

**A DISCUSSION OF THE EHRHARTEAE (GRAMINEAE) WITH SPECIAL
REFERENCE TO THE MALESIAN TAXA FORMERLY INCLUDED IN
MICROLAENA**

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SUMMARY

The genera *Microlaena* R. Br., *Petriella* Zotov, and *Tetrarrhena* R. Br. are included in *Ehrharta* Thunb. (Gramineae-Ehrharteae), which necessitates four new combinations in the latter. In Malesia *Ehrharta* is represented by two taxa originally included in *Microlaena*: *E. diplax* F. v. Muel. var. *giulianettii* (Stapf) L. P. M. Willemse (*M. giulianettii* Stapf) and *E. stipoides* Labill. var. *stipoides* [*M. stipoides* (Labill.) R. Br. var. *stipoides*]. Descriptions of and notes on these taxa are given.

INTRODUCTION

In the course of a revision of the genus *Microlaena* R. Br. for the Flora Malesiana it became apparent that its delimitation against the South African genus *Ehrharta* Thunb. is artificial. Nevski (1937) included both genera together with *Tetrarrhena* R. Br., *Heterachne* Benth., *Brylkinia* F. Schmidt and *Megalachne* Steud. in the tribe Ehrharteae Nevski. Today the latter three genera are usually included in other tribes: *Heterachne* in the Eragrosteae (Hubbard, 1936; Pilger, 1954), *Brylkinia* in the Brylkinieae (Tateoka, 1960) and *Megalachne* in the Festuceae (Pilger, 1954; Tateoka, 1963). After removal of these genera the Ehrharteae consist of *Ehrharta*, *Microlaena*, *Tetrarrhena* and *Petriella* Zotov, the latter an illegitimate name for a genus consisting of two species endemic in New Zealand. A study of *Petriella* and *Tetrarrhena* revealed that these genera could not be delimited satisfactorily, neither against each other, nor against *Ehrharta* and *Microlaena*.

The Ehrharteae are diagnosed as follows: *spikelets* pedicelled, laterally compressed, 3-flowered; *rachilla* articulating above the glumes; the lower two *florets* sterile, epaleate, the upper floret bisexual, paleate. Because of the resemblance in these morphological characters most earlier authors have treated the Ehrharteae as part of the Phalaridae (Bentham, 1878; Bentham & Hooker, 1883; Bews, 1929; Hackel, 1887; Pilger, 1954; Rossberg, 1935 and Stapf, 1898) and some others (Avdulov, 1931; Buchanan, 1880 and Gardner, 1952) as belonging to the Oryzeae.

The differences between the Phalaridae s.s. and the Ehrharteae are corroborated by the features of the chromosomes (Avdulov, 1931), leaf epidermis (Prat, 1936), and anatomy of the embryo (Reeder, 1957). These characters suggest that the Phalaridae s.s. are related to the Aveneae and that the genera of the Ehrharteae are quite different from such festucoid grasses (Tateoka, 1963). The Ehrharteae and Oryzeae are apparently

much more related but still differ considerably in the anatomy and histology of the leaf-blades (Tateoka, 1963) and in the structure of the spikelet. The results of Tateoka's studies of the anatomy and histology of leaf-blades of the Oryzaceae and Ehrharteae suggest that the Ehrharteae are more closely related to the Arundinoideae than to the Oryzoideae (also according to Dr. S. A. Renvoize, Kew, pers. comm. to Dr. J. F. Veldkamp). In the view of Tateoka (1963) the Ehrharteae may be a distinct group without very close relatives.

As already mentioned the Ehrharteae are generally considered to contain four genera which might be diagnosed as follows:

Ehrharta: *Glumes* usually relatively large (up to 10 mm or more); *rachilla*-process present or absent; sterile *lemmas* glabrous or pubescent, with or without basal appendages, occasionally transversally wrinkled, apex rounded to more or less acute, sometimes acuminate to contracted into a terminal false awn; *palea* nerveless or 2-nerved; *stamens* 6 or 3 rarely 1 (Vickery, 1975). — About 25 species, all but one restricted to South Africa. (Note: *E. avenacea* Schult. & Schult. from Réunion having 2 stamens and a 1-nerved palea would be better placed in the next 'genus' and in the following discussion must be considered to have been included in *Microlaena*).

Microlaena: *Glumes* minute to short (usually less than 4 mm); *rachilla*-process usually absent, occasionally present in some specimens of *M. avenacea* and *M. giulianettii*; sterile *lemmas* glabrous except for the bearded stipe, without basal appendages, not wrinkled, apex contracted into a short to long false terminal awn; *palea* 1-nerved; *stamens* usually 4 or 2 but 3, 1, or 6 have also been observed in *M. stipoides* and *M. polynoda* (Clifford, 1962; Connor & Matthews, 1977). — About 5 species: Réunion, Malasia, Australia (incl. Tasmania), New Zealand and some islands in the Pacific (Fiji and Tahiti); elsewhere as a casual.

Tetrarrhena: *Glumes* minute to short (less than 5 mm); *rachilla*-process absent; sterile *lemmas* glabrous, without basal appendages, not wrinkled, apex rounded to acuminate; *palea* 1-nerved; *stamens* usually 4, one species (*T. oreophila*) with 2 stamens. — Species 5 or 6 (B. K. Simon, 1978): Tasmania and South and West Australia.

Petriella: *Glumes* short (2.0–3.5 mm); *rachilla*-process more or less developed; sterile *lemmas* glabrous except for the bearded stipe, without basal appendages, not wrinkled, apex acuminate to contracted into a short terminal false awn; *palea* 2-nerved; *stamens* always 2. — Two species in New Zealand.

Let us now consider each feature separately. The size of the glumes is quite variable within this tribe and certainly not useful as a generic character. In *Microlaena*, *Petriella* and *Tetrarrhena* the glumes are minute (less than 1 mm) to short (up to 5 mm) and in *Ehrharta* they vary considerably from rather short (2 mm) to relatively large (up to 10 mm or more). A rachilla-process is present in *Petriella*, in most species of *Ehrharta* and occasionally developed in *Microlaena avenacea* and *M. giulianetti*; it is lacking in *Tetrarrhena*, in some species of *Ehrharta*, and most of *Microlaena*, usually absent in *Microlaena avenacea* and *M. giulianettii*. Sterile lemmas are pubescent, or transversally wrinkled, or are provided with basal appendages in a number of species of *Ehrharta* but these features cannot be used to delimitate that genus as not all the species show one or

more of these features. The apex of the sterile lemmas shows a wide range of variability within this tribe: rounded in species of *Ehrharta* and *Tetrarrhena*, acuminate in some species of *Ehrharta* and one species of *Tetrarrhena* (*T. acuminata*), and contracted into a short or long terminal awn in some species of *Ehrharta* and in all of *Microlaena* and *Petriella*. More reliable characters are the number of nerves in the palea and the number of stamens. The palea is 1-nerved in *Microlaena* and *Tetrarrhena* and 2-nerved (or nerveless) in *Ehrharta* and *Petriella*. The number of stamens in *Ehrharta* is usually 6 or 3 and apparently rarely also 1 (Vickery, 1975); in *Microlaena*, *Petriella* and *Tetrarrhena* usually 4 or 2. In *Microlaena stipoides* and *M. polynoda* however 1, 3 and 6 stamens have also been observed.

The position of the stamens within the floret (in a chasmogamous spikelet with 4 stamens) is shown in fig. 3. They are situated in two whorls: an outer one reduced to a single, dorsal stamen and a complete inner one with 3 stamens (see also Rossberg, 1935: fig. a-g, pag. 8).

The Ehrharteae are largely confined to the southern hemisphere and its area can be divided into a western part including only the mainland of Africa and an eastern part including the Mascarenes, Malesia, Australia, New Zealand and some islands in the Pacific. In this way the species of *Ehrharta* s.s. are restricted to the western part and the species of *Microlaena*, *Petriella* and *Tetrarrhena* to the eastern part. In the eastern part *Petriella* is confined to New Zealand, *Tetrarrhena* to Australia while *Microlaena* covers the whole area from the Mascarenes to the Pacific.

Summarising I conclude that nearly all the characters on which these genera have been delimited against each other are too variable within the genera to be reliable for such delimitations. This is more or less understandable because characters such as the pubescence on the sterile lemmas or the length of the glumes generally tend to show a variation which becomes wider with an increasing number of species contained by a genus. The only reliable character remaining is the number of nerves of the palea more or less sustained by the number of stamens, by which three groups can be distinguished: *Ehrharta* s.s. (2 nerves and usually 6 or 3 stamens), *Petriella* (2 nerves and 2 stamens) and *Microlaena* together with *Tetrarrhena* (1 nerve and usually 4 or 2 stamens). However, this division is not correlated with any other character. It must be noted here that in the Gramineae both characters namely the presence of 2 or 4 stamens instead of the usual 3 or 6 and the presence of 1 median nerve in the palea instead of 2 lateral nerves are rather unusual features. Consequently it is not surprising that the various combinations between the number of stamens and the number of nerves in the palea have led to the distinction of regional groups of taxa, which except for these characters show few and ill-defined differences. Because of the overall similarity of the 4 'genera' and the lack of a number of exclusive correlated differences the overall homogeneity of this group seems to be better expressed by putting them together into one genus than to regard them as distinct genera.

Because the former genera have disjunct, not completely overlapping areas of which the distribution is somewhat correlated with the number of stamens and nerves in the palea one is of course tempted to recognize infra-generic taxa. These, however, would then be distinguished on the same arbitrary differences as before, which seems hardly a satisfying solution.

A discussion of the tribe would not be complete without a note on its authorship. Link

(1827) distinguished a 'divisio' Ehrhartineae at what we now would consider the tribal level. He used the same term, however, also at the subgeneric level which makes the Ehrhartineae and invalid name according to Art. 33.4. Although Butzin (1973, p. 114) grudgingly accepted Link's supra-generic taxa, the first to describe the tribe Ehrharteae was Nevski (1937).

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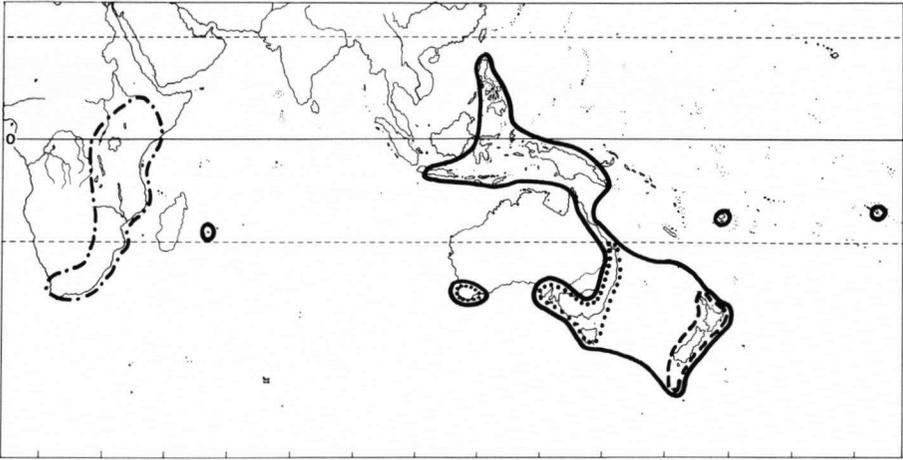
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EHRHARTA Thunb.

Ehrharta Thunb., Vet.-acad. Handl., Stockholm 40 (sem. 2, 1779) 217, *nom. cons.*; Fl. Cap. (1823) 335; Nees, Fl. Afr. Austr. 1 (1841) 196; Steud., Syn. 1 (1853) 5; Dur. & Sch., Consp. Fl. Afr. 5 (1895) 790; Stapf, Fl. Cap. 7 (1900) 660; Chippendall, Gr. & Past. S. Afr. 1 (1955) 34; Reeder,



Map 1: Distribution of the genera formerly distinguished: -.-. = *Ehrharta* Thunb. (s.s.); — = *Microlaena* R. Br.; = *Tetrarrhena* R. Br.; - - - = *Petriella* Zotov.

- Am. J. Bot. 44 (1957) 756; Metcalfe, Anat. Monocot. 1 (1960) 171; Jac.-Fél., Gram. Afr. Trop. 1 (1962) 133; Tateoka, Bot. Gaz. Tokyo 124 (1963) 264; Clayton, Fl. Trop. E. Afr., Gram. 1 (1970) 38; Launert, Fl. Zamb. 10, 1 (1971) 39; Dyer, Gen. S. Afr. Fl. Pl. 2 (1976) 829. — T y p e: *Ehrharta capensis* Thunb.
- Trochera* L. C. M. Richard in Rozier, J. Phys. 13 (March 1779) 225, *nom. rej.*; Beauv., Agrost. (1812) 61, 181. — T y p e: *Trochera striata* L. C. M. Rich. (= *Ehrharta bulbosa* Sm.)
- Microlaena* R. Br., Prodr. (1810) 210; Hack. in E. & P., Nat. Pfl. Fam. II, 2 (1887) 43; Rossberg, Thesis (1935) 1; Pilg., Bot. Jb. 76 (1954) 328; Metcalfe, Anat. Monocot. 1 (1960) 310; Tateoka, Bot. Gaz. Tokyo 124 (1963) 264; Tateoka, Bull. Nat. Sc. Mus. Tokyo 10 (1967) 443; Connor & Matthews, N. Zeal. J. Bot. 15 (1977) 531. — T y p e: *Microlaena stipoides* (Labill.) R. Br. (= *Ehrharta stipoides* Labill.)
- Diplax* Soland. ex Benn., Pl. Jav. Rar. (1838) 11; Raoul, Ann. Sc. Nat. III, 2 (1844) 116; Hook. f., Fl. Nov. Zel. (1853) 289; Fl. Tasm. 2 (1858) 105. — T y p e: not indicated but *D. avenacea* Raoul (= *E. diplax* F. v. M.) only possibility.
- Tetrarrhena* R. Br., Prodr. (1810) 209; Benth., Fl. Austr. 7 (1878) 553; Rodway, Tasm. Fl. (1903) 259; Metcalfe, Anat. Monocot. 1 (1960) 490; Willis, Handb. Pl. Vict. 1 (1962) 90; Tateoka, Bot. Gaz. Tokyo 124 (1963) 264. — T y p e: *Tetrarrhena distichophylla* (Labill.) R. Br. (= *Ehrharta distichophylla* Labill.)
- Petriella* Zotov, Trans. & Proc. Roy. Soc. N. Zeal. 73 (1943) 235; Tateoka, Bot. Gaz. Tokyo 124 (1963) 264, non Curzi (1930). — T y p e: *Petriella colensoi* (Hook. f.) Zotov. (= *Ehrharta colensoi* Hook. f.)

Annuals or perennials, sometimes bulbous at base, branching extra-vaginally at base. *Blades* variable, sometimes reduced; auricles absent to little developed, glabrous to sparsely pilose; *ligule* a short rim, rarely absent (*E. avenacea*), membranous or scarious, margin often ciliate. *Inflorescence* a panicle or a raceme. *Spikelets* solitary or paired, rarely more together, pedicelled, laterally compressed, 3-flowered; two lower *florets* nearly always reduced to epaleate, *sterile lemmas*, the upper floret paleate, bisexual, usually chasmogamous. *Rachilla* articulating above the glumes. *Glumes* persistent, equal or unequal, usually shorter to much shorter than the spikelets or minute, membranous to coriaceous, glabrous, margin usually ciliate, obtusely keeled, 1–11-nerved. *Lowest rachilla-joint* (above the glumes) reduced or elongated into a stipe, glabrous or bearded. *Lemmas* heteromorphous; sterile ones equal or unequal, glabrous, sometimes pubescent,

cartilaginous or membranous, 3–9-nerved, smooth or transversally rugose, the upper often with appendages at base, apex obtuse to contracted into a short to long terminal false awn; fertile lemma often shorter than the sterile lemmas, membranous or hyaline, 3–9-nerved, glabrous, usually smooth, apex rounded, bilobed or acute to contracted into a minute false awn. *Palea* as long as or shorter than the fertile lemma, hyaline, linear to boatshaped, nerves 1 or 2, sometimes very obscure, or absent. *Lodicules* 2, absent in cleistogamous florets, variable in shape, upper margin irregularly serrate or roughly bilobed, ciliolate or glabrous, many-nerved. *Anthers* 1–4 or 6. *Styles* 2, apical, free at base, stigmas plumose. *Caryops* laterally compressed to terete and turgid, ovoid or ellipsoid; hilum linear, almost as long as the grain; embryo 0.1–0.5 times as long as the caryops.

D i s t r i b u t i o n: about 35 species of which *c.* 25 in South Africa, one extending northwards into eastern Africa as far as E. Zaïre and Ethiopia, some of these introduced elsewhere; 10 (or 11) in Réunion, and from Malesia (Java, Philippines, Celebes, Timor, New Guinea) through Australia (incl. Tasmania) and New Zealand (incl. Auckland I.) to Norfolk, Fiji and Tahiti, one of them (*E. stipoides*) introduced or as a casual elsewhere (e.g. Hawaii, Ceylon) — Map 1.

A n a t o m y: Metcalfe (1960) blades and culm; Reeder (1957) anatomy of the embryo; Tateoka (1963) leaf anatomy and histology.

KEY TO THE MALESIAN SPECIES AND THEIR VARIETIES

- 1a. Leaves basal, sometimes a few cauline; sheaths usually loose from the culm; blades (17–) 30–38.5 cm by 4–6 (–13) mm. Second sterile lemma with a puberulous callus. Fertile lemma with a \pm distinctly bilobed unawned apex. Stamens always 2 (cleistogamous florets absent) 2
- b. Leaves both basal and cauline; sheaths tightly clasping the culm; blades (2.7–) 4–14.5 (–19) cm by 1.5–3 (–4) mm. Second sterile lemma with a glabrous callus. Fertile lemma with a cuspidate to shortly awned apex. Stamens in chasmogamous florets usually 4, rarely 2 or 6; in cleistogamous florets 2 or 4, rarely 1 or 3. 3
- 2a. Blades rather flaccid, curving. Inflorescence a panicle, spike-like or lax, at least 27 cm long with more than 100 spikelets, branches several to numerous, lowermost up to 22 cm long. Spikelets slender. Lemmas easily tearing. Fertile lemma distinctly shorter than the first sterile lemma (incl. awn) **1a. *E. diplax* var. *diplax***
- b. Blades rather stiff, \pm erect. Inflorescence a simple raceme or a spike-like contracted panicle, less than 30 cm with less than 50 spikelets, branches absent or a few, lowermost up to 7.7 cm long. Spikelets robust. Lemmas tenacious. Fertile lemma as long as the first sterile lemma (incl. awn). **1b. *E. diplax* var. *giulianettii***
- 3a. Spikelets 21–35 mm (incl. stipe and awn), rarely purplish. Stipe 0.9–1.5 (–1.7) mm long. Awn of the sterile lemma as long as to more than twice as long as its body. **2a. *E. stipoides* var. *stipoides***
- b. Spikelets 13–19 mm (incl. stipe and awn), usually somewhat purplish. Stipe 0.1–0.5 mm long. Awn of the sterile lemma shorter than to equal to its body **2b. *E. stipoides* var. *breviseta***

1. *Ehrharta diplax* F. v. Muel.

For synonymy see under the varieties.

Perennial, tufted, up to 90 cm high; rhizome ascending or spreading, cataphylls membranous. *Culm* slender, simple, erect or geniculate and rooting at the decumbent nodes, glabrous, smooth. *Leaves* basal, sometimes a few cauline. *Sheaths* usually loose from the culm, glabrous, smooth. *Ligule* short, membranous, ca. 0.6 mm high, margin somewhat erose. *Auricles* absent, margins with some c. 1.5 mm long hairs. *Blades* linear, erect or suberect and curving, flat or involute, flaccid or stiff, very gradually narrowing into the sheaths, glabrous and slightly scabrous, (17–) 30–38.5 cm by 4–6 (–13) mm, margins scabrous. *Inflorescence* a simple raceme or a lax or contracted spike-like panicle, up to 55 cm long, with up to 100 or more spikelets. *Axes* and *branches* glabrous, smooth or especially apically scabrous, filiform. Branches absent or a few to numerous, spread along the ax, erect or drooping, delicate, the lowermost up to 22 cm long with up to 33 spikelets. *Spikelets* solitary or paired on filiform, glabrous, scabrous, 2–8.5 mm long pedicels, 11–35 mm long (incl. awn and stipe), robust or slender, chasmogamous (cleistogamous ones absent). *Glumes* small, very much shorter than the spikelets, oblong-ovate to oblong, margin ciliolate in the upper half, apex acute or more or less rounded, slightly keeled, membranous to scarious, unequal; the lower glume (0.5–) 0.6–1.4 (–1.5) by 0.3–0.5 mm, 1-nerved; the upper one (1.3–) 1.6–2.5 by 0.7–1.2 mm, 1- or 3-nerved. *Stipe* 0.2–0.4 mm long at base with a tuft of up to 1.25 mm long appressed white hairs. *Sterile lemmas* membranous, keeled, ovate-lanceolate to lanceolate, tenacious or easily tearing, sides hyaline, tapering into a wavy, filiform, glabrous, scabrous awn, 5- or 7-nerved, margin and nerves scabrous especially in the upper half; first lemma 3.5–8 (–10) by 1.0–1.7 mm, with a (0.5–) 1–10.5 (–14) mm long awn; second lemma 6–14 by 1.1–2 mm, with a (5–) 8–17.5 (–22.5) mm long awn, glabrous except for a puberulous callus. *Fertile lemma* faccid, membranous to hyaline, keeled, ovate-lanceolate, distinctly shorter than or as long as the first sterile lemma (incl. awn), 4.6–8.5 by 1.6–1.9 mm, apex ± distinctly bilobed, lobes acute, 5- or 7-nerved, glabrous, nerves and margins smooth to scabrous or ciliolate in the upper 0.3–0.5th. *Palea* ovate-lanceolate, enclosed by the fertile lemma, 3.0–5.5 by 0.8–1.0 mm, slightly keeled, 1-nerved, glabrous and smooth, margin indistinctly ciliolate in the uppermost part, apex acute. *Anthers* 2, 1.0–2.6 mm long. *Lodicules* obovate c. 1 by 0.7 mm apex rounded, somewhat erose, hyaline, glabrous, smooth. *Caryops* lanceolate, laterally flattened, 3.2–5.0 by c. 0.8 mm. *Embryo* c. 0.15 times as long as the caryops.

Distribution: New Guinea (almost confined to Papua New Guinea), New Zealand (North and South Island), Auckland I., Fiji (Mt. Victoria) and Tahiti (Mt. Aorai).

Ecology: From lowland (sealevel) in New Zealand where it is common to abundant in (beech-)forests to a mountainous plant in Fiji, Tahiti and New Guinea where it grows on wet ground in deep forest shade, in moss forest, in more or less open clearings in the forest, or in forest/grassland margins in shrubbery at 2800–3500 m altitude. Flowering probably throughout the year.

a. var. *diplax* F. v. Muel.

E. diplax F. v. Muel., *Fragm.* 7 (1870) 90; *Select. Extra-Trop. Pl. Ind. Cult. Nat.* (1884) 122. — *Diplax avenacea* Raoul, *Ann. Sc. Nat.* III, 2 (1844) 116; Choix Pl. (1846) 11, pl. 4; Hook. f., *Fl. Nov. Zel.* 1 (1853) 289; *non E. avenacea* Willd. ex Schult. & Schult. (1830). — *Microlaena avenacea* Hook. f., *Handb. New Zeal. Fl.* (1864) 320; Buch., *Man. Indig. Grasses N. Z.* (1880) 5, pl 3; Petrie, *Subantarct. Isl. N. Z.* 2 (1909) 472; Cheeseman, *Man. N. Z. Fl.*, ed. 2 (1925) 145; Tateoka, *Bot. Gaz. Tokyo* 124 (1963) 264; J. W. Parham in A. C. Smith, *Fl. Vit. Nova* 1 (1979) 320, fig. 73b. — *T y p e*: *Raoul s.n.*, Akaroa in umbrosis. (P, holo).
Microlaena carsei Cheeseman, *Trans. N. Z. Inst.* 47 (1915) 47. — *Microlaena avenacea* var. *carsei* (Cheeseman) Zotov, *Trans. Proc. Roy. Soc. N. Z.* 73 (1943) 235. — *T y p e*: *H. Carse s.n.*, forests at Kaiaka, Mongonui County, Dec. 1913. (K, holo).

Blades rather flaccid, curving. *Inflorescence* a spike-like or laxly contracted panicle 27–40 (–55) cm long with several to numerous up to 22 cm long branches and with numerous (more than 100) spikelets. *Spikelets* slender. *Lemmas* easily tearing, the first sterile lemma 3.5–7 mm with a 6–10.5 (–14) mm long awn, the second sterile lemma 6–10 mm with an 8–16 (–18.5) mm long awn. *Fertile lemma* distinctly shorter than the first sterile lemma (incl. awn). *Anthers* 1–2 mm long.

D i s t r i b u t i o n: New Zealand (North and South Island), Auckland I., Fiji (Mt. Victoria), Tahiti (Mt. Aorai).

E c o l o g y: From lowland to mid-elevations and mountainous areas (sealevel to 900 m) in New Zealand, c. 1350 m in Fiji, c. 2000 m in Tahiti, common or abundant in (beech-)forests. Flowering from November to February.

A n a t o m y: Tateoka (1963), leaf anatomy and histology.

U s e s: greedily eaten by cattle during winter (Buchanan, 1880).

N o t e s: The collection from Tahiti (*van Balgooy 1830*; L) is slightly different from var. *diplax* from New Zealand and Fiji in having larger leafblades and a larger inflorescence with far more and also smaller spikelets (11–16 mm). Before assigning a rank to this single record more material should be studied. According to van Balgooy (or. comm.) it certainly is indigenous and not introduced, as the area is but rarely visited and there is no logging. Although very conspicuous only a single plant was found.

This provenance is contrary to the suggestion expressed by Parham (1979), that it was accidentally introduced in Fiji from New Zealand by timber cutters. From its occurrence in Tahiti it becomes more likely that it is native in Fiji too.

b. var. *giulianettii* (Stapf) L. P. M. Willemse, *comb. et stat. nov.* — Fig 1, 3a.

Microlaena giulianettii Stapf, *Kew Bull.* (1899) 114; Hitch., *Brittonia* 2 (1936) 119; Henty, *Bot. Bull. Lae* 1 (1969) 125; Royen, *Alp. Fl. N. G.* 2 (1979) 1199, fig. 387. — *T y p e*: *Giulianetti s.n.*, 1896, Br. New Guinea, Mt. Scratchley, 12200 ft. (K, holo).

Blades rather stiff, ± erect. *Inflorescence* a simple raceme or a spike-like contracted panicle, less than 30 cm long with no or only few up to 7.7 cm long branches with less than 50 spikelets. *Spikelets* robust. *Lemmas* tenacious, the first sterile lemma (4.5–) 6–8 (–10) mm with a (0.5–) 1–5 (–9) mm long awn, the second sterile lemma 8–14 mm long with a (5–) 8–17.5 (–22.5) mm long awn. *Fertile lemma* as long as the first sterile lemma (incl. awn). *Anthers* 1.5–2.6 mm long.

Distribution: New Guinea. Irian Jaya: Southeast (Lake Habbema). — Papua New Guinea: West Sepik Dist. (Mt. Capella, Mt. Scorpion), Western Highlands (Yobobos), Morobe Dist. (Mt. Saruwaket), Northern Dist. (Mt. Kenive), Central Dist. (Mt. Albert Edward, Mt. Scratchley, Mt. Strong, Mt. Victoria), Milne Bay Dist. (Mt. Suckling).

Ecology: On wet ground in deep forest shade, in moss forest, in more or less open clearings in the forest or in forest/grassland margins in shrubbery; 2800–3500 m altitude. Flowering throughout the year.

Anatomy: Tateoka (1963), leaf anatomy and histology.

Vernacular names: *hjeink* (Enga, Keilam), *gudbeeyot* (Mt. Strong, the only grass recognized as a distinct species).

Notes: In *E. diplax* var. *giulianettii* some specimens have been found in which some florets have a distinctly developed rachilla-process and some others in which the second sterile lemma encloses a small palea.

In New Guinea both *E. diplax* var. *giulianettii* and *E. stipoides* var. *stipoides* occur. It is interesting to see that these taxa prefer different habitats. The former is found in rather wet, well-sheltered parts of the mountains between 2800 and 3500 m whereas the latter grows in drier and more sunny parts on the mountain-slopes between 1800 and 3100 m.

2. *Ehrharta stipoides* Labill.

For synonymy see under the varieties.

Slender flaccid perennial, tufted, (23–) 45–100 cm high, with a spreading rhizome; cataphylls ovate to oblong, smooth, glabrous, shiny, papyraceous. *Culms* slender, ascending to erect, simple or geniculate, then branching extra-vaginally and/or rooting at the lower nodes. *Leaves* both basal and cauline. *Sheaths* tightly clasping the culm, the basal ones especially apically usually scabrid-pubescent to pubescent, the upper ones usually glabrous and smooth. *Ligule* reduced to a short membranous rim, 0.1–0.4 (–0.5) mm long, upper margin usually distinctly erose, sometimes minutely ciliolate or with rather long hairs. *Auricles* absent to distinctly developed, up to 3.5 mm long, callose yellowish, usually with some up to 1.7 mm long hairs. *Blades* linear to linear-lanceolate, flat or coiled, flaccid or stiff, (2.7–) 4–14.5 (–19) cm by 1.5–3 (–4) mm margin sometimes undulate, often with a whitish callose rim, usually scabrous, both sides smooth and glabrous to scabrous and pubescent or with bulbous-based hairs, apex acute sometimes sharp and spiny. *Inflorescence* a raceme or a sparsely branched panicle, erect to suberect, narrow, slender, laxly contracted, (4–) 11–19 (–29.5) cm long with (3–) 8–24 (–30) spikelets. *Axes* and *branches* smooth, glabrous, filiform. *Branches* spreading in the basal part, erect, appressed, up to 9 cm long with up to 6 spikelets. *Spikelets* paired or solitary, green or purplish, cleistogamous or chasmogamous, 13.5–19 mm (var. *breviseta*) and 21–35 mm (var. *stipoides*) long (incl. stipe and awn), on short to long, filiform, glabrous, scabrous, 1–15 (–19) mm long pedicels. *Glumes* minute, much shorter than the spikelets, broadly ovate to ovate-oblong, margin ciliolate, apex acute to more or less rounded, slightly keeled, 1-nerved, membranous; the lower glume 0.5–0.9 (–1.0) by 0.3–0.5 mm; the upper one 0.6–1.2 (–1.5) by 0.4–1.6 mm. *Stipe* variable, 0.1–0.5 or 0.9–1.5 (–17) mm

long, at base with a tuft of 0.7–1.5 mm long appressed white hairs. *Sterile lemmas* rigid, keeled, ovate-oblong, sides hyaline, gradually tapering into a straight or somewhat wavy, filiform, scabrous, glabrous awn, indistinctly 5- or 7-nerved, scabrous especially on the nerves, glabrous; first lemma (6–) 7–12 by 1.5–3 (–3.3) mm, awn (8–) 9–15 (–17.5) mm long; second lemma (7.5–) 9–13.5 (–14.5) by (1.7–) 2–3 (–3.5) mm, callus glabrous, awn (11–) 13–22 mm long. *Fertile lemma* ovate-oblong to -lanceolate, about as long as to slightly shorter than the second sterile lemma (without awn), (5.5–) 7–10.5 (–12) by (1.5–) 2–3.6 (–4.3) mm, apex cuspidate to shortly awned, awn up to 1.5 mm, keeled, (3 or) 5 (or 7)-nerved, nerves scabrous in the upper 0.3d, glabrous, flaccid, hyaline. *Palea* in chasmogamous florets ovate-lanceolate, 6–7.5 by c. 1.5 mm slightly keeled, nerve 1, faint, smooth, slightly pubescent, in cleistogamous florets linear, (2.5–) 3.2–4.6 (–5) by (0.2–) 0.3–0.6 (–0.7) mm, slightly keeled, nerveless or with 1 faint nerve, margin scabrous in the upper 0.3d, apex acute. *Anthers* in chasmogamous florets 4, rarely 2 or 6, c. 4.0 long, in cleistogamous florets 2 or 4 rarely 1 or 3, 0.2–0.6 mm long. *Lodicules* absent in cleistogamous florets, in chasmogamous florets obovate, c. 2 mm by 0.7–1.0 mm, apex rounded, more or less erose, membranous, hyaline towards the apex. *Caryops* lanceolate, laterally flattened to tergid, smooth, 4–6 (–7) mm by 0.6–1.2 (–1.4) mm. *Embryo* 0.2–0.5 times as long as the caryops. (For the description of cleistogamic clandestine spikelets see note under var. *stipoides*)

D i s t r i b u t i o n: Malesia. Java: Preanger (G. Papandajan), Kedu (Jeng-plateau), Malang (G. Arjuno, G. Tengger, G. Welirang), Besuki (G. Argopura, G. Ijen, G. Hiyang, G. Merapi). — Timor (Mt. Tatamailau). — Philippines: Luzon (Mt. Data, Mt. Santo Tomas, Mt. Tonglon). — Papua New Guinea: W. Highlands (Sirunki, Wabag), E. Highlands (Mt. Kerigomna, Mt. Wilhelm), Morobe Dist. (Mt. Saruwaket), Central Dist. (Murray pass), Milne Bay Dist. (Mt. Donana, Mt. Suckling). — Australia: all states except N. Territory. — New Zealand: North and South Island. — Introduced in Great Britain, Ceylon, Hawaii, and Réunion.

E c o l o g y: Variable, occasional or common, sometimes dominant but always in separate tufts; in the mountains in Malesia growing between 1500 and 3100 m on clay or sand in *Casuarina* and *Pinus* forests, in more open habitats on slopes, ridges and road- or pathsides and in the lowland of Australia and New Zealand in semi-shade in forests and woodlands but also in open pastures, Flowering throughout the year.

a. var. *stipoides* Labill. — Fig. 2, 3b.

E. stipoides Labill., Nov. Holl. Pl. 1 (1804) 91, t. 118; F. v. Muel., Fragm. 7 (1870) 90. — *Microlaena stipoides* R. Br., Prodr. (1810) 210; Benth., Fl. Austr. 7 (1878) 552; Buch., Man. Indig. Grasses N. Z. (1880) 3, pl. II; Merr., Philip. J. Sc. 1, Suppl. (1906) 371; Hitchc., Mem. B. P. Bish. Mus. 8 (1922) 167, fig. 56; Cheeseman, Man. N. Z. Fl., ed. 2 (1925) 144; Back., Handb. Fl. Java 2 (1928) 197; Rossberg, Thesis (1935); Heyne, Nut. Pl. Ind., ed. 3 (1950) 257; Metcalfe, Anat. Monocot. 1 (1960) 310; Tateoka, Can. J. Bot. 38 (1960) 951; Clifford, Univ. Queensl. Pap., Dep. Bot. 4 (1962) 63; Tateoka, Bot. Gaz. Tokyo 124 (1963) 264; Hair in Tothill & Löve, Phytton (Buenos Aires) 21 (1964) 21; Monod de Fr. in Back. & Bakh. f., Fl. Java 3 (1968) 529; Henty, Bot. Bull. Lae 1 (1969) 125, fig. 50; Steen., Mt. Fl. Java (1972) t. 22, fig. 9; Connor & Matthews, N. Zeal. J. Bot. 15 (1977) 531, fig. 2; Simon, Techn. Bull. Bot. Br. Dept. Prim. Ind. Brisbane 3 (1978) 45; Royen, Alp. Fl. N. G. 2 (1979) 1196, fig. 386. — T y p e: *Labillardière s.n.*, Tasmania, 'Capite van-Diemen'. (FI, holotype).

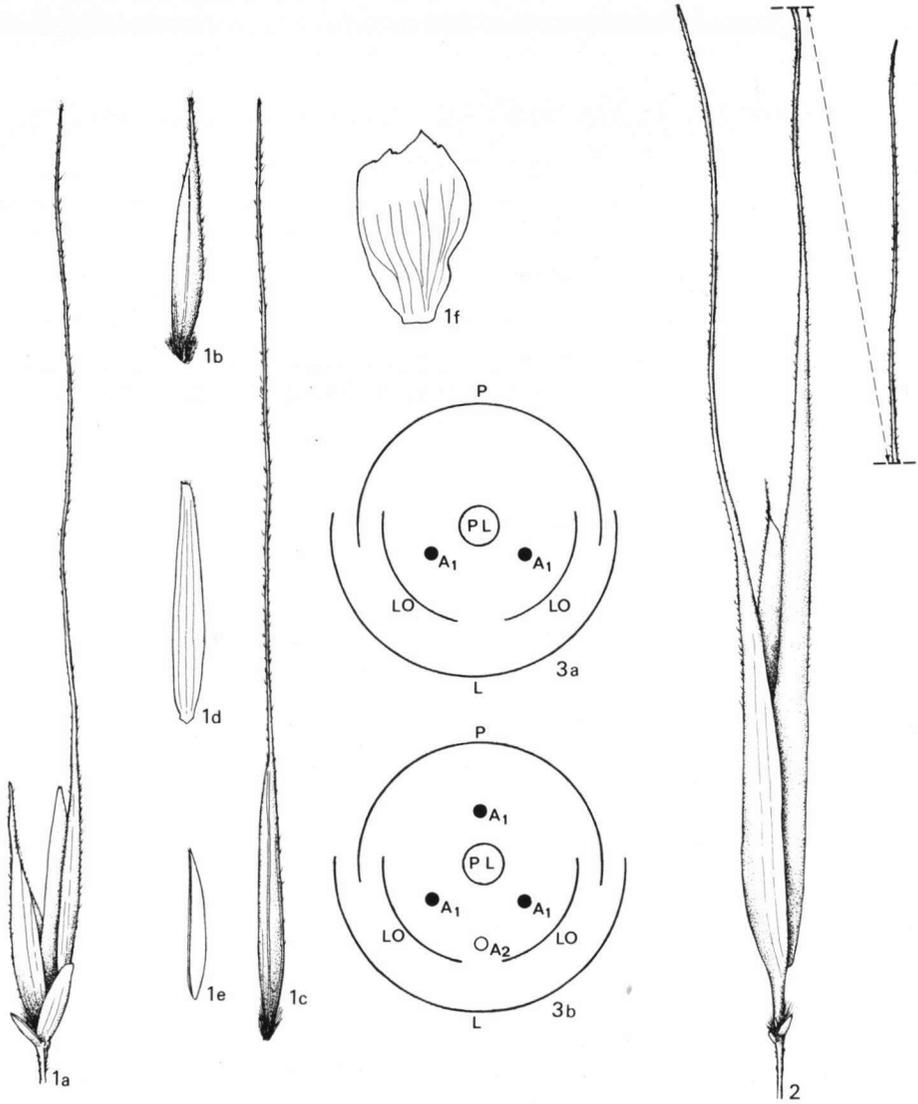


Fig. 1-3. *Ehrharta*. — 1. *E. diplax* var. *giulianettii* (Hoogland & Schodde 7707), a. spikelet, $\times 5$; b. first sterile lemma, $\times 5$; c. second sterile lemma, $\times 5$; d. fertile lemma, $\times 5$; e. palea of the upper floret, $\times 5$; f. lodicule, $\times 25$. — 2. *E. stipoides* var. *stipoides* (van Steenis 4784), spikelet, $\times 5$. — 3. Floral diagrams: a. *E. diplax* var. *giulianettii*; b. *E. stipoides* var. *stipoides*. (Al. anther of the inner whorl; A2. anther of the outer whorl; L. lemma, LO. lodicule; P. palea; PL. pistil.)

Microlaena gunnii Hook. f., Fl. Tasm., 2 (1860) 105, t. 155A; Clifford, Univ. Queensl. Pap., Dep.

Bot. 4 (1962) 70. — T y p e: *Gunn 1492*, Tasmania, Penquite, near Launceston. (K, holo; P).

Microlaena stipoides (Labill.) R. Br. var. *micrantha* Domin, Bibl. Bot. XX, 85, 2 (1915) 336. — T y p e: *Domin*, III, 1910, S. Queensland, Tambourine Mountains. (PR, holo, n.v.).

Microlaena micranthera Ohwi, Bull. Tokyo Sc. Mus. 18 (1947) 10; Clifford, Univ. Queensl. Pap., Dep. Bot. 4 (1962) 71. — T y p e: *Backer & Posthumus s.n.*, Java, Pasoeroean, G. Tengger, 2200 m. (BO, holo; L, K).

Blades flat and flaccid, apex acute but not sharp or spiny. Upper margin of the *ligule* glabrous or minutely ciliate. *Spikelets* 21–35 mm long (incl. awn and stipe), green; stipe elongated, 0.9–1.5 (–1.7) mm long. *Awn* of the *sterile lemmas* as long as to more than twice as long as its body.

Distribution: as the species.

Ecology: as the species.

Anatomy: Metcalfe (1960), leaf and culm anatomy; Tateoka (1963), leaf anatomy and histology.

Chromosome number: $n = 24$ (Tateoka, 1960); $n = 21$ (Hair, 1964).

Uses: In Java gathered by inhabitants of mountain villages in times of scarcity of food (fodder?) (Monod de Fr. in Back. & Bakh. f., 1968); providing rather sufficient amounts of leaf eaten readily by horses and with a very satisfactory nutriment value (Heyne, 1950); affording nutriment for stock during the winter in Australia (Buchanan, 1880).

Vernacular names: Java: *pari kesit* (J.). — New Guinea: *tewai* (Enga); *animiamikul* (Chimbu: Masul); *hakkis* (Wahgi: Minj); *kalwiljip* (Hagen: Togoba). — Australia, New Zealand: *weeping grass* or *meadow rice grass*.

Notes: Connor & Matthews (1977) reported both aerial cleistogamic and chasmogamic spikelets in the terminal panicles as well as axillary cleistogamic spikelets ('clandestine spikelets'). About 50% of the specimens from Malesia had one or more of such clandestine spikelets. These usually occur at the second, third and fourth node from the top and are hidden by the sheath. They are usually solitary but up to 4 spikelets may occur together as well.

The shape of these spikelets is quite different from the 'normal' aerial cleistogamic ones. The size, particularly the length of the awns, however, differs not as markedly as Connor & Matthews have stated. The awn of the lower sterile lemma of the clandestine spikelets varies from 0.5 to 10 mm (usually averaging *c.* 4 mm) and that of the upper sterile lemma from 1 to 15 mm (usually about 6.2 mm). The other dimensions are generally slightly smaller than those of the aerial cleistogamic spikelets except for the anther and caryops which are the same. The clandestine spikelets otherwise differ by the reduced and almost glabrous stipe, the absence of even vestiges of glumes and the number of anthers which is usually 2 while in the aerial cleistogamic spikelets it is more often 4. Morphological, ecological or geographical correlations with the presence of clandestine spikelets seem to be absent.

As Clifford (1962) already suggested the type of *Microlaena micranthera* from Java turned out to be a cleistogamous specimen of this species.

The number of stamens is quite variable as 1–4 and 6 have been reported. The chasmogamous spikelets studied had 4 stamens and only exceptionally 2. Chasmogamous spikelets with 3 and 6 stamens are reported by Labillardière (1804, see plate), Clifford (1962) and Connor & Matthews (1977). Examination of the type specimen, described and depicted as having 6 stamens, however, revealed spikelets with 4 stamens only. In cleistogamous spikelets it is often very hard to count the number of stamens because the anthers are so much reduced. Therefore one has to try and count the filaments which are very thin and flimsy and often adhere to the caryops. In general 4 stamens seem to be

most common in aerial cleistogamous spikelets while 2 stamens are less often seen. In clandestine spikelets, however, the presence of 2 stamens is usual, while the occurrence of 1 stamen is rare and 3 or 4 stamens have been found only once.

b. var. breviseta (Vickery) L. P. M. Willemse, *comb. nov.*

M. stipoides var. *breviseta* Vickery, *Telopea* 1 (1975) 43; *Fl. N.S.W.* 19, 2 (1975) 300. — **T y p e:** *E. Cheel* NSW 115640, New South Wales, Central tablelands, Hill Top, 8 Dec. 1912 (NSW, holo).

Blades coiled and stiff, apex acute, sharp, spiny. Upper margin of the *ligule* with rather long hairs. *Spikelets* 13–19 mm long (incl. awn and stipe), usually somewhat purplish; stipe 0.1–0.5 mm long. *Awn* of the *sterile lemmas* shorter than to equal to its body.

D i s t r i b u t i o n: Australia: New South Wales, (Central Tablelands).

E c o l o g y: as *E. stipoides* from Australia.

N o t e: *Microlaena polynoda* (Hook. f.) Hook. f. from New Zealand seems very closely allied to var. *breviseta*. As far as could be observed it differs from var. *breviseta* only in having slightly longer glumes and rougher pedicels and lemmas but as only two specimens of *M. polynoda* could be studied examination of more material might show that both taxa are actually identical. At present, however, it is best regarded as name of doubtful application.

NEW COMBINATIONS

Because *Microlaena* and *Tetrarrhena* are included in *Ehrharta* some new combinations must be made.

Ehrharta oreophila (D. I. Morris) L. P. M. Willemse, *comb. nov.* — *Tetrarrhena oreophila* D. I. Morris. *Rec. Queen Vict. Mus.* 55 (1977) 4.

Ehrharta oreophila* var. *minor (D. I. Morris) L. P. M. Willemse, *comb. nov.* — *Tetrarrhena oreophila* var. *minor* D. I. Morris, *Rec. Queen Vict. Mus.* 55 (1977) 4.

Ehrharta tasmanica (Hook. f.) L. P. M. Willemse, *comb. nov.* — *Diplax tasmanica* Hook. f., *Fl. Tasm.* 2 (1860) 105, pl. 155.

Ehrharta tasmanica* var. *subalpina (F. v. Muel. ex Benth.) L. P. M. Willemse, *comb. nov.* — *Microlaena tasmanica* var. *subalpina* F. v. Muel. ex Benth., *Fl. Austr.* 7 (1878) 552.

NOMINA DUBIA

1. *Microlaena ciliativertex* Ohwi, *Bull. Tokyo Sc. Mus.* 18 (1947) 10. — **T y p e:** *Kjellberg 3699*, Celebes, B. Poka Pindjang, 2800 m. (BO, holo).

Only known from the type specimen. Said to be closely allied to *E. stipoides* only differing in the rounded apex of the fertile lemma and in the length of the first sterile lemma (c. 5 mm). No specimens could be examined as none could be found in BO (Drs. R. Dekker, Bogor, oral comm.) nor are there any duplicates in the herbaria consulted.

2. *Microlaena polynoda* (Hook. f.) Hook. f., Handb. N. Z. Fl. (1864) 320. — *Diplax polynoda* Hook. f., Fl. N. Z. (1853) 290. — Type: *Colenso s.n.*, New Zealand, Northern Island, East Coast, base of Ruahine range etc.

An insufficiently known taxon of which only two specimens have been examined (*Colenso 673* and *1557*). Apparently closely allied to *E. stipoides* var. *brevisetata* (see also note under *E. stipoides* var. *brevisetata*).

IDENTIFICATION LIST

The numbers refer to the taxa described in the account above. Unnumbered collections without dates have not been included.

- ANU 700 (*Walker*): 2a; ANU 2512 (*Flenley*): 2a; ANU 15331 (*J. M. B. Smith*): 2a.
Backer 13324: 2a; *21873*: 2a; *25305*: 2a; *37106*: 2a; *37208*: 2a; *Balgooy 1830*: 1a; *Beumée A 656*: 2a; *S. T. Blake 18422*: 2a; *Blakely s.n. (IV. 1914)*: 2a; *Boorman s.n. (7.II.1900)*: 2a; *(IV.1900)*: 2a; *Brass 4411*: 1b; *4651*: 2a; *10721*: 1b; *30774*: 2a; *Brinkman 280*: 2a; *Brownlie 411*: 1a; *Buwalda 7393*: 2a.
Canning 4252: 2a; *Carse s.n. (5.XII. 1913)*: 1a; *CHR 59444 (Talbot)*: 1a; *65904 (Poole)*: 1a; *68662 (Hamlin)*: 1a; *84903 (Zotov)*: 1a; *153103 (Talbot)*: 1a; *158557 (Druce)*: 1a; *183662 (Edgar)*: 1a; *235195 (Zotov)*: 1a; *244803 (Druce)*: 1a; *245008 (id.)*: 1a; *277478 (id.)*: 1a; *293015 (Carse)*: 1a; *293020 (Petrie)*: 1a; *Clemens 7837*: 2a; *10025*: 1b; *16219*: 2a; *Craven 2963*; 1b; *Crisp 2482*: 2a; *Crutwell 1245*: 2a; *Curtis s.n. (1.I. 1947)*: 2a.
Davidse 8913: 2a.
Forsyth s.n. (III.1909): 2a.
Gardner 1692: 1a; *Gillespie 4106*: 1a; *Gordon s.n. (7.II.1945)*: 2a; *Giulianetti s.n. (IX.1896)*: 1b; *Gunn s.n. (1.IV.1845)*: 2a; *(XII.1845)*: 2a; *(26.I. 1858)*: 2a.
Heezen 1: 2a; *Hemsley 6473*: 2a; *6632*: 2a; *Herbst & Spence 5408*: 2a; *Hernaes 3516-A*: 2a; *Hoogland & Pullen 5371*: 2a; *Hoogland & Schodde 7707*: 1b; *Hubbard 8084*: 2a; *8173*: 2a.
Ising s.n. (23.XI.1960): 2a.
Hb. Kneucker 191: 2a; *Koorders 43872*: 2a.
LAE 51372 (Stevens & Coode): 1b; *65268 (Croft e.a.)*: 1b; *65973 (id.)*: 1b; *67307 (Barker & Umba)*: 1b.
Maiden s.n. (II.1909): 2a; *Melville & Melville 6260*: 1a; *6727*: 1a; *6936*: 1a; *Merrill 1343*: 2a; *4543*: 2a; *4696*: 2a; *4831*: 2a; *11728*: 2a.
NGF 10642 (Henty): 2a; *20195 (v. Royen)*: 2a; *20204 (id.)*: 2a; *46237 (Coode & Stevens)*: 1b; *46301 (id.)*: 1b; *NSW 115633 (Deane)*: 2b; *115634 (Meebold)*: 2b; *115636 (Betcher)*: 2b; *115640 (Cheel)*: 2b.
Pullen 351: 2a; *2525*: 2b.
Ralph 61: 1a; *Ridley s.n. (29.I.1915)*: 2a; *Rodway s.n. (XII.1891)*: 2a.
J. V. Santos 5369: 2a; *5788*: 2a; *5934*: 2a; *Simpson 1026*: 1a; *v. Slooten 2474*: 2a; *2621*: 2a; *Spicer 207*: 2a; *v. Steenis 4202*: 2a; *4784*: 2a; *6796*: 2a; *7066*: 2a; *7274*: 2a; *10889*: 2a; *11677*: 2a; *11837*: 2a; *18404*: 2a; *St. John & Fosberg 17062*: 1a; *Sykes 106169*: 1a.
Thompson 520: 1a; *Townrow s.n. (20.XI.1963)*: 2a.
Vanoverbergh 812: 2a; *Veldkamp 6012*: 2a; *Veldkamp & Stevens 5604*: 2a; *5743*: 2a; *5813*: 2a; *5869*: 1b; *Vickery 83*: 2a.