REVISION OF THE GENUS APONOGETON (APONOGETONACEAE)

III. THE SPECIES OF AUSTRALIA

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ABSTRACT

In this revision 4 native species are recorded from Australia, among which 3 are new to science. Of the well-known *Aponogeton elongatus* F. v. M. *ex* Bth. 3 new forms are distinguished. Furthermore one S. African species, *A. distachyon* L. *f.* is cultivated and to some extent naturalized in Victoria. A key is provided to these 5 species. A possible sixth species, probably provenant from Queensland, is in cultivation but is yet only known in sterile state.

Figures and an identification list of material studied are provided.

INTRODUCTION

Unlike Madagascar there is no recent overall publication of the Australian species o *Aponogeton*. As far as I know the only publication of that character was that of Bentham in his Flora Australiensis 7 (1878) 188. All later publications followed this basic work. Bentham distinguished two species, viz. one endemic, *A. elongatus* F. v. M. *ex* Bth., and one which was identified with the Asiatic *A. natans* (L.) Engler et Krause under the synonymous name *A. monostachyon* L. *f.*

In the present revision 5 species are recognized, of which 4 are endemic. Two of these, *A. bullosus* from Queensland and *A. hexatepalus* from West Australia are entirely new to science. The latter is extremely interesting as it has a complete perianth of 6 segments and is the only native Australian species with an inflorescence consisting of two spikes, a feature hitherto unknown in Australia. It is considered to be a primitive species. In the third species, *A. elongatus*, the most widely distributed of all, 3 new forms have been distinguished apart from the type variety. They seem to be more or less geographically defined. There is a possibility that *A. elongatus* occurs also in Papua, but this could not yet be confirmed. The fourth species, *A. queenslandicus*, occurs only in Queensland and was formerly erroneously identified with the SE. Asiatic *A. monostachyon* L. *f.*

The fifth species is the S. African *A. distachyon* L. *f.* which is introduced and to some extent naturalized in Victoria. It is inserted in the key but is further not considered and will be treated in the future revision of the African species.

One species (?) recently acquired for aquarium culture, probably provenant from Queensland, could not yet be identified, as the plants did not yet flower. They appeared to be proliferous. The young plants are produced on peduncle-like, spathed stalks; they tear the spathe, which remains attached at the base of the plantlet. It is almost certain that this plant is an *Aponogeton*. Flowering in viviparous species of *Aponogeton* is extremely

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Fig. 1. 1. *A. hexatepalus* v. Bruggen. — 2. *A. bullosus* v. Bruggen. — 3. *A. elongatus* F. v. M. *ex* Bth. — 4. *A. queenslandicus* v. Bruggen. All × 9. The letters behind the figures indicate: c. tepal or perianth, d. stamen, e. gynoecium, f. fruit, g. seed, h. embryo.

rare; in my cultures the viviparous *A. undulatus* Roxb., from India, flowered only once in 12 years.

Of the 4 native species and 3 forms distinguished I was able to cultivate *A. bullosus*, *A. elongatus* f. *elongatus*, *A. elongatus* f. *latifolius*, and *A. elongatus* f *longifolius*. Corms received of *A. queenslandicus* and *A. hexatepalus* appeared not to be viable.

It is remarkable to notice that all native Australian species of *Aponogeton* possess yellow or yellowish green flowers, a feature which is rather uncommon in the genus.

In the synonymy I have refrained to mention all references in Australian literature, as they appear not valuable, because either they refer only mere records and for the rest do not improve or supplement Bentham's treatment.

Acknowledgements. I would like to thank Mr. S. L. Everist at Brisbane, who generously provided me with living specimens of several species. In am also indebted to Dr. C. den Hartog at Leyden for sending material collected during his exploration in Australia, sponsored by the Netherlands Foundation for the Advancement of Tropical Science (WOTRO) in 1967. Sincere thanks are due to Miss H. I. Aston at South Yarra for drawing a map of the distribution of *A. distachyon* in Victoria. Moreover, she assisted me by localizing place names which could not be found on maps.

Furthermore, I am very much obliged to the directors of the following herbaria, from which I could borrow specimens, viz. the Queensland Herbarium, Brisbane (BRI), the Herbarium Australiense, Canberra (CANB), the Royal Botanic Gardens, Kew (K), the Rijksherbarium, Leyden (L), the Royal Botanic Gardens and National Herbarium, South Yarra (MEL), the National Herbarium of N.S.W. (NSW), and the Western Australia Herbarium (PERTH).

I am grateful to Dr. R. C. Bakhuizen van den Brink Jr, who prepared the Latin diagnoses of the new species and forms and to Miss R. van Crevel who made the excellent drawings. Finally most sincere thanks are due to Professor Dr. C. G. G. J. van Steenis again, without whose help this publication never would have been achieved.

KEY TO THE SPECIES

1. Inflorescence with 1 spike.
   2. Leaves nearly always floating. Ovary *c.* 3 times as long as thick. Seeds with a double testa. **1. A. queenslandicus**
   2. Leaves mostly submerged. Ovary *c.* 2 times as long as thick. Seeds with a simple testa.
      3. Leaves strongly bullate. Spathe nearly always persistent. Young infructescence cone-shaped fruit terminally beaked . . . . . **2. A. bullosus**
      3. Leaves flat or undulate. Spathe nearly always caducous. Infructescence always cylindrical; fruit laterally beaked . . . . . **3. A. elongatus**
1. Inflorescence with 2 spikes; leaves always floating.
   4. Leaves less than 1 cm wide, more than 20 times as long as wide. Tepals 6, greenish, less than 1 mm long. **4. A. hexatepalus**
   4. Leaves more than 1½ cm wide, *c.* 3 times as long as wide. Tepals 1, white, *c.* 15 mm long. — Native in S. Africa, introduced and to some extent naturalized in Victoria. . . . . **A. distachyon L.** *f.*

1. Aponogeton queenslandicus van Bruggen, *sp. nov.* — Type: Rockhampton, *Thozet s.n.* (MEL, 3 sheets, one indicated holotype, the others isotype; K, 1 sheet, indicated isotype). — **Figs 1: 4; 2; map 1.**

A. monostachyon (*non* L. *f.*) Bth., Fl. Austr. 7 (1878) 188; F. M. Bailey, Queensl. Fl. 6 (1902) 1707.

Tuber globosum vel obovoideum, usque ad 2½ cm ⌀, circum apicem crescentem strigosum (reliquia petiolorum delapsorum). *Folia* primaria probabiliter submersa ac

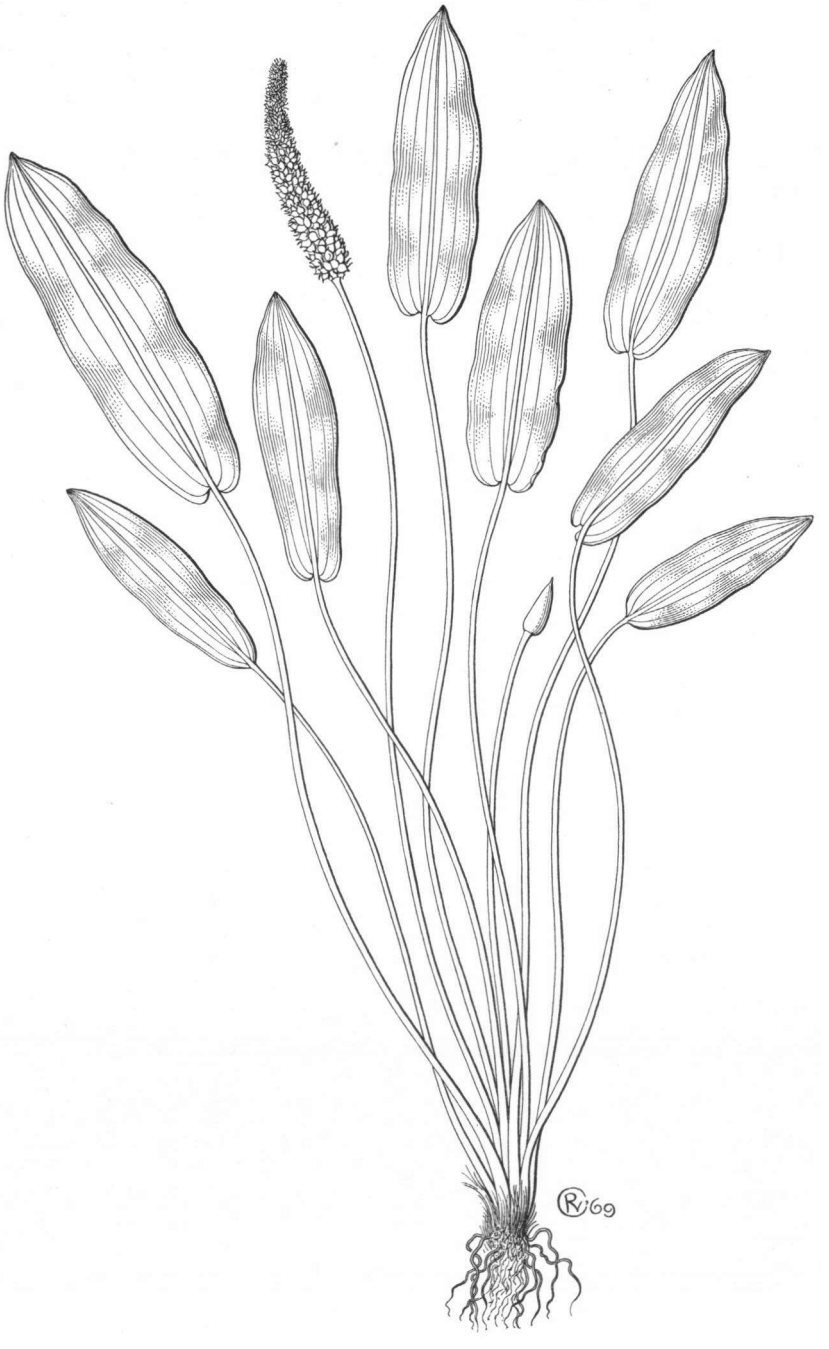


Fig. 2. *A. queenslandicus* v. Bruggen. Habit, × ½. (*Johnson 2619*).

fugacia, herbacea; lamina lanceolata, usque ad 20 × 3½ cm, basi apiceque anguste cuneata; nervi primarii paralleli 7; petiolus usque ad 10 cm longus. *Folia* secundaria natantia, dilute viridia, anguste ovata, 5—11 × 0.8—3 cm, basi cordata, raro rotunda, apice cuneata, vertice obtuso; nervi primarii paralleli (5—)7(—9); petiolus 5—25 cm longus. *Pedunculus* 10—30 cm longus, inflorescentiam versus non incrassatus. Spatha conica, *c.* 1½ cm longa, caduca, raro persistens. *Inflorescentia* 1-spicata, spica usque ad 9 cm longa, valde densiflora, raro sat laxiflora; *flores* omnifarii. Tepala 2, obovata, saepe unguiculata, 1½—2 × ½—1 mm, 1-costata, lutea. Stamina 6, usque ad 3 mm longa, filamentis basin versus vix dilatatis. Ovaria 3(—4), 2—3 × ½—¾ mm; ovula c. 8. *Infructescentia* usque ad 10 cm longa. *Fructus* usque ad 8 × 5 mm, rostro terminali saepe curvato. *Semina* usque ad 3 × 1 mm; testa duplex, exterior laxa translucida reticulato-venosa, interior brunnea, valde embryonem amplectens. *Embryo* c. 2½ × ¾ mm; plumula absens.

Tuber globular or obovoid, up to 2½ cm ⌀; strigose all round the growing apex (remains of old petioles). *Primary leaves* probably submerged, herbaceous and fugacious; blade lanceolate, up to 20 by 3½ cm; base and apex narrowly cuneate; parallel main nerves 7; petiole up to 10 cm. *Secondary leaves* floating, light green, narrowly ovate, 5—11 by 0.8—3 cm; base cordate, rarely rounded, apex cuneate with a blunt tip; parallel main nerves (5—)7(—9); petiole 5—25 cm. *Peduncle* 10—30 cm, not thickening towards the inflorescence. Spathe cone-shaped, *c.* 1½ cm, caducous, rarely persistent. *Inflorescence* with 1 spike of up to 9 cm, very densely, seldom rather laxly flowered. *Flowers* turned towards all directions. Tepals 2, obovate and often clawed, 1½—2 by ½—1 mm, 1-nerved, yellow. Stamens 6, up to 3 mm; filaments hardly widened towards the base. Ovaries 3(—4), 2—3 by ½—¾ mm; ovules *c.* 8. *Infructescence* up to 10 cm. *Fruit* up to 8 by 5 mm, with a terminal, often curved beak. *Seeds* up to 3 by 1 mm; testa double, outer one loose, transparent and reticulately veined, inner one brown, closely fitting the embryo. *Embryo* *c.* 2½ by ¾ mm, plumule absent.

QUEENSLAND. Mulligan River, *Vogan s.n.* (MEL); Thargomindah, *Mrs. Spencer s.n.* (MEL); Cunnamulla, Gilruth Plains, *McKee 10350* (BRI, CANB, NSW); Hannaford, *White 11306* (BRI); Warrego, *Mrs. Cotton s.n.* (MEL); Rockhampton, *O'Shanesy 111* (MEL), *Boorman s.n.* (NSW), *Thozet s.n.* (K, MEL); Gainsford, *Bowman s.n.* (MEL); Fitzroy River, *Johnson 2619* (BRI); Townsville, Alligator Creek, ? (BRI); Townsville, Common, *Trapnell s.n.* (BRI); Ayr, *Michael 1520* (BRI); Burdekin River, *Seton 16* (BRI), *Bowman 378* (MEL); Herbert's Creek, *Bowman s.n.* (MEL); Gilbert River, *Armit 528* (MEL); Fait River, *Birch & Zelling s.n.* (MEL).

Ecology: Only in temporary waters, melon-holes, sometimes in brigalow-wilga scrub, on flood plains or marginal swamp land, 1—2 ft deep, in sunny position and clay bottom. Does not occur in deeper or permanent waters. By the natives the plants were called *Cob-oo-ree* (wild potato) and the tubers were eaten roasted. Collected in flower in January, February, April, August, and December.

Notes. In Australian literature *A. queenslandicus* has hitherto always been referred to as *A. natans* (L.) Engler & Krause under the synonymous name *A. monostachyon* L. *f.*, because of the floating leaves. *A. natans*, however, has white or pink inflorescences, and fruits with a very long, distinctly lateral, straight beak. Therefore both species can easily be distinguished.

I have seen but one specimen with presumably submerged leaves. It was collected in Alligator Creek, Townsville in January 1960; the collector is unknown.

2. Aponogeton bullosus van Bruggen, *sp. nov.* — Type: Ravenshoe, Millstream River, 15-11-1967, *den Hartog 1049* (L, 3 sheets, one indicated holotype, the others isotype). — **Figs 1: 2; 3; map 1.**

Fig. 3. *A. bullosus* v. Bruggen. Habit, × ½ (*den Hartog 1049*).

Tuber elongatum, 1—2 cm ⌀. *Folia* submersa; lamina fasciata, 7—30(—50) × 1—2(—2½) cm, valde bullata, fusco-viridis (folia novella rubescentia), basi apiceque anguste cuneata, vertice obtuso; costa lata in utroque latere nervis parallelis 2 (1, 3) comitata; petiolus 1—10(—15) cm longus. *Pedunculus* gracilis, 8—30 cm longus, c. 2 mm ⌀, inflorescentiam versus haud vel vix incrassatus. Spatha usque ad 1½ cm longa, persistens (interdum caduca); *inflorescentia* interdum submersa; spica solitaria, sat laxiflora, usque ad 5 cm longa. *Flores* omnifarii. Tepala 2, obovata vel spathulata, ¾—1¼ × ¾—1 mm, lutea, 1-costata. Stamina 6, c. 1½ mm longa, filamentis basin versus subdilatatis. Ovaria (2—)3(—4), 1—1½ × ½—¾ mm; ovulis c. 6. *Infructescentia* c. 5 cm longa, saepe conica. *Fructus* 5—6 × 3—4 mm, rostro terminali. *Semina* c. 2½ × 1 mm, testa simplici; plumula non visa (an semina immatura?).

Tuber elongate, 1—2 cm ø. *Leaves* submerged; b ade strap-shaped, 7—30(—50) by 1—2(—2½) cm; strongly bullate, dark brownish green (young leaves reddish); base narrowly cuneate, apex narrowly cuneate with a blunt tip; midrib wide with 2 (rarely 1 or 3) parallel nerves on either side; petiole 1—10(—15) cm. *Peduncle* slender, 8—30 cm long, *c.* 2 mm ø, not or hardly thickened towards the inflorescence. Spathe up to 1½ cm, persistent (sometimes caducous); *inflorescence* sometimes submerged; spike solitary, rather laxly flowered, up to 5 cm. *Flowers* turned towards all directions. Tepals 2, obovate or spatulate, ¾—1½ by ¾—1 mm, yellow, 1-nerved. Stamens 6, *c.* 1½ mm; filaments slightly widened towards the base. Ovaries (2—)3(—4), 1—1½ by ½—¾ mm; ovules *c.* 6. *Infructescence c.* 5 cm, often cone-shaped. *Fruits* 5—6 by 3—4 mm with a terminal beak. *Seeds c.* 2½ by 1 mm, testa single; plumule absent (seeds unripe?).

QUEENSLAND. Atherton Tableland: Millstream River near Ravenshoe, *den Hartog 1049* (L); Ravenshoe *Flecker 5516* (BRI); Millaa Millaa, *Bick s.n.* (BRI); Millaa Millaa Falls, *Boyes s.n.* (BRI); Theresa Creek Millaa Millaa, *Trapnell s.n.* and *251* (BRI); Mitcha Creek, *Stephens 10584* (NSW); Cochable Creek, Forestry Reserve 756, *Hyland AFO/2775* (BRI); Russell River, *Trapnell 109* (BRI).

Ecology: As far as I know *A. bullosus* only occurs on the Atherton Tableland; it is the only species of *Aponogeton* found there. The plants usually grow in fast running creeks and cataracts, fed by mountain-streams with rather cold water, both in sunny and in shady positions. The tubers are rooted between stones in sand, sometimes even in holes in boulders. The peduncles are often insufficiently long to reach the surface; the inflorescences then remain submerged, but seeds are nevertheless produced. Flowering time June—December. Field data I owe to Dr. C. den Hartog and Mr. P. Tsang.

Notes. In Australia *A. bullosus* has nearly always been identified as *A. loriae* Martelli *in sched.* Until now I have not been able to locate the type of the latter, so that I could not compare the two species. The drawing of *A. loriae* in Nuovo Giornale Botanico Italiano 3 (1896), however, shows some distinct differences with *A. bullosus*. Moreover, none of the other collections from Papua I have seen is identical with *A. bullosus*. I therefore do not consider them conspecific.

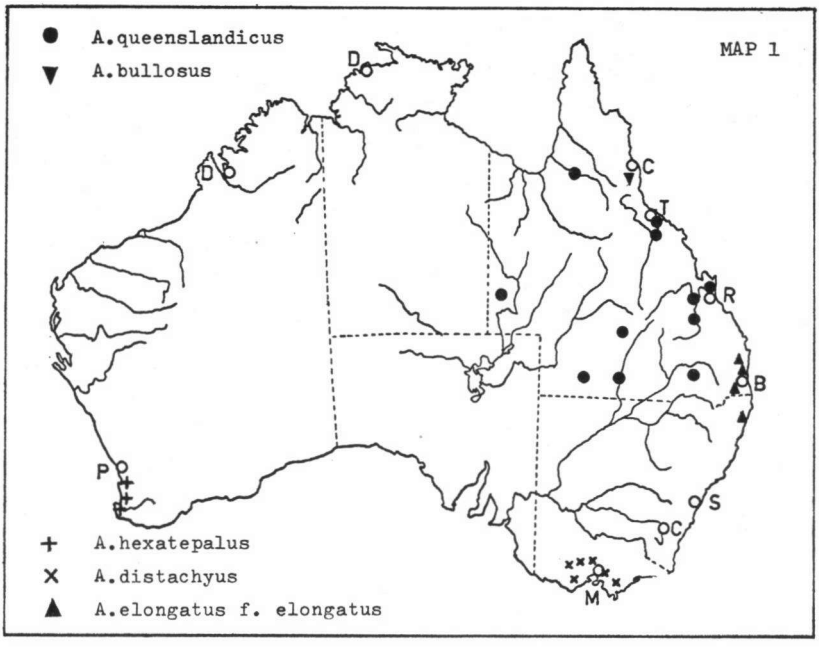
A. bullosus is closely related to *A. elongatus* and it is not always easy to distinguish between these two species. The persistent spathe is not a good characteristic as the spathe of *A. elongatus* is sometimes also persistent, whereas the spathe of *A. bullosus* is not rarely caducous. When *A. bullosus* is dried under a firm pressure the leaves may flatten completely, which under certain circumstances can make the identification nearly impossible.

It seems that due to the activities of irresponsible collectors of aquarium plants some localities have completely been stripped of this species. If this is true the collecting of it should be prohibited or at least put under official control.

3. Aponogeton elongatus F. v. M. *ex* Benth., Fl. Austr. 7 (1878) 189; Engler & Krause, Pfl. R. Heft 24 (1906) 11. — Type: *F. von Mueller s.n.*, SE. Queensland, Brisbane River, Dec. 1856 (K). — **Figs 1: 3; 4; 5; maps 1—2.**

A. crispus (*non* Thunb.) F. v. M., Fragm. Phyt. Austr. 8 (1869) 216.

Tuber ovate or elongate, up to 2½ cm ø, seldom echinate all round the growing apex. Submerged *leaves* bright green, sometimes brownish, flat or undulate, 2½—55 by ½—5 cm; base (very narrowly) cuneate or rounded, tip narrowly cuneate or rounded; midrib wide with 2—4 parallel nerves on either side; petiole 1—50 cm. Floating *leaves* 10—15 by 1½—4 cm; base cordate, truncate, rounded, or cuneate, apex rounded or cuneate, sometimes emarginate. *Peduncle* up to 1½ m; thickening towards the inflorescence to *c.* 4 mm ø. Spathe cone-shaped, mostly caducous, up to 1½ cm; *inflorescence* with


MAP 1
A.queenslandicus
A.bullosus
A.hexatepalus
A.distachyus
A.elongatus f. elongatus
D
D
C
T
R
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S
JC
M

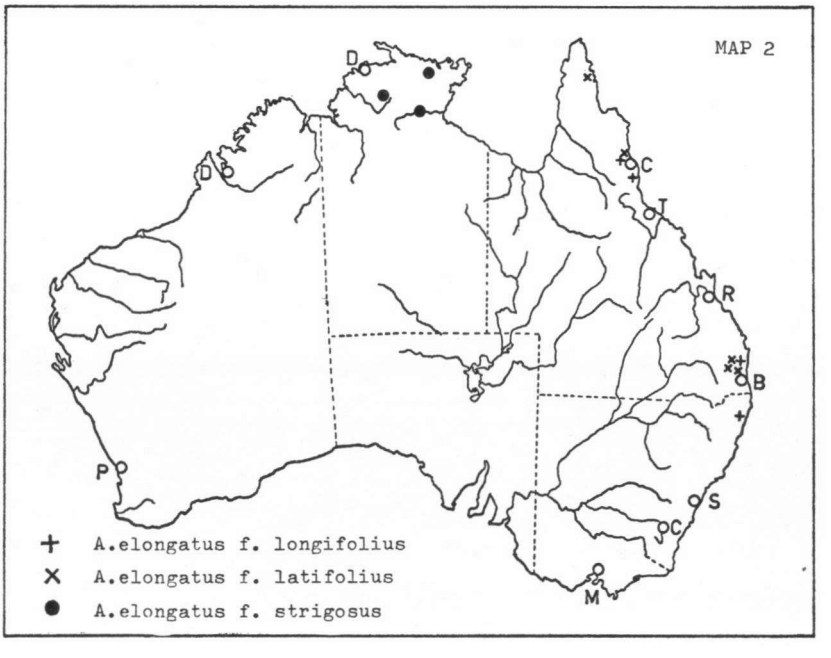
MAP 2
A.elongatus f. longifolius
A.elongatus f. latifolius
A.elongatus f. strigosus
D
D
C
T
R
B
P
S
JC
M

Plate 1. Above: temporary pond near Darradup with *Aponogeton hexatepalus* v. Bruggen, *Scirpus cf. fluitans*, and *Ranunculus sp.*, 28-8-1967. (Photograph C. den Hartog).
Below: close-up of *Aponogeton hexatepalus* v. Bruggen in temporary pond at Trigwell, 2 miles from Boyanup, 26-8-1967. (Photograph C. den Hartog.)

1 spike; spike up to 20 cm, rather or very laxly flowered, fragrant. *Flowers* turned towards all directions. Tepals 2, yellow, obovate, 1½—2½ by ¾—1½ mm, 1-nerved. Stamens 6, 2—2½ mm; filaments slightly widening towards the base. Ovaries 3, 1¾—3 by 1—2 mm, with a terminal or lateral stigma; ovules 4—8. *Fruits* 5—6 by 3—4 mm, laterally beaked. *Seeds* with a simple testa. *Embryo c.* 4 by 1¾ mm; plumule attached at ± ⅓ of the height of the embryo and fitted in a groove.

AUSTRALIA. NE. New South Wales, E. and N. Queensland, N. Northern Territory, and N. Western Australia.

Forms. A. elongatus is a very variable species. It varies mainly in the shape of the leaves and in the dimensions of the leaf blades and the petioles. As far as I have seen now, 4 forms can be distinguished, but, no doubt, new forms may be discovered in the future. A thorough investigation in the field and cultivation of specimens of many localities is desirable. I have got an insight in the forms of *A. elongatus* by cultivating much material, and the descriptions given below have been partly based on these cultivated specimens and compared with the sheets.

The 4 forms are not always clearly distinguishable as the leaves sometimes assume an intermediate shape. For a certain identification at least a complete specimen with full-grown leaves is needed. It is desirable to have the disposal of several specimens. The identification of the sheets was not always easy for lack of complete material. Sometimes I had to choose and I may have made wrong decisions. Of some sheets I was not able to determine to what form they belong. These collections are from Kimberley Downs (Western Australia), Roper- and van Alphen (= Calvert) River (Northern Territory), Mossman and Moreton Bay (Queensland), and Richmond River and Grafton (New South Wales).

KEY TO THE FORMS

1. Tuber not echinate all round the growing apex.
   2. Leaves more than 10 times as long as wide.
      3. Leaves 10—15 times as long as wide, petiole much shorter than the leaf blade . . **a. f. elongatus**
      3. Leaves about 20 times as long as wide, petiole about as long as the leaf blade **b. f. longifolius**
   2. Leaves less than 10 times as long as wide . . . . . **c. f. latifolius**
1. Tuber echinate all round the growing apex . . . . . **d. f. strigosus**

a. f. elongatus. — Fig. 4c; map 1.

Submerged leaves 15—30 by 1.2—2½ cm, undulate; base narrowly cuneate, apex cuneate or rounded; parallel main nerves 5—9; petiole 4—15 cm. Floating leaves *c.* 10 by 1½—2 cm; base rounded or truncate, apex rounded; parallel main nerves 5.

AUSTRALIA. NE. New South Wales: Tintenbar, *Bauerlen s.n.* (NSW).-SE. Queensland: Brisbane River, *F. von Mueller s.n.*, type (K); Maroochy River, *Bailey s.n.* (BRI), *Trapnell s.n.* (BRI); Yandina,Maroochy River, *Trapnell s.n.* (BRI, L), *Whitehouse s.n.* (BRI); Gympie, *Bailey 73* (NSW).

Ecology: Back-waters with silty bottom in shady position.

Note. The type of *A. elongatus* consists of 2 inflorescences and 1 presumably immature leaf with incomplete petiole. Therefore I could not with certainty decide whether the type agrees with the form a or c. My choice was more or less arbitrary and may have been wrong.

b. f. longifolius van Bruggen, *f. nov.* — Type: from Innisfail District, N. Queensland, cultivated, coll. A. Rodd & O. Campbell, 18 Nov. 1967, NSW 97470. — **Fig. 4b; map 2.**

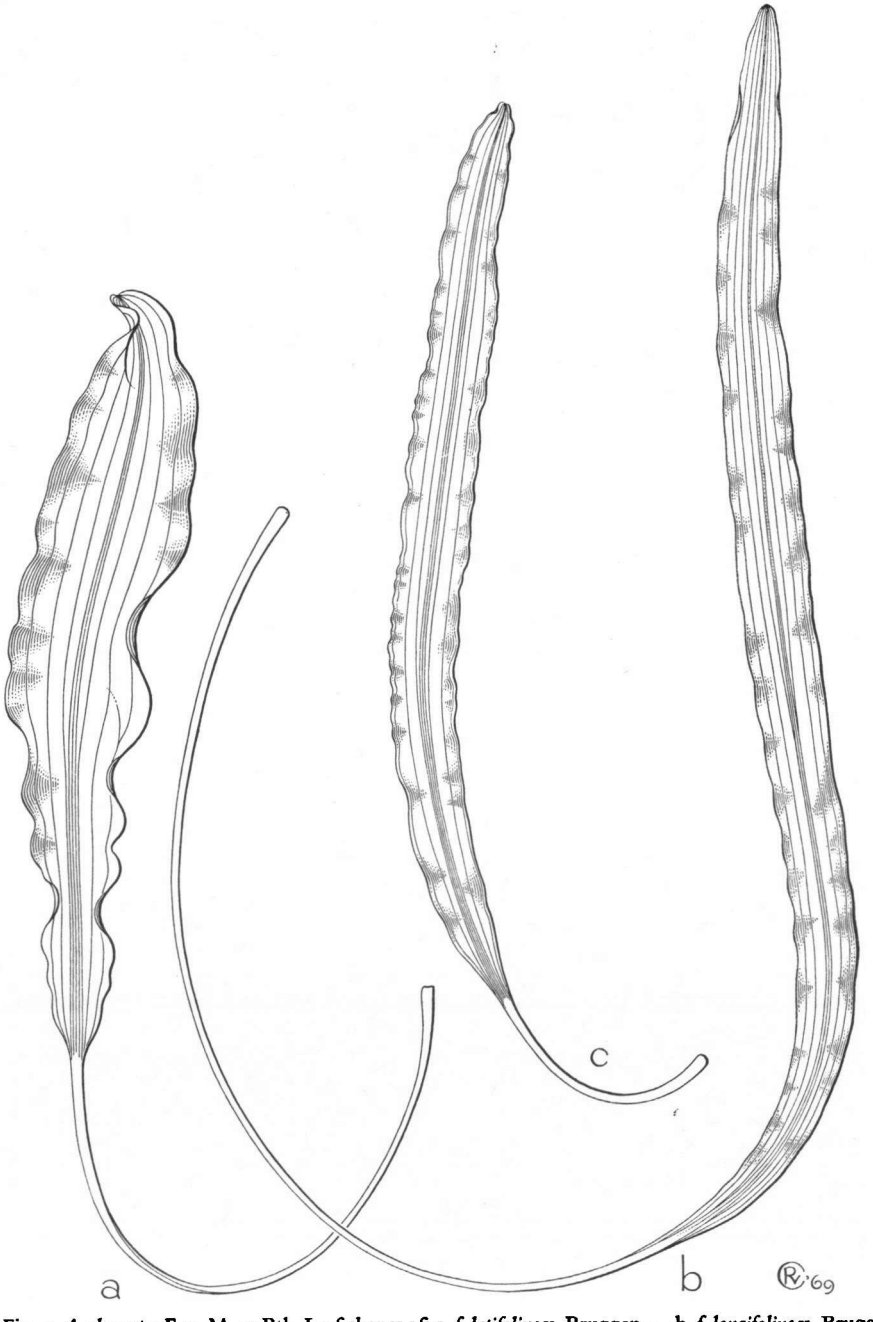

Fig. 4. *A. elongatus* F. v. M. *ex* Bth. Leaf-shapes of: a. *f. latifolius* v. Bruggen. — b. *f. longifolius* v. Bruggen — c. *f. elongatus*. All × ½. (drawn from living cultivated material).

Folia submersa usque ad 55 × 2½ cm, applanata vel undulata, apice anguste, basi valde anguste cuneata, obtusa; nervi primarii paralleli 7 vel 9; petiolus usque ad 50 cm longus. Folia natantia non visa.

Submerged leaves up to 55 by 2½ cm, flat or undulate; base very narrowly cuneate, apex narrowly cuneate with a blunt tip; parallel main nerves 7 or 9; petiole up to 50 cm. Floating leaves unknown.

AUSTRALIA. NE. New South Wales: Richmond River, *Rudder s.n.* (MEL).-E. Queensland: Maroochy *Bailey s.n.* (NSW); Innisfail, *Boyes s.n.* (BRI); North Johnston River, Innisfail, *van Bruggen 06.06* (L) Russell River, *Trapnell 110* (BRI); Cairns, Barron River, *den Hartog s.n.* (L).

Ecology: Near Cairns and Innisfail growing in the freshwater tidal section of rivers, together with *Vallisneria sp.* and *Najas tenuifolia*. Rooting in silty soil. No data of other localities available Flowering time at least June, July, November, and December.

c. f. latifolius van Bruggen, *f. nov.* — Type: Narangba, Sidling Creek, *Gillieatt 151*, 8-4-1964 (L, isotype in BRI). — **Fig. 4a; map 2.**

Folia submersa 8—40 × 1.2—5 cm, applanata vel undulata, basi anguste vel late cuneata, apice rotundata vel cuneata; nervi primarii 7 vel 9; petiolus 10—25(—45) cm longus. Folia natantia usque ad 15 × 4 cm, basi cordata, apice rotundata, interdum emarginata; nervi primarii paralleli 7.

Submerged leaves 8—40 by 1.2—5 cm, flat or undulate; base narrowly or broadly cuneate, apex rounded or cuneate; parallel main nerves 7 or 9; petiole 10—25(—45) cm. Floating leaves up to 15 by 4 cm; base cordate, apex rounded, sometimes emarginate; parallel main nerves 7.

AUSTRALIA. E. Queensland: Petrie, Creek leading to Lake Kurwombah, *van Royen 9305* (L); Petrie, Pine River, *Blake 2060* (BRI); Kilcoy, Sheep Station Creek, *Trapnell s.n.* (BRI, CANB), *Whitehouse s.n.* (BRI); Narangba, Sidling Creek, *Gillieatt 151* (BRI, L); Nambour, Petrie Creek, *Trapnell s.n.* (BRI, CANB); Cairns, Barron River, *den Hartog s.n.* (L); Iron Range, *Brass 19080* (L).

Ecology: Rain-forest streams, fresh-water tidal section of rivers, still waters. Rooting in sandy mud or very silty soil, in sunny and shady positions. Obviously flowering from November to June.

d. f. strigosus van Bruggen, *f. nov.* — Type: Edith Falls road, *c.* 3 miles E. of Stuart Highway, *Adams 1658*, 11-12-1966 (L, isotype in NSW). — **Fig. 5; map 2.**

Tuber circum apicem crescentem strigosum. Folia submersa quoad dimensionem valde variabilia, profundis obnoxia, 2½—40 × ½—5 cm, applanata vel undulata, basi apiceque anguste cuneata; nervi primarii paralleli 5—9. Folia natantia usque ad 11 × 1.7 cm, basi rotundata vel cuneata, apice cuneata; nervi primarii paralleli 5—7.

Tuber strigose all round the growing apex. Submerged leaves very variable in size depending on the waterdepth, 2½—40 by ½—5 cm, flat or undulate; base narrowly cuneate, apex narrowly cuneate; parallel main nerves 5—9. Floating leaves up to 11 by 1.7 cm; base rounded or cuneate, apex cuneate; parallel main nerves 5 or 7.

AUSTRALIA. Northern Territory, Arnhem Land: Roper River, *F. von Mueller s.n.* (K, MEL); Edith Falls road, *c.* 3 miles E. of Stuart Highway, *Adams 1658* (L, NSW); Gulbuwangai River, *Peterson s.n.* (NSW).

Ecology: Locally frequent in permanent fresh water. In shallow pools the submerged leaves are very small, and floating leaves appear. In deep water no floating leaves are developed and the submerged leaves reach huge dimensions. From September to January

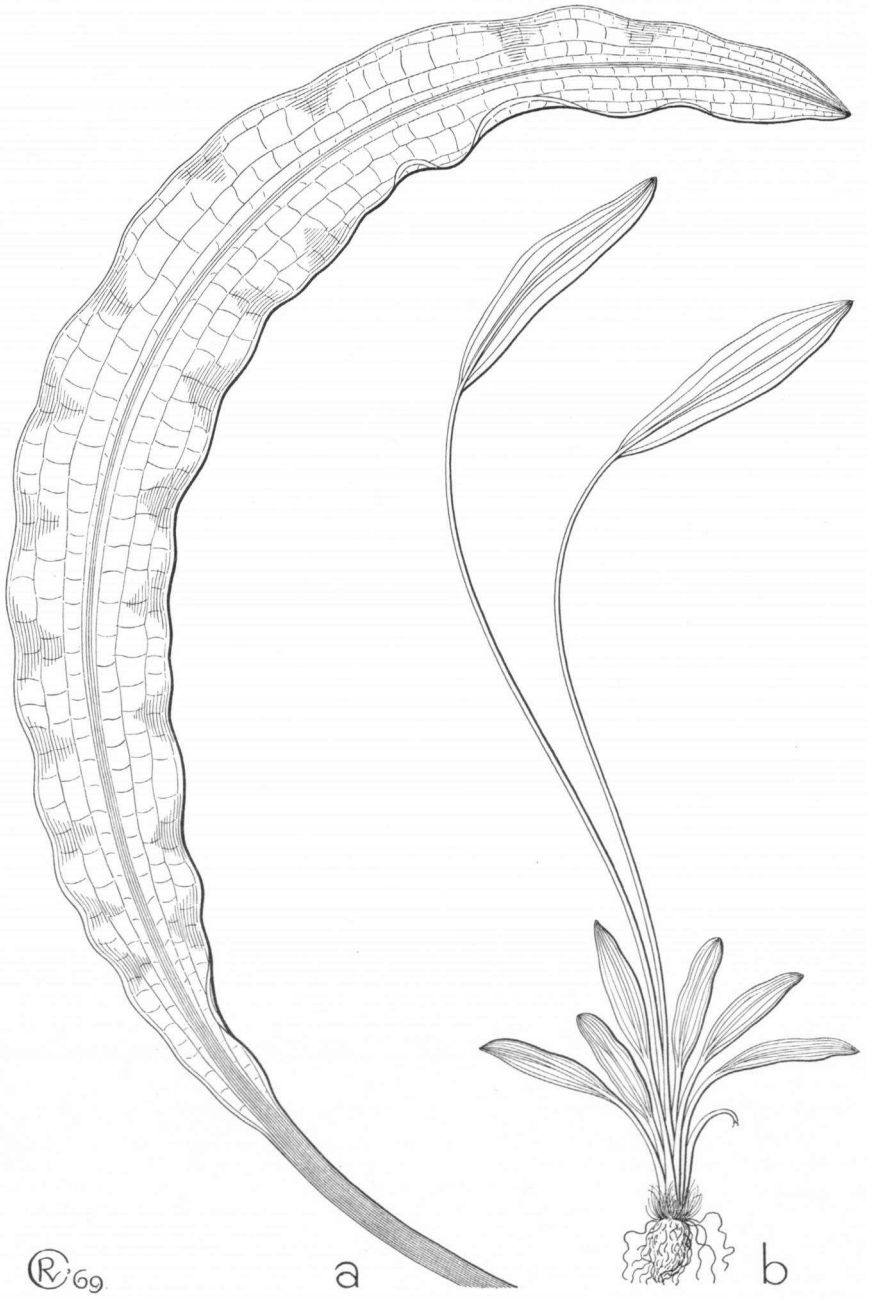

Fig. 5. *A. elongatus* F. v. M. *ex* Bth. *f. strigosus* v. Bruggen. a. Leaf shape from deep water, b. habit from shallow water, both × ½. (a. *F. von Mueller s.n.* in K, b. *Adams 1658*).

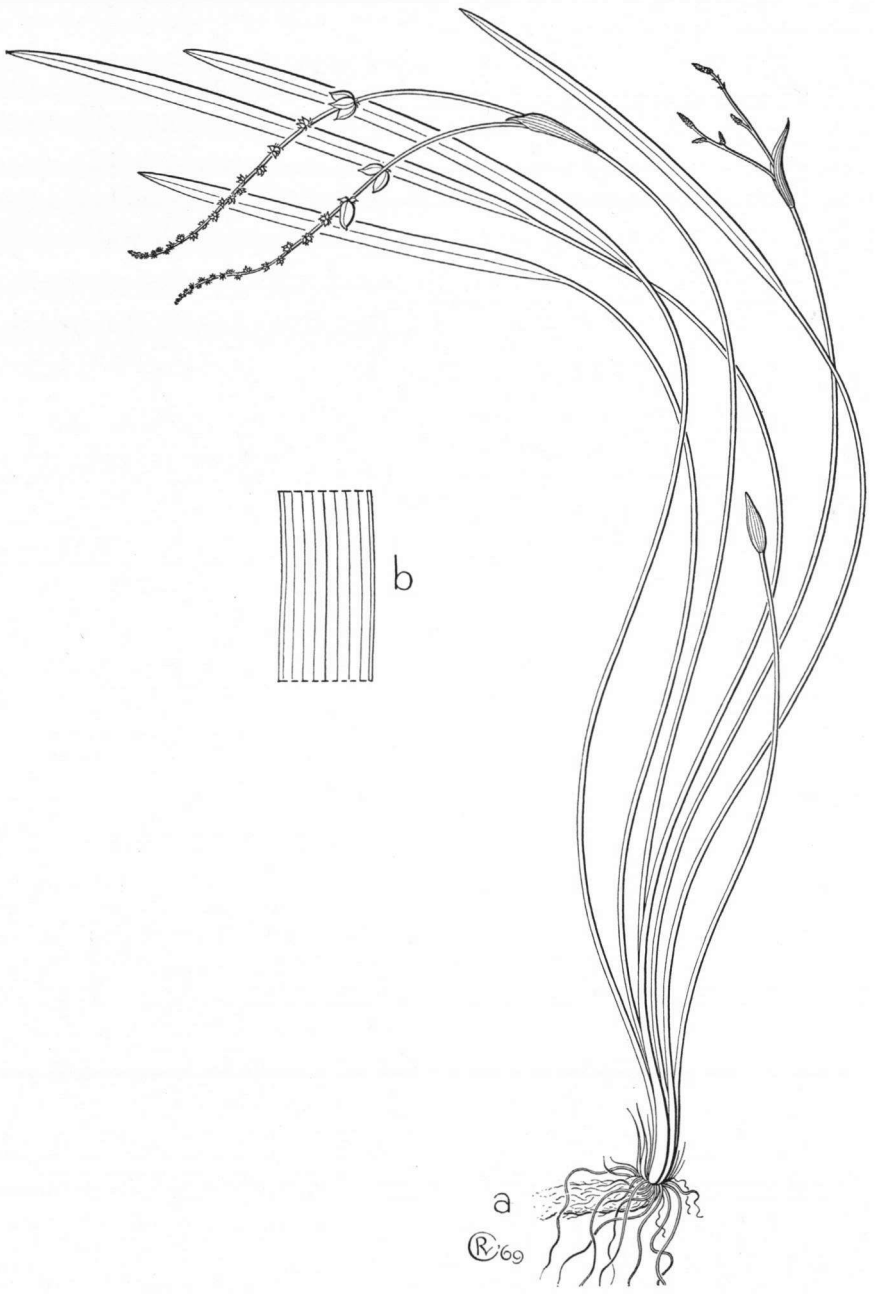

Fig. 6. *A. hexatepalus* v. Bruggen. a. Habit, × ½, b. venation in detail, × 2. (a. *den Hartog 203*, b. *Royce 3777*).

the tubers are (cooked) a very important and prolific food source for the aborigines. Native name *Ngyum-Ngyum* (Peterson *in sched.*). Collected in flower in July, November, and December.

Note. There is a great difference between the collection of F. von Mueller and the other ones. The first has no floating leaves but very small and very large submerged leaves. The other collections only have small submerged leaves and floating leaves. The observation of Peterson that in deep water the submerged leaves become very large made me decide to consider both types as extremes of one form.

4. Aponogeton hexatepalus van Bruggen, *sp. nov.* — Type: Trigwell, 26-8-1967, *den Hartog* 203 (L, 2 sheets, one indicated holotype, the other isotype). — **Figs 1: 1; 6; map 1; plate 1.**

Tuber elongatum, usque ad 5 cm longum et 1 cm ⌀, brunneum. *Folia* natantia, fasciata, usque ad 20 cm × 3—6 mm, basi apiceque anguste cuneata, obtusa; nervi primarii paralleli 5—9, inconspicui; petiolus 15—40 cm longus. *Pedunculus* gracilis, 20—40 cm longus, c. 1½ mm ⌀, inflorescentiam versus non incrassatus. Spatha 2—3 cm longa, persistens, amplexicaulis; *inflorescentia* e spicis duabus interdum ramosis composita, spicis usque ad 17 cm longis, valde laxifloris; rhachis alba, pars inferior (4—8 cm) nuda. *Flores* minuti omnifarii. Tepala 6, transverse late obovata, ½—1 × ¾—1¼ mm, 1-costata, viridia. Stamina 6, c. 1½ mm longa, filamentis basin versus vix elatis. Ovaria 3 (4), 1¼ × ¾ mm; ovula 2. *Fructus* c. 1 cm × 5 mm, viridis, rostro terminali. *Semina* testa simplici; *embryo* c. 7 × 2 mm; plumula in $^1/_6$ longitudinis embryonis insidens atque in sulco anguste apta, c. 1½ mm longa.

Tuber elongate, up to 5 cm long and 1 cm ⌀, brown. *Leaves* floating, band-shaped, up to 20 cm by 3—6 mm; base narrowly cuneate, apex narrowly cuneate, blunt; parallel main nerves 5—9, indistinct; petiole 15—40 cm. *Peduncle* slender, 20—40 cm long, *c.* 1½ mm ⌀, not thickened towards the inflorescence. Spathe 2—3 cm, persistent, amplexicaulous; *inflorescence* with 2, sometimes branching, spikes of up to 17 cm, very laxly flowered; rachis white, lower part (4—8 cm) bare. *Flowers* very small, turned towards all directions. Tepals 6, transverse broadly obovate, ½—1 by ¾—1¼ mm, green, 1-nerved. Stamens 6, *c.* 1½ mm, filaments hardly widening towards the base Ovaries 3(—4), 1¼ by ¾ mm; ovules 2. *Fruits* ± 10 by 5 mm, with a terminal beak, green. *Seeds* with a single testa; *embryo* ± 7 by 2 mm; plumule attached at one sixth of the height of the embryo, *c.* 1½ mm long and fitted in a narrow groove.

WEST AUSTRALIA. SW. Australia: Trigwell, *c.* 2 miles S. of Boyanup, *den Hartog 203* (L); Darradup, *c.* 30 miles S. of Busselton, *den Hartog 265* (L); Pinjarra, *den Hartog 166, 517* (L); Boyanup, *Royce 3777, 4344* (PERTH).

Ecology: Common, sometimes even very numerous, in small, 30—50 cm deep, temporary ponds, which contain water during only 3 or 4 months a year. The bottom of these waters is often densely covered with perennial land plants which endure inundation very well. The tubers are rooted vertically in loamy soil, which becomes very dry in summer. The plants grow together with *Cygnogeton sp.* and *Ottelia ovalifolia*. The total hardness of the water was at best 1° German hardness. Flowering time at least August and September. Field data mentioned provided by Dr. C. den Hartog.

Note. A. hexatepalus is the first *Aponogeton* ever recorded from Southwest Australia. Moreover, it is the first native Australian species with a forked inflorescence. By its peculiar inflorescences and its flowers with 6 tepals it can easily be distinguished from all other known species. In fact a close relationship with any other species of *Aponogeton* does not seem probable.

IDENTIFICATION LIST

In this list collectors' names have been arranged alphabetically. Specimens without number are indicated with '*s.n.*' and provided with the date of collection if any was mentioned. All collections are provided with the standard abbreviation of the Herbarium in which I studied them; type-collections are indicated.

Adams 1658 (type, L, NSW): *3d*; Armit 528 (MEL): *1*.
Bailey s.n. (1-3-1891, BRI): *3a*; s.n. (NSW): *3b*; 73 (NSW): *3a*; Bauerlen s.n. (10-1894, NSW): *3a*; Bick s.n. (BRI): *2*; Birch & Zelling s.n. (1892, MEL): *1*; Blake 2060 (BRI): *3c*; Boorman s.n. (8-1912, NSW): *1*; s.n. (11-1912, NSW): *3*; Bowman s.n. (MEL): *1*; s.n. (1870, MEL): *1*; 378 (MEL): *1*; Boyes s.n. (BRI): *2*; s.n. (12-1958, BRI): *3b*; Brass 19080 (L): *3c*; van Bruggen 06.06: *3b*.
Cheel 11 (NSW): *3*; Cotton s.n. (1887, MEL): *1*.
Dietrich 79 (MEL): *1*.
Fawcett s.n. (MEL): *3*; Fitzgerald 1054 (PERTH): *3*; 1382 (PERTH): *3*; Flecker 5516 (BRI): *2*.
Gardner 9659 (PERTH): *3*; Gillieatt 151 (type, BRI, L): *3c*.
Den Hartog s.n. (11-1967, L): *3b*; s.n. (11-1967, L): *3c*; 166 (L): *4*; 203 (type, L): *4*; 265 (L): *4*; 517 (L): *4*; 1049 (type, L): *2*; Hyland AFO/2775 (BRI): *2*.
Johnson 2619 (BRI): *1*.
McKee 10350 (BRI, CANB, NSW): *1*; Michael 1520 (BRI): *1*; von Mueller s.n. (K, MEL): *3*; s.n. (15-7-1856, K, MEL): *3d*; s.n. (12-1856, type, K): *3a*.
Peterson s.n. (11-1966), NSW): *3d*.
Rodd & Campbell s.n. (18-11-1967, L): *3c*; s.n. (18-11-1967, type, NSW): *3b*; Royce 3777 (PERTH): *4*; 4344 (PERTH): *4*; van Royen 9305 (L): *3c*; Rudder s.n. (1885, MEL): *3b*.
Seton 16 (BRI): *1*; O'Shanesy 111 (MEL): *1*; Spencer s.n. (1885, MEL): *1*; Spencer & Gilruth s.n. (1911, MEL): *3*; Stephens 10584 (NSW): *2*.
Thiel s.n. (6-1961, BRI): *3*; Thornton s.n. (MEL): *3*; Thozet s.n. (type, K, MEL): *1*; Tillman s.n. (5-1965, NSW): *3c*; Trapnell s.n. (6-2-1957, BRI, CANB): *3c*; s.n. (20-3-1960, BRI): *3a*; s.n. (20-3-1960, BRI, CANB): *3c*; s.n. (3-1964, BRI): *2*; s.n. (4-1964, BRI): *1*; s.n. (4-1964, BRI, L): *3a*; 109 (BRI): *2*; 110 (BRI): *3b*; 251 (BRI): *2*.
Vogan s.n. (1889, MEL): *1*.
White 11306 (BRI): *1*; Whitehouse s.n. (11-1957, BRI): *3a*; s.n. (1-1958, BRI): *3c*.