STUDIES IN *Colobanthus quitensis* (Kunth) Bartl. AND *Deschampsia antarctica* Desv.: II. TAXONOMY, DISTRIBUTION AND RELATIONSHIPS

By D. M. Moore*

Abstract. The synonymy and taxonomic description of each species is followed by information on the chromosome number, breeding system, geographical distribution, intraspecific variation and affinities. *Colobanthus quitensis* varies conspicuously in such characters as leaf shape, the relative sizes of sepals and capsule, the shape of the sepal apex and the occurrence of 4- or 5-merous flowers. The variation within each character is continuous and not correlated with that of other characters, so that taxonomically significant discontinuities are absent. This species shows greatest variability in southernmost South America, probably reflecting its migratory history. The affinities of *C. quitensis* with its closest relatives, the New Zealand species *C. apetalus* and *C. affinis*, are discussed. *Deschampsia antarctica* is rather uniform in floral characters, but it shows conspicuous variation in habit and in leaf and ligule size, and this can be correlated to some extent with distribution. *D. antarctica* is most closely related to *D. parvula*, and its affinities with this species and, in a wider context, with the *D. caespitosa* complex, are discussed. Information on the characteristics of the other species of *Colobanthus* and *Deschampsia* occurring in the sub-Antarctic and Antarctic regions is briefly considered.

The genus *Colobanthus* Bartl. in South America has had up to 13 species attributed to it by various authors (e.g. Hooker, 1847; Pax, 1893; Reiche, 1896; Skottsberg, 1916). It is now clear that most South American material is referable to either *C. subulatus* (D'Urv.) Hook. f. or *C. quitensis* (Kunth) Bartl., both of which extend into Antarctic regions, the former to lat. 55°S. on South Georgia and the latter to beyond lat. 68°S. in Marguerite Bay. *Colobanthus* is also represented by one or more species on various sub-Antarctic islands with the diversity increasing again in New Zealand, where 13 species are currently recognized by L. B. Moore (Allan, 1961) and two of which also occur in Australia and Tasmania.

The South American representatives of the genus *Deschampsia* P. Beauv. were monographed by Parodi (1949), who recognized 16 species, half of them occurring in the southern Andes, Tierra del Fuego and the Falkland Islands. Of these, *D. antarctica* occurs in the Antarctic region, reaching lat. 68°12′S. in Marguerite Bay, while *D. caespitosa* has been recorded as a naturalized alien on South Georgia (Greene, 1964; Longton, 1965). *Deschampsia* is also represented by a few species on various sub-Antarctic islands and there are about eight species, including one naturalized alien, in the Australian–Neozeelandic region.

The purpose of this paper is to consider the taxonomy of *Colobanthus quitensis* and *Deschampsia antarctica*, with particular reference to their relationships and intraspecific variation. Information is provided on their distribution, but the details of their occurrence in the Scotia Ridge–Antarctic Peninsula section of the Antarctic region are not considered as this will form the subject of a later paper in the present series.

Colobanthus Bartl.

Colobanthus quitensis (Kunth) Bartl., 1831, in Presl, *Reliq. Haenk.*, **2**, p. 13.

Sagina quitensis Kunth, 1823, in Humb. Bonpl. & Kunth, *Nov. Gen. Sp.*, **6**, p. 19.
S. crassifolia D'Urv., 1825, *Fl. Is. Mal.*, p. 51.
Colobanthus saginoides Bartl., 1831, in Presl, *Reliq. Haenk.*, **2**, p. 13.
C. billardieri Fenzl, 1836, *Annln Wien. Mus.*, **1**, p. 49.
C. crassifolius (D'Urv.) Hook. f., 1847, *Fl. Antarct.*, **1**, Pt. 1, p. 248.
C. cherlerioides Hook. f., 1847, *Fl. Antarct.*, **1**, Pt. 1, p. 249.
C. alatus Pax, 1893, *Bot. Jb.*, **18**, p. 28.
C. meigeni Phil., 1894, *An. Univ. Chile*, **85**, p. 322.
C. maclovianus Gandoger, 1912, *Bull. Soc. bot. Fr.*, **59**, p. 708.

Icones. Presl, 1831, *Reliq. Haenk.*, **2**, t. 49, fig. 2; Moore, 1968, *Sci. Rep. Br. antarc. Surv.*, No. 60, pl. 7a, b; Greene, 1970, *Bull. Br. antarc. Surv.*, No. 23, figs. 2, 3.

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Stems simple, or branched to form mats or loosely compacted cushions up to several cm. in diameter; branches 0·5–2(–5) cm., bearing one to many leafy shoots distally. Leaves 3–20(–27)×(0·5–)0·8–1·5 mm., linear to linear-triangular, gradually or abruptly contracted to a shortly mucronate apex, entire, with thin membranous margin, often weakly channelled on upper surface, herbaceous or rarely subcoriaceous, membranous and weakly sheathing at base. Flowers borne singly at apices of branches; peduncles equalling or usually much exceeding leaves. Sepals 4 or 5, 1·6–4·0×1·0–1·7 mm., ovate to triangular- or lanceolate-ovate, obtuse to acute, often shortly mucronate, usually cucullate at apex, herbaceous, with membranous margins. Petals absent. Stamens 4 or 5, alternating with sepals. Styles as many as sepals. Capsule slightly shorter than to 1·7 times as long as sepals, opening by 4–5 obtuse valves; seeds numerous, *c.* 0·5 mm., triangular-reniform, smooth, pale reddish brown, with darker narrow keel.

Typus. Ecuador: "Crescit in ripa arenosa Río Blanco, inter Guachucal et Tulcal Quitensium, alt. 1,580–1,600 hex." Humboldt and Bonpland (P).

Chromosome number and breeding system

$2n = c.$ 80 (Moore, 1967; material from Punta Arenas, Prov. Magallanes, Chile). Due to the small size of the chromosomes and difficulty in fixing them, completely satisfactory cytological preparations have not been obtained. It is worth recording here that somatic counts of approximately 80 chromosomes have been obtained for *C. apetalus* (unpublished information of D. M. Moore; material from Mount Kosiusko, New South Wales, Australia) and *C. affinis* (personal communication from B. V. Sneddon; material from New Zealand), the two species apparently most closely related to *C. quitensis*.

Colobanthus quitensis is self-compatible and appears to be largely, if not entirely, self-pollinated. The anthers dehisce at or before anthesis, so that there is undoubtedly a considerable degree of inbreeding, indeed in many instances the plant is effectively cleistogamous. There is a consistently high seed yield from such self-pollination, the average number of seeds per capsule being about 43 for Fuegian and Andean material. The germination rate seems generally high, approaching 100 per cent in the cool greenhouse at Leicester.

Geographical distribution (Fig. 1)

Mexico: province of Vera Cruz; **Ecuador**: provinces of Pichincha, Cotopaxi; **Bolivia**: province of La Paz; **Peru**: provinces of Lima, Junín, Huancavelica, Puno, Tacna; **Argentina**: provinces of Jujuy, Tucumán, Catamarca, La Rioja, San Juan, Mendoza, Neuquén, Chubut, Santa Cruz; **Chile**: provinces of Antofagasta, Atacama, Coquimbo, Aconcagua, Santiago, Cautín, Osorno, Chiloé, Aysén, Magallanes; **Tierra del Fuego** and associated islands; **Falkland Islands**: West Falkland, East Falkland; **Scotia Ridge**: South Georgia, South Orkney Islands, South Shetland Islands; **Antarctica**: west coast of Antarctic Peninsula and its offshore islands to lat. 68°12′S.

At the southern edge of its range *Colobanthus quitensis* occurs at sea-level, reaching 180 m. in sheltered habitats on South Georgia, but northwards along the Andes it becomes confined to progressively greater altitudes with the increasingly warm conditions at sea-level (Fig. 2).

Intraspecific variation

Colobanthus quitensis shows considerable variation between populations in a number of characters, notably in leaf length/width, mature capsule length/sepal length, shape of the sepal apex and the occurrence of 4- and 5-merous flowers. Since earlier authors have recognized up to seven species within the material now referred to this one species, it is desirable to offer some justification for the conservative treatment adopted here.

Some of the characters, especially the relative lengths of leaves and peduncles, and the leaf length/width ratio are, in some instances, clearly influenced by such environmental factors as availability of moisture and degree of exposure, as noted by L. B. Moore (Allan, 1961, p. 214). In other cases, however, the variation in these characters has a genetic basis, as has been demonstrated by the controlled environmental studies of Holtom (personal communication). From Fig. 3 it is obvious that leaf length/width is closely correlated with leaf length. In other

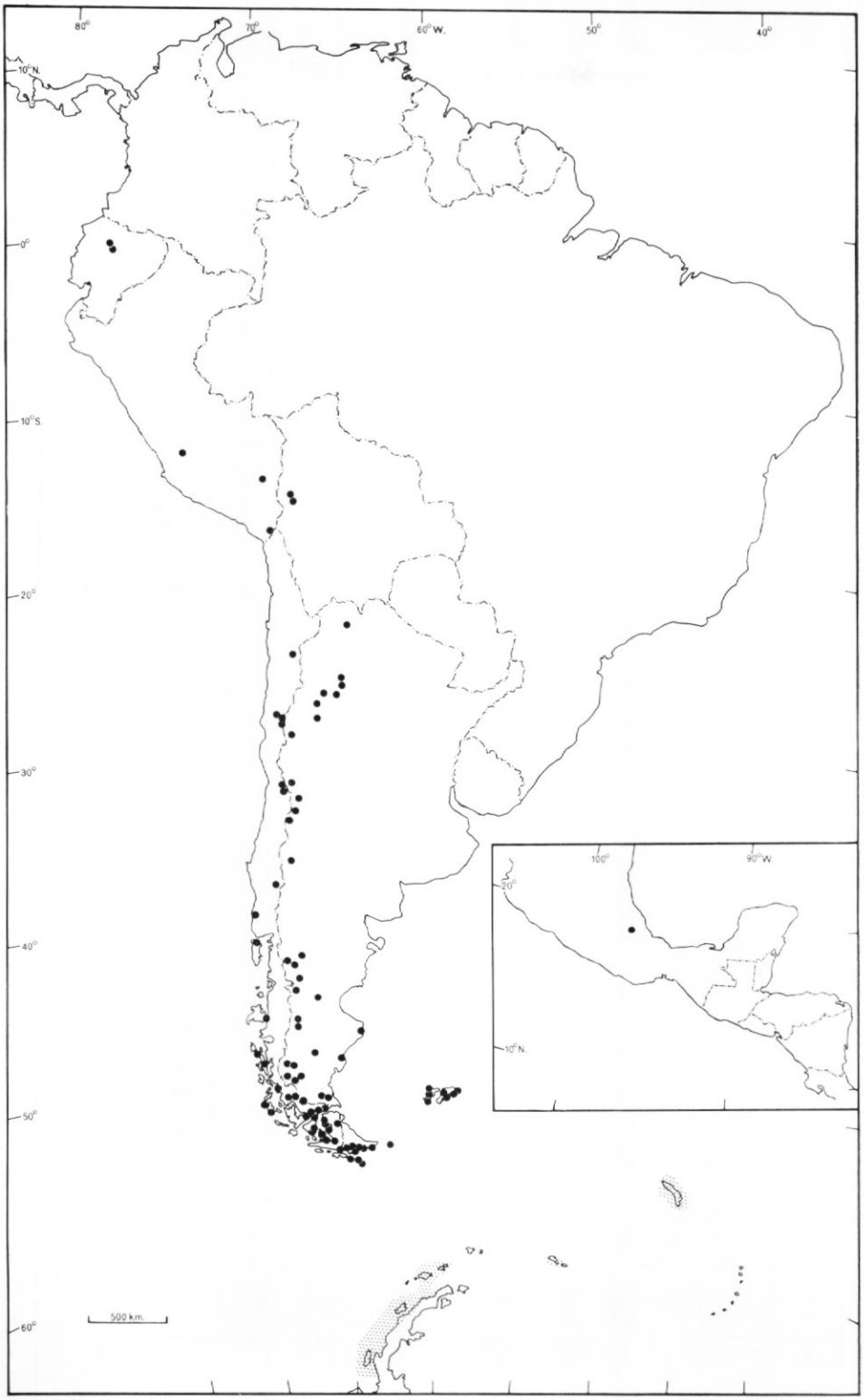

Fig. 1. Distribution of *Colobanthus quitensis*. Further information on the Mexican, South American and Falkland Islands localities is given in the Appendix; outline of Scotia Ridge and Antarctic Peninsula distribution from Holtom and Greene (1967).

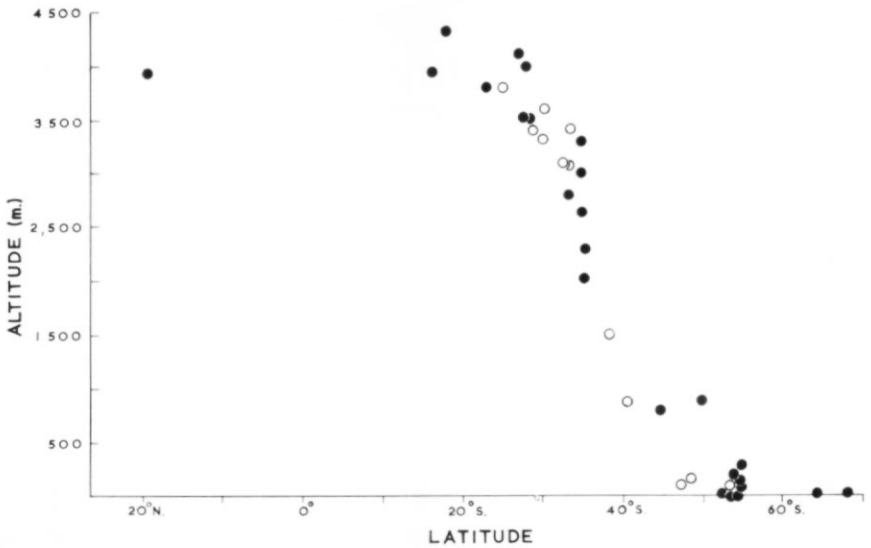

Fig. 2. Altitudinal distribution of *Colobanthus quitensis* throughout its latitudinal range. Open circles indicate from west side of the Andes.

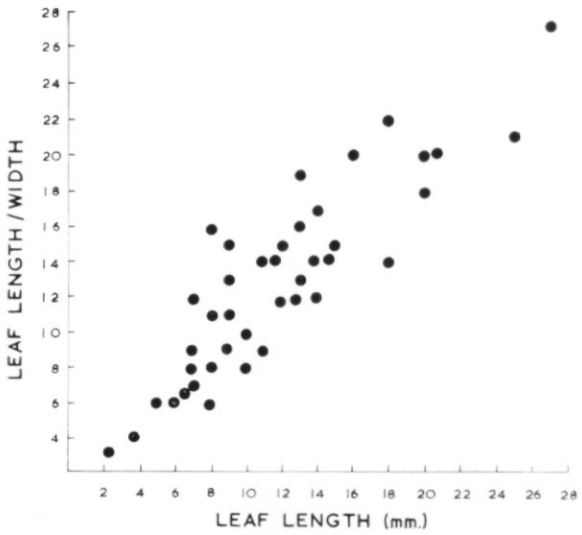

Fig. 3. Relationship between length and length/width of leaves in material of *Colobanthus quitensis* representative of its morphological and geographical range.

words, the rather triangular leaves of some populations differ from the linear, "grassy" leaves in other populations largely because of a reduction in leaf length and, as shown in Fig. 3, there is a complete intergradation between the two extremes. Although not illustrated graphically, it should be noted that shorter peduncles almost always accompany reduced leaf length, but Holtom (personal communication) has found this character to be more susceptible to environmental control. In consequence, it may be supposed that the heritable variation in these characters results from ecotypic responses to habitat differences.

The other measurable characters of use in *Colobanthus* taxonomy, sepal length and capsule length, have to be considered in relation to one another, as shown in Fig. 4. Here again it is

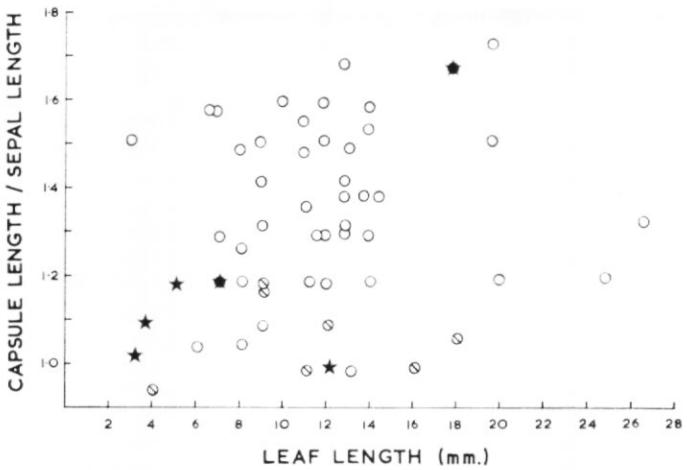

Fig. 4. Relationship between leaf length and the ratio of length of the mature capsule to sepal length in *Colobanthus quitensis*, together with the occurrence of mucronate sepals (diagonal bars) and 4-merous (stars) or 5-merous (circles) flowers.

clear that there is a fairly constant gradation between those populations in which the mature capsule about equals the sepals and those in which it is 1·7 times as long. It should be mentioned here that mature capsules and sepals on the same plant can cover an appreciable part of this range (Fig. 5). The absolute measurements for each character, although not presented, show a similar continuous distribution.

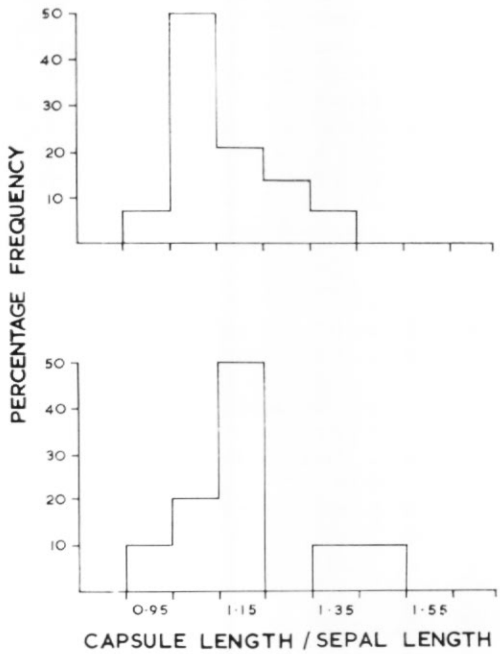

Fig. 5. Histograms showing the ratio of length of the mature capsule to sepal length in progenies of two populations of *Colobanthus quitensis* from the Falkland Islands.

Despite the continuous variation shown by the above characters, it is necessary to see whether any discontinuities are evident when they are considered together. In addition, the occurrence of 4- or 5-merous flowers and of mucronate sepals, as illustrated in Fig. 6x, has to be taken into account. Fig. 4 shows the relationship between leaf length and the ratio of length of mature capsule/sepal length, together with the occurrence of mucronate sepals and 4- or 5-merous flowers and it is clear that no pattern emerges from joint consideration of all these characters. Presence or absence of mucronate sepal apices has been used because of ease in determination, but it should be noted that in the populations lacking mucros the sepal apex varies rather continuously from obtuse to subacute. Although this character has not been shown in the graphs, because of difficulty in quantifying it, some of its gradations are shown in Fig. 6.

Within *Colobanthus quitensis*, therefore, there is a series of populations with characters varying independently of each other, so that no taxonomic sub-division of the taxon is possible. This is a typical situation in inbreeding species, where small differences between populations can be perpetuated by the almost "closed" breeding system; it has been noted earlier that *C. quitensis* is highly self-pollinating, indeed frequently it is essentially cleistogamous. However, a suggestion of a pattern emerges from Fig. 7, which indicates the distribution of characters throughout the range of *C. quitensis*, as it seems that there is a greater likelihood of populations in the southernmost areas, e.g. South Georgia and the South Shetland Islands, having short leaves, a not unexpected result in view of the frequency of exposed habitats in such places. Undoubtedly, local environments of comparable severity are encountered farther north and the short-leaved populations occurring sporadically in these areas may well represent local responses to such conditions. Since 4- and 5-merous flowers can occur on the same plant, as, in some cases, can mucronate and non-mucronate sepals, it appears that these characters have a developmental component which is not yet clarified. It does appear, however, that these characters are more likely to be encountered towards the southern part of the range of *C. quitensis*, although they again occur sporadically throughout most of its distribution.

In summary, the data on intraspecific variability in *Colobanthus quitensis* show that, although it varies conspicuously in a number of characters, the variation within each character is continuous and not correlated with that in any other character. Where the nature of a character permits discontinuities, as in the number of flower parts, there is again no correlation. There clearly appears to be greater variability in this species in southern Patagonia, Fuegia and the Falkland Islands than farther north, which is not unexpected in a species which can be reasonably postulated to have migrated northwards along the Andes. It is interesting to note that *Colobanthus quitensis* shows a very close parallel to the variation pattern described for the umbellifer *Oreomyrrhis andicola* by Mathias and Constance (1955). However, in that instance the greatest variability occurred in the northern Andes, and the less variable Fuegian and Falkland Islands populations, separated by 15–20° of latitude from the northern group, were recognized as a distinct species, *O. hookeri*.

Affinities with related species

Colobanthus quitensis appears to be most closely related to the Australian–Neozeelandic species *C. affinis* and *C. apetalus*; indeed various authors (Skottsberg, 1915; Cheeseman, 1925) have included some populations of both the latter species in *C. quitensis*. All three species are of very similar habit and can be indistinguishable on such characters as leaf length and breadth and peduncle/leaf length ratio which, as previously indicated, are subject to environmental modification and must therefore be used with caution. The size and shape of the sepals and capsule, and the shape of the leaf apex, are generally more reliable characters for distinguishing species in *Colobanthus*. In these three species the leaf apices are very similar, tapering somewhat to a short pellucid mucro (Fig. 6n, v and w), which may be inconspicuous in some populations of *C. quitensis* with rather fleshy leaves. With regard to the sepal and capsule characters, it is necessary to consider the degree of differentiation between *C. quitensis* and each of the other two species.

Colobanthus apetalus has sepals which taper to a shortly mucronate apex (Fig. 6u and v), thus differing from the most usual situation in *C. quitensis* (Fig. 6r), although approached by some southern populations (Fig. 6n and s; Fig. 7). In addition, the sepals of *C. apetalus* are

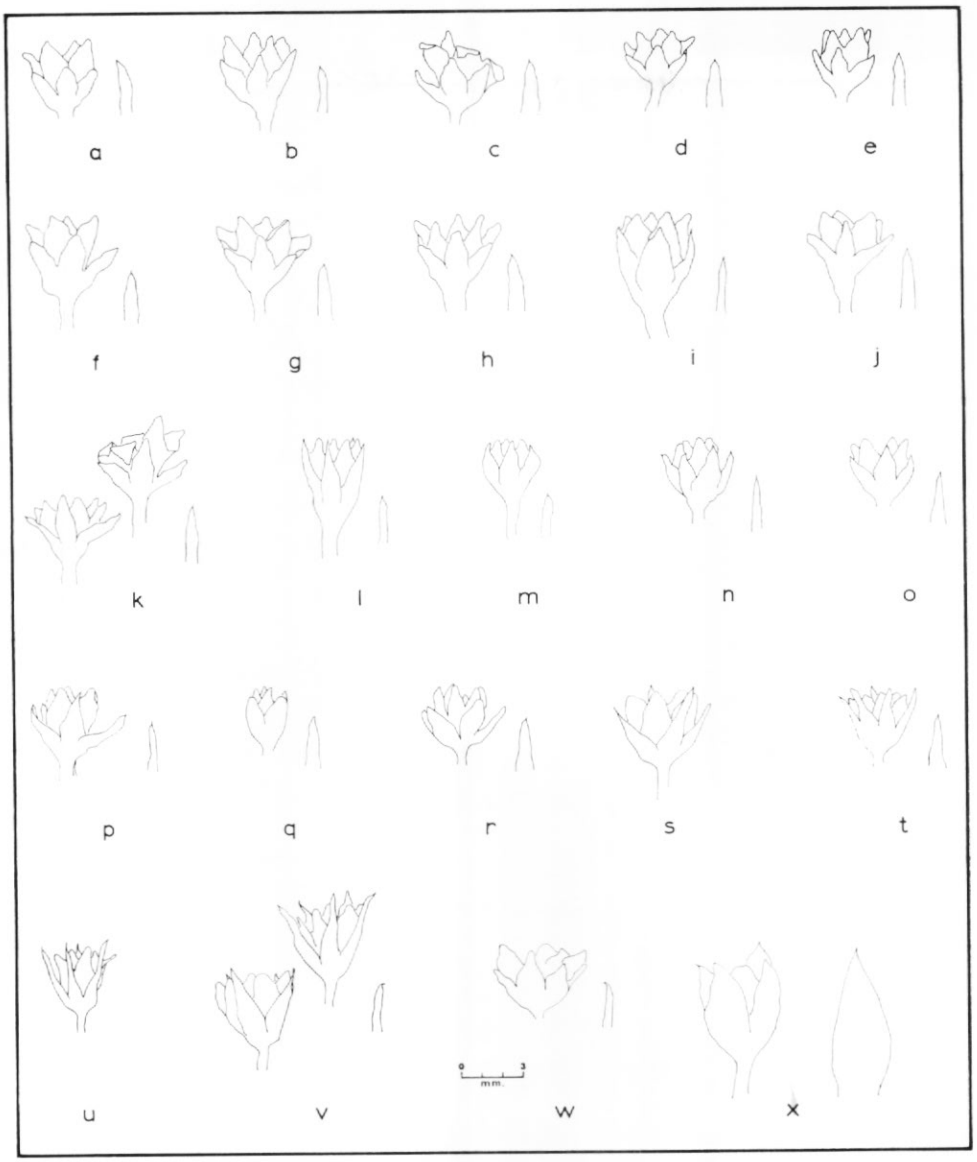

Fig. 6. Camera lucida drawings showing the mature capsule within the calyx, and the leaf apex, of four species of *Colobanthus*; a–t *C. quitensis*, u–v *C. apetalus*, w *C. affinis*, x *C. kerguelensis* from the following localities:
C. quitensis a. **Tierra del Fuego**: Ushuaia, Ruiz-Leal 12772 (MEN); b. **Mexico**: Vera Cruz, Cofre de Perote, Beaman 2167 (US); c. **Chile:** Aconcagua, Horcones valley, in 1896–97, Gosse s.n. (K); d. **Argentina**: Mendoza, Laguna del Diamante, Covas 1104 (MEN); e. **Chile**: Coquimbo, Baños del Toro, Morrison 17265 (K); f. **Tierra del Fuego**: Río Lashifashaj (Tierra Major) valley, Ruiz-Leal and Roig 15070 (MEN); g. **Chile**: Chiloé, Ancud, Reed s.n. (K); h. **Chile**: Atacama, Vallenar, Johnston 6214 (K); i. **Ecuador**: Pichincha, San Juan, Asplund 8674 (K); j. **Peru**: Tacna, Volcán Tacora, Werdermann 1135 (US); k. **Peru**: Puno, Crucero Alto, Stafford 645a (K); l. **Mexico**: Vera Cruz, Pic d'Orizabo, Galeotti 4404 (K); m. **Peru**: Huancavelica, San José de Acobambilla, Lloyd and Marshall 185 (K); n. **Argentina**: Santa Cruz, Lago Argentino, Sleumer 1129 (US); o. **South Georgia**: Harker Glacier, Smith M1009 (BIRM*); p. **Tierra del Fuego**: Ushuaia, Ruiz-Leal 12771 (MEN); q. **South Shetland Islands**: King George Island, Taylor 291a (BIRM*); r. **Falkland Islands**: East Falkland, San Carlos, Moore 659 (LTR); s. **Falkland Islands**: West Falkland, Roy Cove, Moore 922 (LTR); t. **South Georgia**: Grytviken, Sladen JB 12/1 (BIRM*).
Colobanthus apetalus u. **New Zealand:** South Island, Lake Coleridge, in 1964, progeny, Kelly s.n. (LTR); v. **Macquarie Island**: s.loc., Laird 37 (K).
Colobanthus affinis w. **New Zealand**: South Island, Nelson, Mason 34894 (K).
Colobanthus kerguelensis x. **Archipel de Kerguelen**: s.loc., i.1874, Moseley s.n. (K).

* Indicates that specimen is in the herbarium of the British Antarctic Survey.

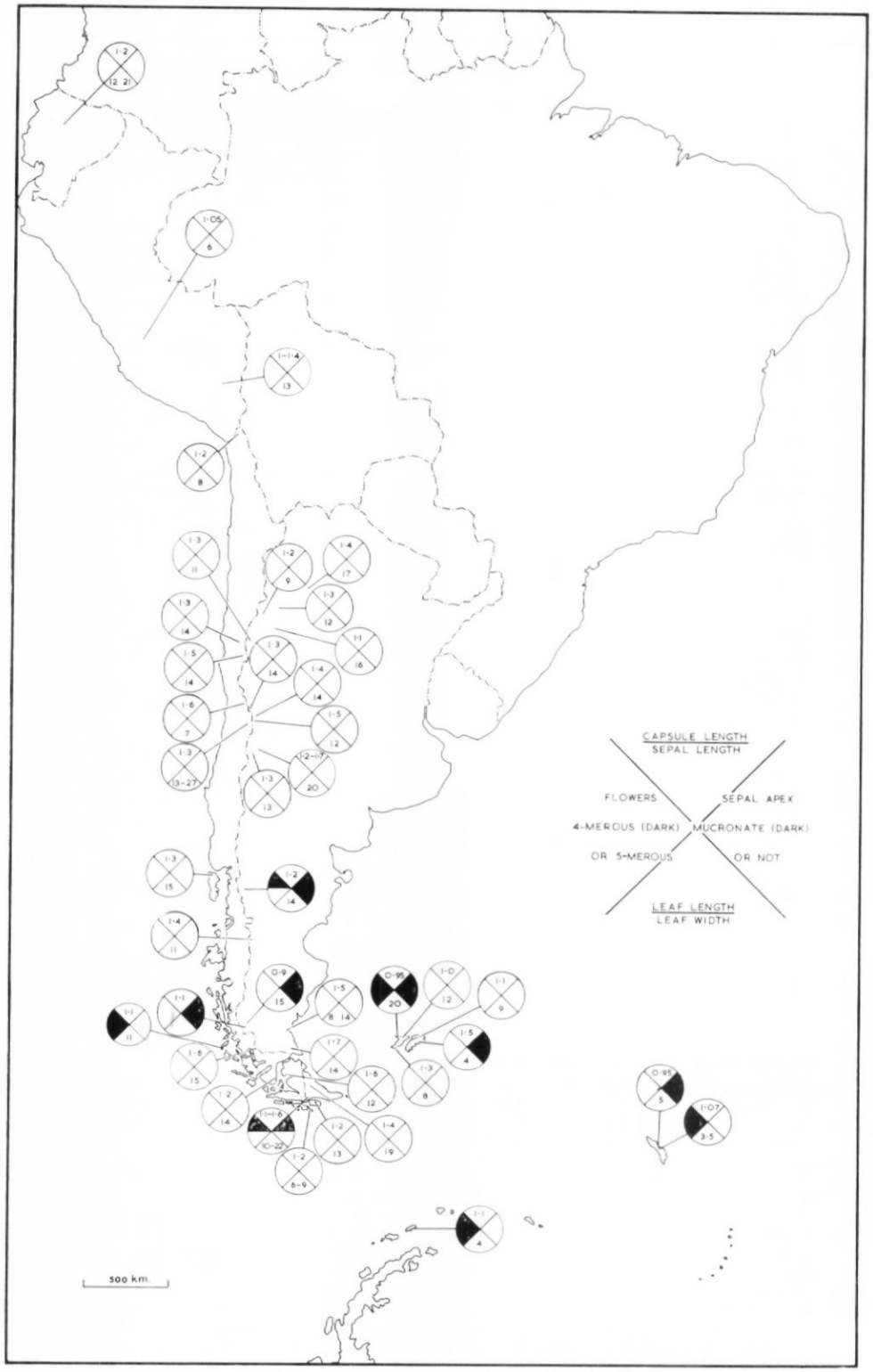

Fig. 7. Map indicating leaf length, mature capsule/sepal length, occurrence of mucronate sepals and of 4- or 5-merous flowers in populations throughout the Southern Hemisphere range of *Cclobanthus quitensis*. Where both kinds of sepal apex and flower occur in a population, half of the appropriate lateral quadrant is shaded.

longer than the mature capsule, which is only rarely the case in *C. quitensis* and never seems characteristic of whole populations. However, under the description of *C. apetalus*, L. B. Moore (Allan, 1961) observed that "specimens from Auckland Islands and Chatham Island . . . sometimes have sepals shorter than the capsule-lobes". It would seem that such populations might be difficult to distinguish from *C. quitensis* and clearly they require further investigation.

Colobanthus affinis is morphologically extremely close to *C. quitensis*. Both species have obtuse to subacute sepals, which are shorter than the mature capsules (Fig. 6w), and they appear to show almost complete overlap both in absolute and relative sizes of these organs. When considering the relationship of *C. affinis* to Falkland Islands material of *C. quitensis*, L. B. Moore (Allan, 1961) noted that "characteristic of the N.Z. plants are the constantly present, small colourless apicula to the leaf, which is itself narrower and less fleshy, the almost invariably 5-merous flowers and the sepals generally very much shorter than the mature capsule". In view of what has already been said about the variation within *C. quitensis*, it is clear that the above comment is only likely to be true if restricted to a few populations, as indeed it was, since only plants from the Falkland Islands were mentioned. Presence or absence of mucronate leaf apices cannot be used as a distinguishing criterion since, as has been noted, they are as constant in *C. quitensis* as in *C. affinis*. Over most of its range *C. quitensis*, like *C. affinis*, has 5-merous flowers, with 4-merous forms becoming more frequent in the southern populations; often, in such cases, four sepals are associated with a 5-merous capsule. The sepals of *C. quitensis* may be much shorter than to almost equalling or slightly exceeding the mature capsule, with all gradations between and often, as noted above, a considerable range within a single population or even on a single plant. *C. affinis* does seem to have narrower and less fleshy leaves as noted by L. B. Moore (Allan, 1961) but, in view of the fact that this character is known to be subject to extensive environmental modification, further study is clearly necessary.

In summary, therefore, it may be noted that *Colobanthus quitensis* and *C. apetalus* are generally distinguishable on sepal shape and the relative lengths of sepal and mature capsule, although some overlap in these characters may occur in plants from the Auckland Islands and some from the Falkland Islands. *Colobanthus affinis* cannot be distinguished satisfactorily from *C. quitensis* on floral characters, although the leaf morphology may provide a useful distinction. There is clearly a very close relationship between the three species and there is a case for considering at least *C. quitensis* and *C. affinis* as conspecific. However, Sneddon (personal communication) has shown, by means of experimental crosses, that considerable barriers to gene exchange exist between *C. quitensis* and each of the other two species, having found that the F_1 hybrids are very highly pollen sterile. It therefore seems most useful to retain the three species, with their geographical, genetical and modal morphological delimitation, until a more comprehensive study is undertaken.

Deschampsia P. Beauv.

Deschampsia antarctica Desv., 1853, in Gay, *Fl. Chile*, **6**, p. 338.

Aira antarctica Hook., 1837, *Icon. Pl.*, **2**, pl. 150. non *Aira antarctica* Forst. f., 1786, *Prodr.*, p. 41.
Airidium elegantulum Steud., 1855, *Syn. Pl. Glum.*, **1**, p. 423.
Deschampsia elegantula (Steud.) Parodi, 1949, *Darwiniana*, **8**, No. 4, p. 452.

Icones. Hooker, 1837, *Icon. Pl.*, **2**, pl. 150; 1847, *Fl. Antarct.*, pl. 133; Macloskie, 1908, *Rep. Princeton Univ. Exped. Patagonia*, **8**, 200; Schenck, 1905, *Wiss. Ergebn. dt. Tiefsee-Exped. 'Valdivia'*, **2**, 23, fig. 6; Schenck, 1906, *Deutsche Südpolar Exped. 1901–03*, **8**, Ht. 1, Botanik, 107, fig. 1; Parodi, 1949, *Darwiniana*, **8**, No. 4, fig. 13; Greene, 1964, *Sci. Rep. Br. antarc. Surv.*, No. 45, pl. 6c; Moore, 1968, *Sci. Rep. Br. antarc. Surv.*, No. 60, fig. 201, 21a; Greene, 1970, *Bull. Br. antarc. Surv.*, No. 23, fig. 1.

Laxly caespitose, glabrous, perennial herb 2·5–30 cm. high, perhaps sometimes annual. Leaf 2–15 cm. long; lamina 0·3–1(–1·5) mm. wide, convolute or folded, rarely flat, smooth; sheath rounded, smooth; ligule 2–8 mm., acuminate, membranous. Culms 1–15 cm., erect, slender. Panicle 1·6–13 cm., 2/3 to 4 times as long as culm, lax and usually spreading, more or less pyramidal, with filiform branches, at least the lower branches arising 3–6 together. Spike-

lets 2-flowered, 4–6·5 mm., greenish, often violet-tinted. Glumes subequal, linear-lanceolate, acuminate, scabridulous on nerves and keel, the lower 1-nerved, the upper 3-nerved; rhachilla pilose, produced beyond upper floret. Lemma 1·6–3·5 mm., oblong, irregularly 4-dentate at apex, membranous, 5-nerved, with dorsal awn, with basal tuft of hairs up to 1/3(–2/3) as long as lemma; awn arising from lower 1/3 of lemma, (2·1–)5–7·5 mm. long, (1·5–)1·7–2·6 times as long as lemma, straight or curved, sometimes bent about middle, scabrid. Palea somewhat smaller than lemma, oblong, 2-keeled, bifid, hyaline. Lodicules 2, lanceolate, minute. Stamens 3; anthers 0·25–0·5 mm. Ovary smooth; styles distant; stigmas prominent, plumose. Grain fusiform, compressed, enclosed by lemma.

Typus. South Shetland Islands, *c*. 1829. J. Eights (K, isotype US).

Chromosome number and breeding system

$2n = 26$ (Moore, 1967). Elsewhere in the genus this chromosome number is predominantly characteristic of *D. caespitosa* (L.) P. Beauv., including the segregate or conspecific taxa *D. bottnica* (Wahlenb.) Trin., *D. brevifolia* R. Br. and *D. beringensis* Hultén (Lawrence, 1945; Bowden, 1960; Löve and Löve, 1961; Kawano, 1966), and some populations of its relatives *D. pumila* (Ledeb.) Ostenfeld (Jorgensen and others, 1958) and *D. alpina* (L.) Roem. & Schult. (Hedberg, 1958). The only other species of *Deschampsia* with $2n = 26$ appear to be *D. hawaiiensis* (Skottsberg) St. John (Skottsberg, 1953) and the western American *D. elongata* (Hook.) Monro ex Benth. (Bowden, 1960).

Deschampsia antarctica appears to be largely, if not entirely, self-pollinated. The small anthers, which are never more than half the size of those in related species, are not exserted from the flowers. Parodi (1949) and Skottsberg (1954) considered this species to be cleistogamous, and this appears to be the case in the very few samples (from the Falkland Islands) that have been cultivated at Leicester. However, there is a great need for further detailed experimental study of this topic.

Geographical distribution (Fig. 8)

Argentina: provinces of Mendoza, Santa Cruz; **Chile**: province of Magallanes; **Tierra del Fuego** and associated islands; **Falkland Islands**: West Falkland, East Falkland; **Sub-Antarctic Islands**: Archipel de Kerguelen, Iles Crozet, Heard Island; **Scotia Ridge**: South Georgia, South Sandwich Islands, South Orkney Islands, South Shetland Islands; **Antarctica**: west coast of Antarctic Peninsula and its offshore islands to lat. 68°12′S.

Intraspecific variation

Deschampsia antarctica varies rather conspicuously in habit and in vegetative characters such as the width and degree of folding of the leaves, and ligule length. In material from the South Orkney Islands, the South Shetland Islands and the Antarctic Peninsula, the culms rarely exceed 2 cm. and are never longer than the inflorescence, the latter being in most cases two to three times as long as the culm. Furthermore, in these populations the inflorescence is frequently not completely expanded, being partially retained within the sheath formed by the uppermost culm-leaf. Farther north, in Patagonia, Fuegia and in most of the Falkland Islands, the culms are 4–15 cm. long and 0·75–1·33 times as long as the inflorescence, which is usually completely expanded. In South Georgia and Archipel de Kerguelen some populations fall into both of the above types and there is a clear need to investigate to what extent this differentiation has a genetical basis. In South Georgia, at least, there seems to be a major environmental component to the variation (Greene, 1964). There is a general tendency for populations from the South Orkney Islands, the South Shetland Islands and the Antarctic Peninsula to have shorter ligules and narrower, more tightly convolute leaves than populations from Fuegia and Patagonia, with some overlap when the leaf width is 0·7–0·8 mm. and the ligule length 4·5–5·5 mm. (Fig. 9). Populations from South Georgia, Archipel de Kerguelen and the Falkland Islands show a considerable overlap with both groups and again it should be noted that Greene (1964) observed a marked increase in leaf width and ligule length in plants from South Georgia brought into greenhouse cultivation in Birmingham.

In contrast to the variability of the vegetative characters, populations from all areas show a

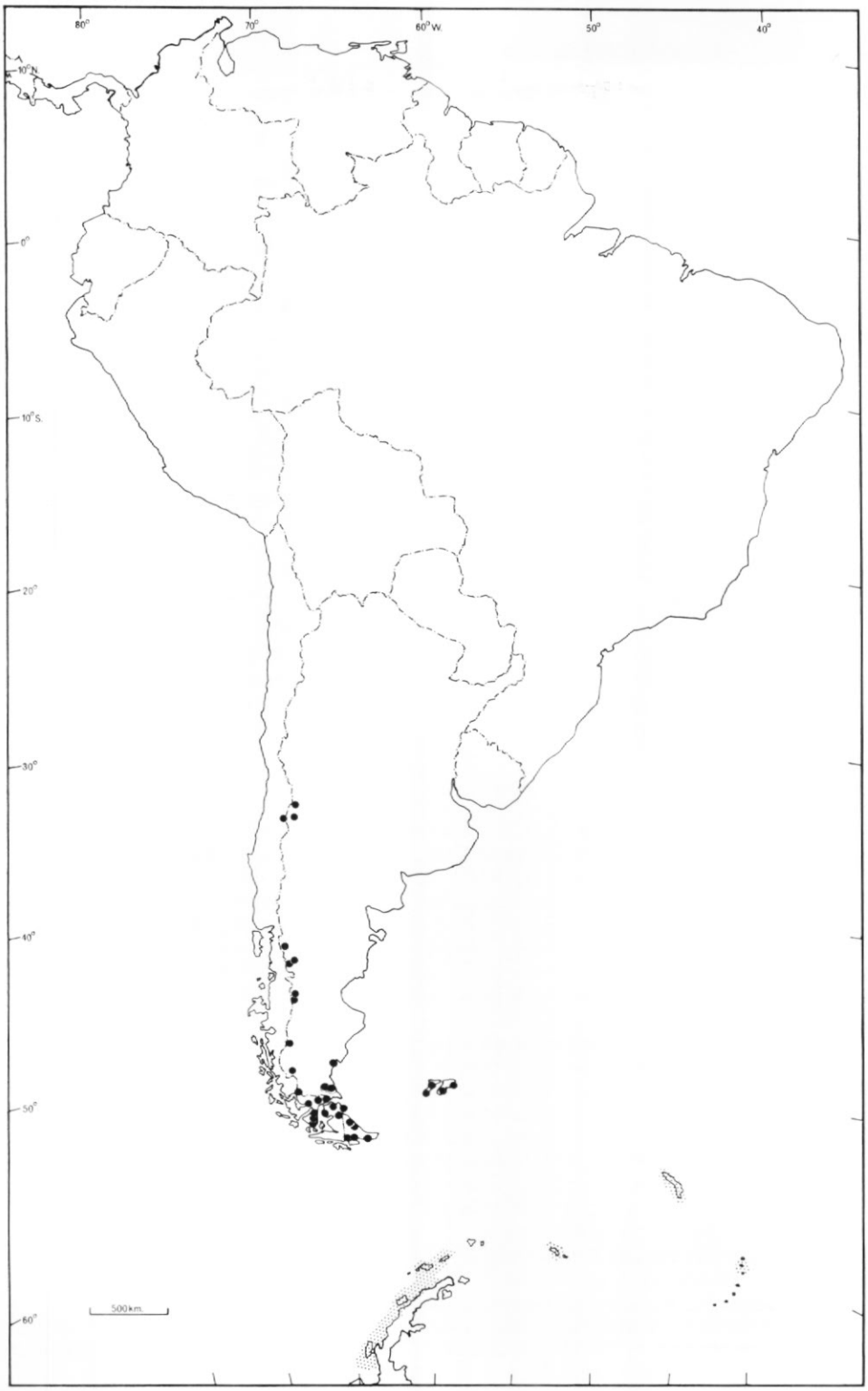

Fig. 8. Distribution of *Deschampsia antarctica*. Further information on the South American and sub-Antarctic localities is given in the Appendix, and by Parodi (1949), including the collections from Archipel de Kerguelen which have not been mapped. Outline of Scotia Ridge and Antarctic Peninsula distribution from Holtom and Greene (1967).

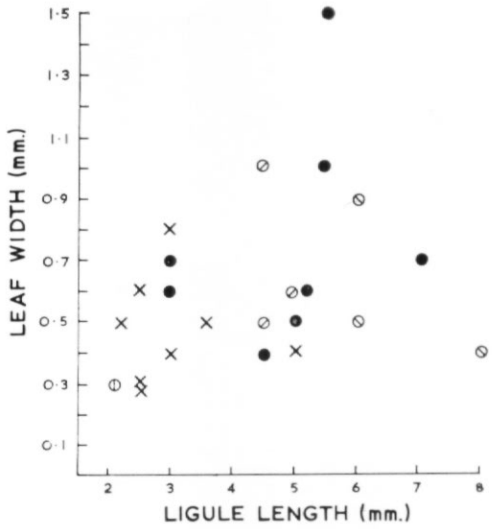

Fig. 9. Relationship between ligule length and leaf width in populations of *Deschampsia antarctica* from Patagonia and Fuegia (●), Falkland Islands (◐), Archipel de Kerguelen (⊘), South Georgia (⊘) and the South Orkney Islands, South Shetland Islands and Antarctica (×).

considerable degree of uniformity in floral characters such as the lengths of the spikelets, lemma, lemma awn and anthers. The most conspicuous departure from this generalization is the sporadic occurrence in Fuegia and Patagonia of populations having the awn shorter than the lemma, thus tending towards *D. caespitosa* in this character. Such plants have been recognized by Parodi (1949) as var. *patula* (Phil.) Parodi.

Affinities with related species

Deschampsia antarctica is most closely related to *D. parvula* (Hook. f.) Desv., which occurs in southern Andean Patagonia (province of Santa Cruz, Argentina), Tierra del Fuego and the Falkland Islands. *Deschampsia parvula* has a congested, spike-like inflorescence, unlike the usually expanded panicle of *D. antarctica*, but it can be most clearly distinguished by the geniculate lemma awn, which is spirally twisted in the basal portion, thus contrasting with the straight or sometimes simply bent awn of *D. antarctica* (Moore, 1968, fig. 21). Skottsberg (1954) has drawn attention to the possibility that the two species further differ in the diameter of the awn, which he gives as 0·02–0·038 mm. in *D. antarctica* and 0·042–0·06 mm. in *D. parvula*.

In a broader context, the affinities of *Deschampsia antarctica* clearly lie with *D. caespitosa* (L.) P. Beauv., a widely distributed and polymorphic boreal species which also occurs in the Andes southwards from lat. 29°S. and in southern Brazil, as well as in Australia, New Zealand and the African mountains. Not only are the two species morphologically close but, as noted earlier, the most widespread chromosome number in *D. caespitosa* is $2n = 26$, i.e. that reported for *D. antarctica*. The variation within *Deschampsia caespitosa* sens. lat. has been treated at several levels, ranging from its consideration as ecotypic differentiation by Lawrence (1945) to the recognition of about six species within the boreal populations (Hultén, 1964). *Deschampsia antarctica* seems to be generally distinguishable from *D. caespitosa* by its narrow leaf lamina, which does not usually exceed 1 mm. in width, by the awn being at least half as long again as the lemma and, except for var. *patula*, more than 4 mm. long, and by the much smaller anthers. Furthermore, it is not common for *Deschampsia caespitosa* to have such a large panicle in relation to plant size and culm length.

In certain other characters *Deschampsia antarctica* shows complete overlap with most of the *D. caespitosa* complex as, for example, in the length and shape of the ligule and the lengths of the spikelets and lemmas. It has already been noted that *D. antarctica* var. *patula* is close to

TABLE I. PRINCIPAL CHARACTERS DISTINGUISHING THE SUB-ANTARCTIC SPECIES OF *Colobanthus*, TOGETHER WITH SUMMARIES OF THEIR DISTRIBUTIONS

	C. kerguelensis	*C. muscoides*	*C. apetalus*	*C. quitensis*	*C. subulatus*
Characters					
Leaf apex	Acuminate	Obtuse	Shortly mucronate	Shortly mucronate	Subulate to acuminate
Leaf width (mm.)	2–3	< 1	< 1	< 1(–1·4)	< 1
Sepal apex	Acute	Subulate	Shortly mucronate	Obtuse to acute or shortly mucronate	Acuminate
Flowers	4-merous	4-merous	(4) 5-merous	(4) 5-merous	4 (5)-merous
Receptacular disc	Conspicuous	Conspicuous	Inconspicuous	Inconspicuous	Inconspicuous
Relative lengths of mature capsule and sepals	Capsule shorter than sepals	Capsule exceeding sepals	Capsule slightly shorter than sepals	Capsule slightly shorter than to exceeding sepals	Capsule shorter than sepals
Distribution					
In the sub-Antarctic and Antarctic	Archipel de Kerguelen, Iles Crozet, Heard Island, Marion Island	Macquarie Island	Macquarie Island	South Georgia, South Orkney Islands, South Shetland Islands, Antarctic Peninsula	South Georgia
Northwards from the sub-Antarctic	—	Snares Islands, Chatham Islands, Antipodes Islands, Auckland Islands	South-east Australia, New Zealand, Auckland Islands, Campbell Island	Falkland Islands, Fuegia, Andes north to Ecuador, Mexico	Falkland Islands, Fuegia, Patagonia north to lat. 52°25′S.

D. caespitosa in awn size; indeed on this character it overlaps with the Baltic segregate *D. bottnica*. Again the hairs at the base of the floret are usually not more than 1/3 as long as the lemma, so that in this character *D. antarctica* resembles *D. caespitosa* sens. str. as well as the Arctic Asiatic populations sometimes called *D. obensis* Roshev., but in some Patagonian populations of *D. antarctica* these hairs can be 2/3 as long as the lemma, as they are in *D. bottnica* and the Alaskan populations sometimes included in *D. beringensis* Hultén. Were the data available, it would clearly be extremely interesting to consider *Deschampsia antarctica* in relation to the complete spectrum of variation within *D. caespitosa* sens. lat. *D. caespitosa* appears to be a predominantly self-incompatible species (Raven, 1963, p. 169) which has evolved self-compatible populations in New Zealand (Connor, 1957) and elsewhere (Raven, 1963), even adopting vivipary in its close boreal relative *D. alpina* (L.) Roem. & Schult. It would appear that *Deschampsia antarctica* is a self-compatible derivative of *D. caespitosa*, which has adopted a high degree of self-pollination, probably even cleistogamy. It thus constitutes, to a less extreme degree, a Southern Hemisphere parallel to the trend towards complete inbreeding shown by *D. alpina* in the north.

TABLE II. PRINCIPAL CHARACTERS DISTINGUISHING THE SUB-ANTARCTIC SPECIES OF *Deschampsia*, TOGETHER WITH SUMMARIES OF THEIR DISTRIBUTIONS

	D. antarctica	*D. caespitosa*	*D. chapmani*	*D. penicellata*
Characters				
Culm length (cm.)	2·5–30	50–150	6·5–45	7·5–30
Leaf length (cm.)	2–15	5–60	10–45	1·9–4·5
Panicle length (cm.)	3–13	10–50	4–16	2·5–7·5
Spikelet length (mm.)	4–6·5	3–6·5	2·5–3·5	3–5
Glumes	Subequal	Subequal or upper longer	Unequal, upper longer	Subequal
Upper glume	3-nerved	3-nerved	3-nerved	3-nerved
Lower glume	1-nerved	1-nerved	1-nerved	3-nerved
Insertion of lemma awn	Lower one-third of lemma	Lower half of lemma	Subterminal	Awn absent
Rhachilla	Silky	Silky	Glabrous	Silky
Distribution				
In the sub-Antarctic and Antarctic	Archipel de Kerguelen, Iles Crozet, Heard Island, South Georgia, South Sandwich Islands, South Orkney Islands, South Shetland Islands, Antarctic Peninsula	South Georgia (introduced)	Macquarie Island	Macquarie Island
Northwards from the sub-Antarctic	Falkland Islands, Fuegia, Andes north to *c.* lat. 34°10′S., east Patagonia	Australia, New Zealand, Estrecho de Magellan, north on Andes to Bolivia, South Brazil, circumboreal	New Zealand (South Island), Stewart Island, Antipodes Islands, Auckland Islands, Campbell Island	—

Colobanthus AND *Deschampsia* ON THE SUB-ANTARCTIC ISLANDS;

Five species of *Colobanthus* are known from islands within the limits of the sub-Antarctic botanical zone (as defined by Greene and Greene (1963)), viz. *C. quitensis*, *C. apetalus* (Labill.) Druce var. *alpinus* (Kirk) L. B. Moore, *C. kerguelensis* Hook. f., *C. muscoides* Hook. f. and *C. subulatus* (D'Urv.) Hook. f. Similarly, four species of *Deschampsia* occur within this region, viz. *D. antarctica*, *D. caespitosa*, *D. chapmani* Petrie and *D. penicellata* T. Kirk. In view of the difficulties which have sometimes arisen in identifying circum-Antarctic members of these genera, some of the salient differences between the sub-Antarctic species, together with their distributions, are summarized in Tables I and II.

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APPENDIX

Material of *Colobanthus quitensis* and *Deschampsia antarctica* from outside the Scotia Ridge–Antarctic Peninsula sector of the Antarctic region examined for this study. Herbarium abbreviations follow Lanjouw and Stafleu (1964).

Colobanthus quitensis (Kunth) Bartl.

Mexico *Vera Cruz:* Cofre de Perote, 3,930 m., 6.viii.1958, Beaman 2167 (US); Pic. d'Orizabo, 12,800 ft. (*c.* 3,900 m.), Galeotti 4404 (K).

Ecuador *Pichincha:* San Juan, 11.ix.1939, Asplund 8674 (K). *Cotopaxi:* Volcán Cotopaxi, Remy s.n. (P).

Bolivia *La Paz:* Achacachi, 3,925 m., i.1856, Mandon 951 (P); Sorata, Pajchani, in 1855, Mandon s.n. (P).

Peru *Lima:* east of Canta (MacBride, 1937, p. 581). *Junín:* Casa Cancha, Wilkes s.n. (US). *Huancavelica:* San José de Acobambilla, Nahuincocha, 14,500 ft. (*c.* 4,420 m.), 14.vii.1961, Lloyd and Marshall 185 (K). *Puno:* Crucero Alto, 14,700 ft. (*c.* 4,510 m.), 14.iv.1937, Stafford 645a (K). *Tacna:* Volcán Tacora, Ancora, 4,300 m., iv.1926, Werdermann 1135 (LIL, MO, S, US, SI); Cerro de las Capillitas, "auf dem Gipfel", i.1874, Schukendang 330 (GOET).

Argentina *Jujuy:* Tilcara, Pampa Corral, 3,800 m., 18.i.1966, Fabris 6363 (BAA). *Tucumán:* El Tuprevillo, i.1913, Castillon 13138 (LIL), Cerro Muñoz; Piedra Pintada, 4,100 m., 25.v.1906, Lillo 5080 (LIL). *Catamarca:* Belén, Laguna Blanca, 3,500 m., 25.iii.1934, Peirano 58498 (LIL); Valle de Cajon, xi.1915, Lillo 49145 (LIL); Andalgala, Jorgensen 1697 (SI); Tinogasta, Reales Blancos, 4,000 m., 3.ii.1930, Schreiter 6133 (LIL). *La Rioja:* Famatina, Sierra de Famatina, 3,500 m., 29.iv.1951, Sparre 8875 (LIL). *San Juan:* Cordill. Colangúil, Vaca Muerta, 3.ii.1950, Castellanos 16251 (LIL). *Mendoza:* Puerta del Inca, 2,800 m., 24.i.1950, Palacios and Barkley 20MZ295 (LIL); Puerta del Inca, 2.ii.1903, Malma 2879 (S, UPS); Puerta del Inca, 24.xii.1946, Wall s.n. (S); San Carlos, near Portrero, 16.i.1965, Ruiz-Leal 23610 (MEN); near Laguna del Diamante, 3,000 m., 27.i.1950, Cuezzo and Barkley 20MZ409 (LIL); near Laguna del Diamante, 2,600 m., 27.i.1950, Balegrio and Palacios 4397 (LIL); near Laguna del Diamante, 3,300 m., 4.ii.1943, Covas 1104 (MEN); Agua del Toro, 17.i.1941, Ruiz-Leal 7144 (MEN); Quebrada del Arroyo Cruz de Piedra, iii.1940, Ruiz-Leal 6803 (MEN); refugio General Alvarado, 2,400 m., 26.i.1950, Cuezzo and Barkley 20MZ443 (LIL); Lujan, Rincon de los Vallecitos, iv.1937, Semper 4609 (MEN); Placetas Bayas, 3,000–3,300 m., 5.i.1937, Semper 4302 (MEN); Malalhue, Atuel valley, 2,000 m., 24.xi.1955, Böcher, Hjerting and Rahn 1182 (BIRM*); Atuel valley, 2,100 m., 7–9.i.1954, Ruiz-Leal 15541 (MEN); Atuel valley, 2,300 m., 11.xi.1955, Böcher, Hjerting and Rahn 915 (BIRM*); Atuel valley, 3,000 m., 7–9.i.1954, Ruiz-Leal 15670 (MEN); Atuel valley, 3,100 m., 28.xii.1955, Böcher, Hjerting and Rahn 1897 (BIRM*); Agua del Choique, 2,170 m., 12.i.1963, Ruiz-Leal 22380 (MEN); Portezuela del Choique, 2,400 m., 12.iii.1967, Ancibor and Schwabe 5780 (BAA); Las Heras, Puerta del Inca, Laguna de los Horcones, 9.ii.1940, Ruiz-Leal 6518 (MEN); Puerta del Inca, Laguna de los Horcones, 12.i.1963, Boelcke, Bacigalupi and Correa 9830 (BAA, BAB, LTR, SI); Tunuyán, Paso del Portillo, 23.xii.1933, Ruiz-Leal 1964 (LIL, MEN); Cerro Marmolejo, 1.ii.1934,

* Indicates that specimen is in the herbarium of the British Antarctic Survey.

Ruiz-Leal 2074 (MEN); Arroyo Grande, near Puesto Alférez Portinari, 21.i.1963, Boelcke, Bacigalupi and Correa 10161 (BAA, BAB, LTR, SI); San Carlos, near Laguna Diamante, 17.i.1963, Boelcke, Bacigalupi and Correa 10000 (BAA, BAB, LTR, SI); San Rafael, Laguna de la Niña Encantada, 14.iii.1944, Covas 2784 (MEN); Las Animas, 20.ii.1946, Rossi 168 (LIL); Los Morros, 14.i.1941, Castellanos 131 (LIL). *Neuquén:* Chos Malal, Risos Bajos, Boelcke, Correa and Bacigalupi 11189 (BAA). *Chubut:* Río Futaleufú, Río Cisne, 3.i.1946, Arnolds s.n. (LIL); Tecka, Estancia Santa Clara, 7.iv.1952, Boelcke 6427 (BAA); Guichawa, 5.iv.1952, Boelcke 6417 (BAA); Laguna Blanca, 17.xii.1901, Koslowsky 251 (BM, K, SI); lat. 44°28′S., long. 71°34′W., 800 m., 16.ii.1902, Högberg s.n. (S); Río Senguerr, Valle Huemules, Loma Pueblo, 22.ii.1943, Bruzzone 186 (LP); Lago Musters, in 1897, Roth s.n. (LP). *Santa Cruz:* Puerto San Julian, in 1925–27, Blake 114 (BM); Río Chico, Gobernador Gregores, 31.i.1965, Ancibor and Vizinis 4557 (BAA); Lago Buenos Aires, Cerro Pyrámide, 28.i.1939, von Rentzell 6112 (SI); Lago Buenos Aires, 13.ii.1936, Birabén 60 (LP); Lago Buenos Aires, i.1928, Guiñazu 1950 (BAA); Lago Ghio, 16.ii.1936, Birabén 82 (LP); Lago Viedma, 900 m., i.1916, Witte 55 (SI); Río Santa Cruz, in 1911, Morelli s.n. (SI); Lago Argentino, Brazo Norte, 970 m., 15.ii.1953, Vervoorst 4486 (LIL); Lago Argentino, Brazo Onelli, 240 m., 3.iii.1953, Vervoorst 4619 (LIL); Lago Argentino, Brazo Rico, 270 m., 17–18.xii.1950, Sleumer 1129 (LIL, US); Lago Argentino, north of Calafate, 12.i.1939, Eyerdam, Beetle and Grondona 24362 (MO, S, SI); Lago Argentino, in 1958–59, James 212, 245 (SI); Las Mesas, 400 m., in 1929, Donat 101 (BM, LIL, MO, NY, SI); Guer-Aike, 20 m., 2.i.1939, Eyerdam, Beetle and Grondona 24059 (LIL, MO, S, SI); Guer-Aike, 15.xii.1945, O'Donnell 4036 (LIL); Estancia Las Vegas, Río Coyle, Brazo Norte, 24.xii.1967, Moore 1272 (BAB, C, K, LTR); Puerto Deseado, 30.xii.1938, Eyerdam, Beetle and Grondona 23894 (SI); Estancia Fitzroy, Río de las Vueltas, 420 m., 26.xii.1950, Sleumer 1333 (LIL, US); Estancia Glencross, 100 m., 6.xii.1950, Sleumer 991 (LIL, US); Estancia Stag River, 270 m., 4.xii.1957, Tweedie 124 (K); Pescadores, 25.xii.1904, Dusén 5451 (S); s.loc., Burmeister 45 (SI); s.loc., Donat s.n. (Z); s.loc., in 1914, Hicken 455 (SI); s.loc., 27.i.1914, Hicken and Hauman 303 (SI).

Chile *Antofagasta:* Taltal, Cordillera. Volcán Llullaillaco, 3,800 m., ii.1926, Werdermann 1452 (S). *Atacama:* Vallenar, Rucas-Corrales, 3,400 m., 16.i.1926, Johnston 6214 (K, P, S); Valle del Yeso, 2,800 m., 3.ii.1960, Schlegel 2589 (LTR, SGO). *Coquimbo:* Elqui, Baños del Toro, 3,300–3,600 m., 5.ii.1939, Morrison 17265 (K, LIL, MO, S, SI). *Aconcagua:* Juncal, Las Calaveras, 3,100 m., ii.1903, Buchtien s.n. (US); Horcones Valley, in 1896–97, Gosse s.n. (K). *Santiago:* Farellones, *c.* 3,100 m., 29.i.1961, Moore 400 (LTR, UC); Mapocho, 3,400 m., ii.1939, Grandjot 3193 (SI); Cordillera Santiago, ii.1857, Germain s.n. (SI); s.loc., Wilkes s.n. (K). *Cautín:* Volcán Llaima, *c.* 1,500 m., 24.iii.1948, Sparre 4798 (S). *Osorno:* Cerro Pelada, 28.i.1825, Gillies s.n. (K). *Chiloé:* Ancud, in 1871, Reed s.n. (K, SI); s.loc., in 1831, Cuming 21 (K). *Aysén:* Istmo de Ofqui, 18.ii.1921, Hicken s.n. (SI); Isla Prat, ii.1904, Hicken 155 (SI). *Magallanes:* Isla Wellington, Puerto Edén, 24.ii.1879, Savatier s.n. (P); Canal Sarmiento, Puerto Bueno, 16.ii.1877, Savatier s.n. (P); Isla Pacheco, Puerto Chalguas, 21.iii.1945, Biese 1410 (LIL); Isla Diego de Almagro, 11.iv.1945, Biese 1683 (LIL); Isla Diego de Almagro, 0–30 m., 28.iii.1945, Biese 1468 (LIL); Estancia Cerro Castillo, Cerro Casador, 11.iii.1964, Moore 978 (C, GH, K, LTR, SGO); Puerto Natales, iii.1941, Siple 399 (US); Lago Balmaceda, 4.ii.1938, Kalela 2040 (S); Laguna Blanca, ii.1927, Guiñazu 1950 (BAA); Río Rubens, 11.i.1952, Pfister and Ricardi 334 (CONC, LIL, LTR); Isla Riesco, Estancia Tita, 5.i.1952, Pfister and Ricardi s.n. (CONC, LTR); Punta Arenas, Río de las Minas, 28.ii.1945, Biese 1195 (LIL); Ski Club Hill, *c.* 250 ft. (*c.* 75 m.), 25.i.1961, Moore 380 (LTR, UC); Punta Arenas, 25.xi.1897, Alboff s.n. (LP); Punta Arenas, 20.i.1904, Hicken s.n., (SI), Punta Arenas, 11.i.1904, Hicken 152 (SI); Punta Arenas, 17.i.1912, Hicken s.n. (SI); Punta Arenas, ii.1882, Coppinger s.n. (K); Punta Arenas, 19.ii.1921, Pastore 219 (SI); Punta Arenas, 20.ii.1903, Pennington 179 (SI); Punta Arenas, xii.1903, Scott Elliott 17 (BM); Punta Arenas, 11.ii.1879, Savatier 1954 (P); *c.* 25 km. to south of Punta Arenas, 23.i.1961, Moore 375 (LTR, UC); *c.* 26 km. to south of Punta Arenas, 18.ii.1945, Biese 1095 (LIL); Fuerte Bulnes, 23.i.1961, Moore 370 (LTR, UC); Puerto Hambre (Port Famine), King 122 (BM); Bahía Nicholas (Cape Froward), in 1852, Andersson s.n. (S); Oazy Harbour, ii.1853, Lechler 1120 (P, S, UPS); Punta Delgada, 9.xii.1921, Valetin s.n. (S); Isla Isabel, 6.ii.1867, Cunningham s.n. (K); s.loc., i–iii.1917, Bonarelli s.n. (SI); s.loc., in 1838–42, Wilkes s.n. (NY); s.loc., Gay s.n. (K); Cordilleris de Chile, in 1822, Haenke s.n. (GOET).

Tierra del Fuego *Isla Dawson:* 3.i.1911, Colegio Salesiano s.n. (SI). *Isla Grande:* Bahía Gente Grande, 20.xii.1895, Dusén 206 (UPS); Porvenir, 50 m., 1.xii.1930, Donat 325 (BM, K, LIL, NY, SI); Porvenir, 16.i.1904, Hicken 150, 151 (SI); Porvenir, 23.xii.1895, Dusén 218 (UPS); Bahía San Sebastian, Estancia Cullen, 13.i.1968, Moore 1473 (K, LTR); San Sebastian to Caleta Josefina, 7 km. west of frontier, 9.iii.1968, Moore 2110 (K, LTR); Río Grande, i.1896, Dusén 210 (UPS); Estancia La Esperanza, 80 km. west of Río Grande, 198 m., 9.iii.1936, Mexia 7928 (BM, K, LIL, MO, NY, S, US); "Fuegia Oriental", ii.1879, Ortega s.n. (SI); Bahía Inútil, Estancia Cameron, Torcido Chico, 19.iii.1964, Moore 1078 (K, LTR); Estancia Cameron, Cerro Cazuela, 200 m., 21.iii.1964, Moore 1122 (LP, LTR); Seno Almirantazgo, Isla Tres Mogotes, 21.iii.1968, Moore 2309 (LTR); Yendegaia, 21.i.1961, Moore 369 (LTR, UC); Ushuaia, 9.iii.1950, Ruiz-Leal 12927, 12970 (MEN); Ushuaia, 23.xii.1949, Ruiz-Leal 12771, 12772 (MEN); Ushuaia, 6.ii.1896, Alboff s.n. (LP, SI); Ushuaia, 6.xi.1896, Alboff 157, 158 (LP); Ushuaia, 5.i.1923, Herborn 25 (SI); Remolino, i.1920, Gusinde s.n. (W); Casle-oh-Gatugoo, i.1897, Nordenskjöld 15 (UPS); Río Lashifashaj (Tierra Mayor) valley, 24.ii.1953, Ruiz-Leal and Roig 15070 (MEN); Estancia Harberton, Cutalataca Peninsula, 12.iii.1967, Goodall 751 (LTR, NA, US); Estancia Harberton, Campo Pescado, Twin Islands, 6.ii.1968, Moore 1796 (BAB, C, K, LTR); Estancia Harberton, Campo Loma Larga Norte, 17.i.1967, Goodall 579 (LTR); Estancia Harberton, Cerro No Top, 4.iii.1967, Goodall 715 (NA, LTR, LP); Estancia Moat, Bahía

Moat, beach, 27.i.1968, Moore 1677 (BAA, K, LTR, US); Río Moat, west bank, 27.i.1968, Moore 1683 (LTR); Bahía Aguirre, Puerto Espagnol, 16.ii.1968, Moore 1880, 1881 (LTR); Peninsula Mitre, s.loc., i.1769, Banks and Solander s.n. (BM, MO, S, US). *Isla de los Estados:* Puerto Cook, 20.i.1912, Hicken s.n. (SI). *Islas Ãno Nuevo:* Isla Observatorio, 6.i.1902, Skottsberg s.n. (S). *Isla Navarino:* Río Lauta valley, 19.i.1961, Moore 345 (LTR, UC); Puerto Williams, 1 km. east, 20.i.1961, Moore 360 (LTR, UC); s.loc., 7.iii.1902, Skottsberg s.n. (S). *Isla Hoste:* Peninsula Hardy, Bahía Orange, in 1838–42, Wilkes s.n. (K, MO, NY). *Islas Wollaston:* Isla Grevy, Puerto Caja, 5.i.1949, Vervoorst 322 (LIL); Isla Hermite, Hooker s.n. (BM); Isla Hermite, Hooker 27 (K); Isla Hermite, 1.i.1883, Hahn 905 (P).

Falkland Islands *West Falkland:* Port Stephens, Ten Shilling Bay, 30.i.1964, Moore 722 (K, LTR, P, US); Port Stephens, Carew Harbour, 10.ii.1964, Moore 814 (CHR, LTR, UC); Roy Cove, Hope Harbour, 19.ii.1964, Moore 922 (K, LP, LTR, S); Roy Cove, Vallentin 44 (MANCH); Shallow Bay, i.1911, Vallentin s.n. (K, MANCH); Shallow Bay, vii.1911, Vallentin s.n. (MANCH); Shallow Bay, 7.ii.1911, Vallentin s.n (MANCH); s.loc., in 1901–02, R. Vallentin s.n. (MANCH). *East Falkland:* San Carlos, White Rincon, 24.i.1964, Moore 659 (BIRM*, C, GH, K, LTR); Darwin, Cerritos, 17.i.1964, Moore 576 (LTR); Rincon Grande, 5.xii.1949, Sladen Fa51/49 (BM); Port Harriet, 2.i.1950, Sladen Fa8/50 (BM); Port Stanley, in 1964, Booth 16, 54 (LTR); Port Stanley, 1.i.1902, Skottsberg 95 (S); Port Stanley, 29.i.1948, Hamilton JH35 (BM); Port Stanley, 27.xii.1903, Hicken 35 (SI); Port William, ix.1850, Lechler s.n. (P, S); Mount William, 28.ii.1904, Birger s.n. (S); Eliza Cove, 13.i.1964, Moore 552 (K, LP, LTR, S); Sparrow Cove, 21.xii.1933, Bennett s.n. (BM); Sparrow Cove, 10.i.1908, Skottsberg 103 (UPS); Sparrow Cove, 5.i.1950, Sladen Fa29/50 (BM); Kidney Island, 25.ix.1904, Birger s.n. (S); Cape Pembroke, 28.iv.1951, Sladen Fa3/51 (BM); Yorke Bay, i.1937, Smith 3 (BM); s.loc., ii.1867, Cunningham s.n. (K); s.loc., in 1822, D'Urville s.n. (P, UPS); s.loc., in 1842, Hooker s.n. (BM, K, P).

Deschampsia antarctica Desv.

Argentina *Mendoza:* San Rafael, Piedra del Burrero, 3,100 m., i.1897, Wilizich s.n. (W). *Santa Cruz:* Lago San Martín, Peninsula Cancha Rayada, 18.i.1909, Skottsberg s.n. (UPS); Guer Aike, 4.i.1939, Eyerdam, Beetle and Grondona 24088 (K, US); s.loc., 6.i.1906, Dusén 5489 (S); Río Gallegos, xi.1896, Nordenskjöld A84 (UPS).

Chile *Magallanes:* s.loc., in 1930, Hunter s.n. (K); Puerto Natales, 12.ii.1946, Barros 5752 (US); Punta Arenas, Lechler 1220 (K, UPS, W, Z); Punta Arenas, 21.ii.1896, Dusén 519 (UPS, W); Punta Arenas, ii.1882, Coppinger s.n. (K); Punta Arenas, 16.ii.1908, Skottsberg s.n. (S); Río Verde, xii.1926, Guiñazu 74 (BIRM*); *c.* 15 km. south of Punta Arenas, 6.i.1939, Eyerdam, Beetle and Grondona 24115 (K, LIL, US); Bahía Nicholas (Cape Froward), in 1852, Andersson s.n. (S); Punta Delgada, 17.xii.1921, Vallentin 282 (S); Punta Delgada, Cañadon Grande, 18.iii.1964, Moore 1042 (K, LTR, S, SGO); Oazy Harbour, Lechler s.n. (W); "Patagonia austral", ii.1900, Reiche s.n. (US); s.loc., in 1888, Philippi s.n. (W).

Tierra del Fuego *Isla Grande:* Párano, 9.i.1905, Dusén 53 (US); Porvenir, 2.xii.1895, Dusén 240 (UPS, W); Río San Martin, 9.i.1896, Dusén 316 (S, UPS, W), "Fuegia Orientalis", ii.1879, Ortega 244 (W); Estancia La Marina, Río de la Turba, lat. 54°18′S., long. 68°30′W., 23.ii.1968, Moore 2029 (BAB, K, LTR, US); Río Grande, 22.i.1905, Dusén 92 (US); Río Grande, 19.i.1896, Dusén 405 (S, UPS, W); Estancia Viamonte, Punta Centella, 18.iii.1968, Goodall 1656 (LTR, NA); Ushuaia, xi.1896, Alboff s.n. (LP); Ushuaia, 7.xi.1896, Alboff 1025 (LP); Ushuaia, 7.xi.1896, Alboff 1026 (LP); Ushuaia, 7.xi.1896, Alboff 1024 (LP); Estancia Harberton, Bahía Brown, 20.i.1967, Goodall 580 (KE, LP, LTR, MICH, NA, UC, US); Estancia Harberton, First West Creek, lat. 54°51′S., long. 67°22′W., 6.i.1968, Moore 1349 (BAB, C, K, LTR); Bahía Aguirre, Puerto Espagnol, lat. 54°57′S., long. 65°58′W., 15.ii.1968, Moore 1866 (BAA, K, LTR); Bahía Aguirre, Puerto Espagnol, 15.ii.1968, Moore 1868 (BAB, C, LTR).

Falkland Islands *West Falkland:* Shallow Bay, 14.ii.1911, Vallentin s.n. (K); Shallow Bay, in 1909–11, Vallentin s.n. (K); Port Stephens, Cape Meredith, 5.ii.1964, Moore 781 (BIRM*, C, CHR, GH, K, LP, LTR, P, S, SGO, UC, US); s.loc., iv.1937, Weir s.n. (K). *East Falkland:* s.loc., Hooker s.n. (K, BM); Port Stanley, 1.i.1902, Skottsberg s.n. (S, W); Port Harriet, 12.i.1908, Skottsberg s.n. (S); Port William, 25.ii.1904, Birger s.n. (S); Fitzroy, 25.iv.1949, Sladen JB102/18 (BM); Arrow Harbour, 17.i.1908, Skottsberg 100 (UPS).

Archipel de Kerguelen Royal Sound, Murray Island, 23.ii.1930, B.A.N.Z. B214c (US); Bras Bolinder, 13–14.ii.1930, B.A.N.Z. s.n. (US); s.loc., in 1874, Kidder s.n. (US); s.loc., Aubert de la Rue (Z); s.loc., i.1874, Moseley s.n. (W); s.loc., Hooker s.n. (W).

* Indicates that specimen is in the herbarium of the British Antarctic Survey.