

THE GENUS ZOYSIA (GRAMINEAE) IN MALESIA

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SUMMARY

In Malesia only one species of *Zoysia* occurs: *Z. matrella* (L.) Merr., of which there are 2 varieties: var. *matrella* and var. *pacifica* Goudswaard, var. nov. The latter variety is generally cultivated under the name *Z. matrella* var. *tenuifolia*, or *Z. tenuifolia*, which is a heterotypic synonym of *Z. matrella* s.s.

According to various authors two, or perhaps three taxa of *Zoysia* occur in Malesia, viz. *Z. matrella* (L.) Merr. (also called *Z. pungens* Willd.), *Z. tenuifolia* Thiele, and *Z. macrantha* Desv. As far as the last is concerned, no specimens of it have come to my notice, so it would seem that it may be excluded from the area. For completeness' sake it has been included in the key.

The epithet '*tenuifolia*' used for a narrow- and fine-leaved plant is typified by collections made by Bory de St. Vincent and Sieber in Mauritius and the Ile aux Toneliers in the Mascarenes. These specimens, however, belong to the typical variety of *Z. matrella*, while those in cultivation represent a distinct, apparently undescribed taxon. As it occurs wild in the western Pacific, the name *Z. matrella* var. *pacifica* is proposed.

The spelling of the name *Zoysia* is conserved by the current Code (1978). It is the original spelling and Art. 73.1 would therefore automatically apply. The name could just as well be deleted altogether from the list, but has apparently been retained because in previous editions the alternative spelling *Zoisia* had been conserved, while at some time it was also conserved against *Osterdamia* Necker (1790). All names used by Necker in the *Elementa Botanica* are now considered to be unitary designations of species and not to be regarded as generic names. In this case *Osterdamia* is meant for *Agrostis matrella* L. (See also the discussion in *Regnum Vegetabile* 20, 1960: 42–48).

Another generic synonym is *Matrella* Pers. Under the only species, *M. juncea*, Persoon stated: '*Agrostis matrella* Lin. Willd. sp. pl. 1. p. 367? *A. juncea* Lam. ill. gen. t. 41. f. 2. Hab. in Malabaribus maritimis. Flor. subnitentes 10–12 in rachi alternatim sessiles. Fol. disticha, pungentia'.

At first sight *Matrella juncea* would appear to be a new combination based on *Agrostis juncea* Lamk. The latter was described by Lamarck for a Sonnerat collection and suggested conspecificity with either *A. matrella* or *A. virginica* L. (= *Sporobolus virginicus*). In the *Tableau* (1791) he incorrectly placed *A. matrella* in the synonymy of his *A. juncea* (it should have been the other way round). From the original description and the plate it is clear that *A. juncea* is not identical with *A. matrella* at all, as a panicle with c. 20–30 spikelets is mentioned, but it is *A. virginica*. Bor (1960) confirmed this opinion again after having seen the type.

Now, if *M. juncea* is to be regarded as a new combination, it would become a synonym of *Sporobolus virginicus*, with the consequence that the name *Sporobolus* R. Br. (1810) must be conserved against *Matrella* Pers. (1805). Actually, the latter is obviously based on *Agrostis matrella*, as is shown by the generic ('*Cal. O. Cor. cartilaginea s. indurata, compressa, mutica, 2-valvis: valv. demum connatae?*') and specific diagnoses. As Persoon did not want to make the tautonym *Matrella matrella*, he created a nomen novum, the only complication being that he used the epithet of a name doubtfully included in the synonymy. Specimens in the Persoon herbarium, now in L, of *Zoysia matrella* were labeled *Matrella* by him, while those of *Sporobolus virginicus* were written up as *Agrostis*.

The first record of *Z. matrella* for Malesia is apparently given by Houttuyn (1782), who cited a collection by Thunberg from Java (probably from Semarang) under *Agrostis indica*. This specimen is still present in L and constitutes the seventh specimen that can be attributed to the Houttuyn herbarium now known. See also Van Steenis & Veldkamp 1973, where four collections are enumerated; a fifth is *Memecylon floribundum* Bl., a sixth is *Gigantochloa verticillata* (Willd.) Munro.

ZOYSIA

Zoysia Willd., Neue Schr. Ges. Naturf. Fr. Berlin n. S., 3 (1801) 440, *nom. cons.*; Honda, J. Fac. Sc. Univ. Tokyo III, 3, 1 (1930) 314; Zotov, N. Zeal. J. Bot. 9 (1971) 639; Clayton & Richardson, Kew Bull. 27 (1973) 40. — T y p e : *Z. pungens* Willd. [= *Z. matrella* (L.) Merr.].

Osterdamia Neck. [Elem. Bot. 3 (1790) 218, *nom. inval.*] ex O. Ktze, Rev. Gen. Pl. 2 (1891) 781; Honda, Bot. Mag., Tokyo 36 (1922) 112. — T y p e : *O. matrella* (L.) O. Ktze. [= *Z. matrella* (L.) Merr.].

Matrella Pers., Syn. 1 (1805) 73. — T y p e : *M. juncea* Pers. [= *Z. matrella* (L.) Merr.].

Brousemichea Balansa in Morot, J. Bot. 4 (1890) 163; Camus, Fl. Gén. I.-C. 7 (1922) 505; Schmid, l'Agron. Trop. 13 (1958) 479. — T y p e : *B. seslerioides* Balansa [= *Z. seslerioides* (Balansa) Clayton & Richardson].

Matforming, usually stoloniferous, rarely tussock-forming perennials, branching intravaginally; *culms* ascending to erect, at base with imbricate, sometimes subgeminant cataphylls, rooting from the decumbent nodes; *rhizome* with alternately long and short internodes. *Leaves* conspicuously distichous; *sheaths* imbricate, throat with long, soft, wavy hairs on the auricles, near the ligule, and at base of the sheath; *ligule* a dense row of short stiff hairs; *blades* erecto-patent to patent, involute, stiff, acute, glabrous, smooth. *Raceme* spiciform, contracted; *pedicels* dorso-ventrally flattened, appressed against the axis, margins finely spiculate, apex occasionally widened and with 1 or 2 small persistent appendages appressed against the spikelet. *Spikelets* 1-flowered, laterally flattened, appressed against the axis, deciduous as a whole. *Lower glume* rarely present, then membranous; *upper glume* enveloping the spikelet, coriaceous, acute, (sub)apically shortly awned or not. *Lemma* membranous, midrib present or not. *Palea* usually absent, very thin when present. *Lodicules* absent. *Stamens* 3. *Styles* 2, connate at base. *Embryo* about half as long as the caryopsis; hilum subbasal, punctiform.

D i s t r i b u t i o n . About 10 species along the coasts of the Indian and western Pacific Ocean; some species widely cultivated also inland.

KEY TO THE MALESIAN TAXA

- 1a. Leaf-blade 0.7–2.6 mm wide (when expanded). Upper glume with revolute margins, the outer of which sometimes rough below the apex, smooth at base, not enveloping the inner. Base of caryopsis truncate; styles apical . . . 2.
 b. Leaf-blade 2.7–4 mm wide (when expanded). Upper glume with the margins revolutely appressed, the outer of which rough and longer than the inner, curving over it. Base of the caryopsis oblique; styles subapical. (Australia)

Z. macrantha

- 2a. Leaf-blade 1.5–2.6 mm wide (when expanded), usually erectopatent to patent. Peduncle exerted from the uppermost sheath at anthesis, the raceme distinctly exerted above the foliage, up to 4.2 cm long . . . a. **Z. matrella** var. **matrella**
 b. Leaf-blade 0.7–1 mm wide (when expanded), usually erect. Peduncle, even in fruit, not or hardly exerted from the uppermost sheath, the raceme therefore not or little exerted above the foliage, up to 1.5 cm long

b. Z. matrella var. **pacifica****Zoysia matrella** (L.) Merr.

Matforming perennials, up to 35 cm high. *Ligule* c. 0.25 mm long. Pedicels occasionally with up to 1 mm long obtuse to acute scales. *Spikelets* ovate-oblong to lanceolate. *Lower glume* usually absent; *upper glume* with the margins revolutely appressed, equally wide, midrib distinct; *arista*, when present, smooth. *Lemma* oblong, up to 2 mm long, acute, midrib sometimes excurrent, glabrous. *Palea* absent. *Anthers* c. 1.2 mm long. *Styles* apical. *Caryopsis* with a straight truncate base.

a. var. matrella. — Map 1.

Zoysia matrella (L.) Merr., Philip. J. Sc. 7 (4 Sep. 1912) 230; Fl. Manila (31 Dec. 1912) 185; Enum. Born. Pl. (1921) 48; Back. in Heyne, Nutt. Pl. (1922) 148; ed. 2 (1927) 197; ed. 3 (1950) 197; Merr., Enum. Philip. Fl. Pl. 1 (1923) 51; Beumée, Hand. 3e Ned.-Ind. Nat. Congr. (1925) 165, 172; Back., Onkr. Suikerr. (1928) 59, pl. 52; Honda, J. Fac. Sc. Univ. Tokyo III, 3, 1 (1930) 315; Burk., Dict. 2 (1935) 2308; Bor, Grasses (1960) 684; Dansk Bot. Ark. 20 (1963) 153; Larsen, Ibid. 244; Bosser, Gram. Madag. (1969) 111, fig. 33a–e; Henty, Bot. Bull. Lae 1 (1969) 191; Monod de F. in Back. & Bakh. f., Fl. Java 3 (1969) 543; Gilliland, Rev. Fl. Mal. 3 (1971) 109, pl. 13-d, f. 19; Gould & Soderstrom, Canad. J. Bot. 52 (1974) 1082; Christopher & Abraham, Cytologia 39 (1974) 567, f. 34; Sindhe & Narayan, Taxon 25 (1976) 159; Hsu, Fl. Taiwan 5 (1978) 508, fig. 1414. — *Agrostis matrella* L., Mant. 2 (1771) 185. — *Matrella juncea* Pers., Syn. 1 (1805) 73, excl. syn. Lamk., see introduction. — *Osterdamia matrella* O. Ktze, Rev. Gen. Pl. 2 (1891) 781, *nom. inval.*; Honda, Bot. Mag. Tokyo 36 (1922) 113. — *O. zoysia* Honda, Bot. Mag. Tokyo 36 (1922) 113, *nom. superfl.*, *incl. var. typica* Honda, *nom. inval.* — *Z. matrella* var. *typica* Sasaki, List Pl. Formosa (1928) 80, *nom. inval.*; Cat. Govern. Formosa (1930) 94. — *Z. matrella* var. *matrella*: Fosberg e. a., Smithson. Contr. Bot. 22 (1975) 14; Walker, Fl. Okinawa & Ryukyu Isl. (1976) 200. — T y p e : *König 56* in Hb. Linné (*LINN*, no. 84.11, microfiche), iso in L (no. 909. 67–176).

Z. pungens Willd., Neue Schr. Ges. Naturf. Fr. Berlin 3 (1801) 441; Beauv., Agrost. (1812) 1, pl. 4, 1; Buse in Miq., Pl. Jungh. (1854) 368; Miq., Fl. Ind. Bat. 3 (1857) 478; Franch. & Sav., Enum. Pl. Jap. 2 (1879) 186; Rendle, J. Bot. 32 (1894) 100; Hook. f., Fl. Br. Ind. 7 (1896) 99; Merr., Philip. J. Sc. 1, Suppl. (1906) 26, 342; Koord., Exk. Fl. 1 (1911) 118; Camus, Fl. Gén. I.-C. 7 (1923) 492; Ridl., Fl. Mal. Pen. 5 (1925) 243; Schmid, l'Agron. Trop. 13 (1958) 466, f. 82. — T y p e : *Klein s.n.* in Hb. Willdenow (B, no. 01514, n.v.: IDC 7440!).

Z. tenuifolia Willd. ex Thiele, Linnaea 9 (1834) 30; C. E. Hubb. & Vaugh., Grasses Maur. & Rodr. (1940) 58. — *Osterdamia tenuifolia* O. Ktze, Rev. Gen. Pl. 2 (1891) 781, *nom. inval.* — *Z. pungens* var. *tenuifolia* Dur. & Sch., Consp. Fl. Afr. 5 (1894) 734, *pro comb.* — *O. zoysia* var. *tenuifolia* Honda, Bot. Mag., Tokyo 36 (1922) 113, *nom. inval.* — *Z. matrella* var. *tenuifolia* Sasaki, List Pl. Formosa (1928) 80, *pro comb.* — L e c t o t y p e : *Sieber Maur. Exsicc. II*, 40 (B, †; iso in BM, L).

Z. aristata C. Muell., Bot. Zeit. 13 (1855) 272. — Syn types: Zollinger 2890 (B, †; BM, P), Hasskarl s.n. ('Java, Weltevreden'), (B, †).

Z. griffithiana C. Muell., Bot. Zeit. 13 (1855) 273. — Type: Griffith s.n. ('Serampore') (B, †; iso in K, n.v.).

Z. malaccensis Gand., Bull. Soc. Bot. France 19 (1919) 303. — Type: Ridley s.n. ('Singapore') (LY, n.v.).

Agrostis indica auct. non L.: Houtt., Nat. Hist. 2, 13 (1782) 227, pro specim. Thunberg.

Stolons to 45 cm long with paired *cataphylls* to 1.3 cm long. *Throat of sheath* with up to 5 mm long hairs. *Blades* erectopatent to patent, up to 8 cm by 1.5–2.6 (–2.8) mm (when expanded), base ± cordately contracted into a callose up to 1.2 mm long pseudo-petiole. *Racemes* exserted above the foliage at anthesis, up to 4.2 cm long, rachis somewhat wavy. *Pedicels* occasionally absent, up to 3.2 mm long, broadened under the spikelet. *Spikelets* 2–3.8 by c. 1 mm. *Lower glume* rarely present, then up to 1 mm long, membranous; *upper glume* with the midrib sometimes rough towards the apex, the other 4 nerves faint, *arista* absent or (sub)apical, straight to geniculate, up to 1.3 mm long.

Distribution. Coast of the Indian Ocean, Chinese Sea to the Ryukyu I., and Malesia (Malaya: Penang, Negri Sembilan, Malacca, Johore, Singapore, Pahang; Sumatra: E. Coast, Bengkoelen; Bangka; Java; Kangean Arch.; Timor; N. Borneo: Labuan I.; Celebes: Kendari; Buru; Ceram; Ternate; Philippines: Batan, Luzon, Mindoro, Mimdano, Palawan, Panay; Aru I.; New Guinea: Morobe Dist., but see note), now extensively cultivated as a lawngrass also inland in tropical countries.

Ecology. Sandy beaches on the landward part of the *Ipomoea pes-caprae* formation, dry salt-marsh pastures, locally dominant; cultivated inland for lawns, golf-courses, air-strips; low altitudes.

Uses. Good soil-binder, resistant to trampling; of little use as fodder; Gilliland (1971) noted 'unsuitable for tennis courts ...a disadvantage on golf greens'.

Vernacular names. *Siglap grass* (Singapore), *djukut kakawatan hijau* (Sund.), *(reba)sekem-sekeman* (Mad.), *burikit* (Ceram), *Manila grass*, *barit-baritan* (Tagalog, Philippines), *flawn* (U.S.).

Chromosome numbers. $2n=20$ (Gould & Soderstrom, 1974), 40 (Larsen, 1963, Christopher & Abraham, 1974, Sindhe & Narayan, 1976).

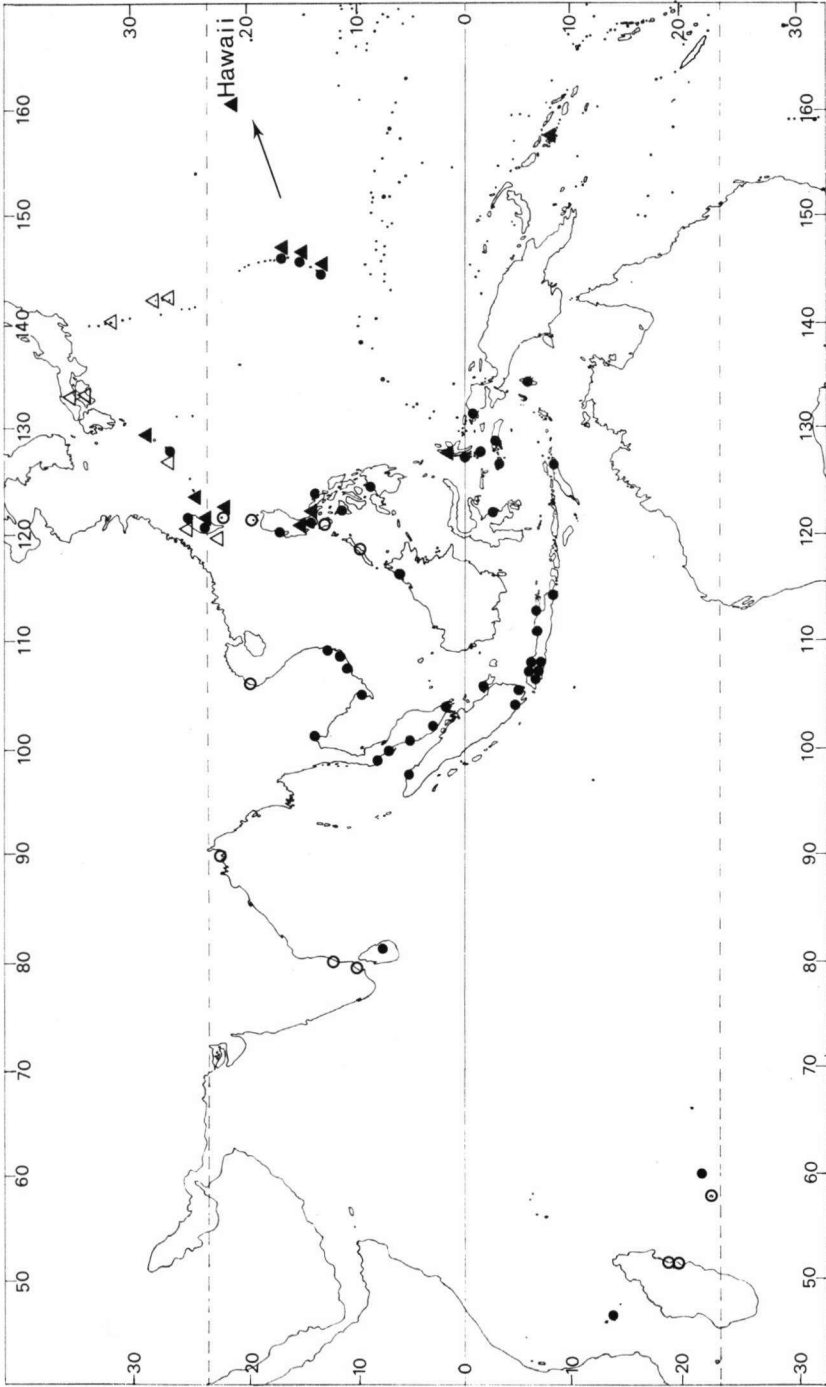
Notes. The record by Warburg (Bot. Jahrb. 16, 1892: 13) for the Finisterres in New Guinea (*Hellwig* 332, in 1888 at 1300 m) seems very unlikely because of the height, the locality, and the date. It is probably a misidentification for a *Digitaria* or a *Sacciolepis*. The only collection from the island I have seen is from Jefman I., near Sorong, where it was probably introduced according to the collector (v. Leeuwen JEF 2).

The citation for Australia by Bentham (Fl. Austr. 7, 1878: 506) refers to *Z. macrantha* Desv.

b. var. pacifica Goudswaard, var. nov. — **Map. 1.**

Varietas longe praetermissa, ab typica differt in foliis explanatis 0.7–1 mm latis, plerumque erectis ad erecto-patentis, pedunculis denique in fructu non vel vix e vagina superiore exsertis, racemis ergo non vel vix supra foliis exsertis, ad 1.5 cm longis, et in distributione originali oceano pacifico occidentali.

Type: *Hatusima* 24127 (L; iso in FU, n.v.), Ryukyu I., Yonakuni I.



Map. 1. Distribution of *Zoysia matrella*. — Dots: var. *matrella*; triangles: var. *pacifica*; when blackened: specimens studied; when open: reliable data from literature.

Zoysia tenuifolia auct. non Thiele: Trin., Mém. Ac. Sc. St. Pétersb. VI, 4, 2 (1836) 96; Steud., Syn. I (1854) 414; Neal, Bish. Mus. Spec. Publ. 13 (1929) 25; Honda, J. Fac. Sc. Univ. Tokyo III, 3, 1 (1930) 318; Hitchc. & Chase, Man. Grasses U. S., ed. 2 (1950) 484, 980, fig. 714; Schmid, l'Agron. Trop. 13 (1958) 466; Bor, Grasses (1960) 684; Fujimoto, Hikobia 4 (1965) 217, fig. 6; Ohwi, Fl. Jap. (1965) 178; Horikawa, Atlas Fl. Jap. (1972) t. 417; Hsu, Fl. Taiwan 5 (1978) 508. — *Z. pungens* Willd. var. *tenuifolia* auct. non Dur. & Sch.: Makino, Bot. Mag. Tokyo 12 (1898) 228. — *Osterdamia zoysia* Honda var. *tenuifolia* auct. non Honda: Honda, Bot. Mag. Tokyo 36 (1922) 113. — *Z. matrella* Merr. var. *tenuifolia* auct. non Sasaki: Makino, Ill. Fl. Nippon (1940) 831; Koyama, J. Jap. Bot. 46 (1971) 65; Walker, Fl. Okinawa & Ryukyu I. (1976) 201.

Stolons up to 30 cm long, with imbricate *cataphylls* up to 1.7 cm long. *Throat of sheath* with up to 2(–5) mm long hairs. *Blades* erect to erecto-patent, up to 6 cm by 0.7–1 mm (when expanded), base contracted above the ligule, but not much widening again, hardly pseudo-petiolate. *Racemes* more or less hidden by the foliage, not or hardly exerted from the upper sheath, even in fruit, up to 1.5 cm long; rachis somewhat wavy. *Pedicels* up to 1.6 mm long, slightly broadened under the spikelet. *Spikelets* 2–2.7 mm long. *Lower glume* absent; *upper glume* smooth, sometimes somewhat rough towards the apex, *arista* absent to minute, up to 0.4 mm long, slightly curved.

Distribution. Taiwan to the Ryukyu I. and Loo Choo I., Marianes, Solomons, Malesia: Moluccas (Halmaheira); now cultivated elsewhere, also inland.

Ecology. Probably as the typical variety: locally abundant in littoral meadows, on coral rock, etc.

Uses. Forming a beautiful thick though bumpy turf, growing fast and eventually crowding out other plants, even other grasses. It needs little water and no cutting and will grow in cool countries, for if frozen it will sprout again (Neal, 1929).

Vernacular names. *Korean grass* (Philippines), *Mascarene grass* (U.S.).

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LITERATURE

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 HOUTTUYN, F. (1782). Natuurlijke historie ... 2, 13: 227. Amsterdam.
 STEENIS, C. G. G. J. VAN, & J. F. VELDKAMP. (1973). Note on Houttuyn's herbarium. Blumea 21: 151–152, fig.

SPECIMENS SEEN

Unnumbered and sterile collections have been omitted.

- Alston* 17051: a; *Anderson* 514: a.
Baker 7703: a; 8178: a; 13005: a; 29710: a; 36090: a; *Bakhuizen v. d. Brink* 1953: a; 2029: a; *Beccari* 3698: a; *Beguín* 80: a; 200: a; 1830: b; v. d. *Bosch* 368: a; *BS* 31498 (*Ramos & Edaño*): a; *BSIP* 164 (*White*): b; *Bünnemeijer* 2500: a; *Buwalda* 3049: a; 3366: a; 4834: a; 5976: a; 7173: a.

Clemens 29767: a.
Danser 6276: a.
Fosberg 24728: a; 24842: b; 24866: b; 25210: b; 25561: a; 37108: b; 37124: a.
Geesink & Santisuk 5262: a.
Hang-An 1132: a; *Hasskarl* 36: a; *Hatusima* 24127: b; *Hatusima & Sako* 21317: b; *Hochreutiner* 2282: a;
Hosaka 2855: a.
Kern 7907: a; 7959: a; *Kerr* 19092: a; *Kjellberg* 382: a; *Koorders* 42649: a; v. *Kregten* 52: a; *Kurz* 1859: a.
Le Barnichal 57: a; v. *Leeuwen JEF* 2: a; *Loher* 1692: a; 7210: a; *Lörzing* 13116: a.
v. *d. Meer & d. Hoed* 2035: a; *Monod de Froideville* 626: a; *Moran* 5008: a.
Nakamine 5006: a; *Nedi & Idjan* 277: a; *Nguyen Van Khiem* 121: a.
Odashima 17785: a; v. *Ooststroom* 13626: a; 13755: a.
PNH 18572 (*Mendoza*): a; 22927 (*Steiner*): a; 33299 (*id.*): b; 33301 (*id.*): a; 42348 (*Mendoza*): a; 42574
(*id.*): a.
Reinwardt 21: a; *Ridley* 1711: a; 5765: a.
Sako 26: b; *Santos* 4016: a, b; 5248: a; 5818: a; 5819: a; 5820: b; 5821: a; 6197: a; 6464: a; 7758: a; 7759: a;
8119: b; 8120: b; 8120: b; 8123: a; *SF* 8251 (*Nur*): a; 52802 (*Corner*): a; *Sieber* 11, 40: a; *Mixta* 142: a;
Smitinand 8916: a; *Sørensen e.a.* 7882: a; v. *Steenis* 3116: a; 17425: a; 17987: a; *Stone* 4951: b. *Tanaka*
17843: b; *Taylor* 2729 (*a*): b.
Tanaka 17843: b; *Taylor* 2729 (*a*): b.
Vanoverbergh 3745: a.
Walker e.a. 6022: a; 6810: b; 7057: b; *Whitford* 1303: a; *Wichian* 495: a; *de Wit* 142: a; 4029: a; 4036: a.
Zollinger 2890: a; *III. Gr.* 36. 8: a.