

REVISION OF THE GENUS *CHEILOXENA* BALY
(COLEOPTERA: CHRYSOMELIDAE: EUMOLPINAE)

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Abstract

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The unusual eumolpine genus *Cheiloxena* Baly is diagnosed, its three known species are revised and two new species, *C. blackburni* and *C. tuberosa*, are described. Lectotypes are designated for *C. insignis* Blackburn and *C. westwoodii* Baly. A phylogeny of the species is proposed. *Cheiloxena* species are confined to upland areas of mainland south-eastern Australia.

Introduction

The genus *Cheiloxena* Baly was erected for an unusual species of chrysomelid beetle, doubtfully placed in the *Sagrinae* (Baly, 1860). Two further species were described by Blackburn without comment on the position of the genus (Blackburn, 1893, 1896). The placement in *Sagrinae* was followed by various authors until the *sagrinae* genera were revised (Crowson, 1946). Crowson placed *Cheiloxena* in the Eumolpinae, noting correspondence between the wing venation of *Cheiloxena* and the African genus *Euryope* Dalman. These ideas were adopted by Jolivet (1950) who also suggested a relationship between *Cheiloxena* and the eumolpine genus *Bechyneia* Jolivet. Selman (1963) illustrated the venter of the prothorax of *Cheiloxena* and showed that it is similar to the eumolpine genus *Spilopyra* Baly. The wing venation (Crowson, 1946; Jolivet, 1950) is of the complete, plesiomorphic chrysomelid type, although a vague subcubital fleck is indicated. Currently *Cheiloxena* is found in section *Euryopites* of *Colasposomini* (Seeno and Wilcox, 1982). There can be no doubt that *Cheiloxena* belongs to the Eumolpinae as far as this group is understood and my studies indicate that it is a member of the *Spilopyrini*. A discussion of the relationship of *Cheiloxena* to other Eumolpinae will be given elsewhere.

Here, the genus and its species are redescribed and a phylogeny proposed. All species are relatively rare and their life-histories are completely unknown.

Material is lodged at the following institutions: Australian Museum, Sydney (AM); Australian National Insect Collection, Canberra (ANIC); Natural History Museum, London

(BMNH); Museum of Victoria, Melbourne (NMV); South Australian Museum, Adelaide (SAM).

Cheiloxena Baly

Cheiloxena Baly, 1860: 255. — Chapuis, 1874: 34. — Jacoby 1903: 4. — Crowson, 1946: 76 (Type species, *Cheiloxena westwoodii* Baly, 1860, by monotypy and original designation).

Chiloxena. — Gemminger and von Harold, 1874: 3233. — Clavareau, 1913: 5. — Jolivet, 1950: 1. — Jolivet, 1957: 99 (misspelling).

Cheilosena. — Selman, 1963: 158 (misspelling).

Chilosena. — Selman, 1963: 159 (misspelling).

Diagnosis. Eumolpinae of large size, with coarse sculpture, and narrow pronotum. Length 7–15.5 mm; entire body surface non-metallic, densely microsculptured and clothed with scale-like setae; small eyes, interocular space at least 3 times eye length; last 4 segments of antennae shorter than segment 7, cylindrical or ovoid and densely microsculptured and pubescent; elytra tuberculate; elytral punctures with pair of tubercles on internal margins; tibial spurs at apex of all tibiae; tarsal segments 1–3 dorsally hollowed and segment 3 weakly bilobed; claws bifid. Male with last segment of maxillary palp expanded at apex; Female ovipositor non-telescopical, with well-defined dorsal and ventral sclerites and vaginal glands.

Distribution and biology. The species are confined to the south-eastern corner of mainland Australia from Brisbane, Queensland to Melbourne, Victoria on or east of the Dividing Range.

Specimens have been collected from the foliage of *Eucalyptus*, *Astrotriche*, *Argyrodendron*

and *Nothofagus* but have only been recorded feeding on the first. The species appear to favour forested upland country. The immature stages are unknown.

Remarks. Superficially, species of the genus strongly resemble lamiine Cerambycidae and specimens may be found under undetermined Cerambycidae in collections.

Key to species of *Cheiloxena*

1. Pronotum with lateral teeth, disc simple (Figs 24–27) 2
- Pronotum without lateral teeth, disc with pair of strongly raised elongate ridges (Figs 28–31) 4
2. Elytra with strongly raised tubercles, without erect setae; antennal segments elongate 3
- Elytra depressed, without strong tubercles, with evenly distributed erect setae; distal antennal segments moniliform (Fig. 7) *C. insignis* Blackburn
3. Elytra with 4 massive acutely raised tubercles, *c.* half height of elytron at humerus (Fig. 12); pronotum widest across mid and/or anterior lateral tubercles (Fig. 29) *C. tuberosa* sp. nov.
- Elytral tubercles small and not prominent, less than one-third height of elytron at humerus (Figs 13, 14); pronotum widest across mid and/or posterior lateral tubercles *C. westwoodii* Baly
4. Frons depressed between antennae; pronotal ridge evenly tapering posteriorly (Figs 26, 27); apex of aedeagal median lobe abruptly contracted to mucronate tip (Fig. 33) *C. frenchae* Blackburn
- Frons convex between antennae; pronotal ridge abruptly terminating posteriorly (Figs 24, 25); aedeagal median lobe gradually contracted to mucronate tip (Fig. 32) *C. blackburni* sp. nov.

Cheiloxena blackburni sp. nov.

Figures 2, 5, 9, 17, 24, 25, 32, 38

Types. Holotype: ♂ / Blackheath 6.12.1946 C. Oke N.S.W. / (NMV). Paratypes (9): 1♂ / Balook, V.C. Oke / (NMV); 1♂3♀♀ / Blue Mts N.S.Wales / F.W. Ferguson collection /, one with additional label / *Cheiloxena westwoodii* Baly /, and one with / *Cheiloxena* sp. W.K. Hughes det. / (ANIC); 1♀ / Blue Mts H.W. Cox / John Captor / *Cheiloxena* ?frenchi Blkb. / (ANIC); 1♂ / Blue Mts / (SAM); 1♀ / Blue Mts / *Cheiloxena* 18051 N.S.Wales / (SAM); 1, sex unknown, / Blue M'tains 1-04 / *Cheiloxena westwoodii* ? var. / (SAM).

Diagnosis. Apical antennal segments elongate and parallel-sided, frons convex between bases of antennae, pronotum without lateral tubercles and with dorsal keels which abruptly terminate posteriorly, elytra with recumbent setae and with small tubercles (less than quarter height of elytron at humerus) near suture.

Description. Entirely black with reddish-brown palpi, and slightly reddish tarsi, apices of tibiae and apical antennal segments; sparsely clothed with broad, rounded recumbent yellowish scales which are clumped on elytra and make them faintly flecked; scutellum scaled; elytra without erect setae; body elongate and cylindrical but broader than *C. frenchae*, ratio of length of elytra

and pronotum to width of elytra across humeri < 2.2:1; head vertically declined, hooded by pronotum; length 10.5–11.5 mm (♂) and 12.5–15 mm (♀).

Head (Fig. 2): surface densely punctured, interspaces less than third puncture diameter, shining; frons slightly convex between antennae; anterior margin of frontoclypeus straight, without lateral teeth; antenna (Fig. 5) elongate, length of segment 8 approximately twice width, length of segment 7 approximately 2.5 times width; last segment of ♂ maxillary palp (Fig. 17) slightly expanded at apex.

Pronotum (Figs 24, 25): cordate, broadest at middle, almost parallel in front, sides evenly contracted or slightly sinuate behind; anterior angles produced but without lateral tubercles; upper surface uneven and with pair of subparallel keels on either side of disc from anterior border to midpoint, these ridges abruptly terminating posteriorly; weakly microreticulate; punctures large and shallow with interspaces less than half diameter.

Elytron (Fig. 9): slightly uneven, with scattered small irregular tubercles in 4 rows from base to apex, larger tubercle in the basal half of sutural row, and 2 larger tubercles in middle of apical half, largest tubercles less than quarter

height of elytron at humerus; upper surface of elytra extremely dull and densely microreticulate except for shining apices of tubercles; elytral punctures large, deep, interspaces equal to diameter. Scutellum shining. Metasternum densely and evenly punctured, interspaces less than third of puncture diameters. Legs: ♂ tarsal segments without expanded bases.

Male genitalia (Fig. 32): apex of aedeagal median lobe gradually contracted to blunt mucronate tip; tegmen shallowly keeled.

Female genitalia: spermatheca (Fig. 38) with uncoiled duct and basally swollen, apically pointed, receptaculum; median ventral sclerite moderately elongate.

Distribution and biology. The species is restricted to the Blue Mountains west of Sydney, New South Wales, and Balook, Victoria. It has not been collected since 1946.

The food plant is unknown. Adults were collected in December and January.

Remarks. The species is similar to *C. frenchae*, but with broader antennae (segment 7 c.2.5 times longer than wide), convex frons between antennal bases, divergent and abruptly terminated prothoracic keels, small elytral tubercles (3 close to suture larger), and median lobe of aedeagus evenly contracted to mucronate apex.

Cheiloxena frenchae Blackburn

Figures 6, 10, 18, 26, 27, 33, 39, 44

Cheiloxena frenchae Blackburn, 1893: 138.

Chiloxena frenchi. — Clavareau, 1913: 5 (misspelling).

Type. Holotype (by monotypy) ♀: / Latrobe R. Dist. Vict. / Type / *Cheiloxena frenchae* Blackb. VICTORIA / Nat. Mus. Victoria C. French's coll. 5.11.08 / Nat. Mus. Victoria / Type T-9752 *Cheiloxena frenchi* [sic] Blkb. / (NMV)

Other material. NSW: 1♂, 5k SW Monga, on *Euc. rubida* C. Reid (ANIC).

Diagnosis. Apical antennal segments elongate and parallel-sided, frons concave between bases of antennae, pronotum without lateral tubercles and with dorsal keels which evenly taper posteriorly, elytra with recumbent setae and with small to medium tubercles (at most third height of elytron at humerus) near suture.

Description. Entirely black with reddish-brown palpi, ♀ with reddish legs; densely (♀) or sparsely (♂) clothed with broad, rounded recumbent offwhite scales which give flecked appearance to elytra; scutellum scaled; elytra without erect

setae; body elongate and cylindrical, narrower than *C. blackburni*, ratio of length of elytra and pronotum to width of elytra across humeri > 2.2:1; head vertically declined, hooded by pronotum; length 11 mm (♂) to 15.5 mm (♀).

Head: surface densely punctured, interspaces less than half puncture diameter, shining; frons slightly depressed between antennae; anterior margin of frontoclypeus straight, without lateral teeth; antenna (Fig. 6) elongate, length of segment 8 approximately twice width, length of segment 7 approximately 3 times width; last segment of ♂ maxillary palp (Fig. 18) slightly expanded at apex.

Pronotum (Figs 26, 27): cordate, broadest at middle, almost parallel in front, sides slightly contracted and sinuate behind; anterior angles produced but without lateral tubercles; upper surface uneven and with pair of subparallel keels on either side of disc from anterior border to midpoint, these ridges smoothly attenuating posteriorly; strongly microreticulate; punctures large and shallow with interspaces less than half diameter.

Elytron (Fig. 10): uneven, with scattered small irregular tubercles plus 7 or 8 conical large tubercles in an irregular row near elytral suture; largest tubercles being a pair at apex of elytral disc, closely spaced and densely scaled (♂), or more distant and less clothed (♀), these tubercles c.1/3 height of elytron at humerus; upper surface of elytra extremely dull and densely microreticulate except for shining apices of tubercles; elytral punctures large, deep, interspaces equal to diameter. Scutellum shining. Metasternum irregularly punctured with smooth microreticulate strips between (♀), or densely punctured with a mixture of large and small punctures (♂). Legs: ♂ tarsal segments without expanded bases.

Male genitalia (Fig. 33): apex of aedeagal median lobe abruptly contracted to blunt mucronate tip; tegmen shallowly keeled.

Female genitalia: spermathecal duct (Fig. 39) simple, receptaculum pointed at apex; median ventral sclerite (Fig. 44) very long and narrow.

Distribution and biology. The species is known only from the Latrobe River district, Victoria, and Monga, New South Wales.

The male was collected in November on *Eucalyptus rubida*.

Remarks. This species is similar to *C. blackburni* but has narrower antennae (segment 7 c.3 times longer than wide), slightly depressed frons between antennal bases, closer and more evenly tapered prothoracic keels, more prominent ely-

tral tubercles (7–8 larger near suture) and abruptly attenuated aedeagal median lobe.

The specific association of the male described here with the unique female of *C. frenchae* is based on the similarities given above, although the metasternal punctures and dorsal setal distributions are different. Until further material is available, the male from Monga is considered conspecific with *C. frenchae*.

***Cheiloxena insignis* Blackburn**

Figures 7, 11, 15, 16, 19, 28, 34, 40

Cheiloxena insignis Blackburn, 1896: 39. — Jacoby, 1903: 4, plate 1 Fig. 7.

Chiloxena insignis. — Clavareau, 1913: 6.

Types. Lectotype (this designation): ♂ carded and labelled / T.H. Vic / Type / Blackburn coll. 1910.236 / *Cheiloxena insignis*, Blackb. / (BMNH).

Paralectotypes (3): ♀ / H. Vict / Austral. / Type Blackburn / Jacoby coll. 1909-289 / *Cheiloxena insignis* Blackb. / (BMNH); 2♂♂ (separate pins) / He.V. / *Cheiloxena insignis* Blackb. Co-type / (SAM).

Other material (29): Vic.: Belgrave, Bullarto, Emerald, Fern Tree Gully, Healesville, Launching Place, Macedon, Monbulk, Mount Macedon.

NSW: Mittagong.

Diagnosis. Apical antennal segments moniliform, frons concave between antennal bases, pronotum with lateral tubercles and without dorsal keels, elytra with recumbent and erect setae and with small tubercles (less than fifth height of elytron at humerus) near suture.

Description. Entirely reddish-brown with black tubercles to entirely black with apex of elytra and palpi reddish-brown; generally sparsely clothed with narrow, pointed, adpressed white scales, which form 2 conspicuous patches on each elytron and smaller scattered pale flecks in fresh specimens; scutellum without white scales; elytra with scattered erect setae, arising from tubercles; body form relatively depressed, and head relatively prognathous, not hooded by pronotum; length 7–10 mm.

Head: surface densely punctured, shining; anterior margin of frontoclypeus triangularly excavate in middle and laterally toothed between base of antenna and mandible; frons concave between antennal bases; antenna (Fig. 7) short, last 4 segments moniliform; last segment of ♂ maxillary palp (Fig. 19) very broad.

Pronotum (Fig. 28): strongly contracted to base from middle, sides with 3 irregular teeth in anterior half; upper surface uneven but not tuberculate, reticulately microsculptured but

shining; punctures large and shallow, interspaces equal to half–total diameter.

Elytron (Fig. 11): uneven and covered in small irregular tubercles, largest tubercles less than fifth height of elytron at humerus; very densely microsculptured and dull except tips of tubercles shining; elytral punctures large, deep, scattered between tubercles. Scutellum shining. Metasternum closely but very shallowly punctured. Legs: ♂ with all tarsal segments (Fig. 16) expanded at base, ♀ simple.

Male genitalia (Fig. 34): apex of aedeagal median lobe abruptly contracted to acute mucronate tip; tegmen shallowly keeled.

Female genitalia: spermathecal duct (Fig. 40) simple, apex of receptaculum rounded; median ventral sclerite very short, vaginal palp apparently 3-segmented due to median constriction.

Distribution and biology. This species seems to be moderately common and widespread on the coastal slopes of the Dividing Range in central southern Victoria, and has also been collected at Mittagong in New South Wales.

This species has been recorded on eucalypts (Blackburn, 1896). Adults have been collected in April, July, October and November.

***Cheiloxena tuberosa* sp. nov.**

Figures 1, 12, 20, 29, 35, 41

Types. Holotype ♂ / Lamington NP Qld Nov. 1983 M. Lowman / no. 15 / *Cheiloxena* sp. det. T. Weir 1983 / (ANIC).

Paratypes (5): 1♂ / Dorrigo NSW W. Heron / (ANIC); 2♂♂ / Dorrigo N.S.Wales W. Heron / (SAM); 1♂ / Mt. Glorious St. For, QLD Nov-Dec 1985 [sic] Y. Basset coll. ex. *Argyrodendron actinophyllum* r/f / ANIC Coleoptera voucher no. 87-0134 / Co/ANT/10 / *Argyrodendron actinophyllum* Edlin subtropical rainforest 19-26.ii.1987 Mt Glorious State Forest Qld Y. Basset 92 / (ANIC); 1♀ / Mt. Warning NSW 11.xii.1977 G. & T. Williams, in rainforest / (AM).

Diagnosis. Apical antennal segments elongate and parallel-sided, frons concave between antennal bases, pronotum with lateral tubercles and without dorsal keels, elytra with recumbent setae and with large tubercles (c. half height of elytron at humerus) near suture.

Description. (Fig. 1) Entirely matt black with labrum reddish-brown, or appendages slightly reddish; wholly clothed with slightly variegated pattern of white and yellowish-brown broad, pointed, adpressed scales; white scales widespread but forming small spot on apex of outer elytral margin, yellowish scales tending to be

restricted to dense areas along anterior pronotal border, scutellum and elytral tubercles; pronotal disc very sparsely scaled; elytral tubercle scales twice length of other scales; elytra without erect setae; body form sub-cylindrical, and head hypognathous, hooded by pronotum; length 9–11 mm.

Head: upper vertex densely punctured, less dense between eyes, dull; anterior margin of frontoclypeus triangularly excavate in middle, not laterally toothed between base of antenna and mandible; frons concave between antennal bases; ♂ antenna (Fig. 4) long, last 4 segments very elongate, ♀ antenna (Fig. 1) shorter and with segments 1–7 much narrower; last segment of ♂ maxillary palp (Fig. 20) moderately expanded.

Pronotum (Fig. 29): cordate, strongly contracted from penultimate marginal tubercle almost to base, sides with 3 irregular teeth in anterior half, posterior tooth small, often smaller than median; front margin strongly produced, thickened and shining; upper surface uneven but not tuberculate, sides and base of disc slightly raised; densely reticulately microsculptured and irregularly sparsely punctured with large and small punctures, interspaces half–4 times diameter.

Elytron (Figs 1, 12): uneven, with 4 massive, acutely raised, and 2–4 smaller tubercles; 3 of large tubercles in row near elytral suture, furthest with another large tubercle outside it; largest tubercles c. half height of elytron at humerus, the latter also strongly raised and laterally produced, with row of small tubercles along its apex; very densely microsculptured and dull except tubercles and a few scattered spots shining; elytral punctures large, deep, evenly distributed approximately 1 diameter apart. Scutellum shining. Metasternum fairly densely but shallowly punctured. Legs: ♂ with tarsal segments not expanded at base.

Male genitalia (Fig. 35): apex of aedeagal median lobe abruptly contracted to pointed mucronate tip; tegmen deeply keeled.

Female genitalia: spermathecal duct (Fig. 41) spirally coiled, apex receptaculum pointed; median ventral sclerite short, similar to *C. westwoodii*.

Distribution and biology. *Cheiloxena tuberosa* is a rare species of subtropical rainforests, distributed from Dorrigo, New South Wales to Mount Glorious, south Queensland.

A single specimen has been taken in a flight trap on *Argyrodendron actinophyllum*. Adults

have been collected from November to February.

Cheiloxena westwoodii Baly

Figures 3, 8, 13, 14, 21–23, 30, 31, 36, 37, 42, 43, 45

Cheiloxena westwoodii Baly, 1860: 255, plate 14 figs 1–2.

Chiloxena westwoodi. — Clavareau, 1913: 6 (misspelling). — Jolivet, 1957: 99, fig. 13D.

Types. Lectotype (this designation): ♂ / Type / Type / *Cheiloxena westwoodi* [sic] Baly / Australia / (BMNH).

Paralectotype: ♀ / Type / *Cheiloxena westwoodi* [sic] Baly / Baly coll. 1879 / (BMNH).

Other material. Southern form (28). Vic.: Belgrave, Healesville, Mount Saint Bernard, Ringwood, Seville, Warburton.

ACT: Blundell Hill (Brindabella Range).

NSW: Island Bend (Kosciusko NP), Musfield [?].

Northern form (49). NSW: Barrington Tops, Blue Mountains, nr Cutters Pass (Williams R.), 17 km N Dorrigo, Dorrigo, Gibraltar Range National Park, Gosford, Hastings River, Middle Brother State Forest, Mount Tomah, Mount Victoria, Ourimbah, Robertson, Sydney, Ulong (nr Dorrigo).

Qld: Stanthorpe.

Diagnosis. Apical antennal segments elongate and parallel-sided, frons concave between antennal bases, pronotum with lateral tubercles and without dorsal keels, elytra with recumbent setae and with small to medium tubercles (up to third height of elytron at humerus) near suture.

Description. Entirely matt black with palpi and often lateral margins of elytra, tarsi and apical antennal segments, reddish-brown; wholly and variably densely clothed with slightly variegated pattern of dull yellowish or rarely silvery, pointed, adpressed scales; scales slightly narrower on pronotum than elytra; scales form series of small spots along outer elytral margin, most apical of which largest and proximal to margin; scutellum densely scaled; pronotal disc densely scaled; elytral tubercle scales slightly longer than other scales, and not more dense; elytra without erect setae; southern form usually with very densely scaled mesepisternum and posterior lateral corner of metasternum; body form subcylindrical, and head hypognathous, hooded by pronotum; length 8–12 mm.

Head (Fig. 3): whole of vertex densely with large punctures, interspaces reduced to ridges, dull; anterior margin of frontoclypeus triangu-

larly excavate in middle, sometimes less deeply concave, not laterally toothed between base of antenna and mandible; frons concave between antennal bases; antenna (Fig. 8) long, last 4 segments very elongate; δ last segment of maxillary palp (Figs 21–23) moderately expanded, slightly narrower in northern form but intermediates present (Fig. 22).

Pronotum (Figs 30, 31): cordate, weakly to strongly contracted from posterior marginal tubercle almost to base; sides with 3 irregular teeth in anterior half, rarely middle tooth absent and posterior tooth reduced; front margin strongly produced, thickened, and shining; upper surface uneven but not tuberculate, sides and base of disc slightly raised; densely reticulately microsculptured and densely punctured with large shallow punctures, interspaces reduced to ridges.

Elytron (Figs 13, 14): slightly uneven, with 4–9 variably raised tubercles, and up to 12 additional small tubercles; *northern form* with 5 large tubercles in row near elytral suture, row of 3 large tubercles outside the first, third and fourth of the inner row, and another large tubercle outside the third tubercle of the outer row, largest tubercles about third height of elytron at humerus; specimens from Robertson and Dorriga (ANIC) with about 12 small but sharply raised tubercles between inner elytral row and outer margin; *southern form* with small tubercles in positions of 2 main rows of northern form, other tubercles minute or absent (in a specimen from Island Bend (ANIC) basal tubercles are elongate ridges reaching elytral base), largest tubercles less than quarter height of elytron at humerus; humerus also strongly raised and laterally produced, with slight tuberculation along its apex; very densely microsculptured and dull except shining apices of tubercles and a few scattered spots; elytral punctures large, deep, evenly distributed approximately 1 diameter apart. Scutellum dull, densely punctate. Metasternum fairly densely but shallowly punctured, inter-

spaces third-half diameter of punctures. Legs: δ with basitarsal segments assymmetrically expanded at base.

Male genitalia: aedeagus of northern (Fig. 37) and southern (Fig. 36) forms almost identical, with apex of median lobe abruptly contracted to pointed mucronate tip and tegmen deeply keeled; northern form with slightly broader apex to median lobe and slightly more deeply keeled tegmen.

Female genitalia: spermatheca of northern (Fig. 43) and southern (Fig. 42) forms apparently identical, with spiral duct and blunt tip. Median ventral lobe short (Fig. 45).

Distribution and biology. At present there is a gap of about 200 km in the distribution records of the two geographic forms, but since the species is rare this gap may not be significant.

Northern form: widespread on the Dividing Range and outlying highlands between Robertson, south of Sydney, New South Wales, and Stanthorpe, south Queensland.

Southern form: widespread on high ground from the central Victorian coastal hills to Brindabella Range, ACT.

The species has been beaten off the unrelated genera *Eucalyptus* (Myrtaceae) and *Astrotriche* (Araliaceae). Most specimens were collected from October to January.

Remarks. The original description of this species by Baly includes an excellent illustration of the habitus. *Cheiloxena westwoodii* is similar to *C. tuberosa* from which it differs in having smaller elytral tubercles and the pronotum less constricted basally from the posterior lateral tooth.

Two geographic forms can be distinguished, but are not separately named because not enough material is available from the potential area of overlap. The type material and description (Baly, 1860) are clearly of the northern form. The description above is of both forms unless otherwise noted.

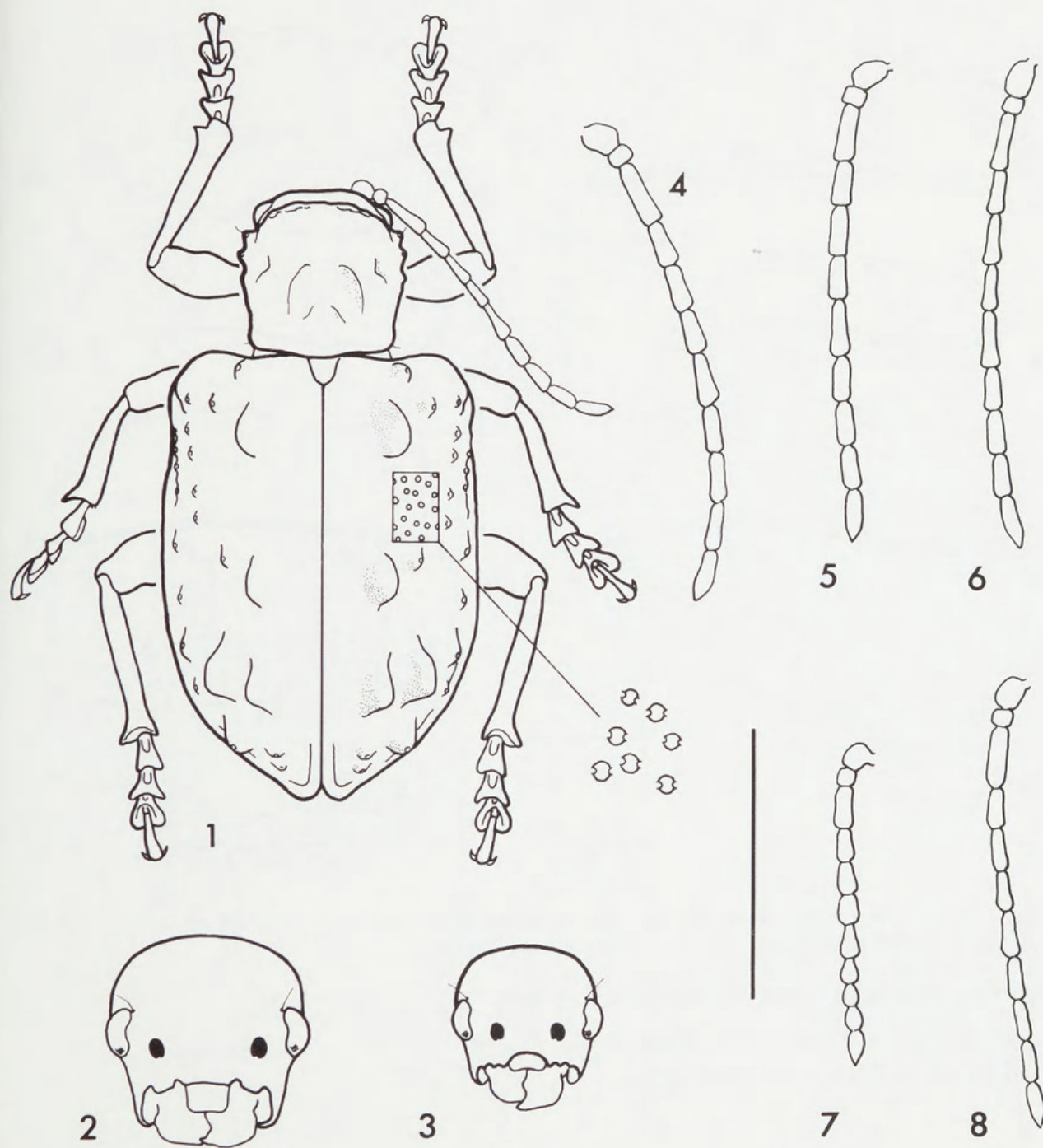
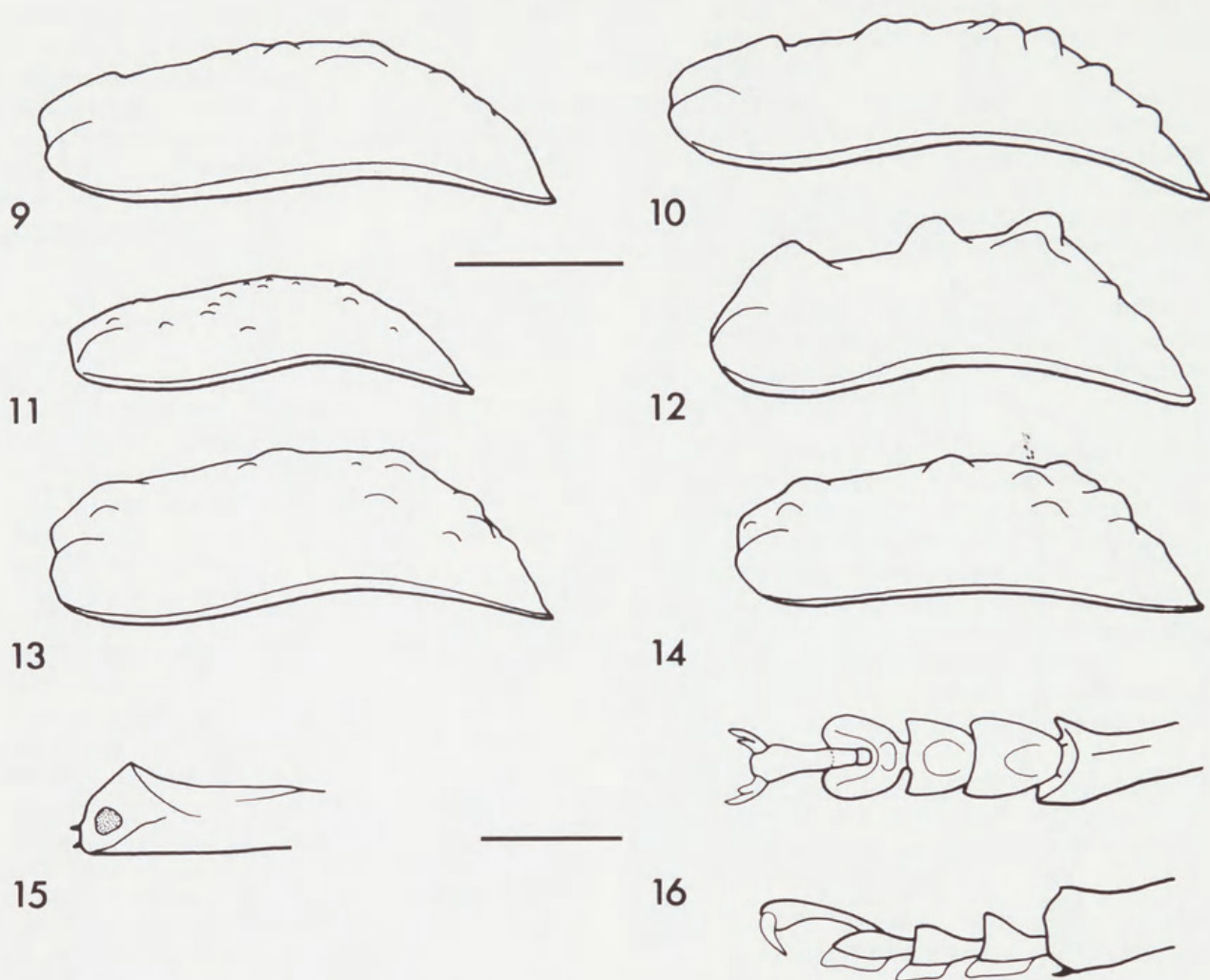


Figure 1. Habitus of ♀ *Cheiloxena tuberosa*, with detail of dorsal punctures.

Figures 2, 3. Anterior view of face of *C. blackburni* (2), and *C. westwoodii* (3).

Figures 4-8. ♂ antennae of *C. tuberosa* (4), *C. blackburni* (5), *C. frenchae* (6), *C. insignis* (7) and *C. westwoodii* (8).

Scale bar = 5 mm.



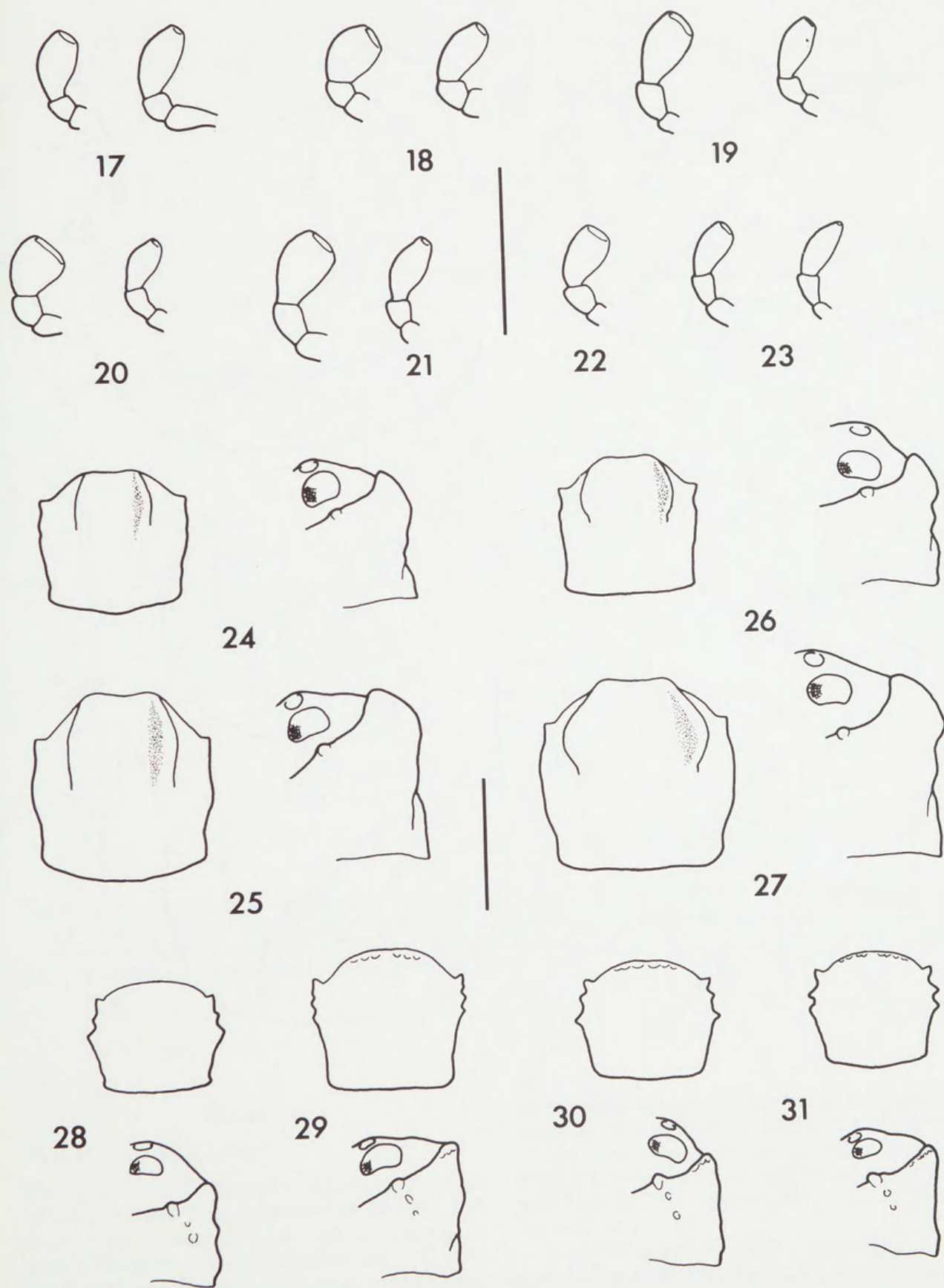
Figures 9–14. Lateral view of elytra of *Cheiloxena blackburni* (9), *C. frenchae* (10), *C. insignis* (11), *C. tuberosa* (12) and *C. westwoodii*, southern form (13) and northern form (14).

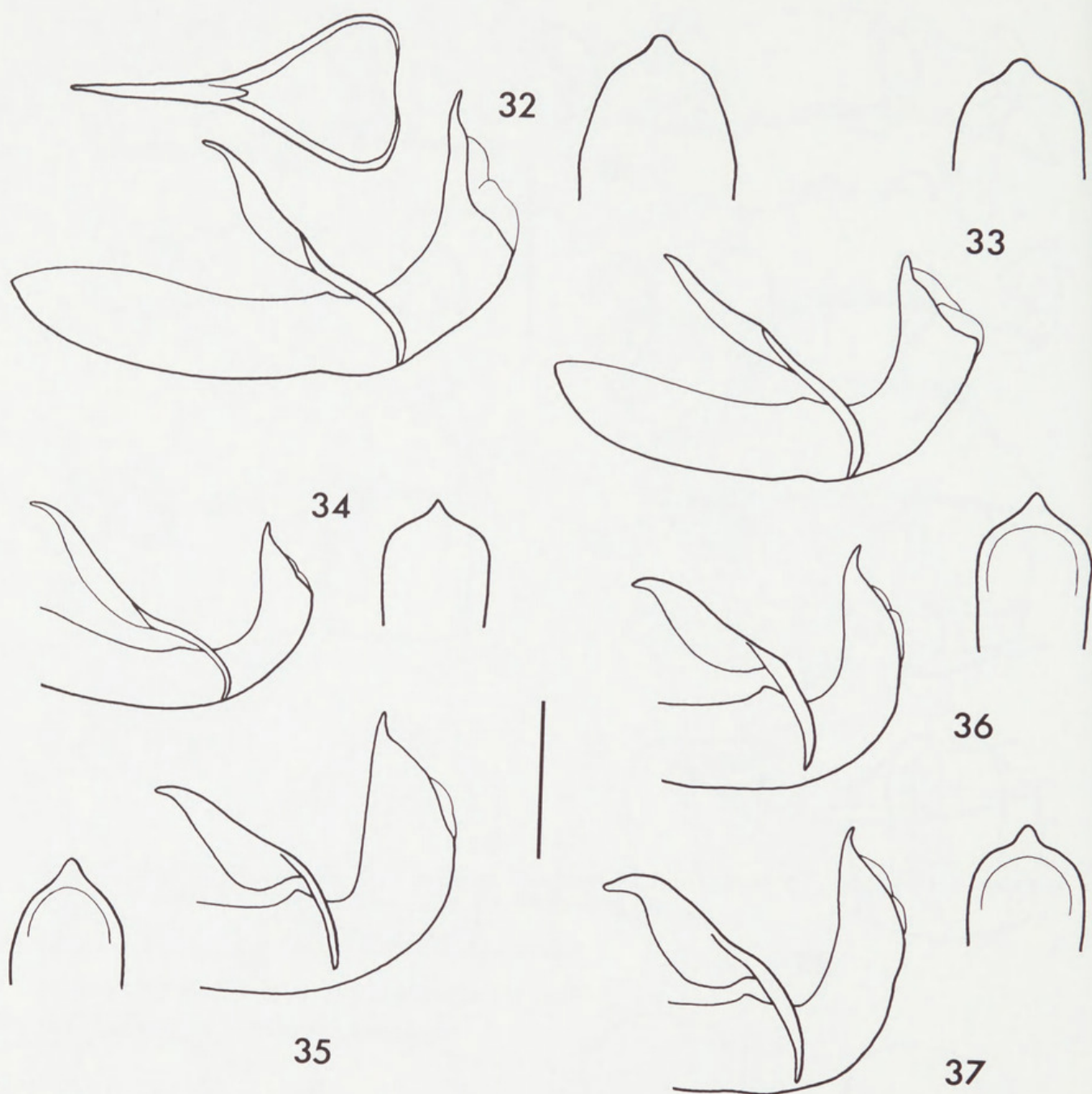
Figure 15. Tibial spurs at apex of metatibia of *C. insignis*.

Figure 16. Dorsal and lateral view of protarsus of *C. insignis*.

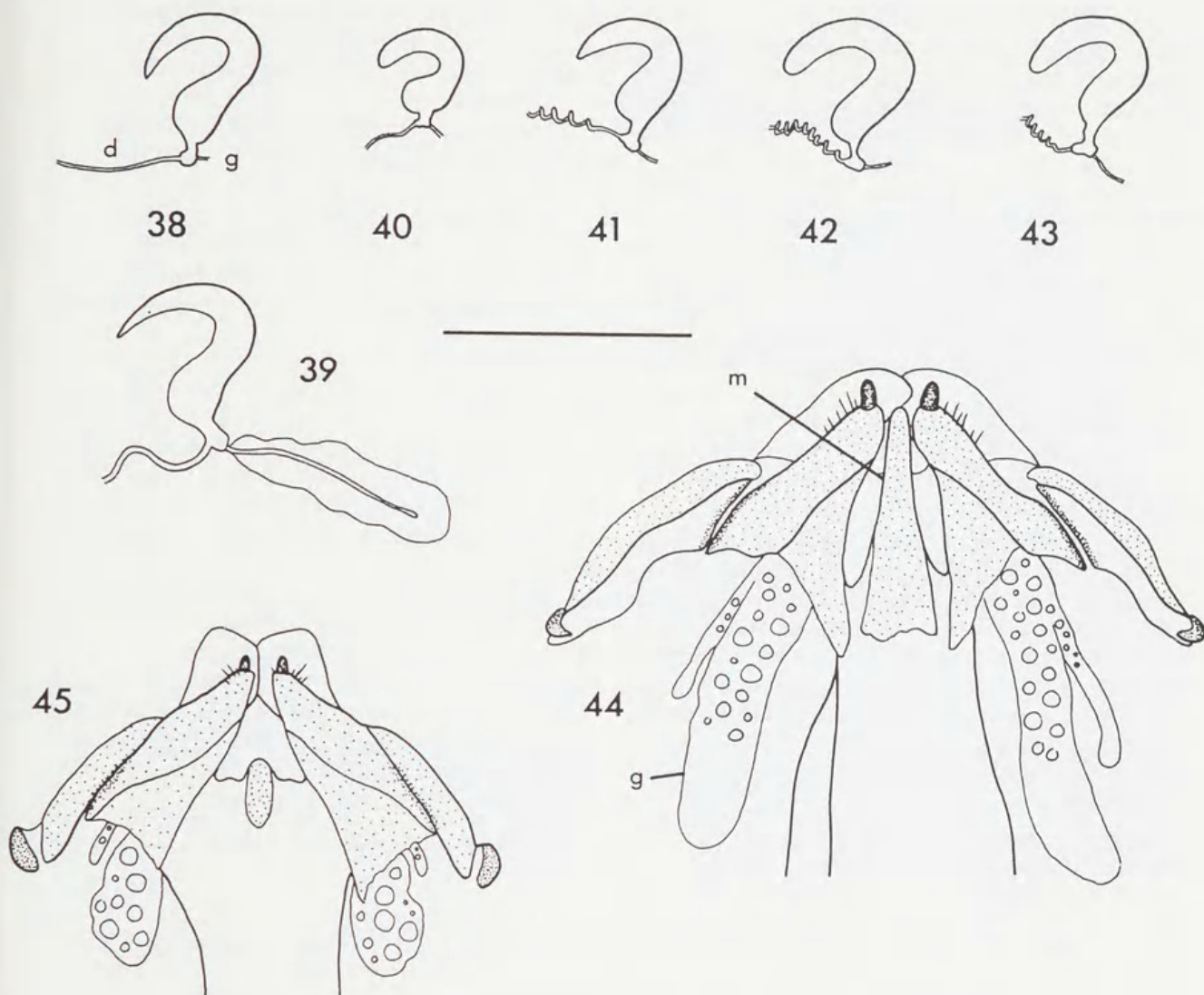
Scale bars = 3 mm (9–14) and 1 mm (15–16).

Figures 17–23. ♂ (left) and ♀ (right) apical maxillary palp segments of *Cheiloxena blackburni* (17), *C. frenchae* (18), *C. insignis* (19), *C. tuberosa* (20) and *C. westwoodii*, southern form (21) and northern form (22; Middle Brother State Forest, ♂ only) and (23; Dorriggo). Figures 24–31. Dorsal and lateral views of pronotum of *C. blackburni* (♂, 24, ♀, 25), *C. frenchae* (♂, 26, ♀, 27), *C. insignis* (28), *C. tuberosa* (29) and *C. westwoodii*, southern form (30) and northern form (31). Scale bars = 1 mm (17–23) and 3 mm (24–31).





Figures 32–37. Lateral and apicoventral views of aedeagus of *Cheiloxena blackburni* (32; including ventral view of tegmen), *C. frenchae* (33), *C. insignis* (34), *C. tuberosa* (35) and *C. westwoodii*, southern form (36) and northern form (37). Scale bar = 1 mm.



Figures 38–43. Spermatheca of *Cheiloxena blackburni* (38), *C. frenchae* (39), *C. insignis* (40), *C. tuberosa* (41) and *C. westwoodii*, southern form (42) and northern form (43). d = spermathecal duct, g = spermathecal gland. Figures 44, 45. Ventral view of ovipositor of *C. frenchae* (44) and *C. westwoodii*, southern form (45). g = vaginal gland, m = median ventral sclerite. Scale bar = 1 mm.

Discussion

Phylogeny of the species

The genus *Cheiloxena* is closely related to *Macrolema* Baly and *Richmondia* Jacoby, and these form a monophyletic group (Reid, in prep.). The genera share the following attributes, the first three of which are apparently synapomorphies: pronotum constricted to base and much narrower than elytra; lateral pronotal mar-

gins absent; last four antennal segments shorter and narrower than preceding and covered with dense adpressed pubescence and microsculpture; first two abdominal ventrites connate; 1, 2 and 2 apical spurs on pro-, meso- and metatibia respectively.

A cladistic analysis of *Cheiloxena* species was made using species of *Macrolema* and *Richmondia* as outgroup (*Macrolema vittata* Baly, *Macrolema* (= *Macrogonus*) *quadrivittatus* Jacoby, and

Richmondia olliffi (Blackburn)). The characters used and their states are given in Table 1 and the matrix (of 6 taxa and 16 characters) in Table 2. The polarity of character 16 is guessed because in *Macrolema* and *Richmondia* this character is extremely reduced. In Table 1 characters 1–5 provide synapomorphies for *Cheiloxena*, states 10(1), 11(1) and 12(2) are autapomorphies for *C. insignis* and state 12(0) is autapomorphic for *C. tuberosa*. The species *C. blackburni* and *C. frenchae* are scored identically and if the phylogenetically uninformative autapomorphies are discounted, the data set is functionally of 5 taxa and 8 characters.

The minimum-length tree for the distribution of these 8 characters (6–9, 13–16) on the 5 taxa was 9 steps long, with Consistency Index of 0.89, found by branch-swapping with the program MACCLADE Version 2.1 (Maddison and Maddison, 1987) (Fig. 46). This cladogram shows that the species pair *C. blackburni*/*C. frenchae* is the sister group of the remaining species of *Cheiloxena* and that *C. insignis* is the sister species of the species pair *C. tuberosa*/*C. westwoodii*. In this hypothetical phylogeny of the species of *Cheiloxena* the shape of the spermathecal receptaculum is the only character which varies homoplasiously.

Table 2. Character matrix for *Cheiloxena* spp.

Taxon	Characters 1–16	
Outgroup	00000000?0	??0?01
<i>C. blackburni</i>	1111100110	010010
<i>C. frenchae</i>	1111100110	010010
<i>C. insignis</i>	1111111001	120001
<i>C. tuberosa</i>	1111111010	001101
<i>C. westwoodi</i>	1111111000	011101

Biogeography

All available records of the five species are plotted in Figure 47. The distributions of *C. blackburni*, *C. frenchae* and *C. insignis* are bimodal but these distribution patterns may be artifacts of collecting bias towards the vicinities of Sydney and Melbourne, because the species are relatively rare. *Cheiloxena tuberosa* is the only species of *Cheiloxena* associated with tropical rainforest despite the entire outgroup being restricted to this habitat. The phylogenetic position of *C. tuberosa* suggests that its presence in rainforest represents establishment in this habitat independent of the outgroup.

Table 1. List of characters and states for determination of phylogeny of *Cheiloxena* species.

Character	Plesiomorphic state (0 unless otherwise indicated)	Apomorphic state (1 unless otherwise indicated)
1. Claws	simple	bifid
2. Tarsi	simple	hollowed
3. Dorsal punctures	simple	microtuberculate
4. Dorsum	metallic, smooth	dull, rugose
5. Dorsum	glabrous	scaled
6. Lateral pronotal teeth	absent (Fig. 24)	present (Fig. 28)
7. Deep excavation of frons	absent (Fig. 2)	present (Fig. 3)
8. Ridges on pronotum	absent (Fig. 28)	present (Fig. 24)
9. Apex of spermatheca	rounded (Fig. 40)	pointed (Fig. 38)
10. Apical antennal segments	elongate (Fig. 5)	moniliform (Fig. 7)
11. Scale-like setae	clavate	narrow
12. Elytral tubercles	prominent (Fig. 10) (1)	very large (Fig. 12) (0) very small (Fig. 11) (2)
13. Tegminal keel	shallow (Fig. 32)	deep (Fig. 35)
14. Spermathecal duct	simple (Fig. 38)	spiral (Fig. 41)
15. Apex median lobe aedeagus	pointed (Fig. 34)	blunt (Fig. 32)
16. Median sclerite of ovipositor	elongate (Fig. 44)	short (Fig. 45)

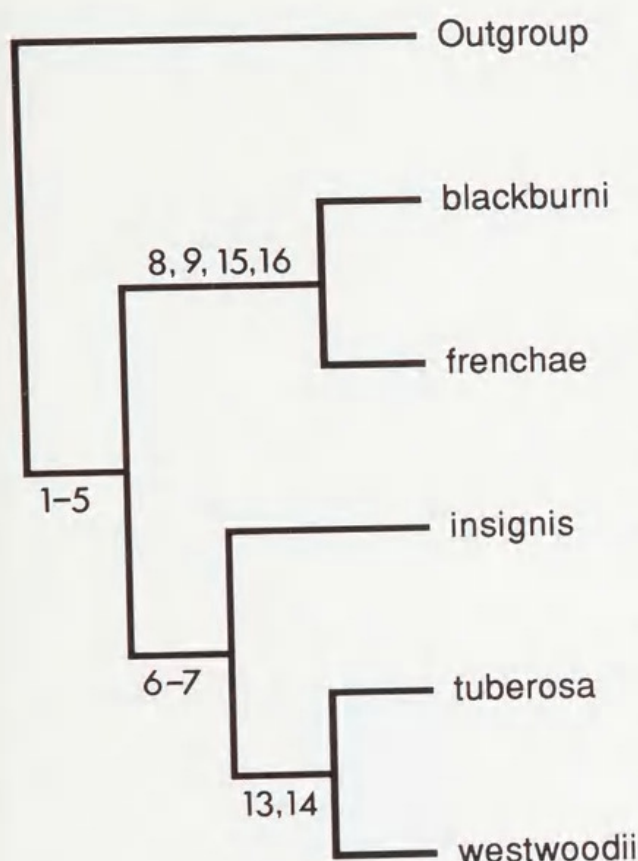


Figure 46. Phylogeny of *Cheiloxena* species. Numbers refer to apomorphic states of characters listed in Table 1.

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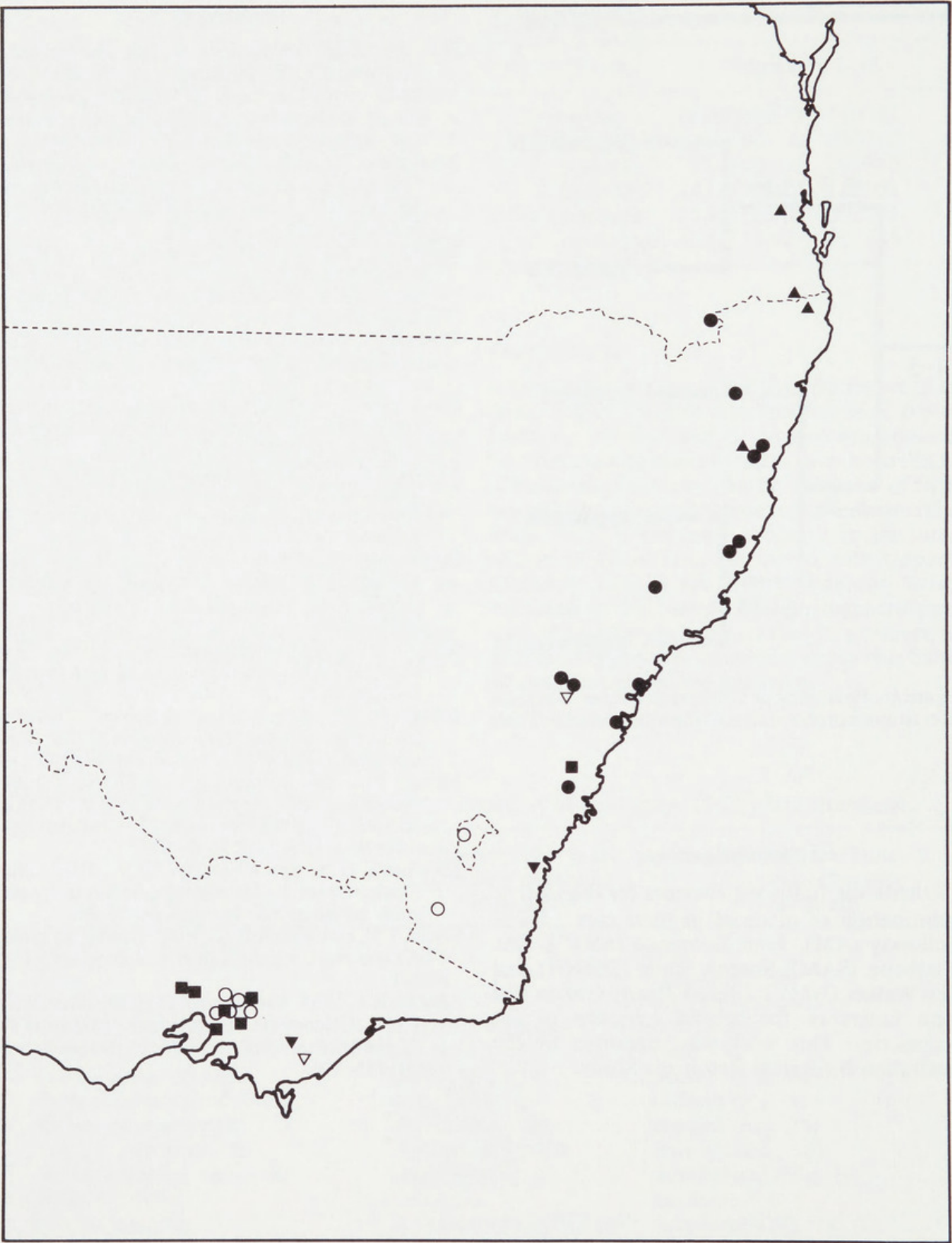


Figure 47. Map of south-eastern Australia showing distribution of *Cheiloxena* spp. ▽ = *C. blackburni*; ▼ = *C. frenchae*; ■ = *C. insignis*; ▲ = *C. tuberosa*; ○ = *C. westwoodii*, southern form; ● = *C. westwoodii*, northern form.



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