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# Austral Hepaticae 43. *Castanoclobos*, a New Genus of Trichocoleaceae from New Zealand

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**ABSTRACT.** Presence of a well-developed perianth, ciliate at the mouth, and brown pigmentation necessitate establishment of a new liverwort genus, *Castanoclobos* J. J. Engel & Glenný. The only species, *C. julaceus* (Hatcher ex J. J. Engel) J. J. Engel & Glenný, which is endemic to New Zealand, is described and illustrated. The hepatic genus is retained in the Trichocoleaceae.

**Key words:** *Castanoclobos*, Hepaticae, IUCN Red List, New Zealand, Trichocoleaceae.

Hatcher (1958) described *Trichocolea julacea* Hatcher based on a plant from Stewart Island, New Zealand. For many years the species was known only from the protologue and “remained somewhat of a mystery plant” (Engel, 1999: 26). Study of the type specimen, together with specimens collected by Engel in New Zealand, formed the basis for a re-evaluation of the taxonomic position of the species by Engel (1999), who placed the plant in *Leiomitra* Lindberg. Schuster (2000, 2001) likewise included the species in that genus. Still, the species remained somewhat of an enigma since it was only known from sterile plants.

Gynoecea came to the attention of the authors by two independent avenues. In the first case Dr. Yin-Long Qui (University of Michigan) provided the senior author fertile material that he collected in Westland, New Zealand. In the second instance the junior author encountered gynoecea-bearing specimens collected by C. D. Meurk (CHR) and H. D. Wilson (see Wilson, 1987) from near South Cape, Stewart Island. These gynoecea-bearing plants provide characters that heretofore were unknown for *Leiomitra* and that facilitate a further assessment of generic placement. Especially noteworthy is the fact that the species is now known to produce a well-developed perianth. That feature, together with several others, argues against retention of the species in *Leiomitra*, and underscores its uniqueness. A new genus is required to contain this unique element, which constitutes

a discrete, rather isolated position in the family Trichocoleaceae, and is described as follows.

***Castanoclobos*** J. J. Engel & Glenný, gen. nov.  
TYPE: *Leiomitra julacea* Hatcher ex J. J. Engel.

Plantae spongiosae, distincte julaceae, colore badio. Ramificatio irregulariter sympodialis vel pseudodichotoma, ramis omnino frullanoideis. Caulis paraphylliis carens. Insertio foliorum valde succuba. Folia asymmetrica 4–6-loba, paribus loborum ventralibus maximis, lobo dorsali minutissimo, lobis caudatis, marginibus eorum per paria ciliorum opponentium copiose armatis, ciliis repetite dichotome ramosis omnino uniformiter uniseriatis, cellulis eorum elongatis, armatura plerumque adaxialiter orienti ad angulum graduum 90° ad planum folii disposita. Discus asymmetricus, ad sinum dorsalem per 3–4 cellulas altus, ad ventralem per cellulas 5–6 altus, marginibus disci ciliis dichotomose ramosis illis loborum similibus. Cellulae disci parietibus tenuibus, valde elongatae, ad superficiem longi-striolatae. Amphigastria paulo minora quam folia, utrinque anguste connata, quadrifida, disco per cellulas 3–4 alto.

Diocae. Androecea in caule principali intercalaria, eximie inconspicua; bracteae quoad magnitudinem foliis similes, modice in parte basali ventricosae; numerus antheridiorum per bracteam unicus, stipite biseriato. Gynoecea plusminusve isophylla, in caule principali terminalia, interdum in ramis longis frullanoideis disposita; innovationes subflorales nullae; perigynia caulina praesentia seriebus tribus bracteatum et bracteolarum in eis insertis, bracteis bracteolisque seriei intimae similibus, usque 0.35–0.45 longitudinis tri- vel quadrifida, lobis longe ciliiformibus. Perianthium praesens, bene effectum, dense pilis brevibus simplicibus vel ramosis obtectum, tricarinatum, carina tertia ventrali, ore non vel leniter contracto ciliis rigidis praedito.

Plants spongy, distinctly julaceous, with all sides appearing as a mass of interwoven cilia, loosely creeping, chocolate brown (the shoot tips light green), the shoots to 2 mm wide. Branching irregularly sympodial to pseudodichotomous, the leading axis soon losing its dominance, the main shoot and branches alike in vigor, the branches strictly of *Frullania*-type. Stem lacking paraphyllia, hidden on all sides by interwoven leaf cilia. Rhizoids occasional, in tight bundles, from stem at immediate base of underleaves, the tips often branched. Leaves widely



spreading, but with lobes arching toward shoot apex, rather closely imbricate, distinctly succubously (almost longitudinally) inserted, the lamina twisted: ventral sector of leaf oriented parallel with substrate, the dorsal sector of leaf anticlinaly assurgent and the dorsal margin seen on edge, the leaves obtusely triangular to subreniform, asymmetrically 4–6-lobed, the ventral pair of lobes largest, the dorsal lobe smallest. Lobes caudate, not trifid, the ventral pair of lobes 4–5 cells wide at base (tier immediately above sinus base), then 2–3 tiers of laterally juxtaposed cells basal to the uniseriate row of 6–10 cells; cells of uniseriate row cylindrical, with dilated septa, 13–25  $\mu\text{m}$  wide, 62–98  $\mu\text{m}$  long, the cells toward base of uniseriate row rather thick walled, the cells becoming progressively smaller and less thick walled toward lobe apices, the surface of penultimate and terminal cells striolate-papillose, that of the remaining cells finely striolate; terminal cell of uniseriate row somewhat tapered, 10–12  $\mu\text{m}$  wide, 68–90  $\mu\text{m}$  long, slightly thick walled in the tip; margins of lobes copiously armed with pairs of opposing cilia, the cilia of lobes and sinus bases repeatedly dichotomously branched, the branches of each dichotomy stiffly diverging, but the armature primarily directed adaxially and oriented at right angles to the leaf plane, the leaf thus appearing to have a stiffly ciliate adaxial leaf surface, the cilia ultimately forming a densely interwoven dendroid crown to the leaf; marginal cilia of lobe uniformly uniseriate throughout, the cells elongate, rather thick walled, the surface of cells toward base of cilium striolate, the surface of cells toward and including terminal cell striolate-papillose; sinus bases plane and not reflexed. Disc slightly convex, asymmetric, 3 to 4 cells high at dorsal sinus, 5 to 6 cells high at ventral sinus (from base to sinuses); margins of disc with dichotomously branched cilia similar to those of lobes, the cilia often adaxially displaced and lying at right angles to the disc plane. Cells of disc thin walled, strongly elongated, aligned in somewhat irregular tiers, in lamina middle 22–26  $\mu\text{m}$  wide  $\times$  84–108  $\mu\text{m}$  long; surface markedly long striolate, with only a few papillae. Underleaves somewhat smaller than leaves, narrowly connate on both sides, cuneate, quadrifid, the marginal armature similar to leaves and likewise forming a mass of interwoven cilia; disc 3 or 4 cells high. Asexual reproduction lacking.

Dioecious. Androeceia intercalary on main shoot, notably inconspicuous, the bracts in ca. 3 pairs, of similar size to leaves, transversely inserted at dorsal end, moderately ventricose in basal sector, the dorsal margin somewhat dilated and inflexed, the disc a little higher than leaves (6 cells high at dorsal

sinus), the bracts otherwise as in leaves; antheridia large for bract size, 1 per bract, the stalk biserial. Gynoeceia isophyllous, terminal on main shoot, sporadically on long *Frullania*-type branches, subfloral innovations lacking; stem perigynium present, 2(3)-stratose, obscurely and bluntly trigonous, with 3 inserted series of bracts and bracteoles, the bracts and bracteoles each with their lamina erect, clasping the perianth and closely adhering to its contours but with the lobes moderately but stiffly spreading, each series ensheathing the perianth, the lateral margins mutually connivent but not fused; bracts and bracteoles similar in size and form, deeply convex (dorsal view), those of first and second series subequal in size, those of innermost series similar to bracts and bracteoles of series immediately below (second series) except for the slightly smaller size, the less-armed lobe bases, and the greater number of simple cilia of the lamina margins, the bracts and bracteoles of innermost series symmetrically narrowly ovate, 3- to 4-lobed to 0.35–0.45, the lobes long ciliiform, terminating in a uniseriate row of 7 to 11 elongated, thick-walled cells with slightly swollen septa and a finely striolate surface, the lobe bases entire or with 1 to 2 pairs of opposing simple or branched cilia, the lamina distinctly inflated at base, the margins with simple (or somewhat less common) once-forked cilia, the 2 cilia of this fork subequal. Perianth present and well developed, the transition from stem perigynium to perianth not evident in either external or internal aspect, the outer surface of the entire sporophyte protective device (stem perigynium + perianth) densely invested with short, simple or branched hairs (the inner face of the perianth with a few hairs distally, but smooth in median and basal sectors), the perianth rather sharply trigonous distally (the third keel ventral), the intervening sulci deep, the perianth tapered toward mouth, the mouth not or at most feebly contracted, fringed with stiff cilia, the cilia comprised of 2 to 4 elongated (to 9:1) thick-walled cells with a distinctly papillose surface, the tip cell tapering to a rather sharp summit; perianth unistratose (or very locally bistratose) in distal and median sectors; shoot calyptra apparently lacking, the unfertilized archegonia at or near calyptra base (gynoeceia seen only in a state soon after fertilization). Sporophyte unknown.

**Castanoclobos julaceus** (Hatcher ex J. J. Engel) J. J. Engel & Glenn, comb. nov. Basionym: *Leiomitra julacea* Hatcher ex J. J. Engel, Novon 9: 26, fig. 1. 1999. *Trichocolea julacea* Hatcher, Trans. Roy. Soc. New Zealand 85: 245, figs. 30–36. 1958, nom. inval. (Art. 37). TYPE: New Zealand.



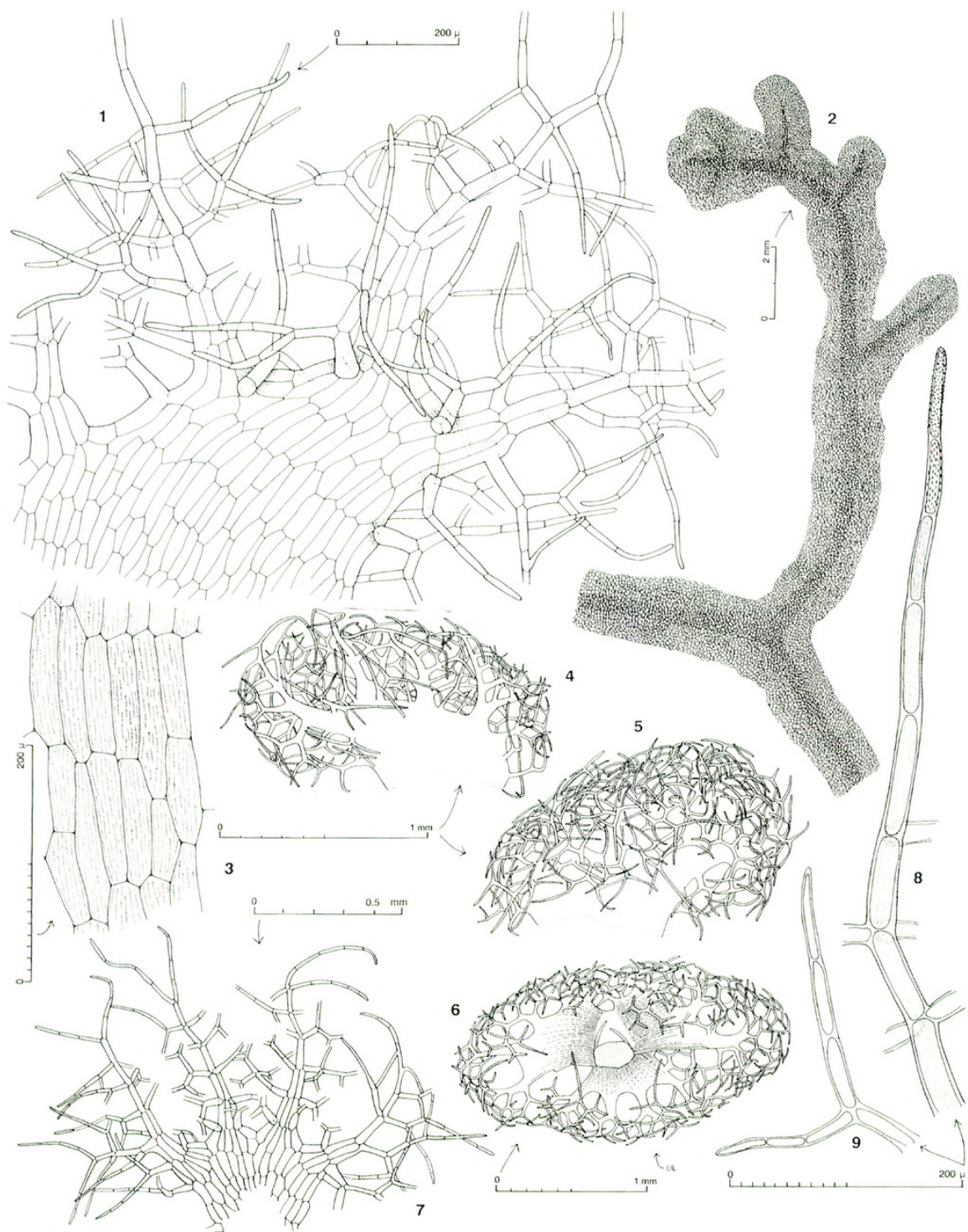


Figure 1. *Castanoclobos julaceus* (Hatcher ex J. J. Engel) J. J. Engel & Glenney. —1. Ventral sector of leaf, adaxial aspect (some portions of marginal armature not shown for clarity). —2. Shoot, dorsal view. —3. Median cells of lamina. —4. Leaf, adaxial view. —5. Leaf, abaxial view. —6. Cross section of shoot showing mass of interwoven, branched cilia (ul = underleaf) of 1 gyre. —7. Underleaf (some portions of marginal armature not shown for clarity). —8. Leaf lobe, distal sector. —9. Lateral armature of leaf lobe, distal sector. (Drawn from the holotype, *Martin* 621.)

Stewart Is.: Port Pegasus, Sawmiller’s Arm, 1949, *W. Martin* 621 (holotype, F; isotype, UWM). Figures 1, 2.

The generic description serves to characterize the single species.

*Taxonomy.* It is evident from the description that this species does not fit within the circumscription of *Leiomitra*. *Leiomitra* has the bracts and bracteole of the innermost series well developed and either (a) free and then a perianth is entirely lacking, or (b) fused to form a low, vestigial perianth, e.g., as in *L. lanata* (Hooker f.)



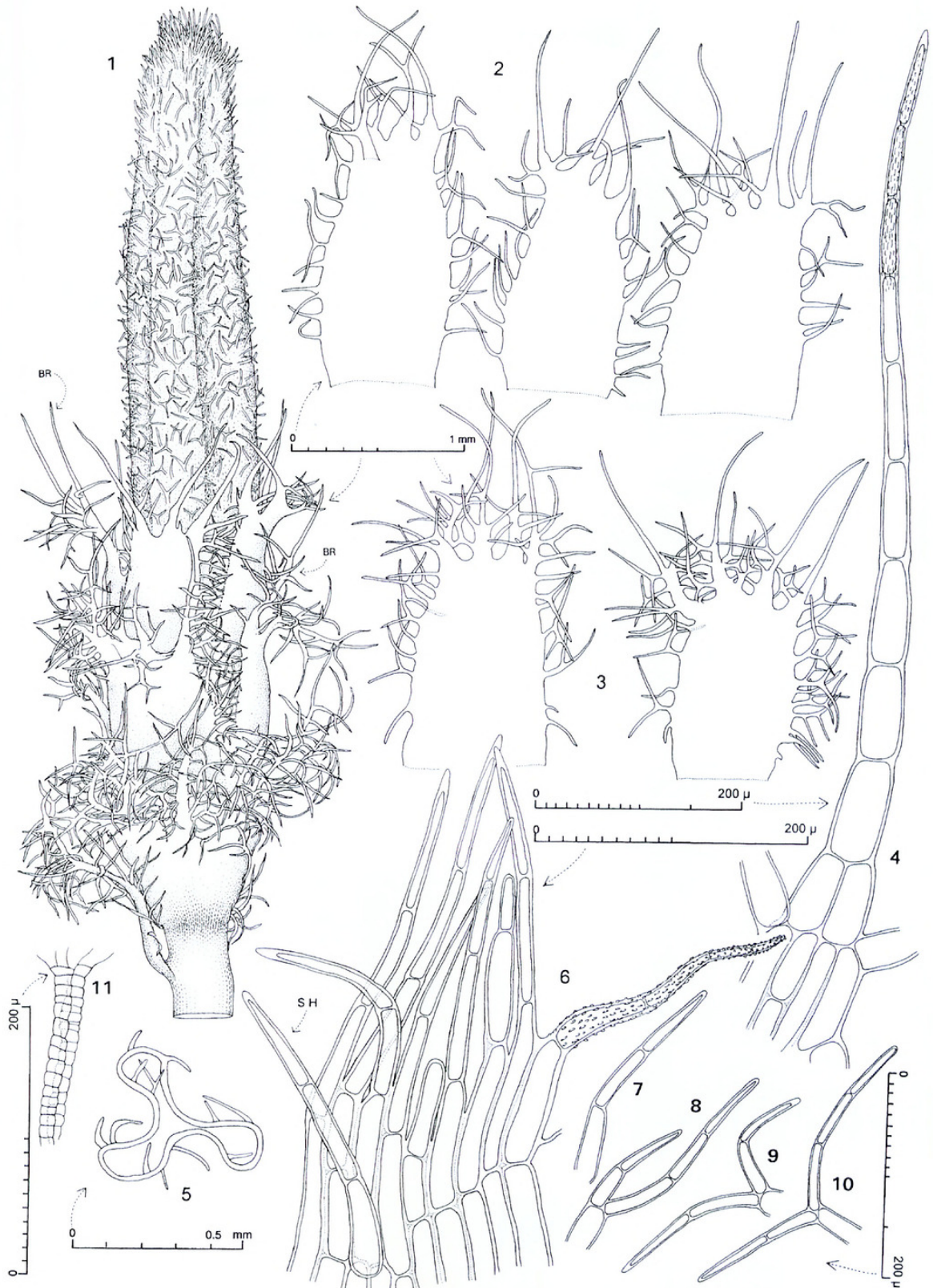


Figure 2. *Castanoclobois julaceus* (Hatcher ex J. J. Engel) J. J. Engel & Glenn. —1. Gynoecium, ventral view (br = bract); note isophyllous condition. —2. Innermost bracts, and in middle, bracteole. —3. Bracteole (left) and bract from second series. —4. Lobe of innermost bract, the surface striolae shown in part. —5. Perianth, cross section through distal portion. —6. Portion of perianth mouth with surface papillae shown in part (sh = surface hair). —7–10. Hairs of perianth surface. —11. Antheridial stalk. (Drawn from Y. Qiu & Braggins NZ-03128.)



R. M. Schuster. In *Leiomitra* the distal portion of the sporophyte is protected by the calyptra together with bracts and/or a low, vestigial perianth. The gynoecium of *Castanoclobos*, on the other hand, has a well-developed perianth that is rather sharply trigonous distally (Fig. 2: 5) and has a ciliate mouth (Fig. 2: 1, 6). The perianth is subtended by a stem perigynium with three series of bracts and bracteoles inserted on it (Fig. 2: 1). As noted in Engel (1980: 17), "vestigial stem perigynia have independently developed in a wide variety of unrelated taxa. In this condition, there is a swollen region of axial proliferated tissue at the perianth base on which several or all of the bracts and bracteoles are inserted." Also, in *Castanoclobos* the calyptra is low, with unfertilized archegonia at or near its base, and affords protection of the sporophyte only in the early development stages (i.e., it does not protect the distal portion of the sporophyte as in *Leiomitra*). The form of the gynoecium in *Castanoclobos* is similar in several respects to, for example, that of *Clasmatocolea puccioana* (De Notaris) Grolle of southern South America, a plant that is discussed and illustrated by Engel (1980, fig. 50: 1, see p. 17). In that species a stem perigynium subtends a perianth and has two cycles of bracts and bracteole inserted on it, the innermost and the adjacent series below. In *Castanoclobos* the surface of the entire sporophyte protective device (stem perigynium + perianth) is densely covered with short, simple or branched hairs (Fig. 2: 1, 7–10) versus a smooth coelocaulis surface in *Leiomitra*. Also, these plants differ from not only *Leiomitra*, but all other Trichocoleaceae, in developing brownish secondary pigments.

One could argue for placement of *Castanoclobos* in the Pseudolepicoleaceae based on presence of a trigonous perianth that is ciliate at the mouth, and brownish secondary pigments. However, rather than unnecessarily distend the Pseudolepicoleaceae with inclusion of *Castanoclobos*, it appears preferable to place the genus as the basalmost member of the Trichocoleaceae. The trichocoleoid gametophyte architecture, especially the form of the leaf lobes with branched cilia, and the complete lack of ventral-intercalary branching support that placement. In the Pseudolepicoleaceae, on the other hand, leaf lobe and lamina margins are entire or spinose dentate or, if ciliate, the cilia are nearly always simple and never branched. Also, ventral-intercalary branching is very common in Pseudolepicoleaceae.

*Castanoclobos* underscores the close affinity between Pseudolepicoleaceae and Trichocoleaceae. In fact,

some authors (e.g., Schuster, 1980, 1984, 2000, 2001) would treat the complex in a single family, the Trichocoleaceae, with four subfamilies, including subfam. Blepharostomatoideae, subfam. Chaetocoleoideae, subfam. Temnomoideae, and subfam. Trichocoleoideae.

*Distribution and IUCN Red List category.* *Castanoclobos julaceus* is known only from Stewart Island (the type collection and from near South Cape, New Zealand) and the Cascade ultramafic moraine in southern Westland. The species should be classified as DD (Data Deficient) according to IUCN (2001) criteria.

*Additional specimens examined.* NEW ZEALAND. **Stewart Island:** Near South Cape, 200 m, *Meurk & Wilson s.n.* (CHR), 160 m, *Meurk & Wilson s.n.* (CHR). **South Island:** Westland, 19 km on Jackson River Rd. from Arawata River Bridge, 140 m, *Y. Qiu & Braggins NZ-03128* (F).

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