

A NEW SPECIES OF *BEZZIA* KIEFFER FROM ARGENTINEAN PATAGONIA (DIPTERA: CERATOPOGONIDAE)

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Abstract.— *Bezzia galesa* Spinelli, a new Patagonian species, is described in all stages and illustrated by using binocular, phase-contrast and scanning electron microscopy. Immatures were collected associated to submerged filamentous algae in an unnamed pond in western Chubut province, Argentina, and reared to adults in the laboratory. Adults and immatures of this new species are compared with the most similar species *Bezzia ventanensis* Spinelli, *Bezzia roldani* Spinelli et Wirth and *Bezzia blantoni* Spinelli et Wirth. Details on the rearing process and feeding behavior in laboratory are given.



Key words.— *Bezzia galesa*, new species, adult, immatures, western Patagonia.

INTRODUCTION

The genus *Bezzia*, worldwide in distribution, was reviewed for the Neotropical region in a series of papers by Spinelli and Wirth (1989a, 1989b, 1990, 1991), who described and/or recorded 44 species. Further three species were subsequently described by Dippolito *et al.* (1995), Spinelli and Ronderos (2001) and Spinelli *et al.* (2012), arising to 47 the number of species that inhabit the Neotropics. The majority of them were described from adults, with only the following five known also from larvae and pupae: *B. blantoni* Spinelli et Wirth, *B. glabra* (Coquillett), *B. nobilis* (Winnertz), *B. roldani* Spinelli et Wirth and *B. ventanensis* Spinelli.

During a recent entomological survey in the vicinities of Esquel in northwestern Argentinean Patagonia, a new species of *Bezzia* was collected, which is herein described in all stages.

MATERIAL AND METHODS

Larvae and pupae were collected with pipette and placed in a white tray with water from a pond from Corcovado, Chubut Province. Other specimens were carried to the laboratory in plastic bags with water from the same pond and light green Chlorophyta filamentous algae. Larvae were observed daily in the laboratory until they reached the pupal stage, and pupae were placed in vials individually, with a drop of water until adult emergence. Larvae, pupae and adults were slide-mounted in Canada balsam following the technique described by Borkent and Spinelli (2007). For detailed examination with phase-contrast microscope in oil immersion, larvae were placed with ventral side upward to observe internal structures in the head capsule. Photomicrographs were taken with a digital camera Micrometrics SE Premium, through Nikon Eclipse E200 microscope. Ink illustrations were drawn with

a camera lucida. Larvae and pupae were also examined using scanning electron microscopy (SEM) (JOEL 2000) by using the technique of Ronderos *et al.* (2000, 2008). The map was traced from Google Earth and the track was kept in KLM format; afterwards, the format was turned into .plt through GPS Visualizer site. http://www.gpsvisualizer.com/gpsbabel/gpsbabel_convert) and also drawn on OziExplorer 3.95.4 version.

For terminology of larvae see Ronderos and Spinelli (2009), for pupae see Borkent (2012) and the Manual of Central America Diptera (Brown *et al.* 2009) for adults. Type material is deposited in the Museo de La Plata, Argentina (MLP).

RESULTS

Bezzia galesa Spinelli, sp. nov.
(Figs 1–25)

Diagnosis. The only species of Neotropical *Bezzia* in which male and female adults have a bunch of setae in the interocular space and lack ventral spines on fore femur, and the spermathecae necks of the female are very elongate. Pupa: the only species of Neotropical *Bezzia* with respiratory organ unilobed with 50–60 apical pores, 3 dorsal apotomal sensilla and 2 clypeal/labral sensilla. Larva: the only species of Neotropical *Bezzia* without scopae, hypopharynx ventral comb rounded and bearing 6–7 teeth, dorsal comb elongate, and palatal bar triangular.

Description. Male adult (Figs 1–3, 44–45). Similar to female with usual sexual differences. Antenna and palpus as in Fig. 1; AR (11–13/1–10) 0.37–0.43 (0.40, $n = 3$); PR 2.50–2.55 (2.54, $n = 4$). Legs banded as in female, but less notorious; hind tarsal ratio 2.04–2.10 (2.07, $n = 4$). Wing (Fig. 2) length 1.52–1.64 (1.60, $n = 4$) mm; width 0.46–0.54 (0.51, $n = 3$) mm; CR 0.77–0.79 (0.78, $n = 4$). Genitalia (Fig. 3): tergite 9 reaching distal level of gonocoxites, cercus stout; sternite 9 0.33 times longer than wide, with shallow, rounded posteromedian excavation. Gonocoxite stout, 1.6 times longer than wide; gonostylus 0.8 times longer than gonocoxite, nearly straight, tip pointed. Paramere (Fig. 44) elongate, anterolateral plates bilobed; distal process narrowing anteriorly, surface smooth, without pubescence, tip rounded. Aedeagus (Fig. 45) triangular, slightly shorter than basal width; basal arch low, extending to $\frac{4}{5}$ of total length; lateral arms slender, tapering to hyaline, blunt tip; ventral surface spiculate.

Female adult (Figs 4–12).

Head (Fig. 4). Dark brown. Eyes bare, separated medially by width of about 3–4 ommatidia, with 22 setae on interocular space (Fig. 5). Antenna (Fig. 6) dark brown, base of flagellomeres pale; scape with 1–2 setae; AR 0.76. Palpus (Fig. 7) dark brown, elongate;

third segment with few sensilla on inner margin; PR 2.77. Proboscis (Fig. 8) short, 0.4 times longer than width of head. Mandible (Fig. 8) with 12 stout teeth.

Thorax (Fig. 10). Uniformly dark brown; small anterior spine present; 3 prealar setae, one postalar; scutellum dark brown, with 4 setae. Legs hairy, pale brown, knees dark; distal $\frac{1}{3}$ of fore femur slightly darker, distal $\frac{1}{3}$ of hind femur dark brown; tibiae with darker mesal bands, more evident in fore, hind legs, apices of tibiae dark brown; fifth tarsomeres (Fig. 11) dark brown; fore femur without ventral spines; hind tibial comb with 7 slender spines; pair of black apical spines on tarsomeres 1–3 of mid leg; ventral palisade setae absent on tarsomere 1 of fore leg; in one row on tarsomeres 1–2 of mid leg and tarsomeres 3 of hind leg, in two rows on tarsomeres 1–2 of hind leg; hind tarsal ratio 2.15; fourth tarsomere of each leg cordiform; tarsal claws of each leg small, equal, each with short basal tooth (Fig. 11). Wing (Fig. 9), length 2.40 mm; width 0.84 mm; CR 0.80; membrane slightly infuscate; veins pale brown; M narrowly sessile. Halter dark brown.

Abdomen. Dark brown. Sternite 8 sclerotized as in Fig. 11. One pair of heavily sclerotized gland rods arising from anterior portion of tergite 7 and extending through segment 6. Three ovoid, strongly sclerotized spermathecae with elongate necks (Fig. 11); largest two subequal, measuring 60 by 40 μm , necks 20–32 μm , third spermatheca smaller, moderately developed, measuring 44 by 36 μm , neck 18 μm .

Fourth instar larva (Figs 13–20, 33–36). Exuviae pale yellowish. Head capsule (Figs 13–14) elongate, apex slightly bent ventrally, setae minute, poorly visible, chaetotaxy as in Figs 13–15; HL 0.448–0.456 (0.452, $n = 2$) mm, HW 0.160–0.168 (0.164, $n = 2$) mm; HR 2.71–2.8 (2.75; $n = 2$), SGW 0.096–0.104 (0.1, $n = 2$) mm; SGR 1.615–1.666 (1.640, $n = 2$) mm. Labrum (Figs. 16–17) longer than wide, not extending beyond hypostoma, with pair anterolateral sensilla styloconica (Figs 15–17); palatum (Figs 14–17, 33) with 3 pairs of closely spaced sensilla, 2 trichoidea, one campaniformia (Figs 15–17); palatal bar (Figs 16, 34) triangular, represented by small sclerite situated immediately posterior to messors; messors (Figs 16–17, 33–34) small, thin, curved, gently sclerotized, situated away from mandibles, without scopae. Maxilla (Figs 15–16, 18) with blunt sensillum, maxillary palpus long, cylindrical (Fig. 18), with 4 subapical papillae, 3 medium-sized, one elongate; galeolacinia (Fig. 18) with stout, sharp pointed, medium-sized seta. Mandible (Figs 15–18, 34) hooked, curved, tooth long, deep fossa mandibularis on ectal surface; MDL 0.062–0.070 (0.066, $n = 2$) mm, MDW 0.012–0.018 (0.015, $n = 2$) mm. Hypostoma (Figs 14–16) finely toothed, with strong lateral teeth. Labium small, triangular. Epipharynx (Figs 35–36) less massive, with 2 combs: ventral comb with

6–7 stout, small teeth, apical margin concave; dorsal comb with long, pointed teeth on posterior edge, auxiliary sclerites located near lateral arms; LAW 0.062–0.069 (0.065, $n = 2$) mm; DCW 0.026–0.030 (0.028, $n = 2$) mm. Hypopharynx (Fig. 35) long, thin, gently sclerotized, arms slender, without fringe. Thoracic pigmentation uniformly pale yellowish. Caudal segment (Figs 19–20) about 5–6 times longer than wide, posterior end with 6 pairs of setae, 4 of them strong, long, stout, pale brown, the other 2 thin, short, brown; CSL 0.824–0.928 (0.876, $n = 2$) mm, CSW 0.208–0.240 (0.224, $n = 2$) mm, CSR 3.866–3.96 (3.91, $n = 2$).

Male pupa (Figs 1–28, 40–43). Total length 4.18–4.94 (4.67, $n = 4$) mm. Cephalothorax (Figs 21–22) length 1.32–1.56 (1.48, $n = 4$) mm; width 0.82–0.92 (0.89, $n = 4$) mm. General coloration uniformly brown (Fig. 37). Exuviae pale brown, body surface smooth. Dorsal apotome (Figs 22, 26, 37, 40) with disc 2.6 times wider than long; ventral margin triangular, pointed end with single apical row of wrinkles, disc grooved on lateral margins; surface mostly smooth, dorsomedial area small, wrinkled; each side of mesal portion with raised areas; 3 dorsal apotomal sensilla (Figs 26–27, 40), as follows: DA-1-H single, long, thin seta located on rounded small tubercle, DA-2-H, DA-3-H pores; dorsal margin V-shaped, deep, smooth, with short wrinkles only on mesal portion; DAL 0.086–0.092 (0.089, $n = 2$) mm; DAW 0.240–0.272 (0.256, $n = 2$) mm; DAW/DAL 3.16. Thorax surface smooth, with mesal inconspicuous crest extending from bases of respiratory organs; dorsolateral cephalic sclerite sensilla (DL-1-H) (Figs 26–27) short, stout seta on quadrangular small tubercle; anterolateral sensilla (AL-1-T) (Fig. 25) stout, medium-sized seta; 2 anteromedials sensilla (Fig. 27), one long, thin seta (AM-1-T), other much longer seta (AM-2-T); 5 dorsal sensilla (Fig. 21), as follows: D-1-T, D-2-T, long, thin setae, D-3–4-T pores; one supralar (SA-2-T). Respiratory organ (Figs 21–22, 24–25, 37) medium-sized, pale brown except distal $\frac{1}{4}$ darker, about 5.5 times longer than broad, surface smooth, apex curved with convoluted row of with 50–60 pores and 10–11 lateral ones; length 0.36–0.40 (0.38, $n = 4$) mm, wide 0.064–0.072 (0.0695, $n = 4$) mm; pedicel short, length 0.046–0.056 (0.0495, $n = 4$) mm, P/RO 0.112–0.14 (0.127, $n = 4$) (Figs 21–24). Two long, thin clypeal/labral sensilla (CL-1-H, CL-2-H) (Fig. 41); 3 ocular sensilla (Fig. 28), one long, thin seta (O-1-H) other medium-sized seta (O-3-H), other pore (O-2-H). Abdominal segments (Figs 30, 43) with dark spots, surface with scattered small spinules on distal portion; tubercles short with single apex, triangular-shaped. First abdominal segment (Figs 23, 37, 42) with setae as follows: 2 thin anterior setae, one short on triangular stout tubercle (D-2-I), other long, thin on small tubercle (D-3-I); 3 lateral setae on two tubercles, two of them long, thin setae (L-2–3-I), other short, stout seta

(L-1-I); one mesal pore (D-4-I); 2 posterior setae, one long, thin (D-9-I), other medium-sized, stout (D-8-I), both on small rounded tubercle. Sensillar-segment 4 (Figs 29, 30, 37, 43) pattern as follows: D-2-IV short, thin seta on small, stout, simple tubercle; D-3-IV medium-sized, thin seta on stout, small tubercle; D-4-IV pore, D-5-IV short, stout seta on small tubercle, D-8-IV medium-sized, thin seta, D-9-IV long, thin seta, both on bifid tubercle; L-1-IV long, thin, hyaline seta on small tubercle; L-2-IV short, thin seta on lateral margin of stout triangular tubercle, L-3-IV medium-sized, thin seta on apex of same tubercle, L-4-IV, short, thin seta on stout tubercle at base of tubercle that supports L-2-IV and L-3-IV; V-1–2-IV pore, V-5-IV short, thin seta, V-6–7-IV medium-sized, thin seta, all on rounded small tubercles. Segment 9 (Figs 31, 37) 1.33 times longer than wide, dorsal surface with abundant posteriorly directed spicules extending to terminal processes. Terminal processes (Fig. 31) nearly straight, tip moderately curved mesad, base wide, extreme tip pointed, darkish; length 0.416–0.48 (0.44, $n = 4$) mm, width 0.160–0.176 (0.168, $n = 4$) mm.

Female pupa (Figs 32, 37–39). Similar to male with usual sexual differences; total length 5.76 mm. Dorsal apotome (Fig. 38) with abundant stouter wrinkles, DAL 0.102 mm; DAW 0.296 mm; DAW/DAL 2.90. Respiratory organ length 0.464 mm; P/RO 0.172; P 0.08 mm. Segment 9 (Fig. 32) with abundant stouter pointed spicules, genital lobe elongate, surface smooth; length 0.52 mm, width 0.22 mm.

Distribution. Known only from the type locality (Fig. 46).

Type material. Holotype male with pupal exuviae, labeled “Holotype *Bezzia galesa* Spinelli, Argentina, Chubut, Corcovado, 39°29'59”S, 71°27'41”W, 26.XII.2010, P. Pessacq – G. Omad, collected as pupa and reared in laboratory (MLP)”. Paratypes, 4 males, 2 females, 2 pupae, 2 larvae, as follows: same data as holotype, 1 male (teneral); same data except 20.XII.2010, 1 male, 1 female; 20.XII.2010 but with also larval exuviae, 1 male; same data but without pupal exuviae, 1 male; same data except 5.IV.2010, 1 female (damaged, without pupal exuviae); same data except, 1 male pupa, 1 female pupa, 2 larvae (on SEM stubs).

Etymology. The name *galesa* refers to the brave Welsh people that during the second half of the 19th century established their colony in western Patagonia very close to the type locality. “Galesa” is the Spanish word for “Welsh”.

Bionomics. Immatures of *Bezzia galesa* were found associated with floating aquatic vegetation in an unnamed pond of approximately 120 by 50 meters and a maximum depth of approximately 7 meters. Without permanent tributaries, the pond feeds through a stream and groundwater (“mallin”), and is surrounded by a forest of the southern beech *Nothofagus*

antarctica (G. Forster) Oerst. (“ñire”) in an ecotonal zone between steppe and forest. It freezes in winter and reaches the maximum temperature (25°C) in December.

Immatures were collected during three times in 2010. Larvae collected in April (5/IV/2010 and 21/IV/2010) lasted 25–170 (average: 118) days to reach the pupal stage. Only one larva took less than one month (25 days), while the remaining ones lasted 80–170 days. The only pupa that reached the adult stage took 5 days to emerge. The two larvae collected in November (2/XI/2010 and 25/XI/2010) took 34 and 48 days, respectively, to reach pupal stage. The two larvae collected in December (20/XII/2010) took one and three days, respectively to reach pupa, and the only one that completed metamorphosis took an additional day to reach the adult stage; pupae collected in December took an average 1–3 (average 2.3) days to reach the adult stage. Larvae were kept at a temperature ranging between 16 and 22°C.

Larval behavior alternated fast undulating translation movements with static periods. In the static periods larvae remained completely immobile or they moved slowly the anterior part of the body.

At the beginning larvae were fed with copepods collected in the same pond. Feeding behavior with copepods was only recorded in one occasion, but empty shells of copepods were usually observed after one or two days. Latter on and for most of the time, larvae were fed with whole living chironomids larvae or pieces of them. During the slow lateral movements of the body, when a chironomid was detected, the ceratopogonid stopped moving and started to approach the prey, and when close enough, the midge larva grabbed the prey, which struggled only for a few seconds, by a sudden fast movement or pumping action. The larvae remained attached to their preys, and the mouthparts were easily observed by transparency moving inside the head. The feeding lasted for several minutes, and the prey was completely sucked or only partially eaten.

The collected pupae lasted 2–3 days to reach the adult stage. Pupae exhibit the typical semi-circular, slow abdominal movement of most other ceratopogonid pupae.

DISCUSSION

Bezzia galesa is very similar to other three species: *B. roldani* from eastern Argentina, *B. blantoni* from Belize to eastern Argentina, both collected as immatures in large ponds associated with hydrophytes, and *B. ventanensis*, recently described from adult and pupa that inhabits the margin of a narrow stream in the Ventania hill system in the southwest of the Buenos Aires province, Argentina (Spinelli *et al.* 2012).

The pupa and fourth instar larvae of *B. roldani* and *B. blantoni* were fully described through observations carried out with SEM by Ronderos *et al.* (2007) and Ronderos and Spinelli (2009), respectively. However, adults and immatures of these three species can be distinguished from *B. galesa* by a series of characters, as follows:

Bezzia ventanensis: the male adult differs by the gonostylus shorter and curved and by the pubescent parameres with pointed tip, while the female differs by the interocular space with 11–14 setae, very short palpus, mandible with 7–8 teeth, scutum with evident narrow longitudinal pale lines and 4 prealar setae, scutellum with 6 setae, legs almost unbanded and spermathecae larger, with very short necks. The pupa has the respiratory horn with straight apex and bearing 13–15 pores, the dorsal apotome with a single pore (DA–2–H) close to seta DA–1–H, and the segment 9 with shorter, nearly straight terminal processes.

Bezzia roldani: male and female adults have the distal flagellomeres not elongate, the legs banding is poorly visible, the posteromedian excavation of the male sternite 9 is especially deep, the spermathecae necks are distinctly shorter and the female sternite 8 exhibits a pair of glabrous rounded areas. The pupa has 2 dorsal apotomal sensilla and 3 clypeal/labral sensilla, while the larva differs from this new species by the triangular ventral comb of the epipharynx which bears 4–5 teeth, the dorsal comb rectangular and slender with smaller teeth and W-shaped palatal bar.

Bezzia blantoni: the male adult differs from *B. galesa* by the deeper posteromedian excavation of sternite 9, the tergite 9 abruptly tapering distally and gonocoxite and gonostylus more elongate, while the female adult has the distal flagellomeres more elongate, the legs are mainly yellowish including the entire tarsi and the spermathecae necks are distinctly shorter. The dorsal apotome of the pupa is more elongate and bears 2 dorsal apotomal sensilla (DA–1–H a long and thin seta, DA–2–H a pore). The larva has scopae and fringe in the hypopharynx, 4–5 teeth in the epipharynx ventral comb and rounded dorsal comb.

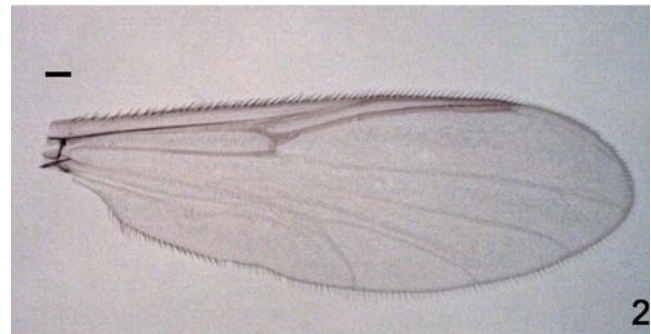
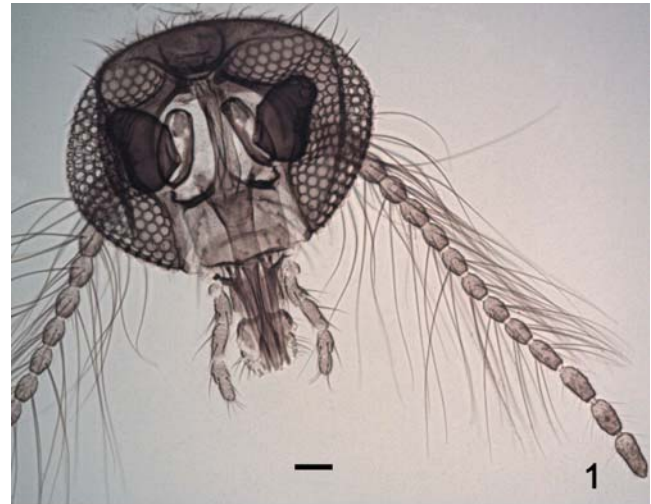
The respiratory organ and the terminal processes of the pupa of this new species, which are very similar to those of *B. blantoni* and *B. roldani*, are typical of ceratopogonids that inhabit large environments and are associated with floating vegetation.

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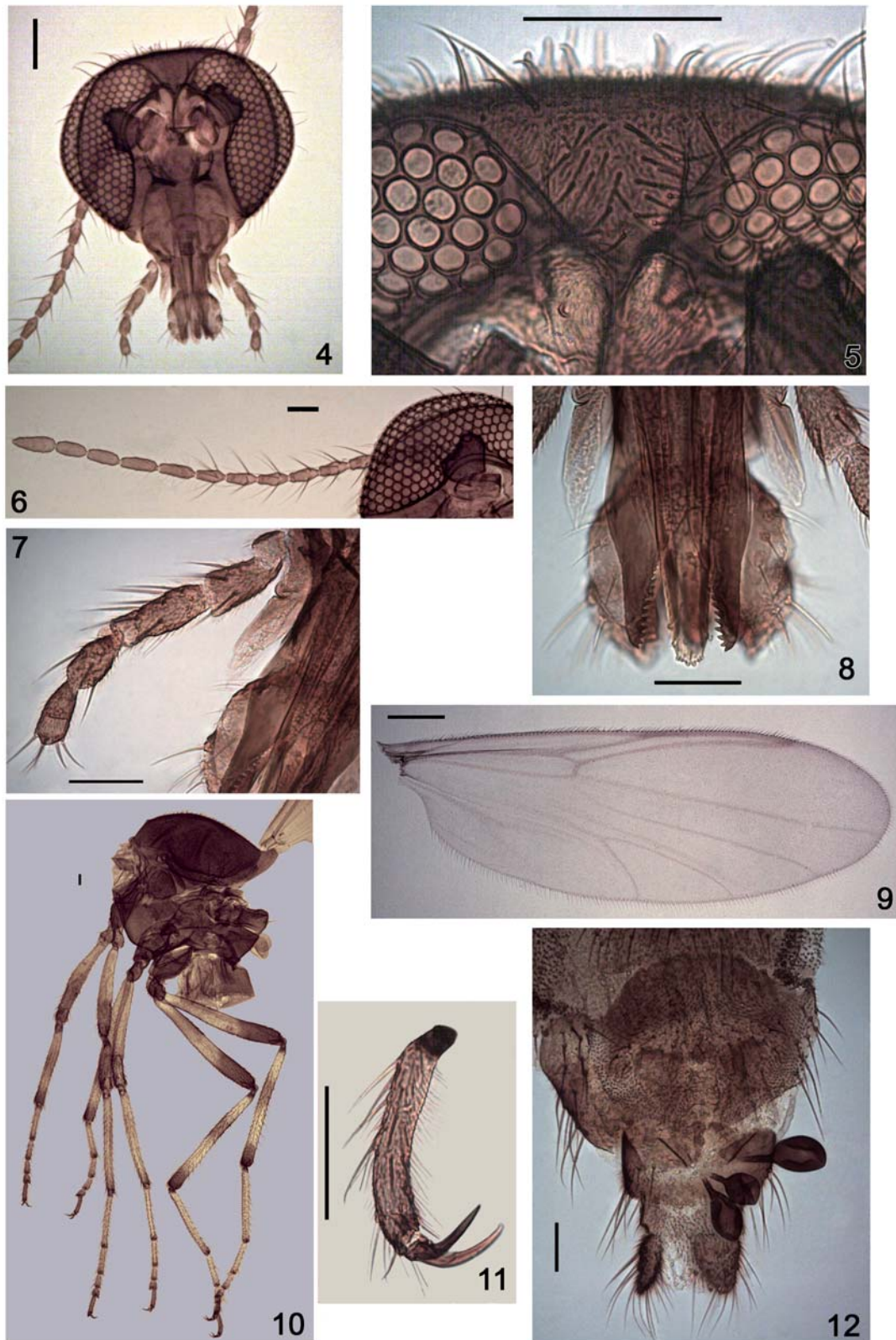
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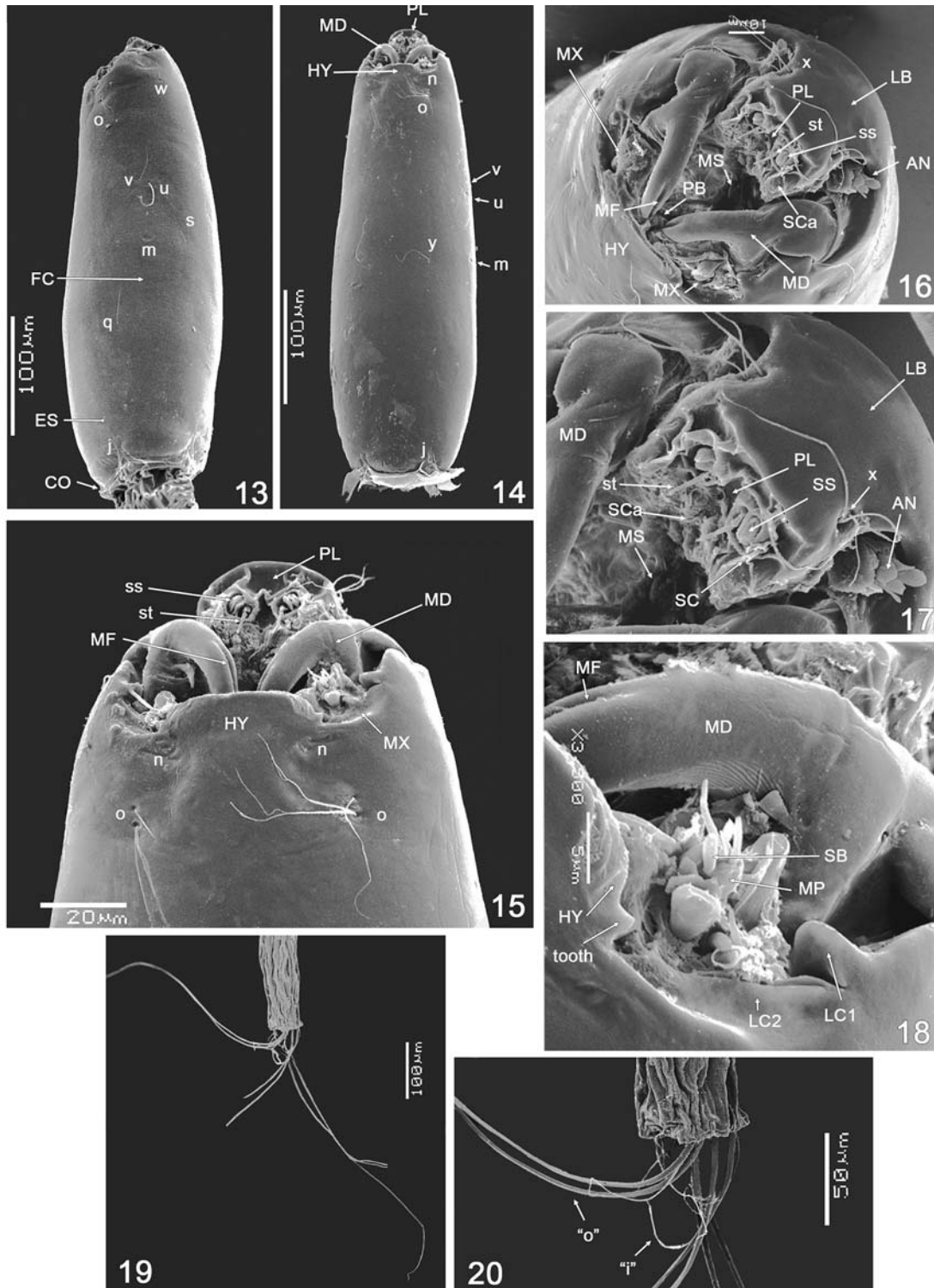
Figures 1–3. *Bezzia galesa*, adult male: (1) head; (2) wing; (3) genitalia.

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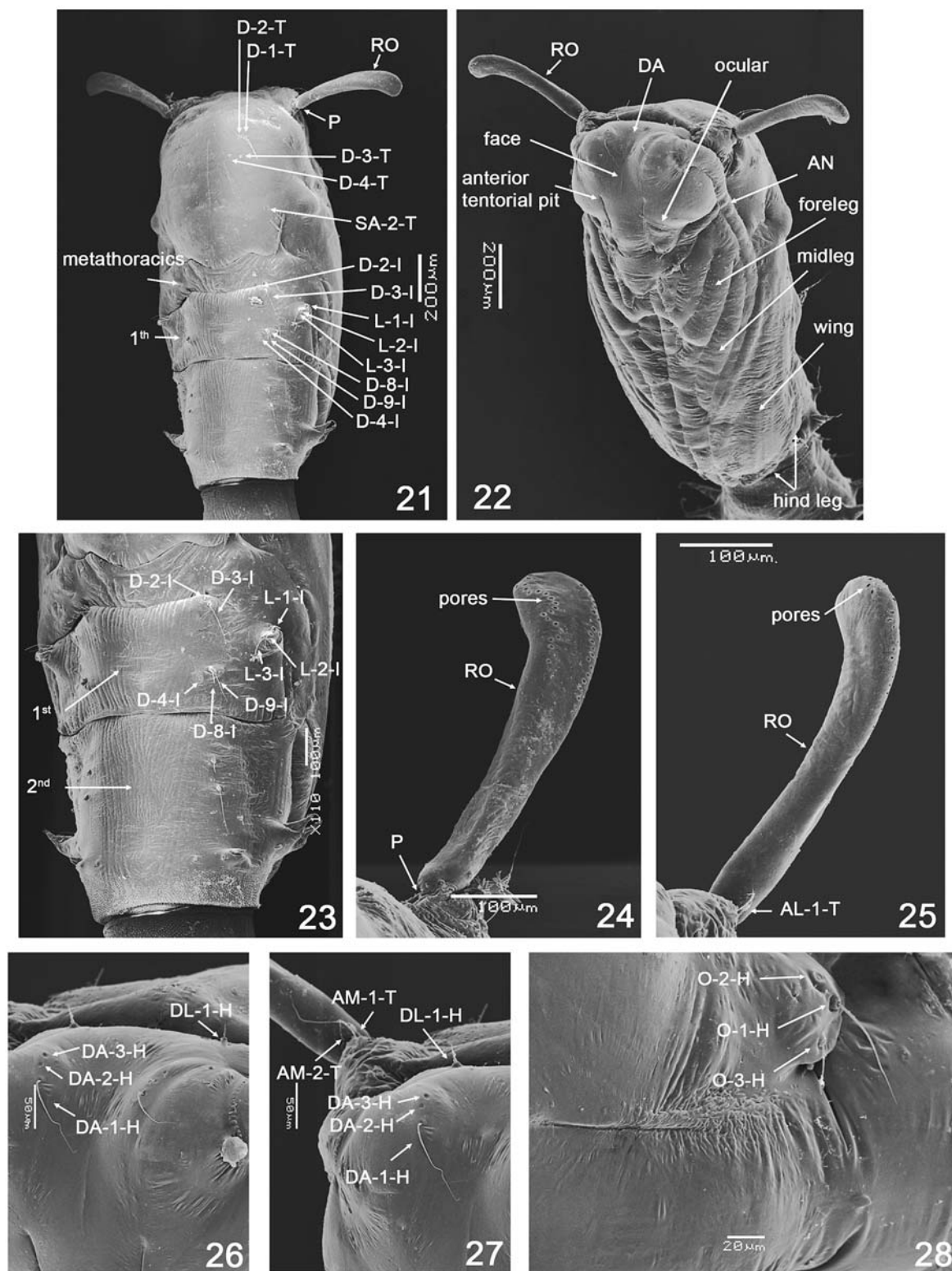
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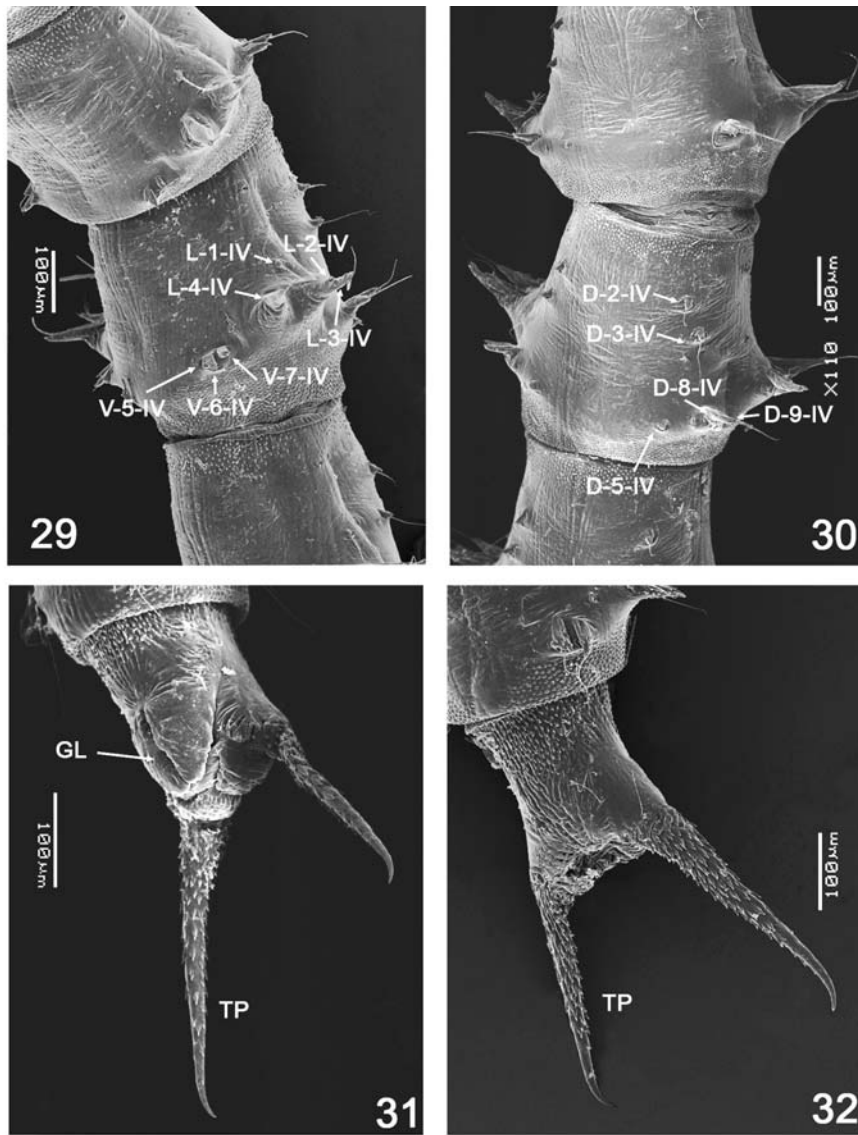
Figures 4–12. *Bezzia galesa*, adult female. (4) head; (5) interocular space; (6) antenna; (7) palpus; (8) proboscis; (9) wing; (10) thorax; (11) tarsomere 5 of hind leg and claws; (12) tip of abdomen.



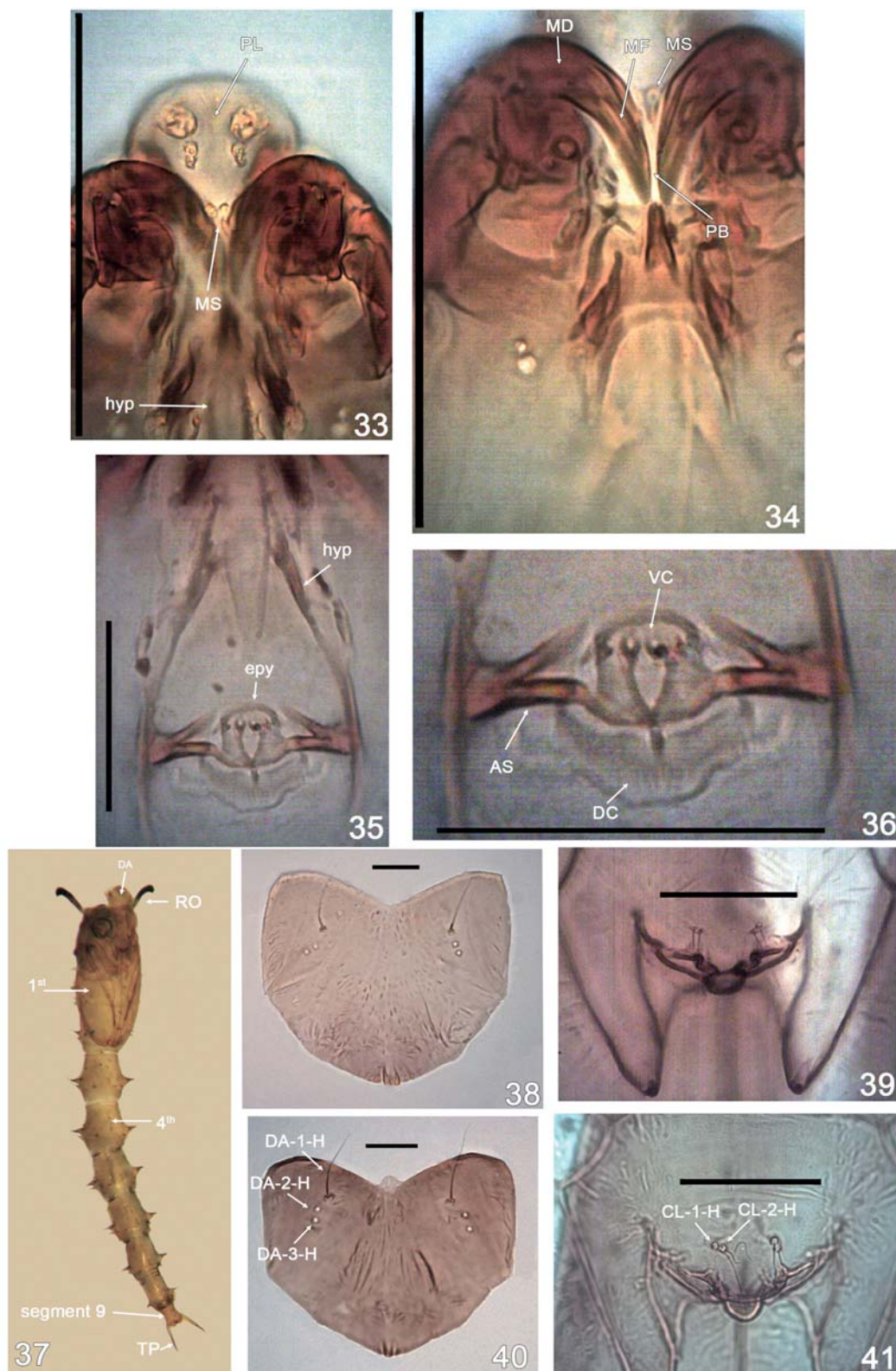
Figures 13–20. *Bezzia galesa*, larva. (13) head capsule chaetotaxy, dorsolateral view; (14) head capsule chaetotaxy, ventral view; (15) head capsule, anteroventral view; (16) head capsule, frontal view; (17) head capsule, detail of frontal view; (18) head capsule, detail of anteroventral view; (19) caudal segment; (20) caudal segment, insertion of setae. Antennae (AN); collar (CO); epicraneal suture (ES); fossa mandibularis (MF); frontoclypeus (FC); hypostoma (HY); lacinial sclerite 1 (LC1); lacinial sclerite 2 (LC2); labrum (LB); mandible (MD); maxilla (MX); maxillary palpus (MP); messors (MS); palatal bar (PB); palatum (PL); sensilla basiconica (SB); sensilla campaniformia (SCa); sensilla styloconica (SS); sensilla trichoidea (ST). Larva caudal segment chaetotaxy: “o” outer setae; “i” inner setae. Head capsule chaetotaxy: j, collar pits; m, posterolateral pits; n, anterolateral pit; o, parahypostomal setae; q, postfrontal setae; s, anterior perifrontal setae; u, mesolateral setae; v, posterolateral setae; w, anterolateral setae; x, paranntal setae; y, ventral setae.



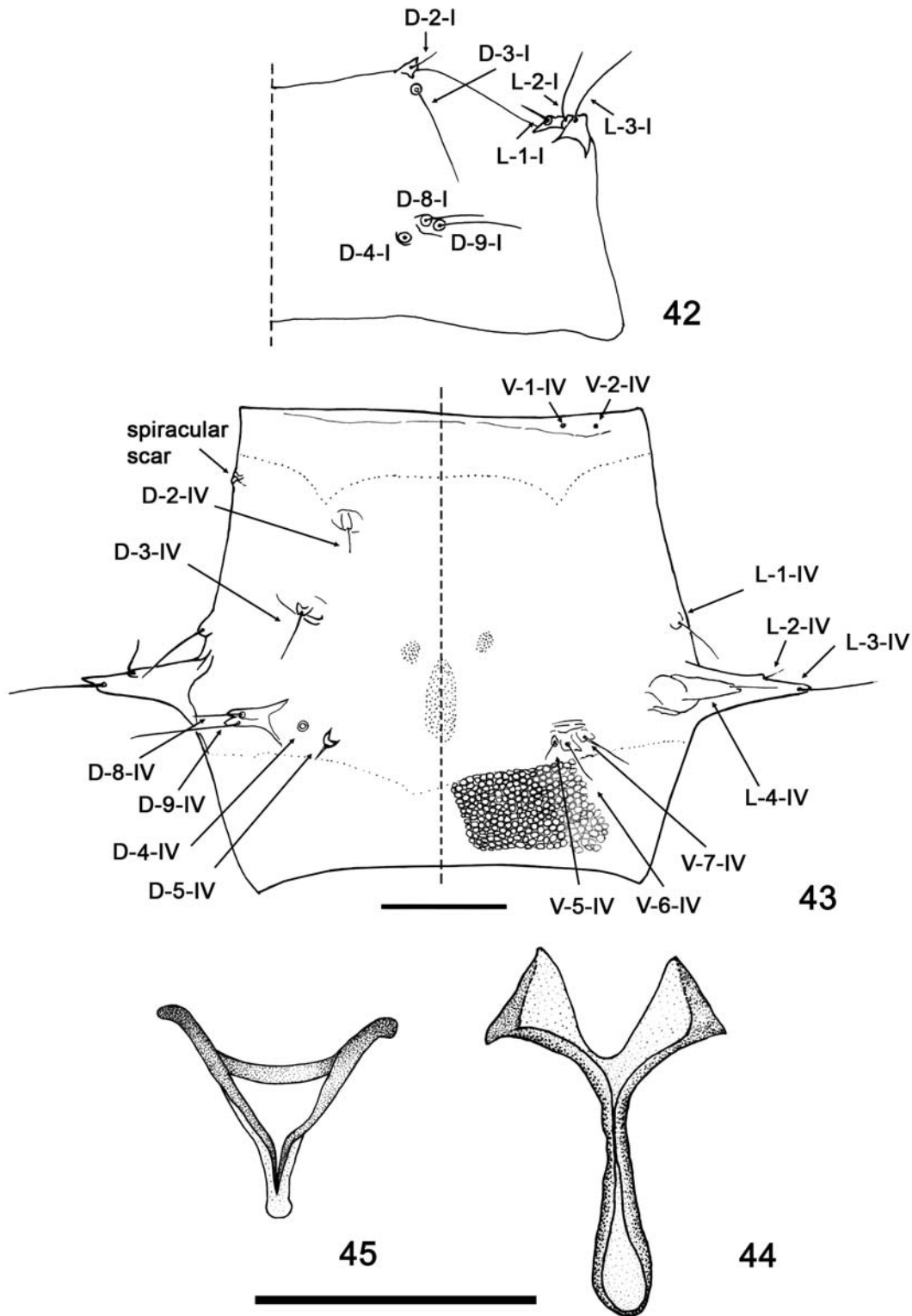
Figures 21–28. *Bezzia galesa*, male pupa. (21) cephalothorax chaetotaxy, dorsal view; (22) cephalothorax, ventral view; (23) chaetotaxy of first and second segment of cephalothorax, dorsal view; (24) respiratory organ, dorsal view; (25) respiratory organ, lateral view. Antenna (AN); anterolateral sensilla (AL-1-T, AL-2-T); anteromedial sensilla (AM-1-T, AM-2-T); dorsal apotomal sensilla (DA-1-H, DA-2-H, DA-3-H); dorsal apotome (DA); dorsolateral cephalic sclerite sensilla (DL-1-H); ocular sensilla (O-1-H, O-2-H, O-3-H); respiratory organ (RO); dorsal sensilla of first abdominal segment (D-2-I, D-3-I, D-4-I, D-8-I, D-9-I); lateral sensilla of first abdominal segment (L-1-I, L-2-I, L-3-I).



Figures 29–32. *Bezzia galesa*, pupa. (29–31) male, (32), female. (29) fourth abdominal segment chaetotaxy, ventrolateral view; (30) fourth abdominal segment chaetotaxy, dorsal view; (31–32) segment 9, ventral view. Dorsal sensilla (D-2-IV, D-3-IV, D-5-IV, D-7-IV, D-8-IV, D-9-IV); genital lobe (GL); lateral sensilla (L-1-IV, L-2-IV, L-3-IV, L-4-IV); terminal process (TP); ventral sensilla (V-5-IV, V-6-IV, V-7-IV).



Figures 33–41. *Bezzia galesa*, (33–36) larva, (37–39) female pupa, (40–41) male pupa. (33) head capsule, anteroventral view; (34) head capsule, detail ventral view; (35) faringeal apparatus; (36) detail of epipharynx; (37) entire pupa, ventral view; (38, 40) dorsal apotome; (39, 41) clypeal/labral sensilla. Auxiliary sclerite (AS); clypeal/labral sensilla (CL-1-H, CL-2-H); dorsal apotomal sensilla (DA-1-H, DA-2-H, DA-3-H); dorsal comb (DC); epipharynx (epy); fossa mandibularis (MF); hipopharynx (hyp); mandible (MD); messor (MS); palatal bar (PB); palatum (P); ventral comb (VC).



Figures 42–45. *Bezzia galesa*, (42–43) male pupa, (44–45) male adult. (42) First abdominal segment chaetotaxy; (43) Fourth abdominal segment chaetotaxy; (44) parameres; (45) aedeagus. Dorsal sensilla of first abdominal segment (D-2-I, D-3-I, D-4-I, D-8-I, D-9-I); lateral sensilla of first abdominal segment (L-1-I, L-2-I, L-3-I); dorsal sensilla of fourth abdominal segment (D-2-IV, D-3-IV, D-4-IV, D-5-IV, D-7-IV, D-8-IV, D-9-IV); lateral sensilla of fourth abdominal segment (L-1-IV, L-2-IV, L-3-IV, L-4-IV); ventral sensilla of fourth abdominal segment (V-5-IV, V-6-IV, V-7-IV).

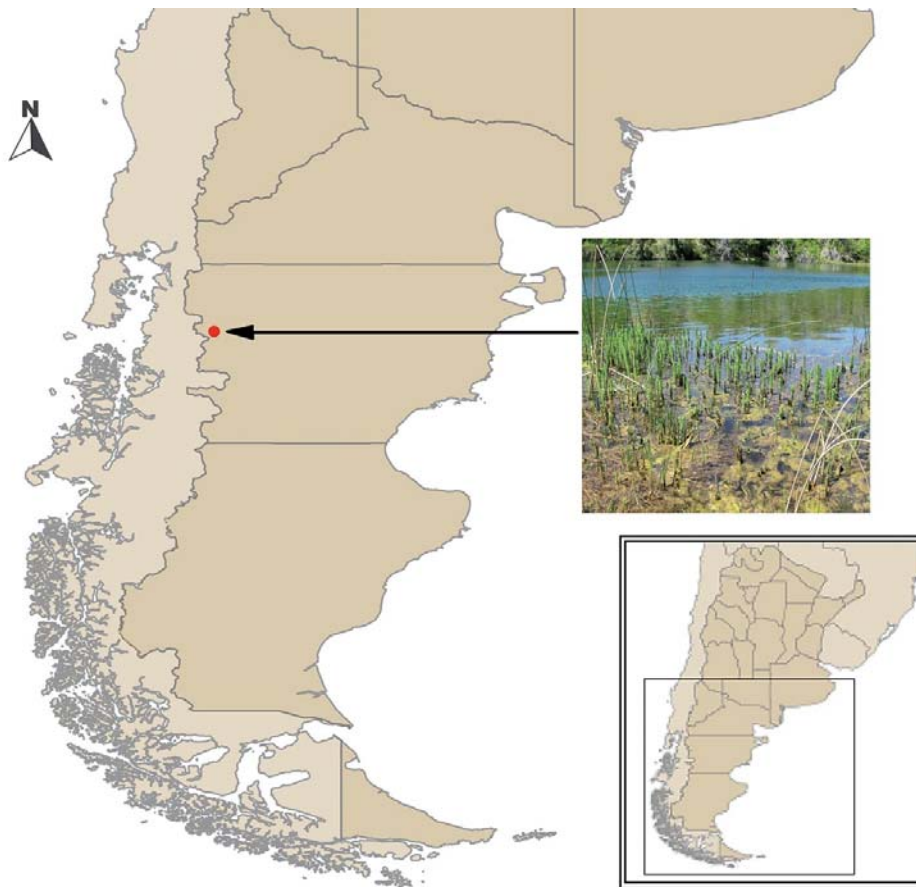


Figure 46. Distribution map and collecting site.