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# Liliaceae of Southeastern Polynesia[1]

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BOTANICAL GARDENS, GÖTEBORG, SWEDEN

## CORDYLINE Commers.

**Cordyline terminalis** (L.) Kunth.

*Cordyline fruticosa* (L.) A. Chev.: Cat. Pl. Jard. Bot. Saigon, 66, 1919 (non Guép., 1855).

Tuamotu Islands: Hao, Boring Bay, cultivated in village, 1 m., May 19, 1934, *St. John 14416.*

Austral Islands. Rimatara: Anapoto, open woods, 3 m., Sept. 4, 1934, *St. John and Fosberg 16880;* stream near Mutuaura, moist ravine, 25 m., Sept. 5, 1934, *Fosberg 12052.* Rurutu: Paparai Valley, shaded hillside, 50 m., Aug. 28, 1934, *St. John 16690.* Tubuai: Taitao, northeast slope, edge of forest, 320 m., Aug. 6, 1934, *St. John and Fosberg 16341.* Raivavae: south side of pass south of Raurua, edge of wood, 80 m., Aug. 3, 1934, *St. John and Fosberg 15815;* northwest slope of Pic Rouge, woods, 140 m., Aug. 5, 1934, *St. John and Fosberg 15950;* Hotuatua Islet, rocky hillside, 15 m., Aug. 11, 1934, *St. John and Wight 16116.*

Mangareva Islands. Agakautai: west side, in woods on sandy flat, 5 m., June 8, 1934, *St. John 14945.* Taravai: northeast end, thicket in village (probably cultivated), 5 m., June 1, 1934, *St. John 14799.* Akamaru: north side in thicket, 4 m. (occasionally up to 100 m.), May 29, 1934, *St. John 14699.* Aukena: Point Mata Kuiti, thicket near shore, 5 m., May 28, 1934, *St. John 14640.*

[1] Mangarevan Expedition Publication 18.

Rapa, Maungaeae, east of Mangaoa Peak, dense moist woods, 250 m., July 4, 1934, *St. John and Maireau 15367.*

Pitcairn, flatland on wooded slope, 100 m., June 13, 1934, *Fosberg and Christian 11240.*

Henderson Island: northwest end, cliffs above landing in dense forest, 30 m., June 21, 1934, *Fosberg 11351;* west end, jungle on elevated dissected coral, 33 m., June 18, 1934, *St. John and Fosberg 15415.*

The Polynesian plant with wide leaves belongs to variety *ti* of Baker (1, p. 540).[2]

## DIANELLA Lam.

All specimens of *Dianella* collected on the expedition belong to *D. intermedia* in the sense of F. B. H. Brown (4). The leaves are comparatively wide, the keel and margin scabrid by minute hyaline spines which in some specimens are quite conspicuous, in others much less so; but no specimen is quite smooth. The flowers in Brown's specimens are greenish or lilac, the color being quite variable. (See table, page 242, for color and flower size of specimens described in this paper.) Several specimens from various islands bear seeds which are all of the same type (fig. 1, *a, b*).

I have attempted to find the relations between *D. intermedia* of Brown and the original plant as described by Endlicher from Norfolk Island, but I have seen only one specimen of this collected by Backhouse (Kew Herbarium). The leaves are strongly revolute, at least when dry, narrower than in most Polynesian plants, the panicle narrow but of the same type as in other specimens. Fragments of flowers remain which are sufficient to show that their size is the same. The outer tepals are 7-veined, the inner 5-veined, whereas in most Polynesian forms they are 5-veined and 3-veined respectivly. Variety *marquisensis* Brown agrees with the Norfolk plant, and variety *gambierensis* is said to have both series 5-nerved. Previously, Brown has established a variety *norfolkensis* Brown for *D. intermedia* from Norfolk, New Zealand, and Fiji (3, p. 11) based on a specimen from New Zealand. According to the description, the latter agrees perfectly with all New Zealand plants which I examined but it differs from the Norfolk plants. The result is that variety *norfolkensis* does not occur in

[2] Numbers in parentheses refer to Literature Cited, p. 244.

Norfolk Island unless more than one form is found there and one of them is the same as the one from New Zealand. I have not seen any material from Fiji, but a flowering and fruiting specimen from Fiji is described by Brown under variety *norfolkensis* (3, p. 11).

Kunth (12, p. 53) refers only the type from Norfolk to *D. intermedia* of Endlicher whose description is copied. The outer tepals are greenish with base and tip tinged lilac, the inner whitish with a green center. These colors fit Polynesian plants quite well. The inner tepals are 5-nerved according to Kunth, and when the inner tepals have 5 complete nerves, the outer usually have 7. Baker (1, p. 578) describes the perianth as pale blue and only 2 lines long, but this figure must be incorrect since no form of *D. intermedia* ever has such small flowers.

The New Zealand *D. intermedia* is widespread in the islands and common in herbaria, so that authors have most likely formed their idea of Endlicher's species from New Zealand material. A New Zealand specimen is one of the reference types of variety *norfolkensis* Brown, and his description fits all the specimens I have seen. The species is well represented in the Kew Herbarium. All the specimens are alike and answer to the description of Cheeseman (5, p. 320) and Brown. They differ from all others in their lax and large, repeatedly dichotomous panicles with long and slender, subumbellately arranged pedicels, only single Polynesian specimens approaching them. The number of tepalic veins is 5 and 3 as in the majority of southeastern Polynesian forms, and in variety *norfolkensis* from Fiji as well as in a plant from Tahiti (Kew Herbarium), but these numbers do not occur in the Norfolk plant as far as is known. The leaf width is about the same in all. Unfortunately fruit and seeds of the Norfolk *D. intermedia* have not been described, and until they are known nothing definite can be said of its relation to other forms. It seems likely that the seed type is of great systematic importance in this case. One of the two types known (fig. 1, *a, b*) is found in plants from Raiatea, Austral Islands, Rapa, and Henderson Island. From Brown's description, Fijian plants also belong here, and it is probable that the same type is found in Tahiti. The other type (fig. 1, *c*) is peculiar to the New Zealand form. In the Kew Herbarium there are several fruiting specimens from New Zealand. The seed shape is uniform, lengths ranging between 2.8 and 3.5 mm. (average 3 mm.), widths 2-2.1 mm., and thickness 1.4-1.5 mm. It is evident from Brown's description that he

found the same kind of seeds in his specimens. If I am right, his variety *norfolkensis* includes three forms.

Concerning *D. intermedia* in New Caledonia, the Kew Herbarium contains two sheets of the type material of *Anthericum adenanthera* Forster, named *D. intermedia.* Baker (1, p. 577) refers Forster's species to *D. ensifolia* (L.) Red. The two specimens in question have the habit of the New Zealand plant, but unfortunately they lack flowers and fruit. As no less than four species of *Dianella* have been reported from New Caledonia, besides the peculiar shrubby *D. austrocaledonica,* Forster's species may be a mixture.

The Norfolk *D. intermedia* seems to approach *D. ensifolia* closely, but according to Baker the latter is a caulescent species, the former acaulescent. There is hardly any strict limit between these two types; both are scabrid and have 5-nerved inner tepals, and leaf width and flower color are variable in both, but the seeds of *D. ensifolia* as described by Baker (1) are quite distinct from the seeds of the various forms of *D. intermedia,* and resemble the seeds of *D. sandwicensis,* a species reduced to *D. ensifolia* by Baker. It is possible that the Hawaiian plant was used for the description just as it served Kunth for his description of *D. odorata* Blume.

Kunth used the number of veins of the tepals as the main distinction between the species groups. If we follow him, Brown's Polynesian *D. intermedia* should be divided between the two groups, 5-7-nerved and 3-5-nerved, and consequently belongs to at least two different species. To me it seems unwise to lay such great weight on this character in this case. The geographical distribution is not in favor of such an action, and two additional veins are sometimes developed in otherwise 3-nerved inner tepals. The presence or absence of blue pigment does not serve as a basis for specific distinction (see table 1), especially in the specimens from Henderson Island, all of which belong to the same variety. Neither does the specimen from Raiatea (no. *17242*) nor that from Rurutu (no. *16684*), both of which have clear blue flowers, seem to be distinguishable from whitish-greenish-purplish-flowered forms. The common color in Tahiti is white or pale yellow (?) tinged with green (9, p. 229).

**Dianella intermedia** Endl. var. **punctata** F. B. H. Brown (fig. 1, *a*).

Outer tepals 5-veined, inner 3-veined, especially the former punctate under a lens. Reported by Brown from the Marquesas, Austral Islands, and Rapa. The degree of punctuation varies considerably and there are forms (table 1) where

the dots are few or wanting, but these do not seem to be distinguishable from the rest, as there is no sharp limit between them. Specimens without dots should be referable to variety *nukuhivensis* Brown (Marquesas, Tahiti, Raiatea) but if no better characteristics are found than those indicated, there is little reason to leave it standing.

Society Islands: Raiatea, turfy slope on the Temehani plateau, 500 m., Oct. 5, 1934, *St. John 17242.*

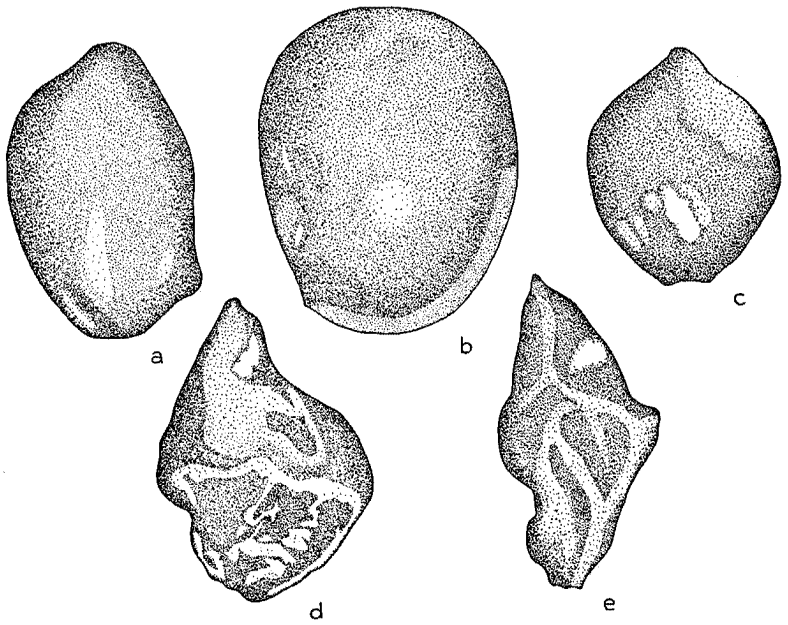


FIGURE 1.—Seeds of *Dianella*: *a, D. intermedia* var. *punctata,* no. 16684; *b, D. intermedia* var. *gambierensis,* no. 15121; *c,* the New Zealand variety, Colenso no. 1554; *d, e, D. sandwicensis,* Skottsberg no. 161. All × 10.

Austral Islands. Rurutu: open grassy ridges along road southwest of Moerai, Aug. 26, 1934, *St. John 16684,* "Perianth within clear blue, petals without lined up the middle with reddish brown, sepals outside reddish brown, fruit oval-fusiform, bright blue." Tubuai: low land west of Mataura, Aug. 16, 1934, *Fosberg and Anderson 11805,* "Flower white, purplish tinged", a stout caulescent form with wide leaves; Rautaro Islet, grassy openings in woods on coral sands, Aug. 19, 1934, *St. John 16381,* "Perianth parts white within, without white, streaked down the middle with green or brownish purple", less

high but as wide-leaved as no. *11805.* Tapapatauai Islet: in open woods on coral sands, Aug. 19, 1934, *St. John 16418,* "Flower white, without greenish or purplish tinged", very like no. *11805.* Raivavae: Motu Tehau, on coral gravel, 1 m., *St. John and Wight 16131,* "Flower bluish", seeds larger than in other specimens of the collection. South side, pass south of Raiurua, in grass at edge of woods, Aug. 3, 1934, *St. John and Fosberg 15822,* "Flower purplish"; south slope of Pic Rouge, 60 m., shaded ledges in woods, Aug. 5, 1934, *St. John and Fosberg 15975,* "Fruit ellipsoid, china blue." Hotuatua Islet, dry hillside, 8 m., Aug. 11, 1934, *St. John and Wight 16104,* "Flower whitish."

Rapa: south side, peak between Ahurei Bay and Atanui Valley, grassy ledges at base of small cliff, 150 m., July 3, 1934, *Fosberg 11367,* "Flower outer parts purple, inner ones pale blue-purple, fruit purple"; cliffs and slopes above Area, 90 m., ledges on cliffs, July 3, 1934, *Fosberg 11379,* "Flower white, greenish outside", a narrow-leaved form with smallish seeds; Mount Taga above watering place, 50 m., July 4, 1934, *Fosberg 11395,* "Sepals purple, petals bluish lavender"; Taratika, east side of Mount Perahu, precipitous bushy slope, 590 m., July 21, 1934, *St. John, Fosberg and Maireau 15677,* "Flower inside white, outside purplish, fruit purplish, fusiform." Tapui Islet, rocky grassy slope, 15 m., July 9, 1934, *Fosberg 11449,* "Flower whitish inside, brownish outside." Tauna Island, coral ground, 1 m., July 15, 1934, *St. John and Wight 15550.*

Pitcairn, summit of precipice above The Rope, 200 m., July 14, 1934, *St. John 15005,* "Flower said to be blue," leaves almost smooth. This and other sterile forms are, of course, referred here with hesitation.

**Dianella intermedia** Endl. var. **gambierensis** F. B. H. Brown (fig. 1, *b*).

Tepals more or less dotted, outer 5-7-veined, inner 5-veined in the specimens examined by me, thus differing from Brown's description, "both series faintly punctate and 5-veined." In venation my form agrees better with variety *marquisensis* Brown (Marquesas), but this has less distinctly punctate tepals, and the inner are wider than the outer. This is not the case in the Henderson plant seen by me, but one specimen examined shows almost no dots. Further, the type of variety *gambierensis* (Henderson, Mangareva) came from Henderson (Quayle 394), although the variety was named for Mangareva (Gambier). Forms with only 5 veins well developed are transitional and it might be better to recognize only one variety.

Henderson Island: north end, moist jungle on elevated dissected coral, 33 m., June 17, 1934, *St. John and Fosberg 15116;* same locality, *St. John and Fosberg 15121,* "Flowers blue"; near center, jungle on elevated dissected coral, 30 m., June 20, 1934, *St. John and Fosberg 15157,* "Sepals bluish, petals white, fruit blue, fusiform"; same locality, *St. John and Fosberg 15167,* "Perianth reflexed, sepals dull purplish, petals white."

These specimens are distinctly caulescent. The panicle is narrow with short, dense racemes and recalls *D. multipedicellata* Degener (8).

Besides *D. intermedia,* Brown also lists *D. odorata* Blume and *D. sandwicensis* Hooker and Arnott from the Marquesas, the latter two belonging to the species with smooth leaves. Kunth united them under the name *D. odorata,* and used a specimen of Gaudichaud's from Hawaii for his description (12, p. 51). Hillebrand followed him in referring the Hawaiian species to *D. odorata* (10, p. 445). Baker (1, p. 577) referred both to *D. ensifolia,* a scabrid species. When I examined my own material (13), only one *Dianella* had been recognized in Hawaii, and consequently this was called *D. sandwicensis* (13, p. 216). Lately three species have been segregated by Degener, which have made it necessary to examine Hooker and Arnott's type, because their diagnoses (11, p. 97) say practically nothing. The Kew Herbarium contains two sheets, both from Oahu, which are perfectly smooth. One of these has wider leaves (to 22 mm.), the flowers are rather small, with tepals 5-6 mm. long, the outer 5-veined, the inner 3-veined. The other specimen which has no flowers has strongly revolute leaves (at least in a dry state). Their width cannot be determined but seems not to exceed 12 or 13 mm. Unfortunately there are no fruits or seeds, but *Skottsberg 161,* which is in every respect like the type, is in flower and fruit. The seeds (fig. 1, *d, e*) are quite characteristic and differ markedly from those of all forms of *intermedia.* I have seen many other specimens from Oahu, and all show the same type of seed, rather irregular in outline, angular and ribbed, with one or both ends pointed. They have been described and figured by Degener (6). The same kind is found in a specimen of Hillebrand's labeled "Ewa, Waiawa, March 1850" (Kew Herbarium). His description, however, calls them "ovoid, compressed, and margined", suggesting a type more like that of *D. intermedia.* From our present knowledge, Hillebrand's Hawaiian material must be a mixture, undoubtedly including *D. lavarum* Degener (7) from the island of

Hawaii. This has seeds of the *intermedia* type. It is doubtful whether or not *D. multipedicellata* Degener (8) is specifically distinct from *D. sandwicensis*. Fruit and seeds have not been collected.

Brown's *D. sandwicensis* from Marquesas (4, p. 153) is apparently very like specimens from Oahu. Although the seeds are not mentioned, we have no reason to doubt that the range of *D. sandwicensis* extends to the Marquesas. It is more difficult to place Brown's *D. odorata,* also from the Marquesas, which is said to be of frequent occurrence in Hawaii. But what is *D. odorata* Blume? In order to find this out, it is necessary to study Blume's type and also plants of Loureiro and Rumphius referred by Kunth to *D. odorata.* It remains to be settled whether Brown's Polynesian plant is the same. According to Kunth, *D. odorata* belongs to the group with 5-veined inner tepals. Brown's *D. odorata* has 5-7-veined outer, and 5-veined inner tepals. A critical revision of the whole genus is needed. The taxonomic value of the characters, smooth versus scabrid leaves, has yet to be settled.

## ASTELIA Banks et Solander ex R. Br.

**Astelia rapensis,** new species (fig. 2).

Subg. Asteliopsis, sect. Periastelia.—Robusta, dense caespitosa caudice longo valido. Folia subplana, majora 70-90 cm. longa et 3.5-4 cm. lata, in sicco chartacea, supra opace viridia-olivacea, subtus pallidora, cinerea, costa mediana subtus incrassata, nervi laterales numerosi utrinque incrassati, duo utroque latere ceteris paulum crassiores, valde approximati, subconfluentes; transversi nulli. Vagina longissime squamosa, niveo-sericea; lamina supra more Asteliarum pelliculosa, squamis mox caducis, subtus appresse squamosa et lanigera, squamis caducis. Planta ♀ solum cognita. Scapus ad 67 cm. longus visus, usque spatham infimam ad 42 cm., dense squamoso-lanuginosa. Panicula ad 25 cm. longa visa, spathis 4, infima foliacea 6.5-21 cm. longa et 1.5-3.4 cm. lata. Racemi 6.5-14.5 cm. longi, densiflori, infimi basi virgati. Bracteae liberae, ovatae, acuminatae, subhyalinae, longe villosae, 4.3-5.5 mm. longae et 2.2-3.3 mm. latae. Pedicelli 3-4 (-5) mm. longi. Flores expansi ad 17 mm. diam. Tepala brevissime connata, ovato-lanceolata, viridia, externa (6-) 7-8 mm. longa et (2.5-) 3-4 mm. lata, apice minute cucullata, dorso sparse squamosa, interna (5.5-) 6-7.5 mm. longa et 2.5-3 mm. lata dorso secus medianum squamis nonullis donata. Staminodia lageniformia, 2.2-3 mm. longa (parte libera 1.5-2.5 mm.), inferne 0.7-0.9 mm. crassa, apiculata, antheris nullis. Ovarium 3 mm. longum et 2.8 mm. diam., profunde sulcatum triloculare, stylo 1.2 mm. longo, stigmate generis. Fructus non suppetunt. Ins. Rapa, Kaimaru, alt. 500 m., legerunt *St. John et Maireau 15513.* Typus in herb. Bishop Mus.. Taratika, alt. 450 m., *St. John et Maireau 15573.*

In the following supplementary description, collectors' notes are cited:

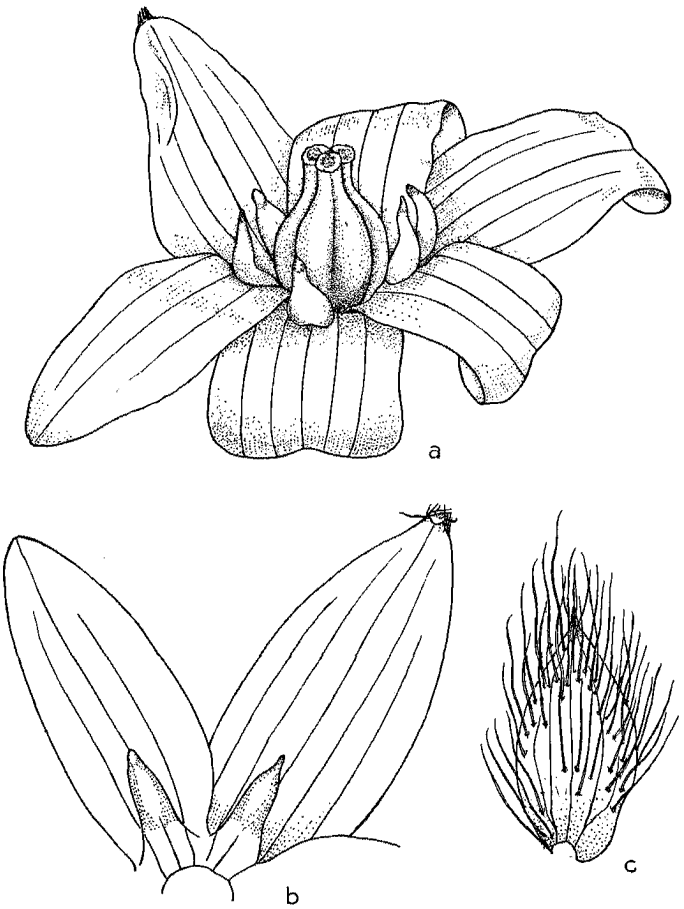


FIGURE 2.—*Astelia rapensis,* no. 15513: *a,* female flower; *b,* outer and inner tepal with staminodes; *c,* bract. All × 5.

Erect, caudex long, ascendent (to 20 cm. long observed), 3-4 cm. thick, covered with sheaths and with vascular bundles of macerated leaves; longest root left about 40 cm. Leaves "almost flat, slightly pleated, one fold on each side", dull green above with a very thin film of 1.5-2 mm. long scales with little wool at base, the film gradually wearing off, ash gray beneath with a thin but dense cover of wool tufts with few scales mixed in, midrib with a cover of 2-2.5 mm. long, narrow scales surrounded with the usual basal wool, the same kind of scales forming a fringe along the margin. The midrib is, as

TABLE 1.—DIANELLA INTERMEDIA IN POLYNESIA

| Locality | Specimen | Width of leaves in cm. | Color of Flower | Size of tepals in mm. | | Size of seeds in mm. |
|---|---|---|---|---|---|---|
| | | | | Outer | Inner | |
| Raiatea | 17242 | 1.5-2.0 | clear blue | 7.2x2.5 d[3] | 6.5x2.5 (d) | 2.8-3.3x1.5-2.0[4] |
| Rurutu | 16684 | 1.5 + | clear blue, reddish brown without | 6.5x2.5 d | 6.5x2.5 d | 3.5x2.5x1.5 |
| Tubuai | 11805 | 2.5-3.0 | white, purplish-tinged | 6.5x2.5 d | 6.2x2.0 (d) | |
| Tubuai | 16381 | 2.5-3.0 | as 11805, outside green and brown-purple | 6.2x2.7 | 5.5-6.0x3.0 | |
| Tubuai | 16418 | 2.0-2.5 | white, tinged outside green and purple | 6.5x3.0 | 6.0x3.0 | |
| Raivavae | 15822 | 2.0 | purplish | 6.2x2.5 d | 5.5-6.0x2.0 d | 4.0x2.5x1.8 (n. 15975) |
| Raivavae | 16104 | 2.0 | whitish | | | |
| Raivavae | 16131 | 2.2 | bluish | | | 4.5-5.0x3.0x2.0 |
| Rapa | 11367 | 2.0-2+ | sepals purple, petals pale blue-purple | 6.0x2.2 d | 5.0x2.0 (d) | 3.2-3.8x2.5x1.6-2.0 |
| Rapa | 11379 | 1.0-1.2 | white, greenish outside | 6.2x2.0 d | 5.0x1.8 (d) | |
| Rapa | 11394 | 2.0-2.5 | white, brownish outside | 6.0x2.2 d | 6.0x2.5 (d) | 3.0-3.3x2.0-1.8x1.5 |
| Rapa | 11395 | 1.9-2.1 | sepals purple, petals bluish lavender | 5.5x2.0 d | 5.5x2.3 (d) | 3.5-3.8x2.5x1.5 |
| Rapa | 11449 | 2.0 | white, brownish outside | 6.3x2.4 d | 6.0x2.3 (d) | |
| Rapa | 15677 | 2.0 | white, purplish outside | 6.0x2.0 (d) | 5.0x1.6 (d) | 3.2-3.5x2.0-2.5x1.5 |
| Pitcairn | 15005 | 1.5-1.8 | blue | | | |
| Henderson | 15121 | 2.5-3.0 | blue | 5.0x2.3 d | 4.5x2.0 d | 4.0x3.2x2.3 |
| Henderson | 15157 | 1.8-2.2 | sepals bluish, petals white | 6.0x2.1 (d) | 6.0x1.6 (d) | 3.8x2.6x2.0 |
| Henderson | 15167 | 1.5-2.0 | sepals dull purple, petals white | 6.0-7.0x2.2 | 6.0-7.0x1.5-1.8 | 3.5x4.0x2.0 |

[3] d=tepals plainly punctate; (d)=tepals inconspicuously punctate or with but few dots.

[4] Not ripe, very flat.

usual, little conspicuous on the upper face, and less thickened beneath than in many other species. Of the very numerous lateral veins 8-10 on each side of the midrib are stronger, and of these 2 on each side stand out, forming, in the lower portion of the blade, a double costa; higher up, the distance between them increases to 1 or 2 mm. and the outer, which is a little weaker, gradually gets thinner and disappears. The sheath is as much as 6 cm. wide with a fleshy central portion and thin, semi-transparent wings. The scales forming the silky cover attain as much as 3 cm. in length. In no. *15513* the lowest raceme has 1 or 2, the next 1 branch; the racemes have a sterile proximal portion of 2-2.5 cm. Flowers "green, or slightly streaked or spotted". The rachis and pedicels are white with scales. No. *15573* is a smaller specimen with scape only 35 cm. long and leaves not over 45 cm. long and 3 cm. wide.

Rapa: Kaimaru, south side of Mount Perahu, in moist thicket of steep ridge, alt. 500 m., *St. John and Maireau 15513;* Taratika, east side of Mount Perahu, on wind swept crest of precipice, alt. 450 m., *St. John and Maireau 15573.*

The discovery of an *Astelia* in Rapa is not unexpected but still is of great interest. In habit the new species comes near *A. veratroides* and its allies in Hawaii, and the Marquesas *A. tovii,* but it differs from all in the presence of a double lateral costa, approaching the Tahitian *A. Nadeaudii* to which otherwise it is not related. It lacks the transverse veinlets characteristic of *A. tovii* (14, p. 48), and the bracts are not concrescent with the pedicel as in this species. The flowers are larger than in all the other species of section Periastelia. Staminodes of the same length are found in *A. menziesiana* Sm., but here as well as in all other Hawaiian species, small sterile anthers are developed, whereas *A. rapensis* and *A. tovii* show no trace of an anther. Of the latter a form with long filaments is known, *Adamson and Mumford 590* (14, p. 49).

Through the discovery of *A. rapensis* the area of section Periastelia is extended south. From the geographical position of Rapa we could have expected a species with its closest relative in Tahiti, but *A. Nadeaudii* belongs to a different subgenus. A connection between Hawaii and southeastern Polynesia via the Marquesas is thus established.

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