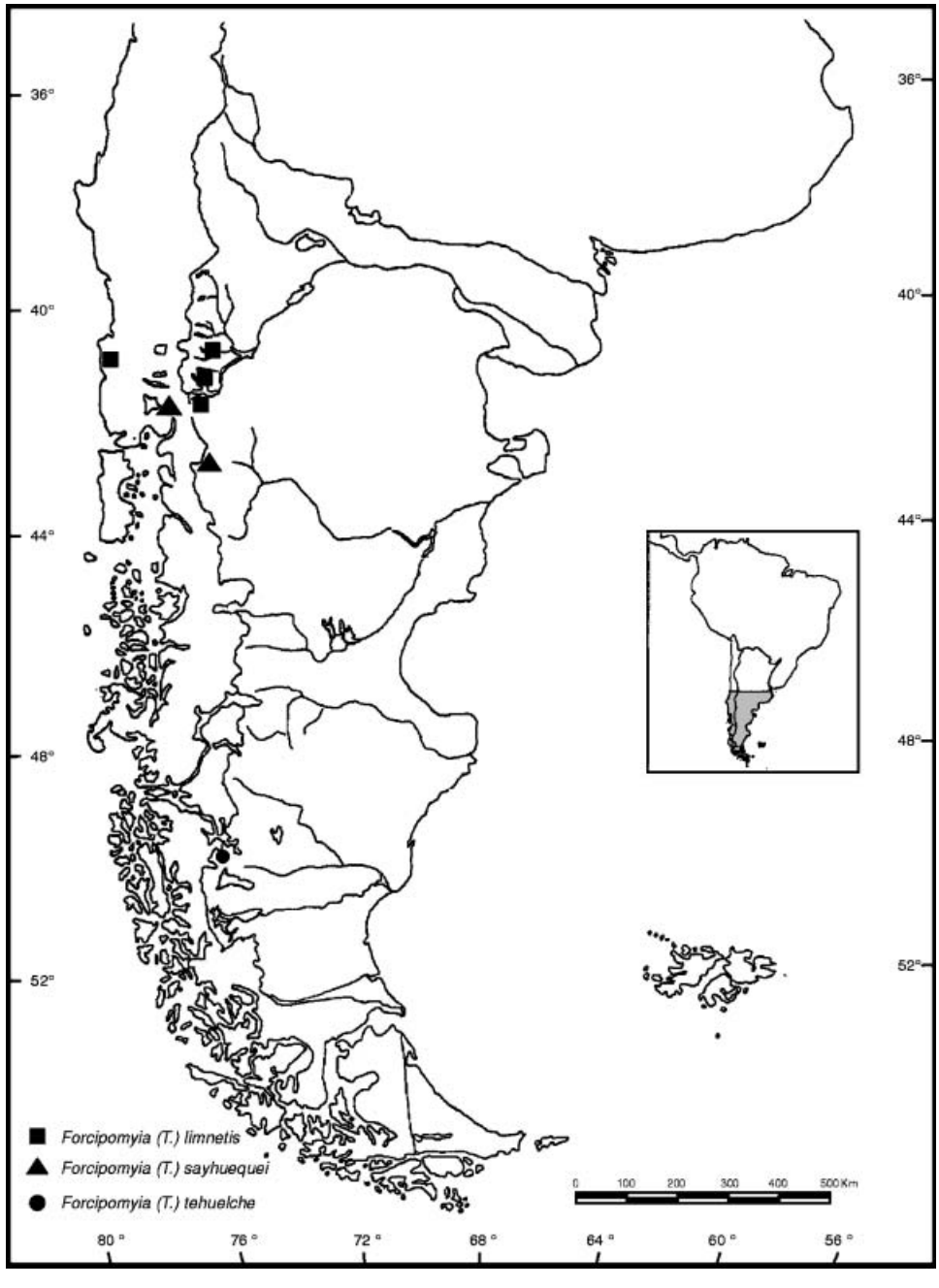


FIG. 24. Known localities for the Patagonian species of the subgenus *Trichohelea*.

Male

Unknown.

Distribution

In subantarctic forest of Chubut province in Argentina, and Llanquihue in Chile (figure 24).

Types

Holotype ♀, Argentina, Chubut Prov., 'Los Alerces' National Park, El Alerzal, 23 January 1988, G. R. Spinelli, CDC light trap. Seven paratypes ♀, Chile, Llanquihue, Yerbas Buenas, 13 km N of Ensenada, 1–6 December 1994, 150 m, L. Quate, CDC light trap.

Discussion

Females of *F.* (*T.*) *sayhuequei* can be distinguished from females of the other two known Patagonian species of the subgenus *Trichohelea* by the shallow sensory pit on third palpal segment; costa and second radial cells very enlarged; and stouter tarsal claws, bifid from the base.

Forcipomyia* (*Trichohelea*) *tehuelche sp. n.
(figures 18–23)

Diagnosis

A medium-sized, brown species; flagellomeres 1–8 distinctly broader than long; third segment of maxillary palpi broadly swollen, sensory pit deep opening by a small pore; CR 0.55; tarsal claws equal, small, bifid at extreme apex; female genital sclerotization open, subquadrangular; two pyriform spermathecae; aedeagus stout with distal medial process, basal arch extending to one-tenth of total length; parameres inverted U-shaped, lateral arms subparallel.

Female

Wing. Length 1.26 mm (1.22–1.30, $N=2$); breadth 0.56 mm (0.54–0.58, $N=2$).

Head. Dark brown. Vertex pilose. Eyes bare, contiguous by a distance equal to diameter of three ommatidia. Flagellum of antenna with flagellomeres 1–8 distinctly broader than long; 9–12 elongated, cylindrical, approximately 2.5 times longer than greatest breadth; distal flagellomere slightly longer than 9–12; AR 1.68 (1.62–1.74, $N=2$). Palpus short; third segment broadly swollen at mid-portion, nearly as long as the combined length of fourth and fifth segments, with deep sensory pit opening by a small rounded pore; fifth segment slightly narrower than 4; PR 1.70 (1.59–1.81, $N=2$). Mandible abruptly tapering to pointed apex, armed with 10 very small teeth. Maxilla slender, nearly straight, with six pairs of minute teeth.

Thorax. Scutum brown, humeral areas slightly paler; scutellum pale brown, with approximately 20 strong setae and 15 slender ones. Legs pale brown, densely covered by hairs; prothoracic TR 1.93 (1.92–1.93, $N=2$), mesothoracic TR 1.87 (1.86–1.87, $N=2$), metathoracic TR 1.88 (1.87–1.88, $N=2$). Claws small, very curved, moderately stout, bifid at extreme apex; empodium well developed. Wing densely covered with macrotrichia, more abundant on anterior margin; a small pale area situated immediately distad to the second radial cell; first radial cell almost obliterated, second radial cell well formed; CR 0.55 (0.54–0.55, $N=2$). Halter whitish.

Abdomen. Pale brown, pilose. Genital sclerotization open, subquadrangular. Two pyriform, well-sclerotized spermathecae, subequal, measuring 0.062×0.050 mm and 0.052×0.044 mm, necks of 0.006 mm.

Male

Wing. Length 1.38 mm; breadth 0.46 mm.

Similar to female with the usual sexual differences: eyes bare except inner margin with sparse pilosity; flagellomeres 1–9 similar in length, 10–13 (figure 18) in proportion of 56-43-35-47; AR 1.22; palpus (figure 19) with third segment slightly shorter than the combined length of fourth and fifth segments, segments in proportion of 11-19-30-18-18; PR 2.5; tarsal claws equal, small, 0.5 times as long as tarsomere 5, bifid at extreme apex, empodium absent; prothoracic TR 1.44, mesothoracic TR 1.53, metathoracic TR 1.83; wing (figure 20) with CR 0.46.

Genitalia (figure 21). Sternite 9 stout, 0.66 times longer than greatest breadth, with narrow, shallow caudomedian excavation; tergite 9 tapering, with conspicuous, pilose apicolateral processes; sternite 10 spiculate. Gonocoxite 2.3 times longer than greatest (basal) breadth; gonostylus 0.85 as long as gonocoxite, slender, nearly straight, tip pointed. Aedeagus stout, slightly sclerotized; basal arms short, recurved; basal arch very low, extending to one-tenth of total length; lateral arms convex; distal portion very lightly sclerotized, tapering to pointed tip, with a pair of subapical, lateral pointed processes (figure 22). Parameres (figure 23) highly sclerotized, inverted U-shaped, lateral arms subparallel.

Distribution

In subantarctic forest of southern Patagonia (Santa Cruz province in Argentina) (figure 24).

Types

Holotype ♂; allotype ♀, Argentina, Santa Cruz Prov., Lake del Desierto, 9–11 December 1996, G. Spinelli, malaise trap; paratype ♀, same data except 9 December 1996, sweep net.

Discussion

Females of *F.* (*T.*) *tehuelche* are barely distinguishable from those of *F.* (*T.*) *limnetis*. Characters to distinguish their males may be found in the discussion under the latter species.

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