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Strongylodon
(Leguminosae-Erythrinae),
a revision of the genus

Shing-Fan Huang
Department of Plant Taxonomy
Wageningen Agricultural University, The Netherlands

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Summary

The genus *Strongylodon* has been taxonomically revised. This revision is based on a morphological study of herbarium specimens. There are 12 species, including 2 new species from Sulawesi (Celebes) and the Philippines, and 4 new sections recognized in this study.

S. crassifolius is treated as an insufficiently known species due to a shortage of representative specimens, while *S. perrieri* is treated as an excluded species as it has distinctly different morphological characters when compared with the other species of *Strongylodon*.

Most *Strongylodon* species are more or less confined to small areas except for *S. lucidus* which is distributed widely by sea currents. A sectional arrangement has been proposed, which is largely commensurate with geographical location.

Keys are written for all species, and separately for those species from the Philippines, Sulawesi, New Guinea and Madagascar. Descriptions, lists of literature and synonyms, notes on taxonomical problems, habitat and distribution maps are prepared for each species.

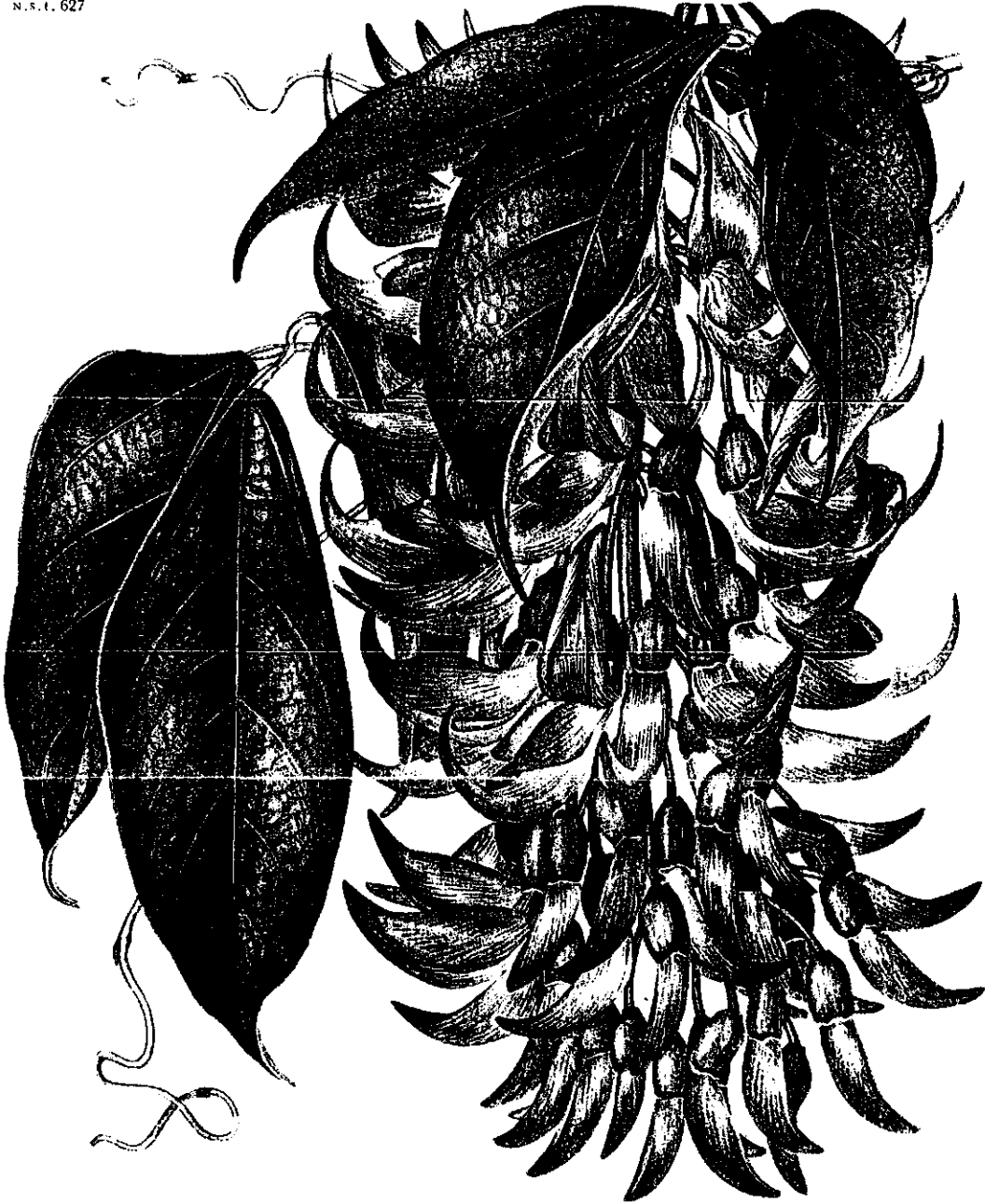


Fig. 1. *Strongylodon macrobotrys* A. Gray, jade vine (reproduced from Curtiss' Botanical Magazine 179, 1972).

1. Introduction

Strongylodon was established as a monotypic genus in 1836 by Vogel. Since then, 25 species have been named in this genus (table 1), but owing to the vague delineation of species, several authors used different names for the same plants. Thus Smith (1985) claimed that the genus needed revision. Furthermore, the chromosome number of *S. macrobotrys*, reported as $n = 14$ (Goldblatt & Davis, 1977), is so different from the other members of the tribe Phaseoleae, being 10 or 11, that a study to reveal the relationships of *Strongylodon* within Phaseoleae is also necessary.

Aside from taxonomic interest, *S. macrobotrys*, the jade vine, which bears big and uncommon jade-green flowers inserted on a long pendulous inflorescence, is considered to be one of the most beautiful ornamental woody vines in the tropics. Other related species also bear graceful flowers and may have potential as garden plants. In order to exploit this potential, further studies are called for.

Before further studies are carried out, however, a taxonomic study to clarify the delineation of species is needed. Such a need led to the present revision of the genus.

2. Materials and methods

This revision is based on a morphological study of conserved material of the plants belonging to the genus *Strongylodon* and some other Phaseoleae. The material was compared with published descriptions and the information taken from the herbarium labels was used to compile data on distribution, habitat, altitude and phenology.

The herbarium work was carried out at the Herbarium Vadense in the Department of Plant Taxonomy of the Wageningen Agricultural University, the Netherlands, where the loan materials were placed.

All cited specimens have been examined for this taxonomic revision except when marked 'not seen'.

Material was studied from the following herbaria, either while visiting the institution or from sheets obtained on loan:

- A: Herbarium, Arnold Arboretum of Harvard University, Cambridge, Massachusetts, U.S.A.
- B: Botanischen Garten und Botanisches Museum Berlin-Dahlem, Federal Republic of Germany.
- BISH: Herbarium Pacificum, Department of Botany, Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A.
- BM: Herbarium, British Museum, Cromwell Road, London, U.K.
- BO: Herbarium Borgoriense, Bogor, Indonesia.
- E: Royal Botanic Garden, Edinburgh, U.K.
- GH: Gray Herbarium of Harvard University, Cambridge, Massachusetts, U.S.A.
- K: The Herbarium, Royal Botanic Gardens, Kew, Richmond, U.K.
- KWA: South China Institute of Botany, Academia Sinica, Kwangchow (Canton), Guangdong, Peoples Republic of China.
- L: Rijksherbarium, Leiden, The Netherlands.
- LE: Herbarium, Komarov Botanical Institute, Academy of Sciences of the U.S.S.R, Leningrad, U.S.S.R.
- M: Herbarium, Botanische Staatssammlung, München, Federal Republic of Germany.
- MO: Herbarium, Missouri Botanical Garden, St. Louis, Missouri, U.S.A.
- NY: Herbarium, New York Botanical Garden, Bronx, New York, U.S.A.
- P: Laboratoire de Phanerogamie, Muséum National d'Histoire Naturelle, Paris, France.
- PNH: Philippine National Herbarium, Manila, Philippines.
- TAI: The Herbarium, Department of Botany, National Taiwan University, Taipei, Taiwan.

US: US National Herbarium, Smithsonian Institution, Washington D.C.,
U.S.A.

WAG: Herbarium Vadense, Department of Plant Taxonomy, Wageningen
Agricultural University, The Netherlands.

I would like to give my cordial thanks to the directors and staff members of
the cited institutes who supplied the facilities and rendered advice.

3. History of the genus *Strongylodon*

In 1836 Vogel established the then monotypic genus *Strongylodon* based on the species *S. ruber*, which was collected from Hawaii by Chamisso. The generic name indicates the characteristic shape of the rounded lobes of the calyx. In 1854 Asa Gray confirmed the generic status and published details of the second species, *S. macrobotrys*, from the Philippines.

In 1865 Seemann, working on the flora of Fiji, treated *S. ruber* as a synonym of *S. lucidus*. The basionym of *S. lucidus* is *Glycine lucida* which was published by G. Forster in 1786, based on materials from the Society Islands (Tahiti). In 1825 de Candolle transferred *G. lucida* to *Rhynchosia lucida* and doubted that this species merited generic status.

From 1881 to 1902, French and English botanists described 7 species (Table 1) from Madagascar and Reunion. Drake (1902) was the first person to revise the *Strongylodon* of Madagascar and he recognized 6 species. Among them, 2 species were newly described and 1 species was transferred from *Chadsia*.

From 1904 to 1915, American botanists described ten species (Table 1) from the Philippines.

In 1913 Craib took up Drake's (1886) comments on *S. lucidus*, and published a new binomial, *S. pseudolucidus*.

In 1923 Merrill revised *Strongylodon* of the Philippines and recognized 10 species. Among them, 9 species were endemic. In 1942 Merrill and Perry described *S. archboldianus* from New Guinea.

From 1950 to 1978, *S. perrieri*, *S. secundus*, *S. decipiens* were described respectively from Madagascar, the Solomon Islands and New Guinea.

In 1979 Verdcourt revised *Strongylodon* of New Guinea and recognized 2 endemic species and 1 widely distributed species. In his treatment, the widely distributed species *S. siderospermus* is distributed from Sri Lanka to Madagascar and eastwards to Queensland, New Guinea and Fiji. His specific delimitation of *S. siderospermus* was challenged by Smith (1985) when he worked on the Flora of Fiji and had a chance to examine the type specimen of *S. lucidus*. He claimed that Fiji's plants were not different from *S. lucidus* from Tahiti, New Guinea and Queensland. Because only incomplete material was studied, he suggested that the genus should be revised in its entirety.

Table I: Chronological account of specific epithets in *Strongylodon* with their present status.

| Year | Species name | Described from | Present treatment |
|------|--|-----------------------------|------------------------------------|
| 1836 | <i>S. ruber</i> Vogel | Hawaii | <i>S. lucidus</i> "ruber" |
| 1854 | <i>S. macrobotrys</i> A. Gray | Philippines | <i>S. macrobotrys</i> |
| 1865 | <i>S. lucidus</i> Seemann | Society Islands (Tahiti) | <i>S. lucidus</i> "lucidus" |
| 1881 | <i>S. madagascariensis</i> Baker | Madagascar | <i>S. madagascariensis</i> |
| 1883 | <i>S. lastellianus</i> Baillon | Madagascar | <i>S. madagascariensis</i> |
| 1891 | <i>S. craveniae</i> Baker | Madagascar | <i>S. craveniae</i> |
| 1895 | <i>S. siderospermus</i> Cordemoy | Reunion | <i>S. lucidus</i> "lucidus" |
| 1902 | <i>S. campenoni</i> Drake | Madagascar | <i>S. craveniae</i> |
| 1902 | <i>S. catati</i> Drake | Madagascar | <i>S. madagascariensis</i> |
| 1902 | <i>S. lantzianus</i> (Baillon) Drake | Madagascar | <i>S. madagascariensis</i> |
| 1904 | <i>S. warburgii</i> Perkins | Philippines | <i>S. macrobotrys</i> |
| 1904 | <i>S. crassifolius</i> Perkins | Philippines | Insufficiently known |
| 1905 | <i>S. caeruleus</i> Merrill | Philippines | <i>S. caeruleus</i> |
| 1905 | <i>S. elmeri</i> Merrill | Philippines | <i>S. elmeri</i> |
| 1907 | <i>S. zschokkei</i> Elmer | Philippines | <i>S. zschokkei</i> |
| 1908 | <i>S. pulcher</i> Robinson | Philippines | <i>S. pulcher</i> |
| 1910 | <i>S. mindanaensis</i> Elmer | Philippines | <i>S. pulcher</i> |
| 1913 | <i>S. pseudolucidus</i> Craib | origin from Madagascar | <i>S. lucidus</i> "lucidus" |
| 1915 | <i>S. agusanensis</i> Elmer | Philippines | <i>S. pulcher</i> |
| 1915 | <i>S. megaphyllus</i> Merrill | Philippines | <i>S. macrobotrys</i> |
| 1915 | <i>S. paucinervis</i> Merrill | Philippines | <i>S. caeruleus</i> |
| 1942 | <i>S. archboldianus</i> Merrill & Perry | New Guinea | <i>S. archboldianus</i> |
| 1950 | <i>S. perrieri</i> Viguier | Madagascar | Excluded species |
| 1972 | <i>S. secundus</i> St. John | Solomon Islands | <i>S. lucidus</i> "lucidus" |
| 1978 | <i>S. decipiens</i> Verdc. | New Guinea | <i>S. decipiens</i> |
| 1978 | <i>S. decipiens</i> var. <i>imbricatus</i> Verdc. | New Guinea | <i>S. decipiens</i> |
| 1990 | <i>S. celebicus</i> Huang | Sulawesi | <i>S. celebicus</i> |
| 1990 | <i>S. lucidus</i> "longiflorus" | Samoa | <i>S. lucidus</i> "longiflorus" |
| 1990 | <i>S. loheri</i> Huang | Philippines | <i>S. loheri</i> |

4. Characters of the genus *Strongylodon*

4.1 Morphology

4.1.1 Branches

The young branches are glabrous, or hairy and becoming glabrous when developed. Young branches are striate and become sulcate when woodified. Older branches always bear lenticels.

4.1.2 Stipules

There are three types of stipules in *Strongylodon*. The peltate type, producing below (with a basal flap), is characteristic for sections Archboldianus and Macrobotrys. The basifixed type, not producing below, is characteristic of Madagascar species. The basifixed type with large auricles at the base is typical for section *Strongylodon*. The auricles are deciduous when developing. All the stipules are distinctively striate and caducous. When fallen, they leave conspicuous scars at the base of petioles.

4.1.3 Leaves

Leaves of *Strongylodon* are alternate, pinnately 3-foliolate and stipellate. The rachis is pulvinate, glabrous or sparsely hairy and grooved adaxially. The supra-jugal part of the rachis is similar to the subjugal part but much shorter. Terminal leaflets are glabrous above, glabrous or sparsely hairy beneath. The blades are 3-nerved, that is basal nerves extending to the upper portion of the blade, in *S. archboldianus*, *S. craveniae*, *S. celebicus*, *S. elmeri*, *S. lucidus*, and *S. macrobotrys* (Fig. 1). The distinctive basal nerves extend either from above the base, e.g. *S. elmeri*, *S. macrobotrys*, *S. zschokkei*, or from the base in the other species. The basal nerves always extend upward away from the basal margin except in *S. pulcher* which has basal nerves extending along the basal margin (Fig. 2). The number of lateral nerves is useful in distinguishing some species. On the whole the number is lower in the 3-nerved group than in the non 3-nerved group. Lateral leaflets are opposite and more or less oblique at the base (Fig. 3). They are always similar to the terminal one in shape but smaller in size. The petiolules may be different in length between species but they are grooved and rugous in general. Stipels are setaceous or linear with striate lines.

4.1.4 Inflorescence

The inflorescences are nodose-pseudoracemous or rarely nodose-paniculate, which are only found in some populations of *S. lucidus*. The inflorescences are axillary, either singly or 2-3 pseudoracemes are clustered. They are often pro

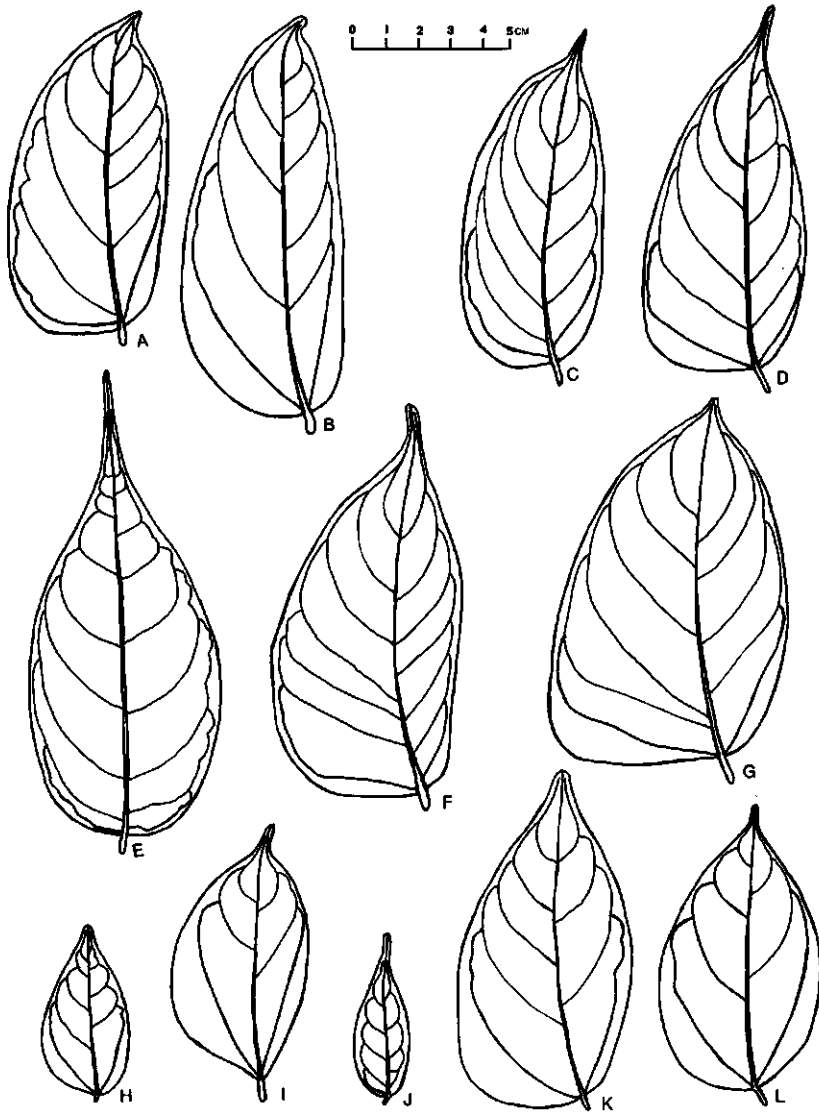


Fig. 2. Terminal leaflets of *Strongylodon* species.

A. *S. macrobotrys* A. Gray; B. *S. elmeri* Merrill; C. *S. zschokkei* Elmer; D. *S. loheri* Huang; E. *S. decipiens* Verdc.; F. *S. pulcher* C.B. Robinson; G. *S. caeruleus* Merrill; H. *S. archboldianus* Merrill & Perry; I. *S. craveniae* Baron & Baker; J. *S. madagascariensis* Baker; K. *S. lucidus* (G. Forster) Seemann; L. *S. celebicus* Huang.

(A. A.D.E. Elmer 9336; B. A.D.E. Elmer 6260; C. A.D.E. Elmer 540; D. A. Loher 2304; E. L.J. Brass 32275; F. A.D.E. Elmer 13461; G. A.D.E. Elmer 90; H. L.J. Brass 11696; I. M.J. Leandri 1579; J. H. Humbert 3449; K. R. Pullen 6794; L. van Balgooy 3422).

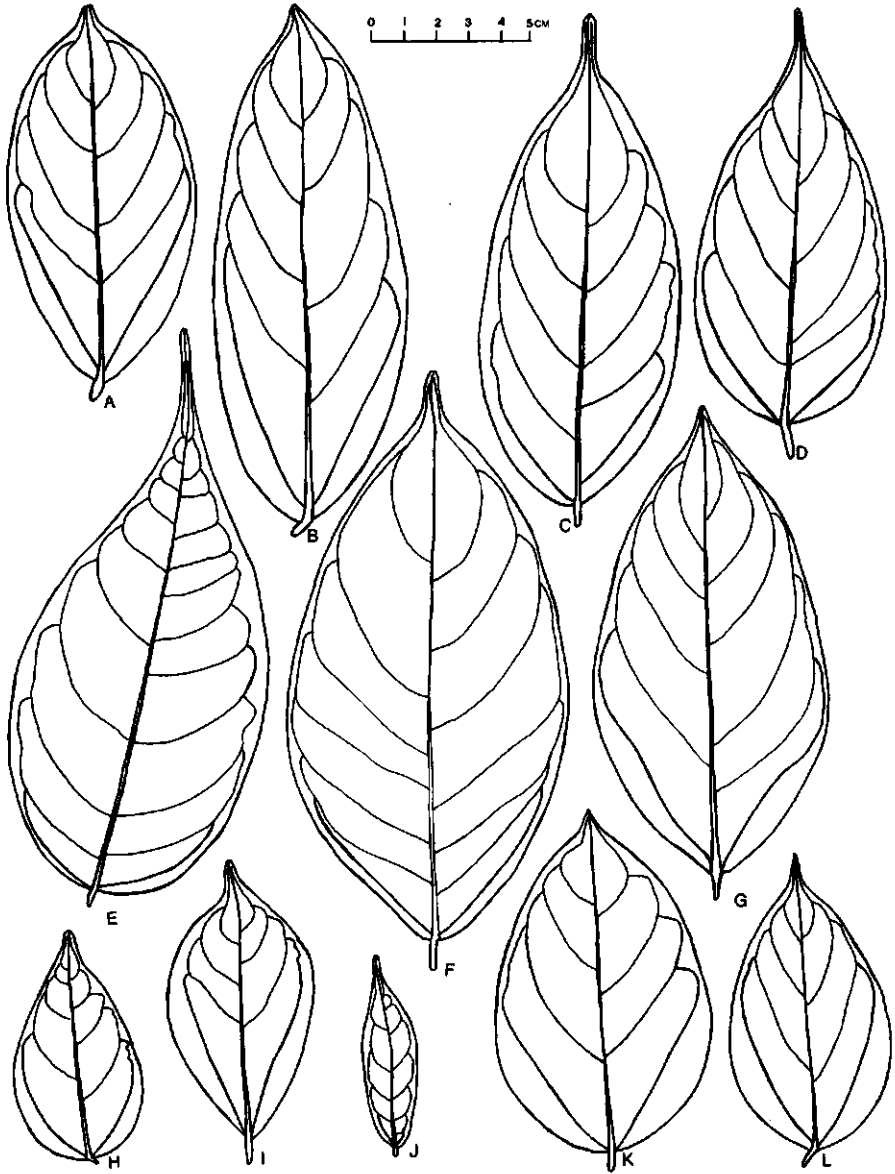


Fig. 3. Lateral leaflets of *Strongylodon* species.

A. *S. macrobotrys* A. Gray; B. *S. elmeri* Merrill; C. *S. zschokkei* Elmer; D. *S. loheri* Huang; E. *S. decipiens* Verdc.; F. *S. pulcher* C.B. Robinson; G. *S. caeruleus* Merrill; H. *S. archboldianus* Merrill & Perry; I. *S. craveniae* Baron & Baker; J. *S. madagascariensis* Baker; K. *S. lucidus* (G. Forster) Seemann; L. *S. celebicus* Huang.

(A. A.D.E. Elmer 9336; B. A.D.E. Elmer 6260; C. A.D.E. Elmer 540; D. A. Loher 2304; E. L.J. Brass 32275; F. A.D.E. Elmer 13461; G. A.D.E. Elmer 90; H. L.J. Brass 11696; I. M.J. Leandri 1579; J. H. Humbert 3449; K. R. Pullen 6794; L. van Balgooy 3422).

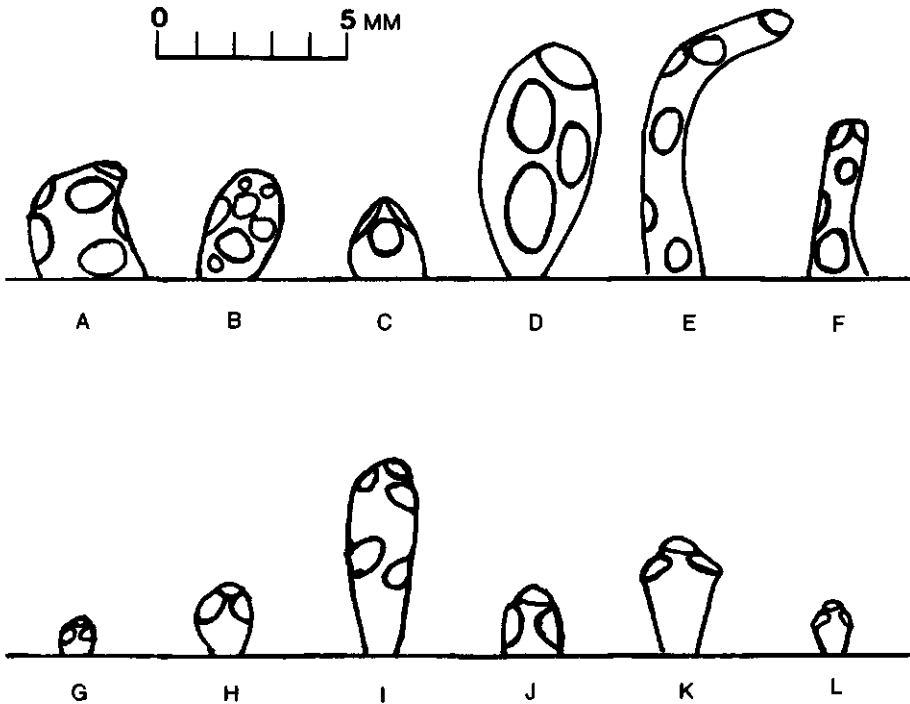


Fig. 4. Nodes of inflorescence (brachyblasts) of *Strongylodon* species.

A. *S. macrobotrys* A. Gray; B. *S. elmeri* Merrill; C. *S. zschokkei* Elmer; D. *S. loheri* Huang; E. *S. caeruleus* Merrill; F. *S. pulcher* C.B. Robinson; G. *S. archboldianus* Merrill & Perry; H. *S. decipiens* Verdc.; I. *S. craveniae* Baron & Baker; J. *S. madagascariensis* Baker; K. *S. celebicus* Huang; L. *S. lucidus* (G. Forster) Seemann.

(A. R. Ramos s.n. April 1921; B. A.D.E. Elmer 6260; C. A.D.E. Elmer 540; D. A. Loher 2304; E. A. Loher 2305; F. M.D. Sulit s.n. March 1949; G. L.J. Brass 11696; H. Clemens 700; I. H. Perrier 1191; J. H. Humbert 31419; K. van Balgooy 3422; L. A. Kanis 1017).

duced from the old branches, cauliflorous, and hang down, away from the foliage. Inflorescences are short in *S. pulcher*, about 10 cm long, or up to 3 m long in *S. macrobotrys*. Peduncles, from the base to the first node of inflorescence, are longer than the flowering axis in *S. elmeri* and *S. zschokkei* but shorter in *S. caeruleus*, *S. craveniae* and *S. pulcher* when fully developed. The other species have both conditions. The nodes of the inflorescence (brachyblasts) are cylindric in *S. caeruleus* and *S. pulcher* or warty in the other species (Fig. 4). Each brachyblast basically contains either 3 flowers in section *Archboldianus*, section *Strongylodon* and *S. madagascariensis* or more than 3 flowers in section *Macrobotrys* and *S. craveniae*. The bracts are ovate, striate and caducous. The bracteoles at the basis of the calyx tube are ovate, striate, ciliate at margin, peltate or basifixed with auricles at base and caducous. They are conspicuous, sometimes larger than the bracts.

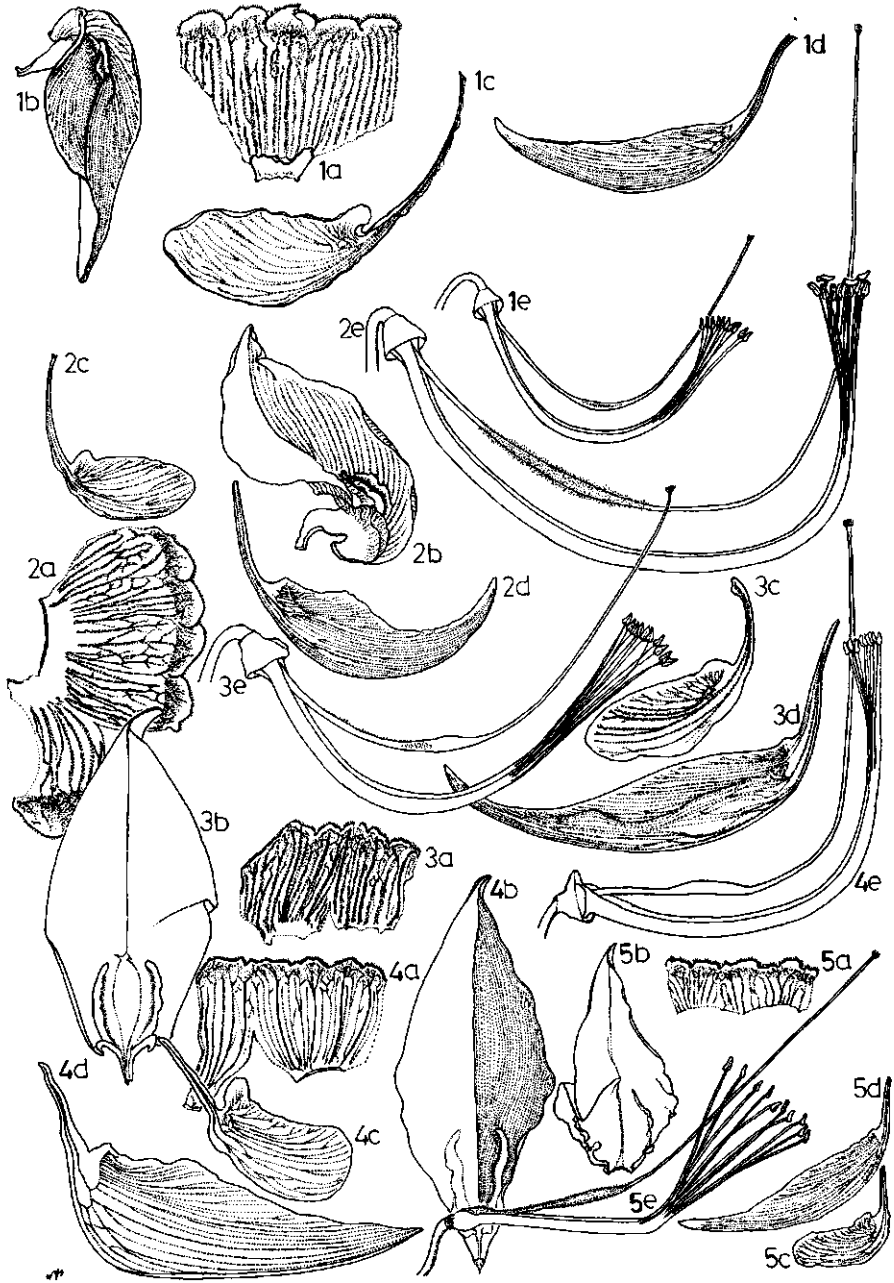


Fig. 5. Flowers of *Strongylodon* species.

1. *S. zschokkei* Elmer: a. Calyx x2; b. Standard x1.; c. Wing petal x2; d. Keel petal x1; e. Stamens and pistil x1; 2. *S. loheri* Huang: a. Calyx x1; b. Standard x1; c. Wing petal x1; d. Keel petal x1; e. Stamens and pistil x1; 3. *S. elmeri* Merrill: a. Calyx x1.6; b. Standard x1.6; c. Wing petal x1.6; d. Keel petal x1.6; e. Stamens and pistil x2. 4. *S. caeruleus* Merrill: a. Calyx x2; b. Standard x2; c. Wing petal x2; d. Keel petal x2; e. Stamens and Pistil x2. 5. *S. pulcher* C.B. Robinson: a. Calyx x1; b. Standard x1; c. Wing petal x1; d. Keel petal x1; e. Stamens and pistil x2.

(1. A.D.E. Elmer 540; 2. A. Loher 2304; 3. A. Loher 14272; 4. A.D.E. Elmer 90; 5. M. Ramos s.n. 1916).

4.1.5 Flower

The flowers are pedicellate and beaked at the apex in general outline (Fig. 5,6). The petal colour is purplish-blue or bluish green in section *Macrobotrys*, or orange-red, red, and whitish in the other sections. The calyx is campanulate and 5-lobed. The upper 2 lobes are connate, up to the tip. The lower 3 lobes are separate and inconspicuous in *S. celebicus*, *S. elmeri*, *S. macrobotrys*, and some populations of *S. lucidus*, or imbricate and distinctive in the other species. The calyx is always hairy at the upper portion inside and glabrous outside except in *S. craveniae* where it is hairy outside. Standards are ovate or lanceolate in outline, usually with thick texture toward the apex. The base of the standard is clawed or subsessile. There are two arched appendages above the claw. Wing petals are oblong and about half as long as the standard. They are clawed, auricled and firmly attached to the keel petals at its base. Keel petals are beaked or acute at the apex and clawed at the base. They are connate adaxially and embrace the stamens and pistil. Stamens are 10 in number. The vexillary stamen is completely free from the 9 others which are fused. The filaments are glabrous. The anthers are uniform, oblong, dorsifixed and longitudinally split. The pistil bears a discoid nectary at its base. The nectary is 1-2 mm long and shallowly toothed at the apex. The stipe of the pistil is densely hairy in *S. pulcher*, some populations of *S. craveniae* and *S. macrobotrys*, and glabrous or sparsely hairy in the other species. The ovary is oblong or elliptic. It is glabrous in *S. caeruleus*, *S. celebicus*, *S. lucidus*, and hairy in the other species. The ovary is 1-2-ovuled in *S. lucidus* or 2-12-ovuled in the other species. The style is flat or filiform and glabrous or sometimes hairy at the lower portion. The length of the style is much longer than that of the ovary and the stipe. The stigma is small and terminal.

4.1.6 Pod

The scant availability of pods in the world's herbaria is a real problem that has discouraged botanists in recent time from tackling taxonomy in *Strongylo-don*. Pods are variable in *Strongylo-don*. Pods are more or less constricted in section *Craveniae*; semi-septate in *S. loheri* and continuous in the other species; linear and thin in section *Archboldianus*; fleshy and thick in *S. celebicus* and section *Macrobotrys* excluding *S. zschokkei*; elliptic and thin in *S. lucidus*, and *S. zschokkei*. Thick pods are rugose while thin ones are reticulate-veined at surface. Pods are dehiscent by rupture of the valve in *S. lucidus* while the suture splits in the other species. The fruiting periods given for each species are incomplete for want of data, but most likely fruits will be produced 1-2 months after flowering.

4.1.7 Seed

Seeds are irregular and rough in section *Archboldianus*, reniform and smooth in section *Macrobotrys*, orbicular or spherical in sections *Strongylo-don* and *Craveniae*. The seed colour is either brown, black, blue or brick-red which may be controlled by one or few genes as different colours can be found in the same population.

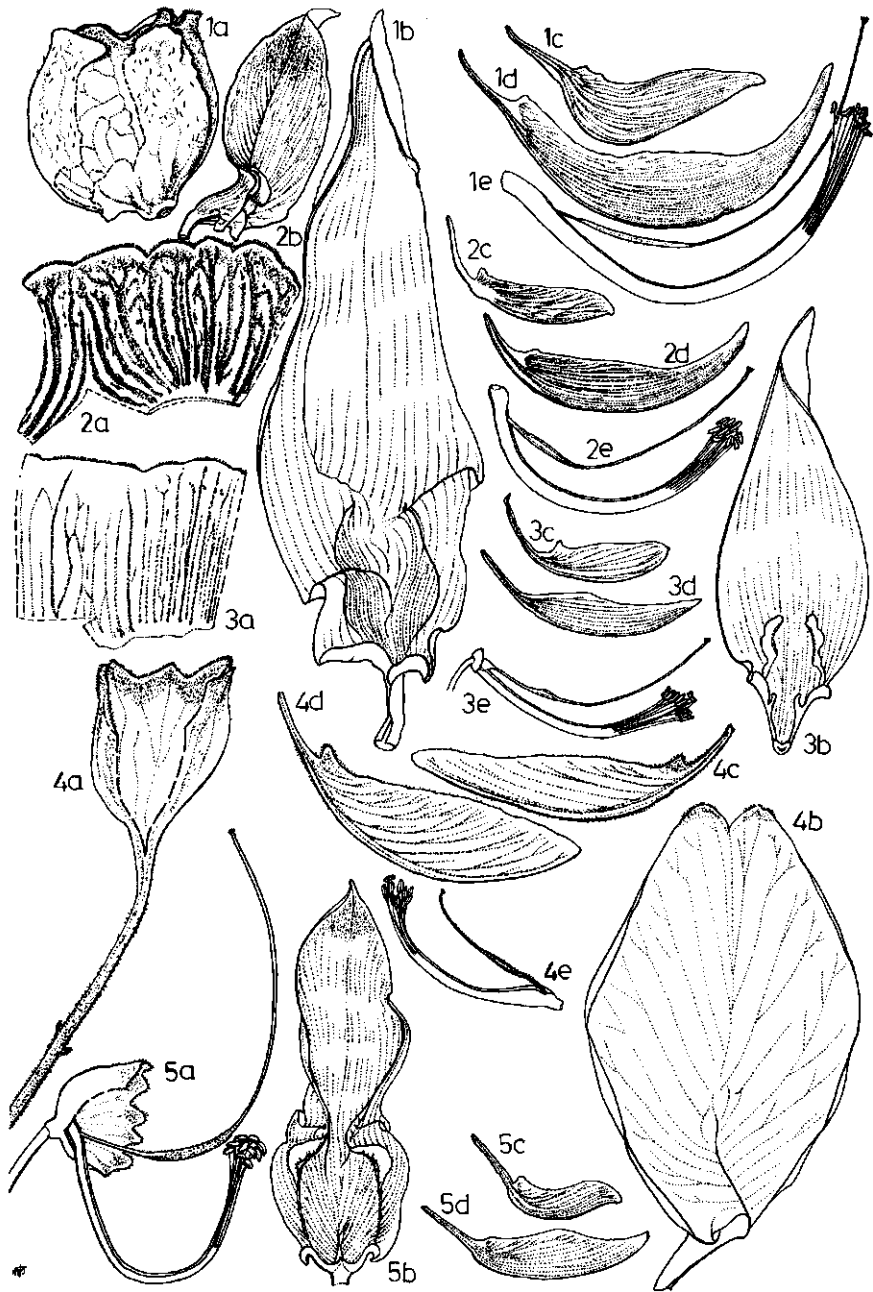


Fig. 6. Flowers of *Strongylodon* species.

1. *S. craveniae* Baron & Baker: a. Calyx x3; b. Standard x2; c. Wing petal x1; d. Keel petal x1; e. Stamens and Pistil x1; 2. *S. madagascariensis* Baker: a. Calyx x3; b. Standard x1; c. Wing petal x1; d. Keel petal x1; e. Stamens and pistil x1; 3. *S. lucidus* (G. Forster) Seemann: a. Calyx x3; b. Standard x2; c. Wing petal x1.6; d. Keel petal x1; e. Stamens and pistil x1; 4. *S. perrieri* Viguier: a. Calyx and pedicel x3; b. Standard x3; c. Wing petal x2; d. Keel petal x2; e. Stamens and pistil x1; 5. *S. archboldianus* Merrill & Perry: a. Stamens and pistil within calyx x2; b. Standard x2; c. Wing petal x1; d. Keel petal x1.

(1. H. Perrier 4216; 2. J.M. Hildebrandt 369; 3. M.J.S. Sands et al. 2214; 4. H. Perrier 1194; 5. L.J.Brass 10755).

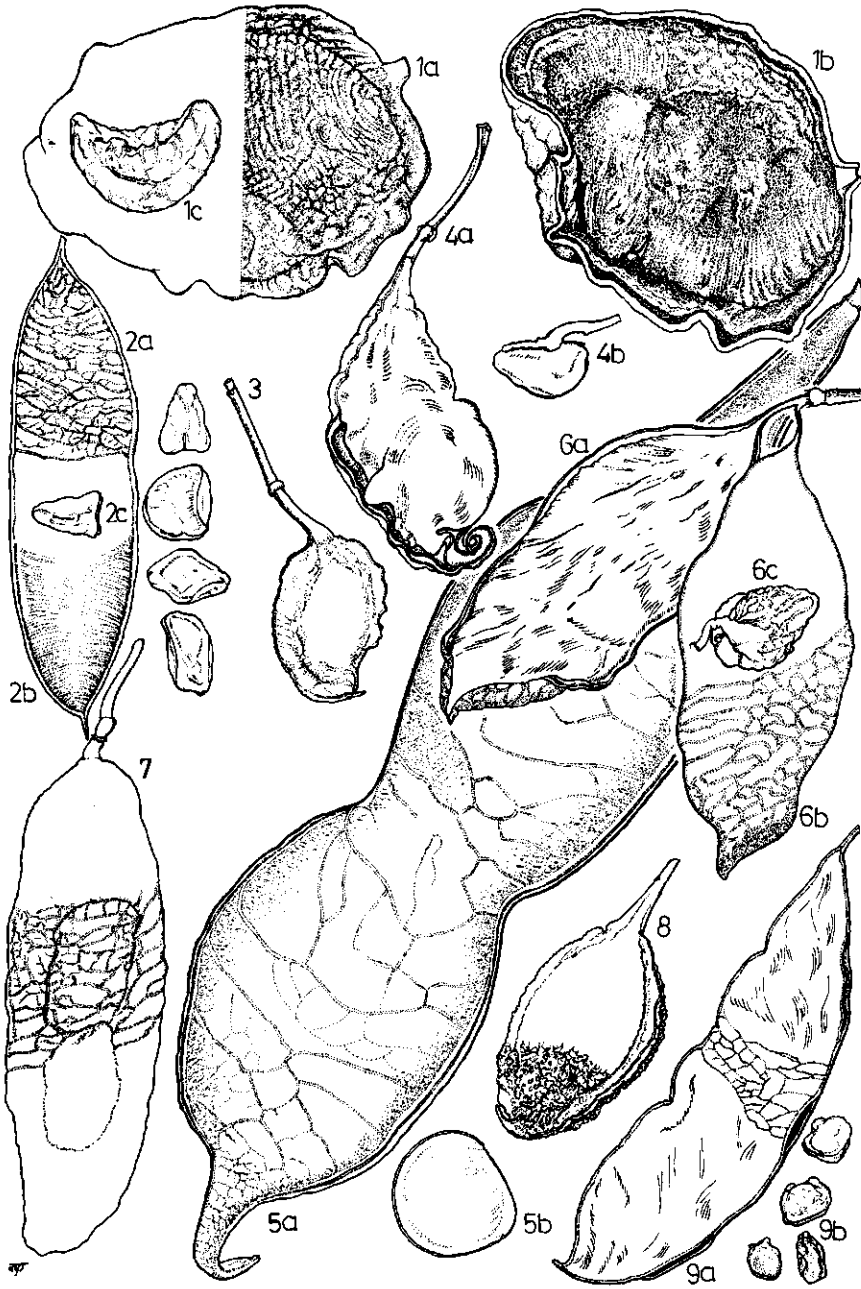


Fig. 7. Pods and seeds of *Strongylodon* species.

1. *S. macrobotrys* A. Gray: a. Outer surface of pod in detail; b. Inner surface of pod in detail; c. Seed; 2. *S. archboldianus* Merrill & Perry: a. Outer surface of pod in detail; b. Inner surface of pod in detail; c. Seeds; 3. *S. caeruleus* Merrill: Pod; 4. *S. elmeri* Merrill: a. Pod; b. Seed; 5. *S. craveniae* Baron & Baker: a. Pod; b. Seed; 6. *S. zschokkei* Elmer: a. Inner surface of pod; b. Outer surface of pod in detail; c. Seed; 7. *S. madagascariensis* Baker: Pod in detail with 2 seeds inside; 8. *S. pulcher* C.B. Robinson: Pod in detail; 9. *S. decipiens* Verdc.: Pod in detail (all x2/3; 1. Ramos & Derooy s.n. April-May 1915; 2. L.J. Brass 11429; 3. R. Ramos s.n. April 1923; 4. A. Loher 13298; 5a. A. Gentry 11722; 5b. H. Perrier 18328; 6. M. Celestino 4363; 7. H. Perrier 4757; 8. C.E. Edaños 11854; 9. Streimann & Kairo 44463).

4.1.8 Hilum

Hila basically extend from the micropyle side to the opposite side of seed. They are linear when seeds are reniform or irregular. They are semi-circumferential when seeds are orbicular or spherical. The hilum is short in *S. archboldianus*, 3-4 mm long which is about 1/5 of the circumference, but long in *S. craveniae*, about 3/4 of the circumference. Each hilum is covered by funicular residue which is termed epihilum or spongy tissue (Lackey, 1981a, 1981b; Gunn, 1981). The presence of epihilum need not be consistent within a genus (Lackey, 1981a), but all the species of *Strongylodon* possess an epihilum. From this view, *Strongylodon* is rather homogenous.

4.2 Cytology

Only the chromosome number of *S. macrobotrys* was reported as $2n = 28$ by Goldblatt and Davis (1977). This number is so peculiar in the tribe Phaseoleae with a basic chromosome number of 10 or 11, that Lackey (1980) and Goldblatt (1981b) cannot explain how the $n = 14$ is derived from $n = 10$ or 11. Because ancient groups of Leguminosae, e.g. Mimosoideae, Caesalpinieae and Sophoreae, bear chromosome numbers $n = 14$, Goldblatt (1981a) considered that *Strongylodon* might be an isolated relict genus.

4.3 Phytochemistry

Only a free amino acid, canavanine, mainly found in the seeds of Papilionoideae, was reported to be present in the seeds of *S. macrobotrys* (Lackey 1977b). The ability to produce canavanine can be considered advanced and the presence or absence of canavanine may be a good character in grouping subgenera (Bell, 1981).

4.4 Pollen

Three species, *S. caeruleus*, *S. lucidus* and *S. macrobotrys*, were studied by Graham and Tomb (1977). The pollen grains of *Strongylodon* are basically 3-colporate with perforate and reticulate tecta which can be distinguished from those of the other genera of the subtribe Erythrinae.

4.5 Pollination

S. lucidus was documented to be pollinated by birds (Hoogland, unpublished; Polhill, 1972; Arroyo, 1981). Polhill (1972) assumed that *S. macrobotrys* was pollinated by bats for it bears big and bluish flowers inserted on long pendulous

inflorescences away from the foliage (the typical bat-flower syndrome, Faegri & van der Pijl 1979). Arroyo (1981) also took the same view. Another species, *S. celebicus*, resembling *S. lucidus* except for the whitish flowers with more ovules and fleshy pods which are similar to *S. macrobotrys*, seems to support Polhill's assumption. If the assumption is correct, the bat-pollinated species should be considered advanced (Polhill, 1981).

4.6 Dispersal

S. lucidus was documented to be dispersed by sea currents (Guppy, 1912; Ridley, 1930; Gunn & Dennis, 1976). The sea current dispersal can explain why only *S. lucidus* is widely distributed (see geography). The pods of *S. macrobotrys* are thick and fleshy which could be eaten and dispersed by bats (Polhill, 1972).

4.7 Habit and habitat

Strongylodon species are tall climbers, that inhabit the canopy of swampy forest, or forest edges usually near a creek or along a stream. The plants may reach heights of 40 m. Some populations of *S. lucidus* can be found in more exposed and disturbed inland forests.

5. The relationships of *Strongylodon*

Since *Strongylodon* was founded in 1836, it was conventionally placed between *Erythrina* and *Mucuna*. These genera and other genera, i.e. *Apios*, *Cochlianthus*, *Rudolphia* and *Butea*, were grouped as subtribe Erythrinae (Taubert, 1894; Lackey, 1977a; 1981a) in the tribe Phaseoleae (Bentham & Hooker, 1865) or grouped as tribe Erythrinae (Hutchinson, 1964) which was considered related to Millettiae (Geesink, 1984).

Though *S. lantzianus* (= *S. madagascariensis* in this revision) once was treated under the genus *Chadsia* by Baillon (1883) which was taken up by Taubert (1894), *Chadsia* is immediately distinguished from *Strongylodon* by its shrubby habit, pinnate leaflets without stipels, fasciculate axillary flowers and absence of a discoid nectary at the base of pistil which characters are more related to Millettiae.

The delimitation between Millettiae and Phaseoleae is not so clear, but *Strongylodon* has some characters, e.g. pinnately 3-foliolate, oblique lateral leaflets and, especially, peltate stipules which are found in Phaseoleae but not in Millettiae, and is suggested to be more related to Phaseoleae.

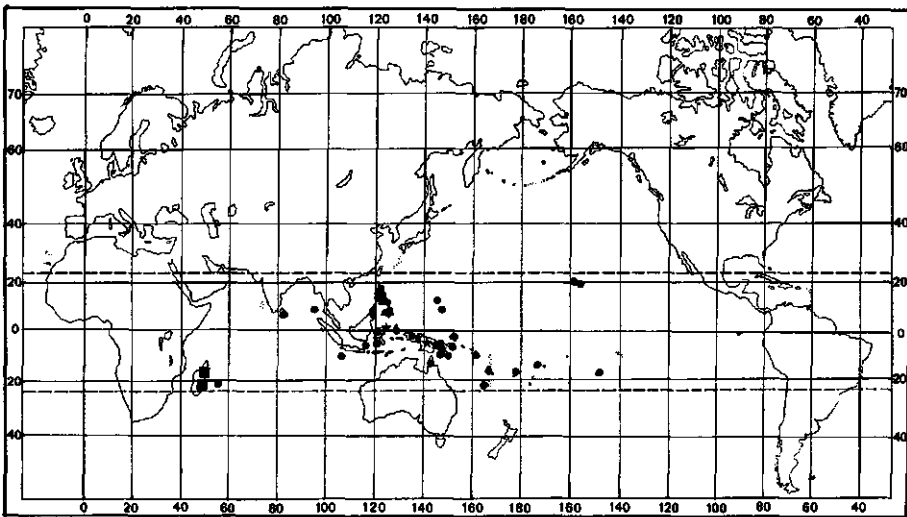
Erythrinae is such an artificial group as claimed and elucidated by Lackey (1977a, 1981a), Goldblatt (1981a) and Graham and Tomb (1977), that there are no genera closely related to each other except *Apios* and *Cochlianthus*. Owing to the scant studies on *Strongylodon*, the real relationship of *Strongylodon* with other genera cannot be established at present. When compared to *Erythrina* and *Mucuna*, *Strongylodon* is close to *Mucuna* in having climbing habit, circumferential hilum and, especially, colpate pollen which was thought to have been evolved along different lines from the porate pollen (Tewari & Nair, 1978) which occurs in *Erythrina*.

6. Distribution of *Strongylodon*

Strongylodon, containing 12 species in 4 sections in this revision, is distributed from Madagascar and Reunion to Sri Lanka, the Andaman Islands, Christmas Island, Cook Peninsula (Australia) then northward to New Guinea, Sulawesi (Celebes), Philippines and eastward to Islands of the Pacific Ocean such as Guam, Kusai, Hawaii, Tahiti, Samoa, Fiji, New Caledonia, New Britain, New Ireland and the Solomon Islands (Map 1). Among the species of *Strongylodon* only *S. lucidus* has widely spread because of long-distance dispersal by sea currents (Guppy, 1912; Ridley, 1930; Gunn & Dennis, 1976). The other species are somewhat confined to a small area (Table 2). The Philippines contain 6 endemic species; Sulawesi contains 1 endemic and shares 1 species with New Guinea; New Guinea contains 1 endemic species besides 1 common species shared with Sulawesi; Madagascar contains 2 endemic species. The endemic species in each area are so much alike that they can be grouped into sections (see sectional arrangement). This indicates that geography is one of the main factors in the evolution of *Strongylodon*.

Strongylodon occurs between the Tropic of Cancer and the Tropic of Capricorn which shows that it is a truly tropical genus (Map 1). Owing to the higher specific richness and diversity occurring in Malesia compared to Madagascar, *Strongylodon* is suggested to be of Malesian origin.

In Asia, *Strongylodon* is only found in eastern Malesia but not in the western part (e.g. Borneo, Java, Sumatra, Malay Peninsula). In a sense it supports the demarcation by Neo-Wallace's line (Dickerson, 1928).



Map 1: Distribution of *Strongylodon*. ● section *Strongylodon* ★ section *Archboldianus*
 ■ section *Craveniae* ▲ section *Macrobotrys*

Table 2: Distribution of *Strongylodon* species.

| Taxa | Area | Madagascar | Islands of a) Indian Ocean | Australia | New Guinea | Indonesia c) | Saluwesi (Celebes) | Philippines | Islands of d) Pacific Ocean |
|----------------------------|------|------------|-------------------------------|-----------|------------|--------------|-----------------------|-------------|--------------------------------|
| Section Archboldianus | | | | | | | | | |
| <i>S. archboldianus</i> | | | | | + | | | | |
| <i>S. decipiens</i> | | | | | + | | + | | |
| Section Macrobotrys | | | | | | | | | |
| <i>S. caeruleus</i> | | | | | | | | + | |
| <i>S. elmeri</i> | | | | | | | | + | |
| <i>S. loheri</i> | | | | | | | | + | |
| <i>S. macrobotrys</i> | | | | | | | | + | |
| <i>S. pulcher</i> | | | | | | | | + | |
| <i>S. zschokkei</i> | | | | | | | | + | |
| Section Craveniae | | | | | | | | | |
| <i>S. craveniae</i> | | + | | | | | | | |
| <i>S. madagascariensis</i> | | + | | | | | | | |
| Section Strongylodon | | | | | | | | | |
| <i>S. celebicus</i> | | | + | + | + | + | + | + | + |
| <i>S. lucidus b)</i> | | | | | | | | | |
| Total | | 2 | 1 | 1 | 3 | 1 | 3 | 7 | 1 |

a) Includes Reunion, Christmas Island, Sri Lanka, Andaman Islands.

b) Includes different populations.

c) Includes Seram (Ceram), Kangean, Key (Kai), Moluccas.

d) Includes Caroline Islands, Fiji, Guam, New Britain, New Caledonia, New Ireland, Samoa, Solomon Islands, Tahiti, Tonga, Vanuta (New Hebrides).

7. Description of *Strongylodon*

Strongylodon Vogel

Strongylodon Vogel in *Linnaea* 10: 585 (1836); A. Gray, U.S. Expl. Exped. 1: 445 (1854); Bentham & Hooker, *Gen. Pl.* 1: 532 (1865); Seemann, *Fl. Vit.* 60 (1865); Baillon, *Hist. Pl.* 2: 247 (1870); Baker in Hooker, *Fl. Brit. Ind.* 2: 190 (1879); Taubert in Engler & Prantl, *Natürl. Pflanzenfam.* 3(3): 365 (1894); Trimen, *Hand-Book Fl. Ceylon* 2: 64 (1894); Drake, *Hist. Pl. Madag.* 1: 108 (1902); Hutchinson, *Gen. Fl. Pl.* 1: 432 (1964); Verdcourt, *Man. New Guinea Leg.* 429 (1979); Lackey in Polhill & Raven, *Adv. Leg. Syst.* 1: 312 (1981); Smith, *Fl. Vit. Nova* 3: 205 (1985).

Type species: *S. lucidus* (G. Forster) Seemann (= *S. ruber* Vogel).

Woody vines, always climbing up to the top of the forest canopy; old branches glabrous, sulcate, sometimes lenticellate, young branches glabrous or hairy, striate, some branches modified as tendrils (Polhill, 1972); *stipules* lanceolate, ovate or triangular, peltate or basifixed, glabrous, striate, caducous, leaving a distinctive scar when deciduous. *Leaves* pinnately 3-foliolate, stipellate; terminal leaflets lanceolate, ovate or orbicular, 3-nerved or not, acute, acuminate or cuspidate at apex, rounded, truncate or slightly cordate at base, glabrous or sparsely hairy beneath; lateral leaflets similar in shape to the terminal one, slightly smaller in size, slightly or strongly oblique at base; petiolules always grooved, rugous; stipels setaceous or linear. *Inflorescences* axillary pseudoracemes or pseudopanicles with 2-5 branches, many flowered, sometimes 2-3 pseudoracemes fasciculate axillary; peduncles glabrous or sparsely hairy; axis glabrous or hairy with swollen nodes; brachyblast warty or cylindrical, (1-)3- ca 15-flowered; bracts ovate, inserted at the base of nodes and pedicels; bracteoles 2 at the base of calyx tube, ovate, striate, ciliate at margin; pedicels glabrous or hairy. *Flowers* orange-red, red, purplish blue or bluish green; calyx campanulate, 5-lobed, the upper 2 lobes slightly connate or connate at the tip; lobes truncate or retuse; standard glabrous, reflexed, acute at apex, with 2 appendages above the claw, usually with thick texture toward the tip; wings glabrous, attached to the keel petals at the base, about half as long as the standard; keel petals connate, beaked at apex, about equal length of standard; stamens 10, diadelphous, the vexillary stamen free, filaments glabrous, anthers uniform, dorsifixed, slit longitudinally; pistil with discoid nectary at base, stipitate; ovary glabrous or hairy, 1-12-ovuled; style long, glabrous or hairy at the lower portion; stigma terminal. *Pods* reticulate-veined or rugous, inflated or constricted between seeds, continuous or semi-septate, tardily dehiscent. *Seeds* black or brown, orbicular or irregular, smooth or rugous; hilum linear or circumferential, short to 3/4 circumference of seed, with spongy tissue (epihilum).

8. Sectional arrangement

Since Vogel (1836) founded *Strongylodon*, many systematists (Bentham & Hooker, 1865; Baillon, 1870; Taubert, 1894; Hutchinson, 1964) placed this genus into their system without further treating infrageneric relationships. New sections are proposed here. The type species are also designated.

Strongylodon bears large pods and seeds which can not be dispersed over long distances except by water. The species in each area, therefore, are so much alike that they can be grouped into sections (table 3).

Key to the sections of *Strongylodon*

1. Stipules basifixed; pods more or less constricted (Madagascar)
. Sect. **Craveniae**
Stipules peltate or basifixed with auricles at base; pods not constricted 2
2. Brachyblast with more than 3 flowers; flowers purplish blue or bluish green (Philippines) Sect. **Macrobotrys**
Brachyblast with 3 flowers; flowers red or orange red 3
3. Stipules peltate; seeds irregular, rough; pods linear (New Guinea and Sulawesi) Sect. **Archboldianus**
Stipules basifixed with auricles at base; seeds orbicular or ellipsoid, smooth; pods elliptic or oblong (Sulawesi and islands of Pacific and Indian Ocean)
. Sect. **Strongylodon**

8.1 Sectio *Strongylodon*

Stipules basifixed with auricles at base; brachyblast 3-flowered; flowers red; pods elliptic, reticulate-veined or rugose at surface, continuous between seeds; seeds orbicular or ellipsoid, smooth; hilum linear or $1/2-2/3$ circumference, 1-2 mm wide.

Type species: *S. lucidus* (G. Forster) Seemann

- S. celebicus* Huang
- S. lucidus* "lucidus"
- S. lucidus* "longiflorus"
- S. lucidus* "ruber"

Table 3: Main characters of the sections of *Strongylodon*.

| Character | Archboldianus | Craveniae | Strongylodon | Macrobotrys |
|------------------------|---------------------------------------|------------------------------------|--|------------------------------------|
| Stipule | peltate | basifixed | basifixed with auricle | peltate |
| Lateral leaflet | slightly oblique | slightly or strongly oblique | strongly oblique | strongly oblique |
| Inflor- escence | pseudoraceme | pseudoraceme | pseudoraceme pseudopanicle | pseudoraceme |
| brachy- blast | warty | warty | warty | warty or cylindric |
| | 3-flowered | 3-flowered, 6-flowered | 3-flowered | more than 3-flowered |
| Flower | reddish | reddish | reddish or whitish | bluish |
| Pod | continuous | more or less constricted | continuous | continuous or semi-septate |
| valve | thin | thin | thin or thick | thick or thin |
| dehis- cence | by split of suture | by split of suture | by split of suture or by rupture of valve | by split of suture |
| Seed | irregular | orbicular | orbicular ellipsoid | reniform |
| surface | rough | slightly rough | smooth | smooth |
| hilum | linear | almost circumfer- ential | linear or circumfer- ential | linear |
| Distribution area | New Guinea Sulawesi (Celebes) | Madagascar | Sulawesi, other places excluding Madagascar | Philippines |
| Altitude(m) Habitat | 600-2700 in forest, forest edge | 300-1700 forest edge ravines | 0-1500 forest edge, exposed place | 90-2400 forest edge, ravines |

8.2 Sectio *Archboldianus* Huang, *sect. nov.*

Stipula peltata. *Incrassatio racemi tri-floris*. *Flos ruber*. *Fructus reticulato-venosus non inter semines constrictus*. *Semen irregulare asperum, hilo 0.3-0.7 mm lato lineare, 1/5-1/3 partem longitudinis ambitui seminis occupans*.

Stipules peltate; brachyblast 3-flowered; flowers red; pods linear, reticulate-veined, continuous between seeds; seeds irregular, rough; hilum linear, occupying 1/5-1/3 of the length of the circumference, 0.3-0.7 mm wide.

Type species: *S. archboldianus* Merrill & Perry

S. archboldianus Merrill & Perry
S. decipiens Verdcourt

8.3 Sectio *Macrobotrys* Huang, *sect. nov.*

Stipula peltata. Incrassatio racemi plus quam tri-floris. Flos purpureo-caeruleus vel caesio-viridis. Fructus rugulosus vel reticulato-venosus, non septatus vel septatus. Semen reniformis laevigatum, hilo 1-2 mm lato lineari, 1/2 partem longitudinis ambitui seminis occupans.

Stipules peltate; brachyblast more than 3-flowered; flowers purplish blue or bluish green; pods rugose, continuous or septate; seeds reniform, smooth; hilum linear, occupying 1/2 of the length of the circumference, 1-2 mm wide.

Type species: *S. macrobotrys* A. Gray

S. caeruleus Merrill
S. elmeri Merrill
S. loheri Huang
S. macrobotrys A. Gray
S. pulcher C.B. Robinson
S. zschokkei Elmer

8.4 Sectio *Craveniae* Huang, *sect. nov.*

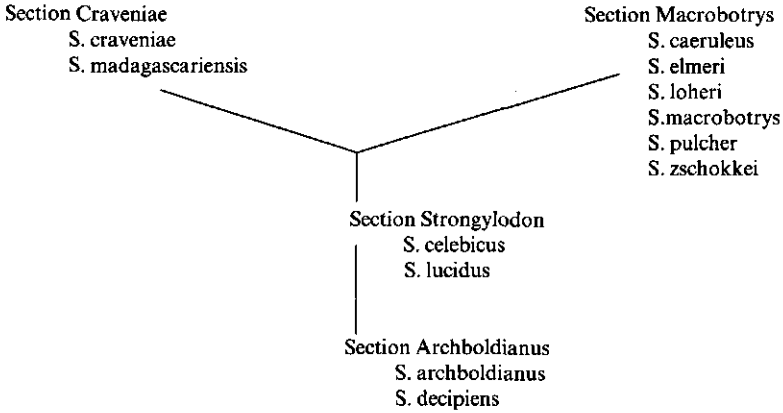
Stipula basifixa. Incrassatio racemi tri-floris vel plus quam tri-floris. Flos ruber. Fructus reticulato-venosus vel rugosus inter seminum conspicue vel inconspicue constrictus. Semen orbiculare laevigatum, hilo 2-3 mm lato fere circumdatum, 2/3-3/4 partem longitudinis ambitui seminis occupans.

Stipules basifixed; brachyblast 3- or more than 3-flowered; flowers red; pods reticulate-veined or rugose, more or less constricted; seeds orbicular, slightly rugose; hilum almost circumferential, occupying 2/3-3/4 of the length of the circumference, 2-3 mm wide.

Type species: *S. craveniae* Baron & Baker

S. craveniae Baron & Baker
S. madagascariensis Baker

Section *Strongylodon* is widely distributed and connects the other 3 sections geographically. Section *Strongylodon* shares the semi-circumferential hilum with section *Craveniae* and shares the thick pod valve with section *Macrobotrys*. The peltate stipules and continuous pods suggest that section *Archboldianus* is more closely related to section *Strongylodon* than to section *Craveniae*. Hence a postulated scheme of relationships among these sections is drawn as follows.



9. Keys to the species

9.1 Key to the species

1. Stipules basifixed, leaving linear or new crescent-shape scar when fallen; pods more or less constricted 2
Stipules peltate or basifixed with auricles at base, leaving elliptic or orbicular scar when shed; pods not constricted 3
2. Terminal leaflets ovate, oblong or narrowly obovate with 6-7 alternate lateral nerves; brachyblast 3-flowered when completely developed, pods 3-4.2 cm wide **10.10 S. madagascariensis**
Terminal leaflets orbicular or obovate, with 1-4 alternate lateral nerves; brachyblast more than 3-flowered when completely developed; pods 5.5-6 cm wide **10.4 S. craveniae**
3. Terminal leaflets 3-nerved (basal nerves prominent and extending above the middle of the blade) 4
Terminal leaflets not 3-nerved (basal nerves extending above or below the middle of the blade and parallel with lateral nerves) 9
4. Basal nerves of terminal leaflet starting at the base; flowers red or whitish 5
Basal nerves of terminal leaflets extending from above the base; flowers bluish 8
5. Inflorescences hairy; pods linear; seeds irregular, rough **10.1 S. archboldianus**
Inflorescences glabrous; pods elliptic or oblong; seeds orbicular, smooth 6
6. Flowers whitish; ovary 5-8-ovuled; pods rugose, valve 6 mm thick **10.3 S. celebicus**
Flowers red; ovary 1-2-ovuled; pods reticulate-veined, valve 1 mm thick 7
7. Flowers 36-42 mm long; lobes of calyx 2-2.2 mm; pods 60-75 x 50-55 mm; seeds 17-23x19-23 mm; pedicels ca 15 mm long (Samoa) **10.8c S. lucidus "longiflorus"**
Flowers 26-32 mm long; lobes of calyx 1.8- 3 mm; pods 70-100x40-55 mm; seeds 21-22x23-25 mm; pedicels (15-)20-36 mm long (Hawaii) **10.8b S. lucidus "ruber"**
Flowers 14-30 mm long; lobes of calyx 0.2-1.8 mm; pods 30-80x20-45 mm; seeds 12-20x13-20 mm; pedicels 10-25 mm long (other area) **10.8a S. lucidus "lucidus"**
8. Inflorescences long, ca 30 to 150 cm long, internodes long; flowers large, about 4-6 cm long **10.9 S. macrobotrys**

- Inflorescences short, 18-59 cm long, internodes short; flowers small, 2.3-3.2 cm long **10.6 S. elmeri**
9. Brachyblast 3-flowered; flowers red; pods linear, valve thin **10.5 S. decipiens**
 Brachyblast more than 3-flowered; flowers blue; pods elliptic, valve thick or thin 10
10. Basal nerves of leaflets near the basal margin; inflorescence about 10 cm long, nodes cylindric; stipe of pistil densely hairy **10.11 S. pulcher**
 Basal nerves of leaflets away from the basal margin; inflorescences more than 10 cm long, brachyblast warty or cylindric; stipe of ovary glabrous or sparsely hairy 11
11. Leaflets short-acuminate; brachyblast cylindric, 4-30 mm long, 1-2 mm wide; calyx 5-6 mm long; ovary glabrous **10.2 S. caeruleus**
 Leaflets cuspidate; brachyblast warty, 2-6 mm long, 1-3 mm wide; calyx 7-12 mm long; ovary more or less hairy 12
12. Basal nerves of leaflets opposite and extending from the base; peduncles of inflorescence equal to or shorter than axis, brachyblast 5-6 mm long; pods rugose, valve 4 mm thick **10.7 S. loheri**
 Basal nerves of leaflets always alternate and extending from above the base; peduncles of inflorescence much longer than axis; brachyblast 2-3 mm long; pods reticulate-veined, valve 1 mm thick **10.12 S. zschokkei**

9.2 Key to the species of the Philippines

1. Terminal leaflets 3-nerved 2
 Terminal leaflets not 3-nerved 4
2. Stipels linear, striate; flowers red; brachyblast 3-flowered; ovary 1-2 ovuled; pods reticulate-veined, valve thin **10.8a S. lucidus "lucidus"**
 Stipels setaceous; flowers blue; brachyblast more than 3-flowered; ovary 5-12-ovuled; pods rugose, valve thick 3
3. Inflorescence long, ca 30 to 150 cm long, brachyblast laxly noded; flowers large, about 4-6 cm long **10.9 S. macrobotrys**
 Inflorescence short 18-59 cm long, brachyblast compact; flowers short, 2.2-3.2 cm long **10.6 S. elmeri**
4. Basal nerves of leaflets near the basal margin; inflorescence about 10 cm long, brachyblast cylindric; stipe of pistil densely hairy **10.11 S. pulcher**
 Basal nerves of leaflets not near the basal margin; inflorescence more than 10 cm long, brachyblast warty or cylindric; stipe of pistil glabrous or sparsely hairy 5
5. Leaflets short acuminate; brachyblast cylindric, 4-30 mm long, 1-2 mm wide; calyx 5-6 mm long; ovary glabrous **10.2 S. caeruleus**
 Leaflets cuspidate; brachyblast warty, 2-6 mm long, 1-3 mm wide; calyx 7-12 mm long; ovary more or less hairy 6

6. Basal nerves of terminal leaflets opposite and extending from the base; petiolules 10 mm long; peduncle of inflorescence equal to or shorter than axis, brachyblast 5-6 mm long; pod rugose, valve 4 mm thick **10.7 S. loheri**
 Basal nerves of terminal leaflets always alternate and extending from above the base; petiolules 4-5 mm long; peduncle of inflorescence much longer than axis, brachyblast 2-3 mm long; pods reticulate-veined, valve 1 mm thick **10.12 S. zschokkei**

9.3 Key to the species of New Guinea

1. Terminal leaflets not 3-nerved, with lateral nerves more than 4 pairs; ovary 5-6-ovuled; pods linear oblong; hila linear, 8- 9 mm long **10.5 S. decipiens**
 Terminal leaflets 3-nerved, with lateral nerves less than 4 pairs 2
2. Inflorescences hairy; ovary 5-8-ovuled; pods linear; hila linear, 3-4 mm long **10.1 S. archboldianus**
 Inflorescences glabrous; ovary 1-2-ovuled; pods elliptic; hila circumferential **10.8a S. lucidus "lucidus"**

9.4 Key to the species of Sulawesi (Celebes)

1. Terminal leaflets not 3-nerved, with lateral nerves 5-10 pairs; inflorescence hairy **10.5 S. decipiens**
 Terminal leaflets 3-nerved, with lateral nerves 2-3 pairs; inflorescence glabrous 2
2. Flowers red; ovules 1-2-ovuled; pods reticulate-veined, valve 1-2 mm thick **10.8a S. lucidus "lucidus"**
 Flowers whitish, ovary 5-8-ovuled; pods rugose, valve 6 mm thick **10.3 S. celebicus**

9.5 Key to the species of Madagascar

1. Terminal leaflets ovate, oblong or narrowly ovate, with lateral nerves 6-7 pairs; brachyblast 3-flowered when completely developed; pods 3-4.2 cm wide **10.10 S. madagascariensis**
 Terminal leaflets orbicular or obovate, with lateral nerves 1-4 pairs; brachyblast more than 3-flowered when completely developed; pods 5.5-6 cm wide **10.4 S. craveniae**

10. Alphabetical treatment of species

10.1 *Strongyloдон archboldianus* Merrill & Perry

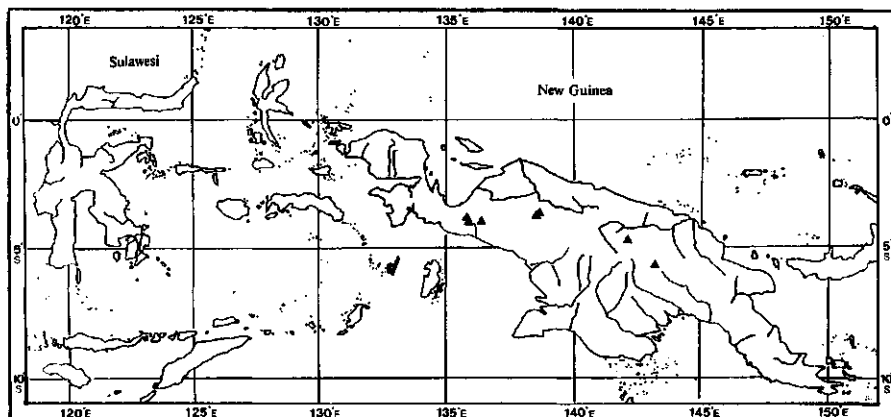
Figures 2,3,4,6,7; Map 2; Tables 1,2.

Strongyloдон archboldianus Merrill & Perry in J. Arnold Arbor. 23: 403 (1942); Verdcourt, Man. New Guinea Leg. 431 (1979).

Type: New Guinea: Bale River, 18 km NE of Lake Habbema, *L.J. Brass 11429* (holotype: A; isotypes: BM, GH, K (photo), L).

Paratypes: New Guinea: Baliem River, *L.J. Brass 11696* (A, BO, L); Grand Valley, *L.J. Brass 9552* (A); Lake Habbema, *L.J. Brass 10755* (A, BM, BO, K, L); 9 km NE of Lake Habbema, *L.J. Brass 10881* (A, L).

Woody vine; branches glabrous, striate; *stipules* lanceolate or ovate, peltate, striate, glabrous, 2.5-4 mm long, 1.2-2 mm wide. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous or sparsely hairy, subjugal part 1.5-4 cm long, suprajugal part 8-14 mm long; terminal leaflets lanceolate or ovate, acuminate to cuspidate at apex, rounded, truncate or slightly cordate at base, 3-nerved, with alternate lateral nerves in 3-4 pairs, 7-12 cm long, 3.5-4.5 cm wide; lateral leaflets ovate or lanceolate, slightly oblique at base, 4.5-8 cm long, 2-4 cm wide; petioles glabrous or sparsely hairy, 1.5-4 mm long; stipels linear, 2-3 mm long. *Inflorescences* 7-26 cm long; peduncles with sparse, short, stiff hairs; axis with short, stiff hairs; brachyblast warty, about 1 mm long, 1 mm wide, 2-3-flowered; bracts ovate, peltate or basifixed and auricled at base, 2-2.5 mm long, 1 mm wide; bracteoles ovate, peltate, ciliate at margin, 1.5 mm long; pedicels 6-13 mm long. *Flowers* red, 25-31 mm long; calyx campanulate, 5-7 mm long, 5-lobed, hairy at the upper portion inside, glabrous or sparsely hairy outside; the upper 2 lobes connate at the tip, 2 mm long, longer than the lower 3 lobes; the lower lobes ovate-triangular, 1.2-2 mm long; standard oblong, reflexed, 21-29 mm long, 6-8 mm wide, with very short claw, with 2 appendages 5-8 mm long above the claw; wings narrowly obovate to oblong, slightly auricled at base, 12-16 mm long, 4-4.5 mm wide, with claw 7-8 mm long; keel petals lanceolate, 20-24 mm long, 6 mm wide, with claw 6-8 mm long; stamens 24-30 mm long, filaments glabrous, anthers dorsifixed, 1 mm long; pistil with discoid nectary at base; stipe glabrous, 7 mm long; ovary oblong, 4-8-ovuled, covered with short appressed hairs; style glabrous, 15-20 mm long; stigma terminal. *Pods* inflated, linear, glabrous, brown when dry, reticulate-veined at surfaces, continuous between seeds, 7.8-11 cm long, 2.5-3 cm wide. *Seeds* brick-red, irregular, rough at surface, 14-15 mm wide, 9-13 mm long; hilum 3-4 mm long, with spongy tissue.



Map 2: Distribution of *Strongylodon archboldianus* Merrill & Perry.

Distribution: Endemic in New Guinea.

Habitat: In more open parts of primary forest, secondary forest, limestone areas and along streams.

Altitude: 1600-2700 m.

Flowering: Mar, Aug, Oct, Nov, Dec.

Fruiting: Nov.

Specimens examined:

INDONESIA: Irian Jaya, Baliem Valley, *Kostermans & Soegeon 645* (A, BO, L); Mt. Tikora, *J.M. Mangen 316* (L); Kurulu, Jiwika, *Widjaja & Hamzah 3084* (BO); Wissel Lake, Wandai-Bico, *P.J. Eyma 4668* (BO).

PAPUA NEW GUINEA: Bale River, 18 km NE of Lake Habbema, *L.J. Brass 11429* (type: BM, GH, K(photo), L); Baliem River, *L.J. Brass 11696* (A, BO, L); Grand Valley, *L.J. Brass 9552* (A); Lake Habbema, *L.J. Brass 10755* (A, BM, BO, K, L); 9 km NE of Lake Habbema, *L.J. Brass 10881* (A, L); Southern Highland District: Fara Range, Kugua-Erave, *H. Streimann 8551* (L); West Sepik District: Telefomin, Oksapmin, *E.E. Henty et al. 41544* (K, photo, L).

10.2 *Strongylodon caeruleus* Merrill

Figures 2,3,4,5,7; Map 3; Tables 1,2.

Strongylodon caeruleus Merrill in Philipp. Gov. Lab. Bur. Bull. 29: 20 (1905); Merrill in Philipp. J. Sci. 5: 115 (1910), *p.p., excl. specim. Topping 58*; Merrill Enum. Philipp. Pl. 2: 306 (1923), *p.p., excl. specim. Topping 58*.

Type: Philippines: Luzon: Benguet Prov.: Sablan, A.D.E. Elmer 6097 (lectotype: A; isotypes: GH, K, NY).

Heterotypic synonym:

S. paucinervis Merrill in Philipp. J. Sci. 10: 16 (1915); Merrill, Enum. Philipp. Pl. 2: 307 (1923), p.p., excl. *specim. Ramos 24377, Edaño 24798*.

Type: Biliran: R.C. McGregor s.n. June 1914 (holotype: NY?, not seen; isotypes: BM, BO, L).

Woody vine; old branches glabrous, striate, lenticellate, young branches glabrous, striate; *stipules* ovate-triangular, peltate, striate, glabrous, 3.5-5 mm long, 2-3 mm wide. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous, subjugal part 4-13 cm long, suprajugal part 1.5-5.2 cm long; terminal leaflets ovate, short acuminate at apex, rounded at base, glabrous, with alternate lateral nerves in 5-7 pairs, 11-19.5 cm long, 6.5-11 cm wide; lateral leaflets ovate, oblique and rounded or truncate at base, 9-16 cm long, 4-8 cm wide; petiolules glabrous, 6-8 mm long; stipels linear, 1-5 mm long. *Inflorescences* 21-24 cm long; peduncles glabrous, 3.5-8 cm long, much shorter than axis; axis sparsely hairy; brachyblast cylindrical, 4-30 mm long, 1-2 mm wide, 7-14-flowered; bracts wide-ovate or orbicular, peltate, striate, ciliate at margin, 1-2 mm long, 1-2 mm wide, caducous; bracteoles wide-ovate, peltate, striate, ciliate at margin, 2 mm long, 1.5 mm wide; pedicels glabrous, 10-18 mm long. *Flowers* purplish-blue, 25-30 mm long; calyx campanulate, 5-6 mm long, 5-lobed, hairy at the upper portion inside, glabrous outside; the upper 2 lobes connate, rounded at apex; the lower 3 lobes imbricate, 1 mm long; standard ovate-lanceolate, reflexed, 26-28 mm long, 12-16 mm wide, with very short claw, with 2 appendages 7-10 mm long above the claw; wings oblong, auricled at base, 12-14 mm long, 5-7.5 mm wide, with claw 5.5-6 mm long; keel petals lanceolate, 27-28 mm long, 4-6 mm wide, with claw 5.5-8 mm long; stamens 30-35 mm long, filaments glabrous, anthers dorsifixed, oblong; pistil with discoid nectary at base; stipe glabrous or sparsely hairy, 5-9 mm long; ovary oblong, 3-5-ovuled, glabrous, 4 mm long, 1 mm wide, style glabrous, 24-25 mm long; stigma terminal. Immature *pods* elliptic, inflated, rugose, 3.5 cm long, 2.1 cm wide, valve 3-4 mm thick.

Distribution: Endemic in the Philippines.

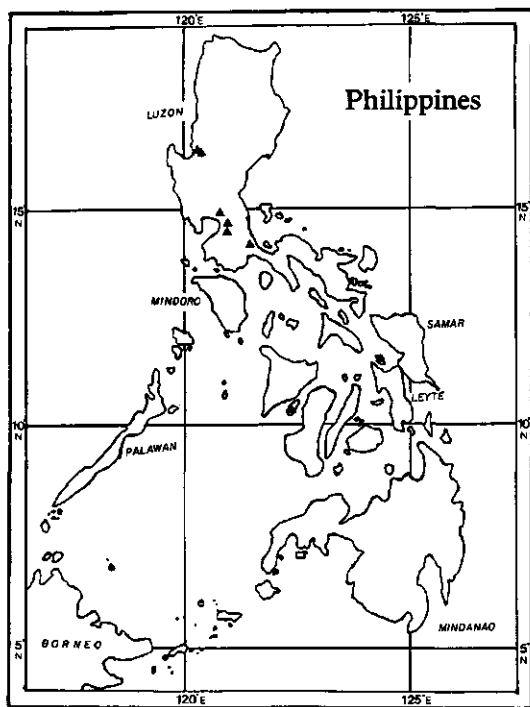
Habitat: In forests.

Altitude: 300 m.

Flowering : Mar, Apr, Jun.

Fruiting: Unknown.

Vernacular name: Yungod-yungod.



Map 3: Distribution of *Strongylodon caeruleus* Merrill.

Specimens examined:

PHILIPPINES: Luzon Island: Uyungan, *A. Loher* 5895 (K). Bataan Prov.: *H.M. Curran* s.n. April 1907 (US). Benguet Prov.: Sablan, *A.D.E. Elmer* 6097 (type: GH, K); 8908 (A, BO, E, K, L, LE, NY); Baguio, *M. Ramos* & *G. Edaña* 45041 NY). Rizal Prov.: Montalban, *A. Loher* 5935 (K); Mt. Irig, *M. Ramos* s.n. April 1923 (BO, KWA, P); Central Luzon, *A. Loher* 2306 (K, p.p. excl. pod). Biliran Island: *R.C. McGregor* s.n. June 1914 (type of *S. paucinervis*: BM, BO, L).

10.3 *Strongylodon celebicus* Huang, sp. nov.

Figures 2,3,4,8; Map 4; Tables 1,2.

Type: C. Sulawesi, Palu, Sopa Valley, *van Balgooy* 3422 (holotype: L; isotypes: A, BO, K).

Frutex scandens; caulis glaber. Folia trifoliolata; stipulae triangulares glabrae, 3-5 mm longae, 4-5 mm latae; rachidibus glabri, 3-5 cm longi; foliola terminalia ovata glabra 3-nervia, 8.5-13.5 cm longa, 5.2-9 cm lata. Inflorescentiae pseudo-racemosae 20-26 cm longae. Bractae ovatae, 2-3 mm longae, ca 2 mm latae. Bracteolae ovatae, 1.5-2 mm longae. Flores albidi vel rosei. Calyx campanulatus, 9-10



Fig. 8. *Strongylodon celebicus* Huang.

1. Habit x2/3; 2. Inflorescence x2/3; 3. Calyx x2; 4. Standard x2; 5. Wing petal x2; 6. Keel petal x2; 7. Stamens and pistil x2; . Pod x2/3; 9. Seed x2/3. (1-9 van Balgooy 3422).

mm longus, lobis 5 triangularibus 0.3-0.6 mm longis. Vexillum ovatum unguiculatum, 26-28 mm longum, 13-16 mm latum, ungue 4-6 mm longo. Alae oblanceolatae auriculatae unguiculatae, 13-16 mm longae, 4.5 mm latae, ungue 7 mm longo. Carinae petala lanceolata unguiculata 24-26 mm longa, 5 mm lata, ungue 6-8 mm longo. Stamen vexilli liberum, anthero oblongo 1 mm longo. Pistillum stipitatum, ovario oblongo glabro, ovulis 5-8. Fructus oblongus rugosus 4.6-7.3 cm longus, 2.7-4.3 cm latus, 1.2 cm crassus.

Woody vine, old branches dark brown, terete, sulcate, glabrous, young branches densely covered with cataphylls at base; *stipules* triangular, basifixed with auricles at base, striate, glabrous, 3-5 mm long, 4-5 mm wide, the lower portion often caducous. *Leaves* innately 3-foliolate, stipellate; rachis glabrous, subjugal part 3-5 cm long, suprajugal part 2 cm long; terminal leaflets glabrous, ovate, cuspidate at apex, rounded at base, 3-nerved, with alternate lateral nerves in 2-3 pairs, 8.5-13.5 cm long, 5.2-9 cm wide; lateral leaflets ovate, oblique and rounded at base, 9.5-11 cm long, 6-8.5 cm wide; petiolules glabrous, 6-8 mm long; stipels narrow-triangular, 5-6 mm long, 1.5 mm wide. *Inflorescences* 22-26 cm long; peduncles glabrous 7.5-8 cm long, scattered with cataphylls; axis glabrous; brachyblast warty, 1-3 mm long, 1 mm wide, 3-flowered; bracts ovate, striate, caducous, 2-3 mm long, ca 2 mm wide; bracteoles ovate, striate, slightly ciliate at margin, caducous, 1.5-2 mm long, 1.5-2 mm wide; pedicels glabrous, 19-20 mm long. *Flowers* whitish to pinkish, 2.6-3 cm long; calyx campanulate, 9-10 mm long, 5-lobed, hairy at the upper portion inside, glabrous outside; the upper 2 lobes connate, truncate at apex, 0.6 mm long; the lower 3 lobes triangular, separate, 0.3 mm long; standard ovate, 26-28 mm long, 13-15 mm wide, with claw 4-6 mm long, with 2 appendages 5 mm long above the claw; wings narrowly obovate or oblong, base auriculate, 13-16 mm long, 4.5 mm wide, with claw 7 mm long; keel petals lanceolate, 24-26 mm long, 5 mm wide, with claw 6-8 mm long; stamens 35-37 mm long, filaments glabrous; anthers dorsifixed, oblong, ca 1 mm long; pistil with discoid nectary at base; stipe flat, glabrous, 6-8 mm long; ovary oblong, glabrous, 5-8-ovuled, 5 mm long; style flat, glabrous, 20-22 mm long; stigma terminal. *Pods* oblong, inflated, rugose, continuous between seeds, 4.6 cm long, 2.7 cm wide (7.3 cm long, 4.3 cm wide in spirit specimen); each valve 6 mm thick. Seeds brown, elliptic or orbicular, compressed, 1.6-2 cm long, 2.4-2.8 cm wide, 1.2 cm thick; hilum linear, 22-26 mm long, 1 mm wide, with spongy tissue.

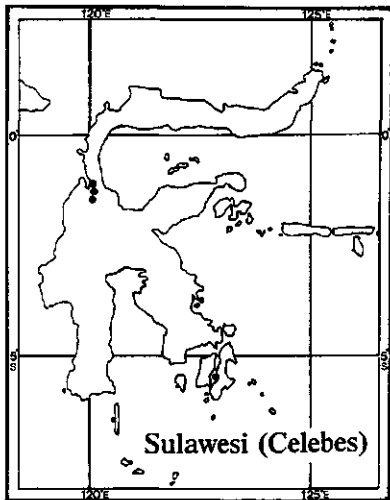
Distribution: Endemic in Sulawesi (Celebes).

Habitat: In primary swampy vegetation, in forest near a stream or river.

Altitude: 800-1000 m.

Flowering: Apr, May, Oct.

Fruiting: Apr, May.



Map 4: Distribution of *Strongylodon celebicus* Huang.

Specimens examined:

INDONESIA: C. Sulawesi: Sopo Valley, *van Balgooy* 3028 (A, BO, K, L); 3422 (type: A, BO, K, L); Palu, Polokaa, *D. Darnaedi* 1428 (BO, L); Palu-Parigi, *W. Meijer* 9381 (BO, L, MO, US); Kulawi, Mt. Malemo, *J.P. Moge* 1430 (BO, L); Muara, Mt. Nokilalaki, *W. Meijer* 9677 (L); Lake Lindu, Mt. Nokilalaki, *W. Meijer* 9747 (BO, L).

Note: This species is closely related to *S. lucidus* but differs from it by the ovary with 5-8 ovules, rugose pods and much thicker valves.

10.4 *Strongylodon craveniae* Baron & Baker
Figures 2,3,4,6,7; Map 5; Tables 1,2.

Strongylodon craveniae Baron & Baker in J. Bot. 29: 74 (1891); Drake, Hist. Pl. Madag. 1: 110 (1902).

Type: Madagascar, *Craven s.n.* Jan. 1891 (holotype: K)

Heterotypic synonym:

Strongylodon campenoni Drake, Hist. Pl. Madag. 1: 109 (1902).

Type: Madagascar, Central Region, *B.P. Campenon s.n.* Nov. 1889 (holotype: P).

Woody vine, old branches glabrous, sulcate, lenticellate, young branches glabrous or hairy, striate; *stipules* broad ovate-triangular, basifixed, striate, 2-4 mm long, 3 mm wide. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous, subju-

gal part 2-13 cm long, suprajugal part 6-8 mm long; terminal leaflets obovate-orbicular or obovate, 3-nerved or rarely not, short acuminate at apex, rounded at base; with alternate lateral nerves in 1-4 pairs, 4-10 cm long, 3-8 cm wide; lateral leaflets ovate-oblong, oblique and rounded at base, with inopposite lateral nerves in 2-4 pairs, 8-9 cm long, 5-6 cm wide; petiolules 1.4-2.5 cm long; stipels linear, 1-4 mm long. *Inflorescence* 10-38 cm long; peduncles short, 1-3 cm long, hairy and becoming glabrous; axis hairy; brachyblast warty, 3-6 mm long, 1.5-2.5 mm wide, 2-6-flowered; bracts ovate-triangular, slightly peltate or basifixed and auricled at base, striate, caducous, 2-3 mm long, 1-2.1 mm wide; bracteoles ovate, slightly peltate or basifixed and auricled at base, striate, 2-2.2 mm long, 2 mm wide; pedicels hairy, 10-30 mm long. *Flowers* red, 5-6 cm long; calyx campanulate, 8-10 mm long, 5-lobed, hairy at the upper portion inside, spreading hairy outside; standard ovate, reflexed, 44-50 mm long, 18-22 mm wide, with claw 5-6 mm long, with 2 appendages 10 mm long above the claw; wings lanceolate, shortly auricled at base, 21-29 mm long, 5-7 mm wide, with claw 8-10 mm long; keel petals lanceolate, 37-48 mm long, 7-10 mm wide, with claw 7-10 mm long; stamens 60-71 mm long, filaments glabrous, anthers dorsifixed, oblong, ca 1 mm long; pistil with discoid nectary at base; stipe glabrous or hairy, 10-13 mm long; ovary linear, 3-9-ovuled, 18 mm long; style hairy at base, 47-61 mm long; stigma terminal. *Pods* linear, reticulate-veined, brown when dry, 1-6-seeded, constricted between seeds, 13-36 cm long, 5.5-6 cm wide. *Seeds* black, orbicular, 25-30 mm wide, 23-34 mm long; hila about 3/4 circumference of seed, 2-3 mm wide, with spongy tissue.

Distribution: Endemic in Madagascar.

Habitat: Along forest edges.

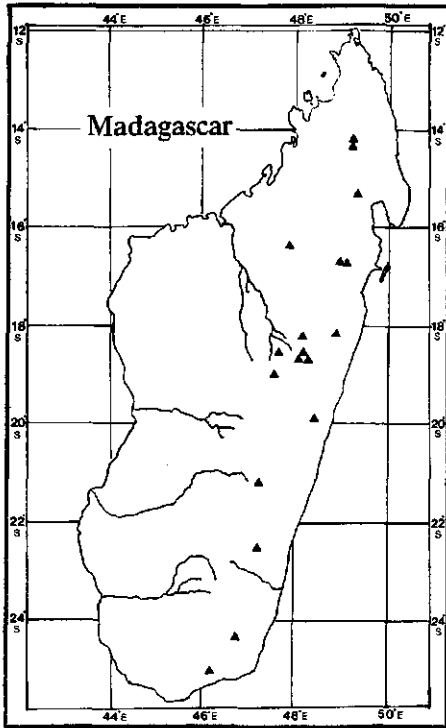
Altitude: 300-1700 m.

Flowering: Feb, Aug-Nov.

Fruiting: Apr, May, Dec.

Specimens examined:

MADAGASCAR: Central Madagascar, *R. Baron* 1763 (BM); 3811 (K); sine loc. *R. Baron* 6760 (K); Moramanga, *J. Bosser* 16595 (P); Fianarantsoa, *J. Bosser* 18253 (P); sine loc. *B.P. Campenon* s.n. Nov. 20, 1889 (type of *S. campenoni*: P); Sandrangato-Anosibe (Sud de Moramanga), *Capuron & Leandri* 1579 (P); sine loc. *Craven* s.n. Jan. 1891 (type: K); Ankaizina, *M.R. Decary* 1940 (P); Farafangana, *M.R. Decary* 5816 (P). Majunga Prov., Tsaratana Massif above Ankazotonana, *A. Gentry* 11722 (WAG); Massif du Beampingaratra, Maloto, *H. Humbert* 6307 (B, P, US); Bassin Mandrare, Marosoui, *H. Humbert* 6596 (B, P); Massif du Kalambatitra, Mt. Kalambatitra, *H. Humbert* 11889 (P); Affluent de L'Androranga (Bemarivo Bassin), Vallée de L'Andalangy, *Humbert & Capuron* 24173 (P); Moramanga-Anosibe, *Jacqueline & Peltier* 2668 (P); Moramanga, Analamazotra, *Lam & Meeuse* 5372 (L, K). Fianarantsoa Prov., Ambalavao, 10 Km of Antanifotsy, *D.J. Maberley* 1067 (K, MO); Tsohimanitra forest, *F. Major* 14 (BM, K); Tsaratana, *H. Perrier* 4216 (P); Takaleona(?), *H. Perrier* 4696 (P); Tambirana(?), *H. Perrier* 15342 (P); Beforona, *H. Perrier*



Map 5: Distribution of *Strongylodon craveniae* Baron & Baker.

14049 (P); Betsiboka, Tampohetsa, Manirinerina, *H. Perrier 16841* (P); Mangoro, Foret Orientale, *H. Perrier 18192* (K, P); Ambordinifody, Mangoro-Mangoaka, *H. Perrier 18328* (P); Tamatave Dist., R.N.I., *G.F. Rakoboniawa 3234* (P). Majunga Prov., Tsaratana Massif above Ankazotokana, *A. Rakotozafy 11722* (WAG); Trail of village of Hiaraka, ESE of Maroantsetra, *Rakotozafy & Nicoll 4031* (MO). D'Andovoranto Prov., Moramanga Distr., Forest of Analamazaotra, *Viguiet & Humbert 1133* (B, P).

10.5 *Strongylodon decipiens* Verdc.

Figures 2,3,4,7,9; Map 6; Tables 1,2.

Strongylodon decipiens Verdc. in *Kew Bull.* 32(2): 457 (1978); Verdcourt, *Man. New Guinea Leg.* 431. f.101. 1979.

Type: New Guinea: Arau, *L.J. Brass 31888* (holotype: LAE, not seen; isotypes: BO, GH, K, L, NY).

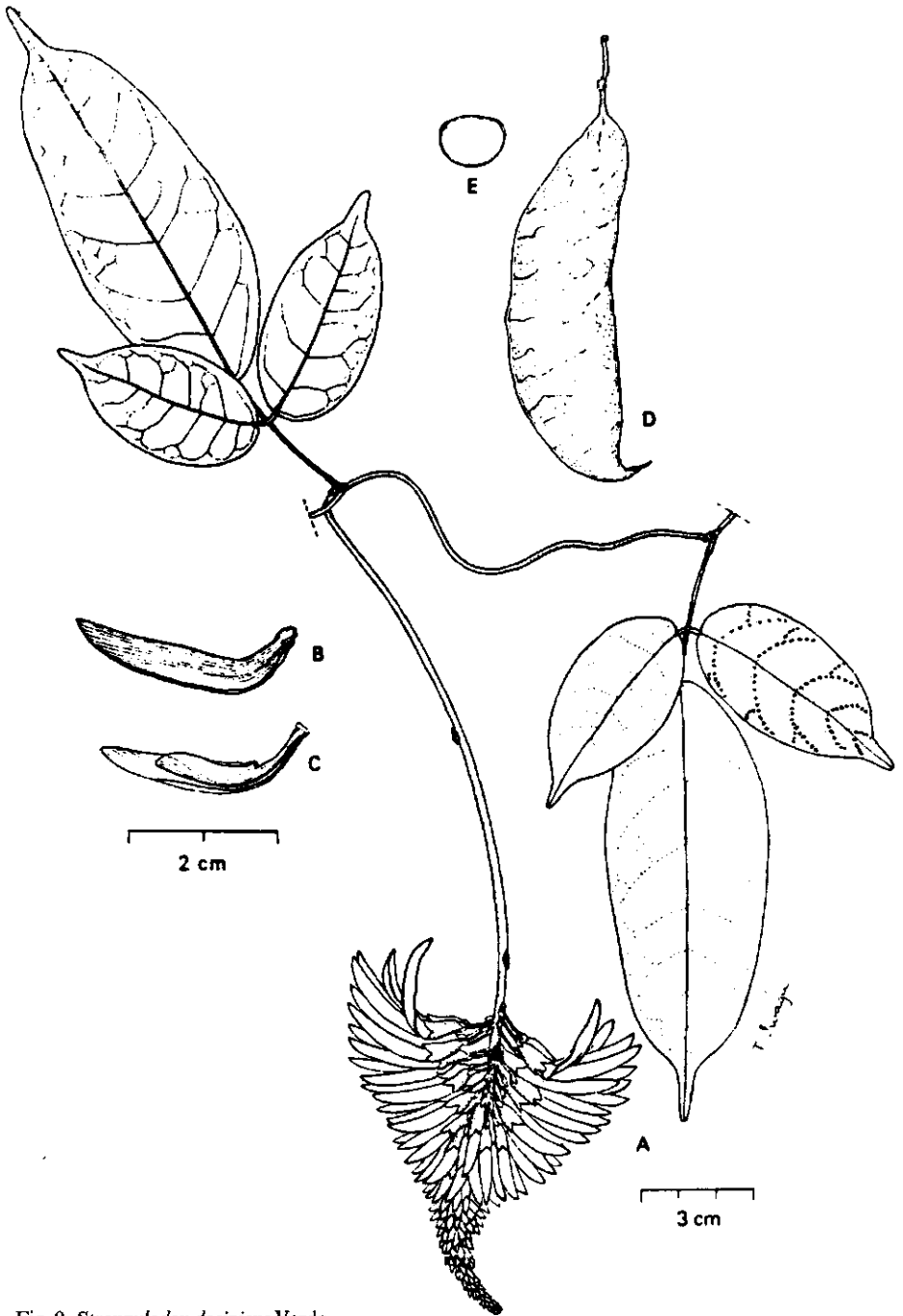


Fig. 9. *Strongylodon decipiens* Verdc.

A. Habit; B. Standard; C. Wing and keel petals; D. Pod; E. Seed.

(reproduced from Verdcourt, A Manual of New Guinea Legumes. Fig. 101. 1979).

Heterotypic synonym:

S. decipiens Verdc. var. *imbricatus* Verdc. (as *imbricata*) in Kew Bull. 32(2): 458 (1978).

Type: Papua New Guinea: Goroka, R.G. Robbins (holotype: K; isotype: L).

Woody vine; young branches glabrous, terete, striate; *stipules* ovate or ovate-triangular, peltate, striate, 2-3 mm long, 1.5-2 mm long. *Leaves* pinnately 3-foliate, stipellate; rachis glabrous or sparsely hairy, subjugal part 3-8 cm long, suprajugal part 1.2-4 cm long; terminal leaflets lanceolate, oblong, elliptic or ovate, acuminate or cuspidate at apex, rounded or truncate at base, with alternate lateral nerves in 5-10 pairs, 9.7-16 cm long, 2.6-9 cm wide; lateral leaflets lanceolate, oblong or ovate, slightly oblique at base, 6-14 cm long, 2.3-7 cm wide; petiolules 2-6 mm long; stipels linear 1.7-2 mm long. *Inflorescences* 7-30 cm long; peduncles sparsely hairy; axis with short stiff hairs; brachyblasts warty, 1-2 mm long, 1 mm wide, 2-3-flowered; bracts ovate, peltate, striate, ciliate at margin, caducous, 1-1.8 mm long, 1-1.5 mm wide; bracteoles ovate, peltate, striate, ciliate at margin, 1-1.5 mm long, 1-1.3 mm wide; pedicels with short stiff hairs, 10-15 mm long. *Flowers* red, 23-35 mm long; calyx campanulate, 6-11 mm long, 5-lobed, hairy at the upper portion inside, glabrous or sparsely hairy outside; the upper 2 lobes connate at the tip, 1-3 mm long, the lower 3 lobes triangular, 1.5-3 mm long; standard lanceolate, 24-33 mm long, 10-11 mm wide, with claw 2 mm long, with 2 appendages 12-13 mm long above the claw; wings lanceolate, shortly auricled at base, 11-21 mm long, 3.5-4.5 mm wide, with claw 10-11 mm long; keel petals lanceolate or oblong, 22-26 mm long, 4-4.5 mm wide, with claw 13-15 mm long; stamens 30-32 mm long, filaments glabrous, anthers dorsifixed, 1 mm long; pistil with discoid nectary at base; stipe glabrous or sparsely hairy, 7-11 mm long; ovary oblong, 6-7-ovuled, covered with short hair; style flat, glabrous, 17-19 mm long; stigma terminal. *Pods* linear, reticulate-veined, glabrous 8-11.5 cm long, 2.5-3 cm wide, 5-6-seeded, brown when dry. *Seeds* black, irregular, rough, about 10 mm wide, 9-10 mm long; hilum linear, 8-9 mm long, with spongy tissue.

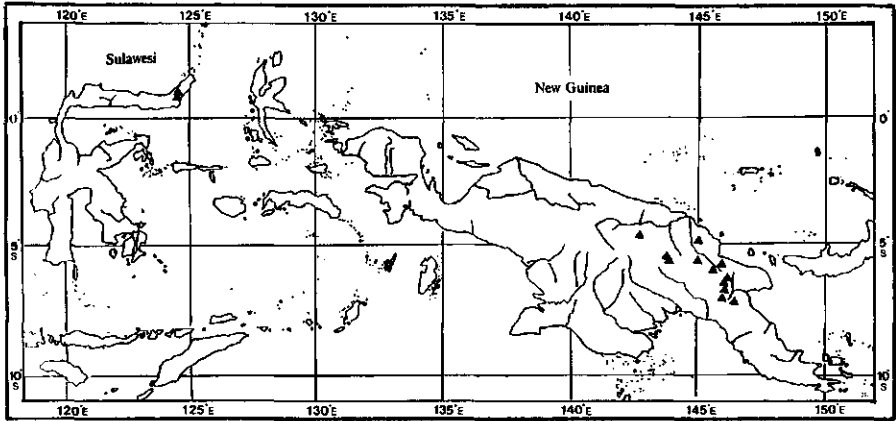
Distribution: New Guinea and Sulawesi (Celebes).

Habitat: Climbing in the forest canopy, understory, or forest edge near rivers; sometimes in secondary forest or scrubland.

Altitude: 660-1920 m.

Flowering: Jun-Oct.

Fruiting: Oct, Dec.



Map 6: Distribution of *Strongylodon decipiens* Verdc.

Specimens examined:

INDONESIA: Sulawesi(Celebes): Manado, Ninakasa, *F.K.M. Scup* 99 (BO); Kotamobagu, *J. Dransfield* 3864 (BO); Tondano, *J. Boesveld* 1 (BO); Tomposoe, *J. Boesveld* 2 (BO); Rante-Lemo, *G. Kjaellberg* 1545 (BO).

PAPUA NEW GUINEA: Kaiser-Wilhelmsland, Finisterre Mts, *R. Schlechter* 16080 (P); 16555 (P); Madang District: Damanti, *C.D. Sayers* 21262 (L, MO); *Henty & Sayers* 20582 (L); Morobe District: Boaee, *Clements* 8700 (A, B, L); Kubandu, *Philipson & Philipson* 3285 (K, L); Wau, *P. Katik s.n.* June 12, 1974(K); Wau, New Yamp, *Streimann & Kairo* 44463 (L); Wau, Yamap, *A. Kairo* 44079 (L); Eastern Highlands District: Arau, *L.J. Brass* 31888 (type: A, BO, K, L, NY); Goraka, Dunantina Valley, *R.G. Robbins* 913 (type of *S. decipiens* var. *imbricatus*: K, L); Kainantu-Okapu, *J.S. Womersley* 24647 (L); *T.G. Hartley* 12152 (A); Kainantu, Kassam Pass, *H. Streimann* 47900 (A, L); Kassam, *L.J. Brass* 32275 (K, L, US); Western Highlands District: Jimmi Valley, *Womersley & Millar* 7654 (A, K).

Note: The plants from Sulawesi are slightly different in having smaller flowers and larger pods. Since the only available pod is immature, detailed comparison is not possible at present. If more material becomes available and the characters are consistent, subspecific status may be decided upon. Presently no specimens from Irian Jaya are known.

10.6 *Strongylodon elmeri* Merrill

Figures 2,3,4,5,7; Map 7; Tables 1,2.

Strongylodon elmeri Merrill in Philipp. Gov. Lab. Bur. Bull. 29: 20 (1905); Merrill in Philipp. J. Sci. 5: 114 (1910); Merrill, Enum. Philipp. Pl. 2: 306 (1923).

Type: Philippines: Luzon: Benguet Prov.: Sablan, *A.D.E. Elmer* 6260 (lectotype: K; isotypes: GH, K, NY, P).

Woody vine; young branches terete, glabrous, striate, old branches sulcate, lenticellate; *stipules* ovate, peltate, striate, 3-4 mm long, 1.5-2.5 mm wide, caducous. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous, subjugal part 5-7 cm long, suprajugal part 1.5-2.5 cm long; terminal leaflets elliptic or ovato-elliptic, 3-nerved, acuminate or cuspidate at apex, rounded at base, with alternate lateral nerves in 3-5 pairs, 10.5-19 cm long, 3.5-7 cm wide; lateral leaflets opposite, ovate, oblique at base, 7.5-16 cm long, 3-7 cm wide; petiolules 6 mm long; stipels setaceous, 3 mm long. *Inflorescence* 18-60 cm long; peduncles glabrous, 15-50 cm long, much longer than axis; axis glabrous; brachyblast warty, 2-3 mm long 1-2 mm wide; bracts lanceolate, 2-3 mm long, caducous; bracteoles caducous; pedicels glabrous, 21-25 mm long. *Flowers* purplish-blue, 2.2-3.2 cm long; calyx campanulate, 8-9 mm long, 5-lobed, hairy at the upper portion inside, glabrous outside; the lobes separate, rounded at apex, 0.5-1 mm long; standards ovate, shortly auricled at base, 20-30 mm long, 11-16 mm wide, with claw 2-4 mm long, with 2 appendages 6-9 mm long above the claw; wings oblong, shortly auricled at base, 11-13 mm long, 5.5-7 mm wide, with claw 7-12 mm long; keel petals lanceolate 20-28 mm long, 6-8 mm wide, with claw 10-11 mm long; stamens 28-36 mm long, filaments glabrous, anthers dorsifixed, oblong; pistil with discoid nectary at base; stipe hairy at the upper portion, 10-12 mm long; ovary, oblong, 4-6-ovuled, covered with stiff hairs, 6-7 mm long; style flat, glabrous, 23 mm long; stigma terminal. *Pods* elliptic, rugose, 4-7.5 cm long, 2.2-4 cm wide, valve 2-4 mm thick. *Seeds* black, reniform, 18 mm wide, 11 mm long; hilum linear, 17 mm long, with spongy tissue.

Distribution: Endemic in the Philippines.

Habitat: In thickets and forest (Merrill, 1923).

Altitude: From low altitude to 1600 m (Merrill, 1923).

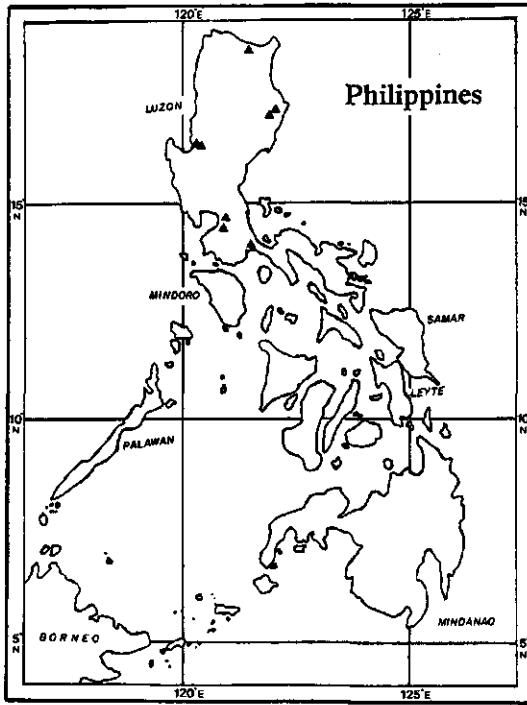
Flowering: Feb, Mar, Apr.

Fruiting: Apr, May.

Vernacular name: Bindanugan (Igorot).

Specimens examined:

PHILIPPINES: Luzon Island: Benguet Prov.: Baguio, *A.D.E. Elmer 8984* (BO, E, GH, K, L, LE, US); Salblan, *A.D.E. Elmer 6260* (type: GH, K, P); Cagayan Prov. *C. Baeabi s.n.* March 1919 (US); Peña Blanca, M. Ramos 46659 (NY); 76707 (NY); Ilocos Prov.: Burgos, *M. Ramos 27344* Feb.-March 1917 (BM, GH, NY); Isabela Prov.: San Mariano, *Ramos & Edaño s.n.* Feb.-March 1926 (KWA); Mt. Moises, id. 47330 (NY); Rizal Prov.: *A. Loher 5901* (K, M); 13298 (GH); 14272 (M, GH).



Map 7: Distribution of *Strongylodon elmeri* Merrill.

Note: *S. elmeri* is very closely related to *S. macrobotrys*. It differs from *S. macrobotrys* by smaller flowers, much shorter inflorescences with compact nodes in the upper portion and comparatively compressed pods.

10.7 *Strongylodon loheri* Huang, sp. nov.
Figures 2,3,4,5,10; Map 8; Tables 1,2.

Type: Philippines: Luzon: Benguet Prov., *A. Loher 2304* (holotype: K; isotype: US).

Paratypes: sine loc. *A. Loher 5926* (K); Luzon: Benguet Prov.: Baguio, *D.L. Topping 58* (US); *Ramos & Edaño s.n.* March 1925 (B, BO, P); Tonglon, *A. Loher 2307* (K, p.p., only pod and seeds).

Frutex scandens; caulis glaber. Folia trifoliolata; foliola terminalia ovata cuspidata, 10-15 cm longa, 6-7.5 cm lata; stipulae ovatae-triangulares deciduae, 6-7 mm longae, 3.5-4 mm latae. Stipellae setaceae deciduae, 4-6 mm longae. Inflorescentiae pseudo-racemosae. Flores caeruleae fasculis positis incrassatione rhachi-



Fig. 10. *Strongylodon loheri* Huang.

1. Habit x2/3; 2. Terminal leaflet from back side x2/3; 3. Inflorescence x2/3; 4. Calyx x2/3; 5. Standard x2/3; 6. Wing petal x2/3; 7. Keel petal x2/3; 8. Stamens and pistil x2; 9. Pod x2/3; 10. Seed x2/3. (1-2, D.L. Topping 5; 3, Ramos & Edaño s.n. March 1925; 4-, A. Loher 2304; 9-10, A. Loher 2307).

dis, 5-6 mm longa, 2-3 mm lata. *Calyx campanulatus*, 10-12 mm longus; *lobis* 5, *rotundatis imbricatis*, 2-2.5 mm longis. *Vexillum oblongum unguiculatum*, 30-33 mm longum, 18-19 mm latum, *ungue* 3-6 mm longo. *Alae oblongae auriculatae unguiculatae*, 14-17 mm longae, 7-9 mm latae, *ungue* 13 mm longo. *Carinae petala oblonga unguiculata*, 29-35 mm longa, 7-9.5 mm lata, *ungue* 10-14 mm longo. *Stamina filametis glabris, antheris oblongis*, 1 mm longis. *Pistillum stipitatum, ovario hispidum, ovulis* 6-8. *Fructus turgidus semi-septatus oblongus*, 4.5-6 cm longus, 2-2.5 cm latus, *parie crassa*. *Semina nigra, circiter* 15 mm longa, 10 mm lata. *Hilum spongiosum, circiter* 14 mm longum.

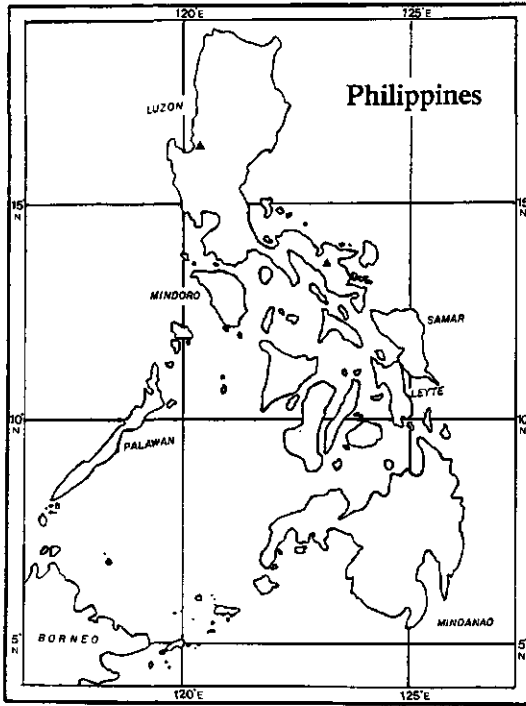
Woody vine; young branches glabrous, striate, old branches glabrous, sulcate, lenticellate; *stipules* deciduous, ovate-triangular, peltate, glabrous, striate, 6-7 mm long, 3.5-4 mm wide. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous, subjugal part 5-8.5 cm long, suprajugal part 1.5-3.5 cm long; terminal leaflets ovate, cuspidate at apex, rounded at base, with alternate lateral nerves in 5-7 pairs, 10-15 cm long, 6-7.5 cm wide; lateral leaflets ovate, truncate and oblique at base, cuspidate at apex, 10-13.5 cm long, 4.5-5.5 cm wide; petiolules glabrous, 10 mm long; stipels linear 4-6 mm long, deciduous. *Inflorescence* 10-19 cm long; peduncles glabrous, 5-6 cm long; axis glabrous; brachyblasts warty, 5-6 mm long, 2-3 mm wide, 5-6-flowered; bracts ovate, peltate, glabrous, striate, ciliate at margin, 1-1.2 mm long, 1 mm wide, caducous; bracteoles ovate, peltate, glabrous, striate, ciliate at margin, caducous, 3 mm long, 2.5 mm wide; pedicels glabrous, 23-25 mm long. *Flowers* purplish-blue, 3-3.5 cm long; calyx campanulate, 10-12 mm long, 5-lobed, hairy at upper portion inside, glabrous outside, lobes imbricate, rounded at apex, 2-2.5 mm long, the upper 2 lobes connate, the lower 3 lobes imbricate; standard oblong, slightly auricled at base, reflexed, 30-33 mm long, 18-19 mm wide, with claw 3-6 mm long, with 2 appendages 10 mm long above the claw; wings oblong, auricled at base, 14-17 mm long, 7-9 mm wide, with claw 7-13 mm long; keel petals oblong, 29-35 mm long, 7-9.5 mm wide, with claw 10-14 mm long; stamens 39-40 mm long, filaments glabrous, anthers dorsifixed, oblong, 1 mm long; pistil with discoid nectary at base; stipe hairy at the upper portion, 10 mm long; ovary oblong, 6-8-ovuled, covered with stiff hairs, 9 mm long; style glabrous, 27-35 mm long; stigma terminal. *Pods* oblong or elliptic, inflated, rough, with valve 4 mm thick, semi-septate between seeds, 4.5-6 cm long, 2-2.5 cm wide. *Seeds* black, ellipsoid, 15 mm long, 10 mm wide; hilum linear, ca 14 mm long, with spongy tissue.

Distribution: Endemic in the Philippines.

Habitat: Unknown.

Altitude: Unknown.

Flowering: Mar.



Map 8: Distribution of *Strongylodon loheri* Huang.

Fruiting: Unknown.

Specimens examined:

See types. Added in proof: Botol river, Camarines Sur, G. Edaño 76304 (NY).

Note: This species is allied to *S. caeruleus* and *S. zschokkei*. From the former, it differs by the cuspidate apex of leaflets, longer flowers and much shorter inflorescence with warty nodes. From the latter, it differs by the peduncle being shorter than the axis, larger warty nodes and thicker pod valve. Rolfe pencilled the new epithet on the holotype sheet at K, but did not publish it.

10.8a *Strongylodon lucidus* (G. Forster) Seemann “lucidus populations”
Figure 2,3,4,6; Map 9; Tables 1,2,4,5.

Strongylodon lucidus (G. Forster) Seemann, Fl. Vit. 61 (1865) as *lucidum*, p.p., excl. specim. Hawaii; Drake, Fl. Ins. Mar. Pac. 151 (1886), as *lucidum*; Peekel, Illustr. Fl. Bism. Archip. 5: 828 (1895); Schumann & Lauterbach, Fl. Deutsch.

Wageningen Agric. Univ. Papers 90-8 (1991)

Schutzg. Suds. 364 (1901); Merrill in Philipp. J. Sci. 5: 115 (1910); Merrill, Enum. Philipp. Pl. 2: 306 (1923); White in J. Arnold Arbor. 10(4): 223 (1929); Stone in Micronesica 6: 345 (1970); Smith, Fl. Vit. Nova 3: 207. f. 41, 42 (1985)

Basionym:

Glycine lucida G. Forster, Fl. ins. austr. 272 (1786).

Type: Society Islands: Tahiti, *Banks & Solander s.n.* 1769 (lectotype: BM; isotype: BM).

Homotypic synonym:

Rhynchosia lucida (G. Forster) DC., Prodr. 2: 387 (1825).

Heterotypic synonyms:

Strongylodon pseudolucidus Craib in Bot. Mag. t. 8494 (1913).

Type: Cultivated specimen (origin Madagascar), *Sussex s.n.* Dec. 20, 1912 (holotype: K).

S. secundus St. John in Pacific Sci. 26: 121-124 (1972).

Type: Solomon Islands, *S.F. Kajewski 2493* (holotype: BISH, not seen; isotypes: BM, BO, GH, L, P).

S. siderospermus Cordemoy, Fl. Ile Reunion 322 (1895); Verdcourt, Man. New Guinea Leg. 432 (1979).

Type: Escarpements de la Riviere des Marsouins, *Cordemoy s.n.* (holotype: MARS, not seen).

Misapplied names:

Mucuna altissima sensu Hook. & Arn., Bot. Beech. 81 (1832), *non* DC.

Strongylodon ruber auct. non Vogel: Baker in Hooker, Fl. Brit. Ind. 2: 191 (1879); Trimen, Hand-Book Fl. Ceylon 2: 65 (1894); Prain in King, J. As. Soc. Beng. 66(1): 69 (1897); Bailey, Queensl. Fl. 2: 429 (1900).

10.8b *Strongylodon lucidus* (G. Forster) Seemann "ruber populations"

Fig. 11; Map 9; Tables 1,2,5.

Synonym:

S. ruber Vogel in Linnaea 10: 585 (1836); Gray, U.S. Expl. Exped. 1: 446. t. 48 (1854), *p.p., excl. specim. Fiji*; St. John, List Summary Fl. Pl. Hawaiian Isl. 194 (1973), Wagner, Herbst & Sohmer, Manual Fl. Pl. Hawai'i 707-709 (1990).

Type: Hawaii: Oahu, Chamisso *s.n.* (LE, holo).

Misapplied name:

S. lucidus auct. non Seemann: Hillebrand, Fl. Hawaiian Isl. 100 (1888); Rock, Leg. Pl. Hawaii 195. pl. 80 (1920).

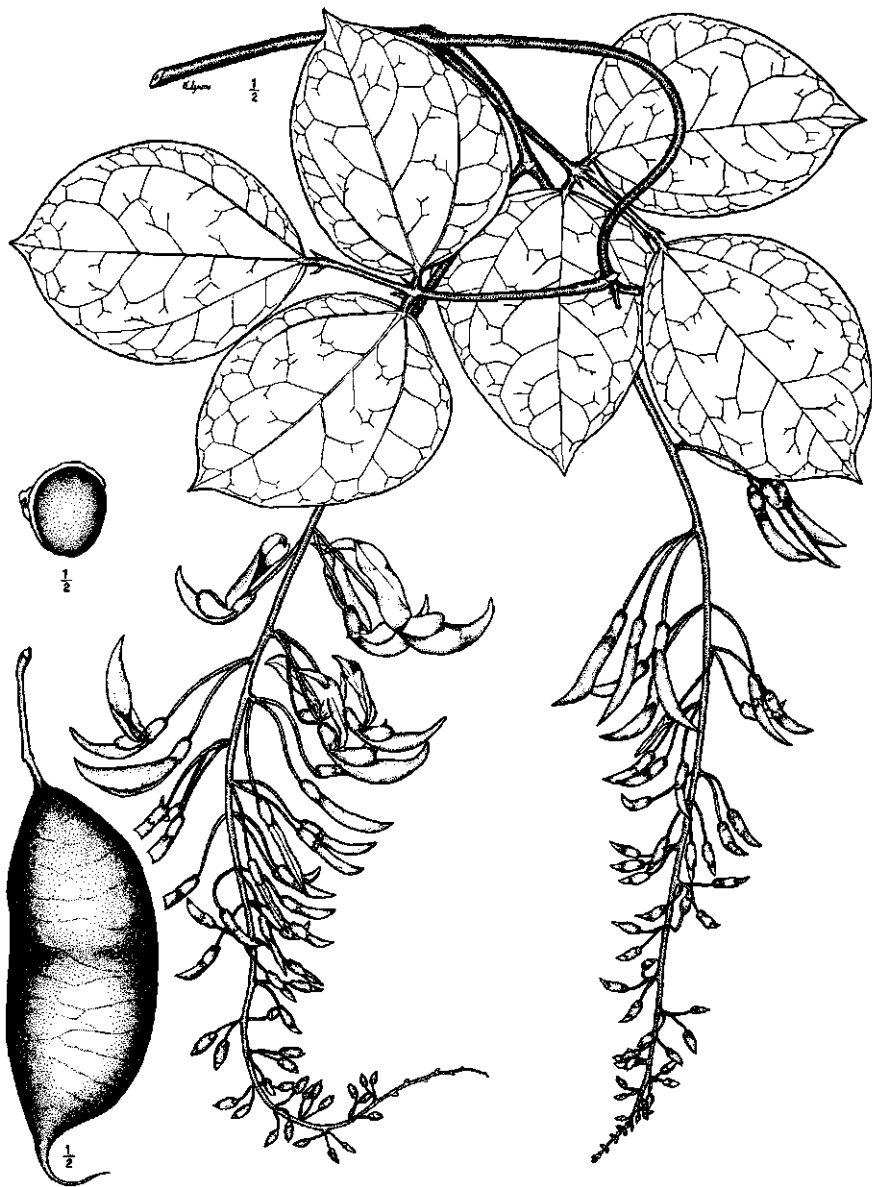


Fig. 11. *Strongylodon lucidus* (G. Forster) Seemann (reproduced from O. Degener, *Flora Hawaiiensis* 2, 6/30/32). Habit with pod and seed.

10.8c *Strongylodon lucidus* (G. Forster) Seemann “longiflorus populations”
Map 9; Tables 1,2,5.

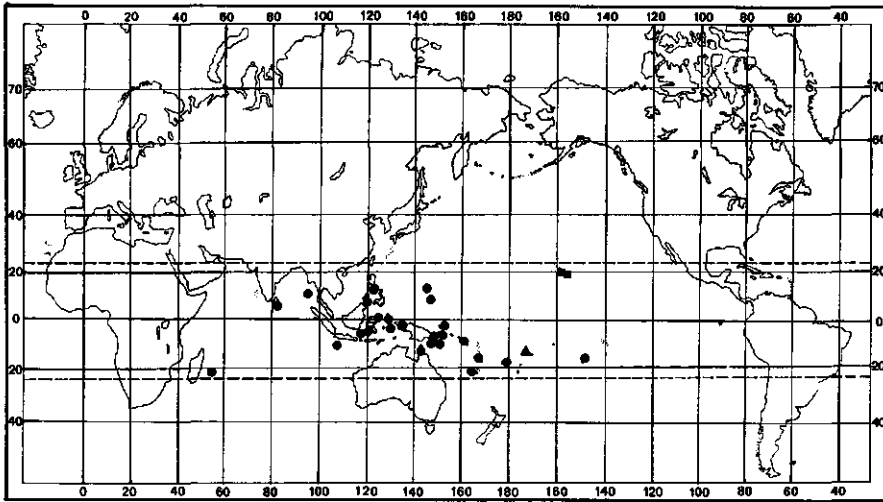
Based on: Samoa: Upolu, Malololelei, *E. Christophersen 343* (B, BISH, US).
Other specimens: Samoa: Above Salailua (only flowers on the forest floor),
Christophersen 2691 (BISH), Savaii, Siuva-o-Auala, *E. Christophersen 3361*
(BISH, K); Upolu, Luatuanu'u, *A. Whistler 1634* (B, BISH, K); Mt. Fao, *A.*
Whistler 3242 (BISH, US).

Misapplied name:

Strongylodon lucidus auct. non Seemann: Christophersen, Flower. Pl. Samoa 103
(1935).

Differs from the “lucidus” populations by longer flowers and broader fruits,
differs from the “ruber” populations by longer flowers.

Woody vine; young branches glabrous, striate; *stipules* ovate-triangular, basi-
fixed with auricles at base, glabrous, striate, 4-7 mm long, 2-4 mm wide, cadu-
cous. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous, subjugal part 3-10
cm long, suprajugal part 1.5-4 cm long; terminal leaflets ovate, wide ovate or
orbicular, 3-nerved, obtuse-acute to cuspidate at apex, rounded or truncate at
base, with alternate lateral nerves in 2-4 pairs, 6-13 mm long, 5.5-9.5 mm wide;
lateral leaflets ovate, wide ovate or orbicular, oblique at base, 5-12 cm long,
3-8 cm wide; petiolules glabrous, 4-11 mm long; stipels linear, striate, 2-5 mm
long. *Inflorescences* axillary nodose pseudoracemes or nodose pseudopanicles
with 2-5 branches, 5.5-30 cm long; peduncles and axis glabrous; brachyblasts
warty, 1.5-3 mm long, 1-1.5 mm wide, 2-3-flowered; bracts ovate or wide ovate,
slightly peltate, striate, ciliate at margin, 1.5-2 mm long, 1-1.5 mm wide; brac-
teoles, wide ovate, basifixed with auricles at base, striate, ciliate at margin, 1.5-2
mm long, 1.5-2 mm wide; pedicels 10-28 mm long. *Flowers* orange to red, 1.4-3
(-4.2) cm long; calyx campanulate, 5-lobed, hairy at the upper portion inside,
glabrous outside, lobes 0.3-1.8(-4.5) mm long, the upper 2 lobes connate,
rounded at apex, the lower 3 lobes separate or imbricate; standard lanceolate
to ovate, slightly auricled at base, 17-31 (-40) mm long, 10-12(-16) mm wide,
with claw 2-5 mm long, with 2 appendages 4-8 mm long above the claw; wings
oblong, obtuse at apex, 7-11 (-21) mm long, 3.5-6 mm wide, with claw 6-10
mm long; keel petals lanceolate, 14-28 (-35) mm long, 4-9 mm wide, with claw
5-10 mm long; stamens 20-24 mm long, filaments glabrous, anthers dorsifixed,
oblong; pistils with discoid nectary at base; stipe glabrous, 6-11 mm long; ovary
elliptic, 1-2-ovuled, glabrous, 3-7 mm long; style glabrous, 13-18 (-28) mm long,
stigma terminal. *Pods* elliptic to elliptic-orbicular, reticulate-veined, 3-8 (-10)
cm long, 2-4.5 (-5.5) cm wide, 1-2-seeded, dehiscent by rupture of epicarp. *Seeds*
brown or black, orbicular or spherical, 9-22 mm long, 12-20 (-25) mm wide;
hilum 1/2-2/3 of circumference, with spongy tissue.



Map 9: Distribution of *Strongylodon lucidus* (G. Forster) Seemann.

- "lucidus" populations
- ▲ "longiflorus" populations
- "ruber" populations

Distribution: From Reunion Island to Sri Lanka, Andaman Islands, Christmas Island and eastwards to Queensland and northwards to New Guinea, Indonesia, Philippines, eastwards to Micronesia and Polynesia. Hawaii and Samoa harbour the "ruber" and "longiflorus" populations respectively.

Habitat: Usually climbing in forest canopy or inhabiting the edge of forests near streams, sometimes found in more exposed places such as on tops of regrown trees, or alongside plantations.

Altitude: 0-1500 m.

Flowering: Indian Ocean: Apr, Jun, Sep-Dec; Pacific Ocean: Jan- Nov.

Fruiting: Indian Ocean: Feb, Mar, Jun, Sep; Pacific Ocean: Jan- Nov.

Vernacular names: Madagascar: Cadoque blanche; Samoa: Tifa, Fue Vai; Solomon Islands: Kwalosa'ambarai (Kwaia'ae), Makiroundi (Arohane), Nuvi nopobla (Graciosa Bay), Pidige-armallo, Pirihiamu.

Specimens examined: "lucidus populations":

AUSTRALIA: Christmas island: *C.W. Andrews s.n.* 1897 (E, K); 101 (BM); *s.n.* 1901 (BO); 154 (BM); *D.A. Powell* 18 (K); Queensland: Atherton, Cooper Creek, *B. Byland* 5996 (K, L); Near first main creek past Noah Creek, *G.C. Stocker* 861 (K, L).

CAROLINE ISLANDS: Kusai, *R. Kanehira* 1356 (NY, US); 1393 (BISH, NY, TAI); *T. Hosokawa* 6444 (TAI); 9401 (TAI); Truk, *C. Y. Wang* 264 (A, BISH, US); Wara, *T. Hosokawa* 8414 (TAI).

FIJI: sine loc. *B. Seemann* 113 (GH, K); Maravu, *Degener & Ordenez* 14201 (A); Serua, *J.D. Yelf* 14346 (BISH, K); Waibau, *D. Koroiveibau s.n.* May 16, 1960 (BISH, K); Viti Levu: Rewa, Lami, Suva distr., *Tothill* 476 (BISH).

GUAM: *R.C. McGregor* 553 (BISH, BM, BO, E, K, NY, US); Upper Yigo, *Krizman* LR 3484 (BISH); Yigo district, *R. Rodin* 723 (BISH, US).

INDIA: Andaman Islands: *Prain* 1 (BM, E); 51 (K, L); Batae, *P. Pinik* 518 (L); Cadele, *King s.n.* Oct. 24, 1891 (L); Cyflanabang, *King s.n.* Sept. 20, 1890 (US); Diglipur, *N.G. Nair* 4822 (L); South Andaman, *King s.n.* Nov. 11, 1893 (BM, L); *C.E. Parry* 244 (K); *N.P. Balakrishnan et al.* (K, KWA, L, MO);

INDONESIA: Seram(Ceram): Oeroeng, *Bornassi* 945 (BO, L); Shores, Tolocarang River, *Bornassi* 93 (BO, L); Wai Beka, *Rutten* 1761 (BO, L); Wai Bolifar, *Rutten* 2139 (BO); Wai Moessi, *Rutten* 409 (BO, L); Kec. Seram, Desa Gah, *Mirmanto & Ruskandi* 104 (BO); Kangean: Tambajangan, *C.A. Backer* 27957 (BO, K, L, P); *Beguín* 11 (BO, L); Key (Kai): *Jaheri* 315 (BO); Moluccas: Aroe, *P. Buwalda* 5215 (B, BO, L); *Hj. Jensen* 266 (BO); Idamdehi, *A.H.G. Alston* 16876 (BM); Sulawesi (Celebes): Manado, *Teysmann* 5275 (BO); *Eyma* 3992 (L); Papepekang, *J.E. Teysmann* 14076 (BO, L); West Irian: Geelvink Bay District, Nabire, *Kanehira & Hatusima* 11506 (A, BO).

NEW CALEDONIA: *M. Balansa* 2469 (E); *M. Leuormand* 3999 (K); *S. J. de Wagap* 2999 (GH); Payel, Mt. Wagap, *Keilland* 2559 (L); Kokingona, *Vieillard* 2559 (NY).

PAPUA NEW GUINEA: sine loc. *L.J. Brass* 1524 (A); sine loc. *S. Clements* 41372 (A); sine loc. *Lauterbach s.n.* 1896 (K); sine loc. *Lae* 5687 (A, BM, L); nr Constantin-Hafen, *R. Schlechter* 14269 (BM, BO, K); Lossuk-Bagaterre, *M. Coode et al.* 29720 (A, BISH, BO, E, L); Namatai, *M.J.S. Sands* 2214 (K, L); Sg. Aendoea nr Oeta, *Aet* 456 (BO, K, L); Tisa nr Bako, *Aet* 14 (BO); Central District: Abau, N of Nunumai village across Ulumanok River, 12 km N of Amazone Bay, *A. Kanis* 1017 (A, BISH, K, L); Brown River, Karema, *R. Schodde* 2504 (BO, K, L); Brown River, Port Moresby, *R. Pullen* 6794 (A, L); Kupiano, *J. Wiakabu* 70471 (E, K, L, M); Laloki River, Rona, *L.J. Brass* 3584 (A, B, BM, L, NY); Madang District: Beon, *A.N. Millar* 22534 (A, BO, L); Gogol River, Dai Village, *R.D. Hoogland* 4875 (A, BM, L); Kar Kar Island, *C.E. Ridsdale* 33936 (A, K, L); Ramu Valley, Unino Village, *R.D. Hoogland* 5009 (A, BM, K, L); Milne Bay district: Rata rata subdistrict: Biniguni - Maneau track, *Streimann NGF* 28800 (BISH); Morobe District: sine loc. *Lae* 3175 (A, L); Bulolo, *J. Womersley* 3591 (A, K); Bulolo, Wau, *Kairo & Streimann* 27917 (A, BISH, BO, K, L); 27804 (A, K, L); *B.C. Stone* 9740 (B, BISH, BO, E, K, L); Curakor Hill, *A.N. Millar* 9974 (A, BO, L); Garagos, *A.N. Millar* 13822 (A); Heldsbach, *M.S. Clemens* 3188 (A); Huon Peninsula, *R.D. Hoogland* 9032 (A, BM, BO, K, L, NY); Lae, *A.N. Millar* 14535 (A, E, L); Lae, Abunaka, *E. Henty et al.* 49890 (L); Lae, Busu River, *P. Katik s.n.* Oct. 20, 1977 (L); Lae-Markham Road, *P. van Royen* 16336 (L); Sattelberg, *M.S. Clements* 6583 (A, B, K); Sepik District: Aitape, Marok Village, *Darbyshire & Hoogland* 7879 (A, B, BM, L); Telefomin, Agathis, *N.H.S. Howcroft* 64053 (L). New Britain: East New Britain District: Pomio, Fulleborn Harbour, *J.R. Croft et al.* 12991 (L); Keravat, 1952 logging area, *A. Floyd* 6697 (A, BM, BO, K, L, US); Gazelle Peninsula, Keravat, *J.S. Womersley* 7950 (A, B, BISH, BM, K, L); West New Britain District: Keravat, *Floyd* 6697 (BISH); Kandrian, Andru, *A. Gillison* 22432 (L); New Ireland: Lamet, New Hanover, *Croft & Lelean LAE* 65477 Oct. 5, 1974 (A, BO, E, L, M, US); Manga, Namatanai, *M. Coode et al.* 46031 (E, BISH, K, L, M, US); *M.J.S. Sands et al.* 2214 (A, K).

PHILIPPINES: Balabac Island, *Ramos & Edaño* 49899 Nov. 1927 (K, NY); Panay, Capiz, Jaminda, *Ramos & Edaño s.n.* April-May 1918 (K); Balut, Pralus Island, *E.D. Merrill* 5411 (L, P, US).

REUNION: sine loc. *Th. Cadet* 595 (K); Grand Brule, *D. Lorence et al.* 2491 (K, MO); Mave Longue, *Cadet & Coode* 5072 (K).

SOLOMON ISLANDS: Bogotu Peninsula, *T.C. Whitmore* 4055 (L); Haleta Village, *I.H. Gafui* 15085 (A, L); Newscorgis, *J.H.L. Waterhouse* 140 (A, L); banks of Pegalo river nr confluence with Warahito, N. E. San Cristobal Island, *T.C. Whitmore* 6147 (A, BISH, LE); Umsami River, *T.C. Whitmore* 6021 (A, K, L, LE); Bougainville Island: *S.F. Kajewski* 1845 (A, BISH, BM, BO, L, P); *A.H. Voyce* 11 (K, L); Siwai, *J.H.L. Waterhouse* 429B (A, L); 675A (A, K, L); Guadalacana

Island: Honiara, Rove Valley, *Nakisi* 7323 (L); Logu Village, *B. Sirutee* 9982 (A, L); Mt. Cullego, *T.C. Whitmore* 2083 (A, K, L); Tutuue, Vulolo, *S.F. Kajewski* 2493 (A, BM, BO, L, P); Malaita Island: Kwara-ai District, Tantalau Village, *B.C. Stone* 2337 (BISH, L); Dala, *I.H. Gafui et al.* 10585 (K, L); San Cristobal Island: Ngonangonamela, above Arohane, *J.M. Powell BSIP* 19416 (BISH); Temotu Island: Graciosa Bay, *D.E. Yen BSIP* 19940 (BISH).

SOCIETY ISLANDS: Tahiti, *Banks & Solander s.n.* 1769 (type: BM).

SRI LANKA: *M. Thwaites* 1479 (BM, GH, LE, P); 5677 (P).

TONGA: summit of Eastern Ridge above Vaingana, Eua, *Hürlimann* 269 (NY); Eua, *H.E. Parks* 16371 (K).

VANUATA (NEW HEBRIDES): eastern limestone cliff, Mt Kolo'aki-lupe-tonga, *Hotta* 5522 (BISH); sine loc. *A. de la Rue s.n.* Sep. 15, 1936 (A); Efate Island, Undine Bay, *S.F. Kajewski* 192 (A, NY); Malekula Island, *A. de la Rue s.n.* May 7, 1936 (P); Ipotu, Enouraigo, *P. Cabalion* 2064 (K); Piste de Baie, Barriera Wali, *Ph. Morat* 5459 (K, US).

Specimens examined: "ruber populations":

HAWAII: Hawaii: sine loc. *J.F. Rock s.n.* 1961 (US); Hiilawe, Waipio, *Rock* 4609 (BISH); Hiilawe, *J.F. Rock* 4612 (GH, L); Hilo, Kea, *W. Hancock s.n.* Aug. 25, 1898 (K); Kumaewa: Kau, *J.F. Rock* 13080 (K).

Kauai: *C.N. Forbes* 15 (BO); Hii Mts, *Forbes* 617K (BISH); Ridge ?side Kepatuilu, *Forbes* 684 M (BISH).

Maui: Honokakau Drainage Basin, *C.N. Forbes* 486M (GH); Keahikauo, *O. Degener* 7177 (MO, NY); Kipahulu valley, *Wagner et al.* 1988.140 (BISH).

Molokai: *C.N. Forbes s.n.* Aug. 1912(K); 456 (MO, NY);

Oahu (Sandwich Island): sine loc. *Hind s.n.* 1841 (K); *Mann & Brigham* 134 (MO, NY); *L.H. McDaniels* 74 (US); *M.J. Remy* 668 (P); 672 (GH, P); *H. St. John* 24861 (B); *Stone & Pearsall* 3260 (K); *A. Gray s.n.* 1833 (K); Bonite, *M. Gaudichaud* 164 (K, P); Byron's Bay, *Macrae s.n.* July 1825 (BM); Honolulu, Mauoa, *A. Meebold* 20451 (M); Mt. Kala, *E.H. Bryan* 710 (US); *W. Krynilo* 28200 (B); Kaluaa, *Herat & Herat* 463 (B, BISH); Makaloha, *A. Meebold* 21987 (M); Manoa Cliff, *D.L. Lopping* 3245 (BO); Manoa Valley, *Fosberg* 9494 (NY); Nunonu Valley, *C.N. Forbes* 1940-O (MO); Popouwela, *E. Christophersen* 3727 (BISH, BO, NY); Rooda Range, *C.N. Forbes s.n.* Feb. 12-19, 1909 (BO, MO); Mt. Tantalus, *L.B. & E.C. Abbe & B.C. Stone* 10078 (NY); *H.F. Bergman* 17 (BO, K, NY); Waianae Range, Mt. Kaala, *Cowan* 327 (NY); *Rogers s.n.* Nov. 17, 1946 (NY); Waianaeuka, valley S of E ridge of Puu Kalena, Waianae Mts, *F.R. Fosberg* 12995 (BISH, GH); *D. Herbst* 1129 (BO); 1611 (US); *H. St. John* 9939 (KWA); 10053 (B, BISH, BO, K, NY); *P.C. Hutchinson et al.* 7373 (NY, US); Kaluaa Gulch, *Sohmer* 6426 (NY); Kakaba, *C. Skottsberg* 927 (BO); Mt Kalena, Waianae district, *Grant* 7368 (BISH); Puu Kanehoa Ridge, *B.C. Stone et al.* 3623 (L); Puu Hapapa, *Meebold s.n.* (BISH); *Takeuchi & Tate* 2515 (GH); Puu Kanehoa-Puu Hapapa, *S. Carlquist* 2159 (GH, L); *T.G. Yuncker* 3282 (NY); Makaha Valley, *O. Degener* 7175 (BM, GH, L, NY); *Obata et al.* JO(85)-576 (BISH); *H. St. John* 11614 (L); Makaleha Valley, *O. Degener* 17652 (GH, NY); *Degener & Hatheway* 20870 (B, BM, GH, K, M, NY, US); Warniano Ridge, *C.N. Forbes* 2004-O (GH); Punalun, Mauka, *O. Degener* 7176 (GH, K, MO, NY); W branch E Makaleha Valley, Mokuleia Range, *Hatheway* 397 (BISH).

Notes: Flowers and pods are eaten by the Guamanians (Rodin 723), leaves crushed in water are used on sore legs of children in the Solomon Islands (Powell 19416).

The main characters of the populations in *S. lucidus* are given in Table 4. Each character is continuous on the whole, except for the plants of Samoa and Hawaii. Samoan *S. lucidus* plants have longer flowers than most populations elsewhere. Hawaiian plants (earlier *S. ruber*) have also longer and larger flowers, larger calyx lobes, pedicels, pods and seeds. Because of their geographical isolation,

Table 4: The main characters of *Strongylodon lucidus* in the areas of occurrence.

| Area | Terminal shape | Leaflet apex | Inflorescence (branch) | Flower (mm) | Calyx tube (mm) | Upper lobes |
|--------------------|--|---------------------------------|------------------------|-------------|-----------------|-------------|
| Hawaii a) | orbicular wide-ovate | acuminate cuspidate | 1-2 | 25-32 | 7-10 | 1.8-3 |
| Samoa | wide-ovate orbiculate | cuspidate acuminate | 1 | 36-42 | 9-10 | 2-2.2 |
| Society Islands b) | wide-ovate | acuminate | 1 | - | - | - |
| Fiji | wide-ovate | acute acuminate | 1 | 18-19 | 5-6 | 0.8-1 |
| New Caledonia | wide-ovate | acute | 1 | 18-20 | 5.8-6 | 0.8-1 |
| Vanuata | wide-ovate | acuminate | 1 | 18-20 | 6 | 1-1.2 |
| Solomon Islands c) | wide-ovate orbiculate | acuminate cuspidate | 1-5 | 22-25 | 6 | 0.5-0.8 |
| New Britain | orbiculate | acute | 2-3 | 25 | 6 | 0.5 |
| New Ireland | wide-ovate orbicula | acute acuminate | 1-3 | 26-28 | 7-7.5 | 0.3-0.5 |
| New Guinea | wide-ovate ovate elliptic orbicular | acute acuminate cuspidate | 1-5 | 18-30 | 5-9 | 0.3-1.8 |
| Key (Kai) Kangean | ovate ovate elliptic wide-elliptic | acuminate acute | 1 1 | - 16-18 | - 5-6 | - 0.8-1 |
| Sulawesi | wide-ovate | acute | 1 | 18-20 | 6 | 1-1.2 |
| Seram | ovate wide-ovate elliptic wide-elliptic | acute acute acuminate | 1 1 | 19-20 | 5-6 | 0.8-1 |
| Moluccas | ovate wide-ovate | acute acuminate | 1 | 18-20 | 7-7.5 | 1 |
| Philippines | wide-ovate | acuminate | 1 | 16 | 7 | 1 |
| Guam | wide-ovate | acuminate | 1 | 25 | 7 | 0.8 |
| Caroline Islands | wide-ovate acuminate | acute | 1-3 | 23 | 7 | 1 |
| Queensland | wide-ovate | acuminate | 1 | 25 | 7 | 0.8 |
| Christmas Island | wide-ovate wide-elliptic | acute | 1 | 14-18 | 5-6 | 0.9-1 |
| Andaman Islands | ovate elliptic wide-ovate | acuminate cuspidate | 1-2 | 18-21 | 6-7 | 0.8-1 |
| Sri Lanka | elliptic ovate | acuminate | 1 | 18-21 | 6 | 1 |
| Reunion d) | wide-ovate | acuminate | 1-2 | 17-18 | 5-5.5 | 0.8-1 |

a) type of *S. ruber* described from Hawaii.b) type of *S. lucidus* described from Tahiti.c) type of *S. secundus* described from the Solomon Islands.d) type of *S. siderospermus* described from Reunion.

Table 4: continued.

| Area | Pedice (mm) | Pod length (cm) | Pod width (cm) | Seed length (mm) | Seed width (mm) |
|-----------------------|----------------|-----------------------|----------------------|------------------------|-----------------------|
| Hawaii a) | 15-36 | 7-10 | 4-5.5 | 21-22 | 23-25 |
| Samoa | 15 | 6-7.5 | 5-5.5 | 17-23 | 19-23 |
| Society Islands b) | — | 5.5 | 3.5-4 | 18-19 | |
| Fiji | 16-17 | 6.5 | 4 | 19 | 20 |
| New Caledonia | 15-20 | 5.5 | 3.5 | 19 | 19 |
| Vanuata | 16-18 | 7 | 3.8 | 16 | 18 |
| Solomon Islands c) | 16-20 | 3-4 | 2-3.2 | 13-15 | 13-15 |
| New Britain | 21 | — | — | — | — |
| New Ireland | 18-21 | — | — | — | — |
| New Guinea | 13-23 | 4.5-5.3 | 3.2-3.5 | 18 | 18 |
| Key (Kai) | — | 5.8-7 | 4 | 14 | 18 |
| Kangean | 14-15 | 7.5-8 | 4-4.5 | — | — |
| Sulawesi | 16-18 | 7 | 3.8 | 16 | 15-18 |
| Seram | 14-16 | 6.5 | 4 | — | — |
| Moluccas | 20-25 | 5.5-7 | 3.5 | 17 | 17 |
| Philip- pines | 20 | — | — | — | — |
| Guam | 13-16 | — | — | — | — |
| Caroline Islands | 16 | — | — | — | — |
| Queens- land | 18 | — | — | — | — |
| Christmas Island | 8-10 | 6.5 | 4 | 13 | 13 |
| Andaman Islands | 17-20 | 5.5 | 3.5 | — | — |
| Sri Lanka | 12-14 | — | — | — | — |
| Reunion d) | 13-15 | 5.5-6 | 3.5-4 | 20 | 20 |

a) type of *S. ruber* described from Hawaii.

b) type of *S. lucidus* described from Tahiti.

c) type of *S. secundus* described from the Solomon Islands.

d) type of *S. siderospermus* described from Reunion.

genetic differences are expressed, but separate subspecific status and nomenclature are not warranted. The differences are visible (Table 5), however, and the groups are best described as populations.

St. John (1972) claimed that *S. secundus*, distributed in New Britain, New Ireland, New Guinea and Solomon Islands, differed from *S. lucidus* by having smaller flowers and pods which are inserted on 4-5-branched panicles, but these characteristics fall within the accepted range of variability and it cannot be separated geographically (Table 4). It is, thus, better treated as a synonym of *S. lucidus*.

S. pseudolucidus, published by Craib (1913), is superfluous since its type originated from Madagascar (or Reunion?) where *S. siderospermus* had already been described. *S. siderospermus* is also inseparable from *S. lucidus*, and is treated as a synonym. No specimens directly from Madagascar were available.

Smith (1985) pointed out that the plants of Tonga can be grouped together with Samoan plants, but no conclusion can be reached from the one specimen without flowers and pods examined by the present author, and it is treated as a *S. lucidus* "lucidus" population.

Table 5: The main characters of the populations of *Strongylodon lucidus*.

| Character | "Longiflorus" | "Ruber" | "Lucidus" |
|------------------------|----------------------------|------------------------------|---|
| Terminal leaflet shape | wide-ovate orbicular | orbicular wide-ovate | elliptic ovate to wide-ovate orbicular |
| apex | cuspidate acuminate | acuminate cuspidate | acute acuminate cuspidate |
| Inflorescence | 1-branched pseudoraceme | 1-2-branched pseudoraceme | 1-5-branched pseudoraceme |
| Flower(mm) | 36-42 | 25-32 | 14-30 |
| Calyx tube(mm) | 9-10 | 7-10 | 5-9 |
| upper lobes | 2-2.2 | 1.8-3 | 0.3-1.8 |
| Pedice(m)(mm) | 15 | (15-)20-36 | 8-25 |
| Pod | | | |
| length(cm) | 6-7.5 | 7-10 | 3-8 |
| width(cm) | 5-5.5 | 4-5.5 | 2-4.5 |
| Seed | | | |
| length(mm) | 17-23 | 21-22 | 13-20 |
| width(mm) | 19-23 | 23-25 | 13-20 |

10.9 *Strongylodon macrobotrys* A. Gray

Figures 1,2,3,4,7,12; Map 10; Tables 1,2.

Strongylodon macrobotrys A. Gray, Bot. U.S. Expl. Exped. 448. t. 49 (1854); Merrill in Philipp. J. Sci. 1. Suppl. 66 (1906); Merrill in Philipp. J. Sci. 3: 81 (1908); Merrill in Philipp. J. Sci. 5: 114 (1910); Merrill, Enum. Philipp. Pl. 2: 307 (1923); Steiner, Philipp. Orn. Pl. ed. 2. 89, 169 (1960); Asis, Pl. Philipp.

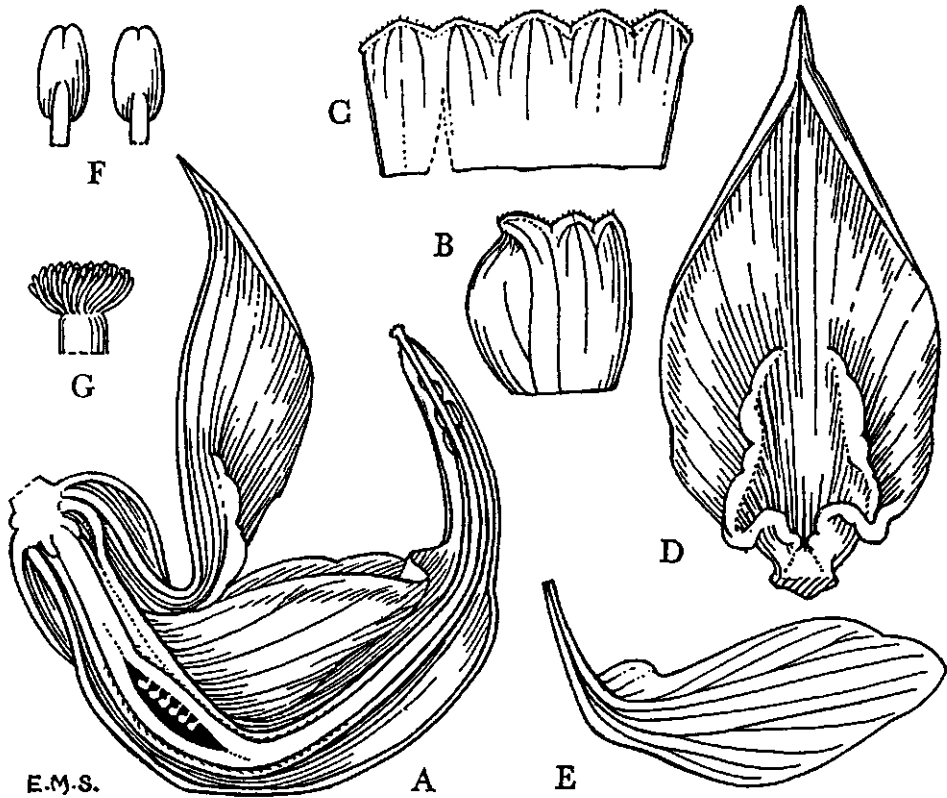


Fig. 12. *Strongylodon macrobotrys* A. Gray.

A. Half-flower x1.2; B. Calyx x1.5; C. Calyx, opened out x1.5; D. Standard x1.5; E. Wing petal x1.5; F. Anthers x6; G. Apex of style and stigma x36 (reproduced from Polhill in Bot. Mag. 179: t. 627. 1972).

278. f. 16 (1971); Polhill in Curtiss' Bot. Mag. 179: t. 627 (1972); Herklots, Flow. Trop. Clim. 125. f. 182. pl. 13 (1976); Nat. Acad. Sci., Tropical Legumes, Resources for the Future 254, 263-4 (1979); Verdcourt, Man. New Guinea Leg. 432 (1979); Smith, Fl. Vit. Nova 3: 209 (1985).

Type: Philippines: Luzon: Los Baños, *Rich s.n.* (holotype: US, not seen).

Heterotypic synonyms:

S. megaphyllus Merrill in Philipp. J. Sci. 10: 16 (1915), *p.p.*; Merrill, Enum. Philipp. Pl. 2: 307 (1923), *p.p.*

Type: Philippines: Luzon: Rizal Prov. Montalban, *A. Loher 5935* (lectotype: K; isotype: M).

S. warburgii Perkins, Fragm. Fl. Philipp. 1: 85 (1904).
Type: Philippines: Tabayan Prov.: Sampaloc, *Warburg 12809* (holotype: B†, not seen).

Woody vine, young branches glabrous, striate, old branches sulcate; *stipules* ovate-triangular, peltate, striate, 3-4 mm long, 1.5-2 mm wide, caducous. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous, subjugal part 4.5-9 cm long; suprajugal part 5-15 mm long; terminal leaflet elliptic or ovate-elliptic, 3-nerved; acuminate at apex, rounded at base; 12-15.5 cm long, 5.5-7.3 cm wide; lateral leaflets ovate, oblique and truncate or rounded at base, 9-15 cm long, 3.5-8 cm wide; petiolules 6-7 mm long; stipels setaceous, 2.5 mm long. *Inflorescence* up to 150 cm long (300 cm long in fresh material; Polhill 1972); peduncles glabrous, long; axis glabrous; brachyblast warty, 2-5 mm long, 1-3 mm wide, 5-8-flowered; bracts caducous; bracteoles ovate, striate, basifixed and auricled at base, ciliate at margin, 1.5 mm long, 1.2 mm wide; pedicels glabrous, 1.8-4 cm long. *Flowers* bluish-green, brilliant green or jade green, 4-6 cm long (to 8.5 cm long in *S. warburgii*); calyx campanulate, 9-12 mm long, 5-lobed, hairy at the upper portion inside, glabrous outside; lobes separated, wavy, ca 0.7 mm long; standard ovate, reflexed, 37-48 mm long, 17-25 mm wide, with claw 3-5 mm long, with 2 appendages 7-10 mm long above the claw; wings oblong-elliptic, rounded at apex, auricled at base, 20-24 mm long, 8-10 mm wide, with claw 11 mm long; keel petals lanceolate, slightly auricled at base, 45-48 mm long, 11-13 mm wide with claw 11-13 mm long; stamens 48-72 mm, filaments glabrous, anthers dorsifixed, oblong, 1.5 mm long; pistils with discoid nectary at base; stipe glabrous or hairy, 13-14 mm long; ovary oblong, 10-12-ovuled, 6 mm long, covered with densely appressed hairs; style flat, glabrous, 38-55 mm long; stigma terminal. *Pods* elliptic, inflated, rugose, 8.5-13 cm long, 6 cm wide, 6-12 seeded, valve 2-6 mm thick. *Seeds* black, reniform, smooth, 30-40 mm wide, 12-20 mm long; hilum linear, 25-40 mm long, with spongy tissue.

Distribution: Endemic in the Philippines and cultivated elsewhere.

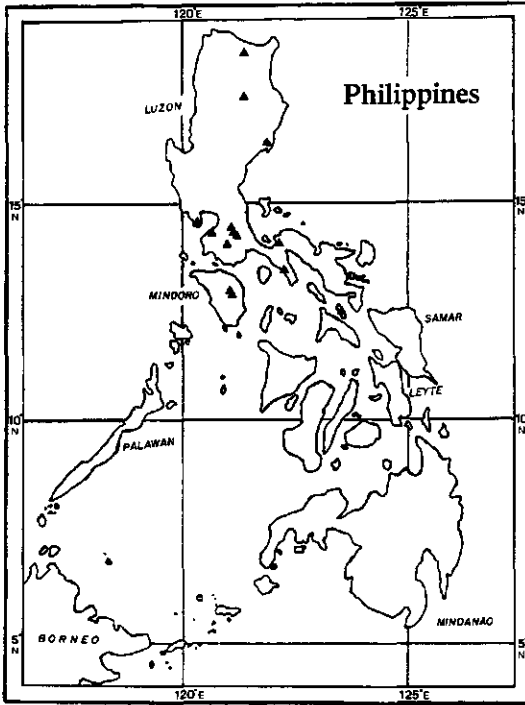
Habitat: In damp forests, along streams or in ravines.

Altitude: 110-1000 m.

Flowering: Jan-Jun, Nov, Dec.

Fruiting: May, Sep.

Vernacular names: Jade vine, English name given by Asa Gray. Well-known name for this ornamental species planted in botanic gardens in the tropics. Balo (E. Cagayan, Agta dialect), Bayou (Negros), Tayabak (Tagalog).



Map 10: Distribution of *Strongylodon macrobotrys* A. Gray.

Specimens examined:

FIJI: Naitasiri: Toninaiwau, Colo-i-Suva, cultivated, *Parkham 16991* (BISH).
 HAWAII: Honolulu, cult. Lyon Arboretum, *G. Spence 375* (BISH, L, US); cult. Foster Gardens, *Neal s.n.* (BISH).
 HONG KONG: *K.Y. Chan 070* (P); *188* (KWA).
 JAMAICA: *H.C. Spongberg s.n.* March 1982 (A).
 SINGAPORE: Band Stand, *A.G. Alphonso s.n.* Jan 1961 (A, BO, L).
 PHILIPPINES: Cultivated, *Howard & Howard 19710* (A); Cultivated, *H. Friedrich s.n.* April 1980 (M); Cultivated, *H. Friedrich s.n.* April 1983 (M); Catanduanes, *R. Ramos s.n.* Nov.14-Dec. 11 1917(BO); Luzon Island: Cavite, *Ramos & Derooy s.n.* Apr.-May 1915(A, US); Central Luzon, *A. Loher 236* (M); *A. Loher s.n.* (K, US); Bataan Prov: Lamao river, *B.C. Copeland 262* (GH); *R. Meyer 2808*. March 1905 (BO, US); *H.N. Whitford 57* (GH); *H.N. Whitford 160* (GH); *R.S. Williams 633* (K, NY). Benguet Prov.: Baguio, *D. Leroy Topping 58* (NY). Cagayan Prov.: Lagum, *M. Adduru 262* (A, K, MO, P, US); Bagio Cove, *M.S. Allen 105-81* (BISH); Peña Blanca, *M. Ramos s.n.* Mar.-May 1929 (K); Laguna Prov.: Los Baños, *A.D.E. Elmer 17472* (A, BISH, BM, BO, K, L, MO, NY); *A. Loher 5930* (M); *E.D. Merrill 5114* (K, NY, US); *M.L. Steiner 1302* (L); Mt. Makiling, *M.D. Sulit 1347* (PNH); *Coode & Fernando 5271* (A); Paete-Piapi, *H.M. Curran s.n.* March 1908 (US); *M.L. Steiner 586* (L); Norte Prov.: Minsag River, *G.E. Edaña 9615* (K, L); Rizal Prov.: *A. Loher 14056* (M); Mt. Irig, *M. Ramos s.n.* April 1923 (GH); Sorsogon Prov.: Irosin (Mt. Bulusan), *A.D.E. Elmer 17205* (A, BISH, BM, BO, GH, L, MO, NY). Tayabas Prov.: Guinayangan, *O. Ladia*

30891 (NY); Mt. Binuang, Ramos & Edaño s.n. May 1917 (BO); Kabibihan, M. Ramos s.n. Feb.-Mar, 1911 (BM, K); Casiguran, Ramos & Edaño 45145 May-June 1925 (BM); Lucban, A.D.E. Elmer 9336 (A, BM, BO, K, L, LE, MO, NY, US); 9338 (LE, NY). Mindoro Island: Baco River, E.D. Merrill 4070 (L, NY, US); Mt. Calavite, M. Ramos s.n. April 1921 (BM, BO, GH); Mt. Yagao, H.C. Conklin 1168 (A, BM, L).

Note: *S. megaphyllus* was based on a mixture of three different materials as Merrill (1923) pointed out. The specimen A. Loher 5935 with flowers and pod from M herbarium belongs to *S. macrobotrys* while the leaflet(?) does not belong to *Strongylodon*. The specimen with larger flowers from K herbarium belongs to *S. macrobotrys* and the smaller flowers and the inflorescence belong to *S. caeruleus* while the leaflet does not belong to *Strongylodon*.

Merrill (1910) did not see the type specimen of *S. warburgii* when he visited Berlin, and the author had no chance to examine it either. The type specimen of *S. warburgii* has probably been destroyed. According to the description, the author agrees with Merrill's opinion and it is treated it as a synonym of *S. macrobotrys*.

10.10 *Strongylodon madagascariensis* Baker

Figures 2,3,4,6,7; Map 11; Tables 1,2.

Strongylodon madagascariensis Baker in J. Linn. Soc. Bot. 18: 267 (1881); Baillon in Bull. Mens. Soc. Linn. Paris 1: 381 (1883); Drake, Hist. Pl. Madag. 1: 108 (1902).

Type: Madagascar: Coast to capital (Antananarivo), L. Kitching s.n. May 1880 (holotype: K; isotype: K).

Heterotypic synonyms:

S. catati Drake, Hist. Pl. Madag. 1:109 (1902).

Type: Madagascar: Vallée de Mandrisara, *Catat* 3200 (holotype: P).

S. lastellianus Baillon in Bull. mens. Soc. Linn. Paris 1: 381 (1883).

Type: Madagascar: Jull Noei, M. de Lastelle 1841 (holotype: P).

S. lantzianus (Baillon) Drake, Hist. Pl. Madag. 1: 109 (1902).

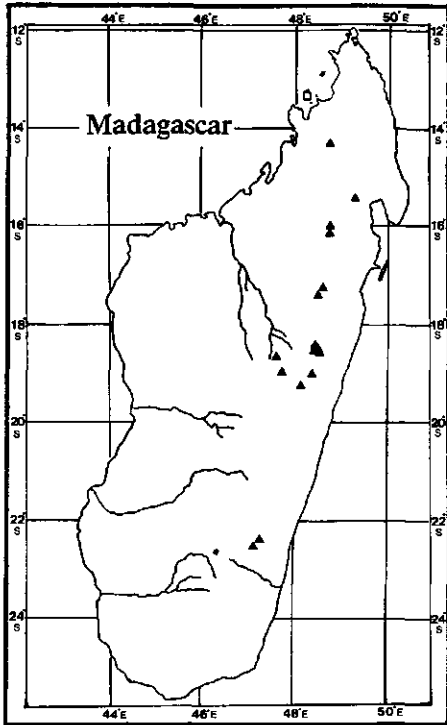
Type: Madagascar: Village d'Ambotelay, M. Lantz 23 (holotype: P).

Basionym:

Chadsia lantzianus Baillon in Bull. mens. Soc. Linn. Paris 1: 391 (1883).

Woody vine; young branches glabrous, striate, old branches grey; *stipules* ovate-triangular or triangular, basifixed, glabrous, striate, 3-4 mm long, 2-3 mm wide, caducous. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous, subjuagal part 2-4.5 cm long, suprajugal part 0.5-1.5 cm long; terminal leaflets oblong, elliptic, lanceolate or narrowly obovate, obtuse to cuspidate at apex, rounded at base, 3-10.5 cm long, 1.2-5.5 cm wide, with alternate lateral nerves in 6-9 pairs; lateral leaflets lanceolate or oblong, slightly oblique at base, 3-11 cm long, 1.5-5 cm

wide; petiolules 2-4 mm long; stipels setaceous, 2.5 mm long. *Inflorescence* 7.5-28.5 cm long; peduncles sparsely hairy; axis with short stiff hairs; brachyblast warty, 1-2 mm long, 1-2 mm wide, 2-3-flowered; bracts triangular or ovate-triangular, basifixed and auricled at base, striate, ciliate at margin, 1.6-2 mm long, 2 mm wide, caducous; bracteoles similar to bracts, 1.6-2.5 mm long, 1-2 mm wide; pedicels glabrous 1.5-3 cm long. *Flowers* red, 28-43 mm long; calyx campanulate, 7-10 mm long, 5-lobed, hairy at the upper portion inside, glabrous outside, the upper 2 lobes connate, 1.2 mm long, the lower 3 lobes imbricate, wide ovate, 1.2-1.5 mm long; standard ovate, 28-35 mm long, 12-14 mm wide, with claw 5 mm long, with 2 appendages above the claw; wings narrowly obovate or oblong, slightly auricled at base, 16-21 mm long, 4-8 mm wide, with claw 9-11 mm long; keel petals lanceolate, oblong, 27-40 mm long, 5-9 mm wide, with claw 9-10 mm long; stamens 32-52 mm long, filaments glabrous, anthers dorsifixed; pistil with discoid nectary at base; stipe glabrous or sparsely hairy, 8-10 mm long; ovary oblong or elliptic, 2-5-ovuled, covered with long hair or sparsely hairy; style flat, glabrous, 25-37 mm long; stigma terminal. *Pods* oblong, slightly constricted, 5.5-10 cm long, 2.5-3.5 cm wide, 2-seeded. *Seeds* unknown.



Map 11: Distribution of *Strongylodon madagascariensis* Baker.

Distribution: Endemic in Madagascar.

Habitat: Climbing in forest canopy.

Altitude: 400-1400 m.

Flowering: Feb, May, Jun, Aug-Nov.

Fruiting: Feb, Oct.

Specimens examined:

MADAGASCAR: Mandraka, *Ch. D'Alleizette* 483 (P); sine loc. *R. Baron* s.n. June 1889 (P); Central Madagascar, *R. Baron* 2803 (BM); Marotandran, *J. Bosser* 16707 (P); R. de Mandritsara, *M. Catoi* 3200 (type of *S. catoi*: P); Androrangabe, *G. Cours* 2758 (P); sine loc. *M. J. Dequaire* s.n. 1952-1955 (P); Tamatave Prov., Reserve Speciale Analamazaotra, *L.J. Dorr et al.* 4322 (K, MO); Farafangana, Vondrozo, *M. Decary* 5053 (P); Farafangana, *M. Decary* 5221 (P); Farafangana, *M. Decary* 5790 (P); E. Imerina, Andragoloaka, *J.M. Hildebrandt* 3698 (BM, K, LE, M, P, US); Bassin du Matitanana, Vallée Rienana, *H. Humbert* 3449 (A, B, K, P); Partie Occidentale du Massif de Marojezy, Vallée L'Ambatoharanana, *Humbert & Saboureaux* 31419 (P); 31420 (P); Mt. Ankaraka au Sud-Est du lac Alaotra, *Humbert & Cours* 17517 (P); Massif de L'Andrangovalo au Sud-Est du lac Alaotra, *Humbert & Cours* 17713 (P); Perinet-Sentier au P.K.153, *Jacquemin* 131-J (P); Coast to capital (Antananarivo), *L. Kitching* s.n. (type: K); sine loc. *M. de Lastelle* 1841 (type of *S. lastellianus*: P); Central Madagascar, Village d'Ambotilay, *M. Lantz* 23 (type of *S. lantziannus*: P); d'Anbongie, Forêt Orientale, *H. Perrier* 4221 (P); d'Analamazaotra, *H. Perrier* 4757 (P); Andrangolaoka, *H. Perrier* 14974 (P); Mangoro, Forêt Orientale, *H. Perrier* 17016 (P); Moramanga-Anosibe, Forêt Orientale, *H. Perrier* 18192 (P); Mandraka, *H. Perrier* 18342 (P); Ambatondrazaka, *Rakotavao* 9603 (P), 12226 (P); trail to the SE of Village of Hiaraka, ESE Maroantsetra, *Rakotozafy & Nicoll* 4077 (MO).

10.11 *Strongylodon pulcher* C.B. Robinson

Figures 2,3,4,5,7; Map 12; Tables 1,2.

Strongylodon pulcher C.B. Robinson in Philipp. J. Sci. 3: 184 (1908); Merrill in Philipp. J. Sci. 5: 115 (1910); Merrill, Enum. Philipp. Pl. 2: 307 (1923).

Type: Philippines: Mindanao: Zamboanga Prov.: Sax River, *R.S. Williams* 2362 (holotype: NY; isotypes: GH, K, NY).

Herterotypic synonyms:

S. agusanensis Elmer, Leafl. Philipp. Bot. 8: 2738 (1915); Merrill, Enum. Philipp. Pl. 2: 306 (1923).

Type: Philippines: Mindanao: Agusan Prov.: Cabadbaran (Mt. Urdaneta), *A.D.E. Elmer* 13461 (lectotype: NY; isotypes: A, BM, BO, E, GH, K, L, MO).

S. mindanaensis Elmer, Leafl. Philipp. Bot. 2: 696 (1910).

Type: Philippines: Mindanao: Davao Prov.: Todaya (Mt. Apo), *A.D.E. Elmer* 11818 (lectotype: NY; isotypes: BM, BO, E, GH, L, MO).

Woody vine; young branches glabrous, striate, old branches glabrous, sulcate; *stipules* wide-ovate, peltate, glabrous, 4-6 mm long, 5 mm wide, caducous. *Leaves* pinnately 3-foliolate, stipellate; rachis glabrous, subjugal part 5.5-12.5 cm long, suprajugal part 0.5-3.5 cm long; terminal leaflets ovate-elliptic, elliptic or oblong, cuspidate at apex, rounded at base, basal nerves along the margins, 13-22 cm long, 4.2-13 cm wide; lateral leaflets oblong, oblique and truncate at base, 11.5-19 cm long, 4.5-10.5 cm wide; petiolules glabrous, 6-15 mm long; stipels linear, 5 mm long. *Inflorescences* 3.5-11 cm long; peduncles glabrous, 1.5-5.5 cm long; axis glabrous or sparsely hairy; brachyblast cylindrical, 2-10 mm long, 1-1.5 mm wide, 4-10-flowered; bracts ovate-triangular, peltate, striate, 1-5 mm long, 1-3 mm wide, caducous; bracteoles, ovate, basifixed and auricled at base, ciliate at margin, 1.5-2 mm long, 1.2-1.5 mm wide, caducous; pedicels 1.5-2.0 mm. *Flowers* purplish blue, 2.1-3.2 cm long; calyx campanulate 5-7 mm long, 5-lobed, hairy at the upper portion inside, glabrous outside, the upper 2 lobes connate, truncate at apex, 1-1.3 mm long, the lower lobes separate or imbricate, the lowest lobe triangular, 1-1.5 mm long; almost equal to the lateral ones; standard lanceolate, slightly auricled at base, reflexed, 21-25 mm long, 9-10 mm wide, with claw 1.5-3.5 mm long, with 2 appendages 6 mm long above the claw; wings oblong, auricled at base, 8-11 mm long, 3-4.5 mm wide, with claw 6-8 mm long; keel petals lanceolate, 21-23 mm long, 4-5 mm wide, with claw 7-8 mm long; stamens 25-32 mm long, filaments glabrous, anthers dorsifixed, oblong, 1 mm long; pistil with discoid nectary at base; stipe stiffly hairy, 4-10 mm long; ovary oblong, 4-5-ovuled, 4-6 mm long, covered with short hairs; style hairy at lower portion, 18-25 mm long; stigma terminal. *Pods* elliptic, inflated, rugose, continuous between seeds, 5.5 cm long, 3.5 cm wide, 4-seeded, valve 4 mm thick. *Seeds* black, 25-30 mm wide, 7-11 mm long.

Distribution: Endemic in the Philippines.

Habitat: Climbing in swampy forest near creeks or inhabiting the forest edge along rivers.

Altitude: 90-1700 m.

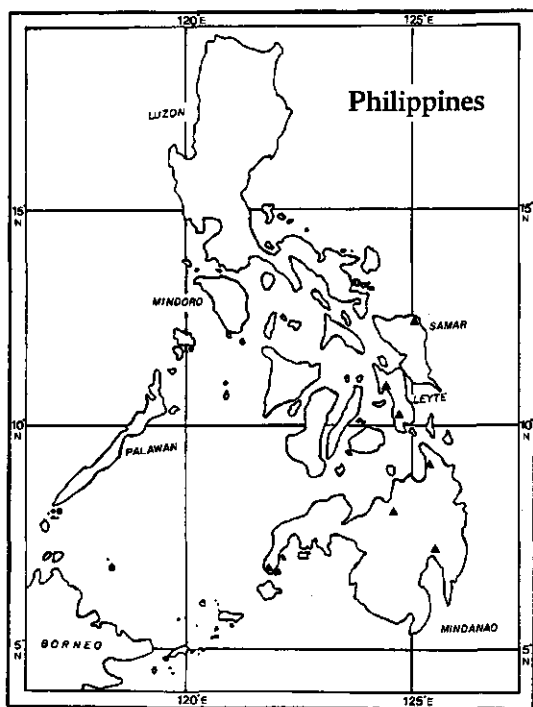
Flowering: Feb, Mar, Aug, Sep.

Fruiting: Mar.

Vernacular name: Panadihohon, Lipe.

Specimens examined:

PHILIPPINES: Leyte Island: Mt. Abucayan, *G.E. Edano s.n.* Feb. 1923 (A, BO, K, L, P, US). Ormoc Prov.: Antilao River, *G.E. Edano 2044* (A, L). Samar Island: Catubig River, *R. Ramos s.n.* Feb.-Mar. 1916 (BM, US). Mindanao Island: Agusan Prov.: Cabadbaran, *A.D.E. Elmer 13461* (type of *S. agusanensis*: A, BM, BO, E, GH, K, L, MO). Bukidnon Prov.: Mt. Katanglad, *M.D. Sulit 3324* (A, L, PNH). Davao Prov.: Todaya, *A.D.E. Elmer 11818* (type of *S. mindanaensis*: BM, BO, E, GH, L, MO). Zamboanga Prov.: Sax River, *R.S. Williams 2362* (Type: GH, K).



Map 12: Distribution of *Strongylodon pulcher* C.B. Robinson.

Note: *S. pulcher* is similar to *S. caeruleus* in having cylindrical nodes of the inflorescence. Yet it differs from *S. caeruleus* in having shorter inflorescences, basal nerves extending along the basal margin, wider stipules and hairy ovaries. *S. mindanaensis* only differs slightly from *S. pulcher* by having longer inflorescence nodes, but cannot be regarded as a distinct species.

10.12 *Strongylodon zschokkei* Elmer

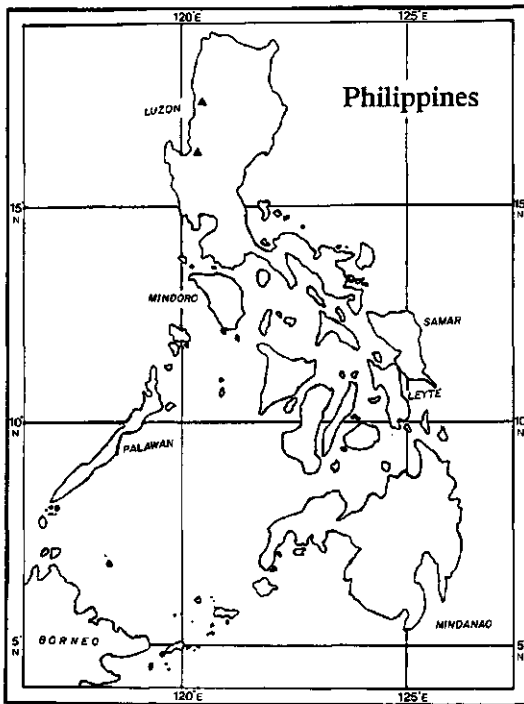
Figures 2,3,4,5,7; Map 13; Tables 1,2.

Strongylodon zschokkei Elmer, Leafl. Philipp. Bot. 1: 227 (1907); Merrill, Enum. Philipp. Pl. 2: 307 (1923).

Type: Philippines: Luzon: Benguet Prov.: Baguio, A.D.E. Elmer 8540 (lectotype: K; isotypes: BO, E, GH, L, LE, NY).

Woody vine, young branches glabrous, striate, old branches lenticellate; *stipules* triangular-ovate, peltate, striate, 4-6 mm long, 2.5-3 mm wide, caducous. *Leaves*

pinnately 3-foliolate, stipellate; rachis glabrous, subjugal part 4-5 mm long, suprajugal part 1.3-2.2 cm long; terminal leaflets elliptic or ovate, cuspidate at apex, rounded at base, with alternate lateral veins in 5-6 pairs, 8.5-16 cm long, 3.3-6.7 cm wide; lateral leaflets ovate, oblique and rounded or slightly cordate at base, 9-13 cm long, 2.8-6 cm wide; petiolules 4-5 mm long; stipels setaceous, 1-5 mm long. *Inflorescence* 19-29 cm long; peduncles glabrous, much longer than axis; axis glabrous; brachyblast warty, 2-4 mm long, 1-3 mm wide, 4-7-flowered; bracts caducous; bracteoles ovate-triangular, striate, ciliate at margin, 2.5 mm long, 1 mm wide; pedicels 18-23 mm long. *Flowers* purplish blue, 28-32 mm long; calyx campanulate, 9-11 mm long, 5-lobed, hairy at upper portion inside, glabrous outside, the upper 2 lobes connate to the tip, 1.2-2 mm long, the lower 3 lobes imbricate, slightly smaller than the upper 2 lobes; standard ovate, reflexed, auricled at base, 29-30 mm long, 10-15 mm wide, with claw 4-5 mm long, with 2 appendages 6 mm long above the claw; wings oblong, shortly auricled at base, 10-13 mm long, 5-6 mm wide, with claw 6-12 mm long; keel petals lanceolate, 26-28 mm long, 5-6 mm wide, with claw 9-12 mm long; stamens 32-37 mm long, filaments glabrous, anthers dorsifixed; pistil with discoid nectary at base; stipe glabrous or hairy at the upper portion, 10 mm long; ovary oblong or elliptic,



Map 13: Distribution of *Strongylodon zschokkei* Elmer.

5-6 ovuled, 6-8 mm long, covered with stiff hairs; style flat, glabrous, 20-21 mm long; stigma terminal. *Pods* elliptic, compressed, reticulate-veined, 9 cm long, 3.5 cm wide, 1-2-seeded, valve 1 mm thick. *Seeds* brown, reniform, 14 mm long, 22 mm wide; hilum linear, with spongy tissue.

Distribution: Endemic in the Philippines.

Habitat: Climbing on tree trunks close to creeks or in thickets.

Altitude: ca 1400 m.

Flowering: Feb, Mar, May.

Fruiting: Mar.

Vernacular name: Bindanugan (as for *elmeri*).

Specimens examined:

PHILIPPINES: Luzon Island: Urinen, *A. Loher* 5949 (K). Abra Prov.: Mt. Posuey, *M. Ramos* s.n. Feb. 1917 (BM, GH, P). Benguet Prov.: *A.D.E. Elmer* 7697 (BM); Baguio, *A.D.E. Elmer* 8540 (type: BO, E, GH, K, L); Mt. Santo Tomas, Ramos & Edaño 45119 (NY). Mountain Prov.: Mt. Pulog, *M. Celestino* s.n. March 1948 (GH, PNH). Tayabas Prov.: Mt. Camatis, *Alcasid & Edaño* s.n. March 1939 (A).

Note: Although Merrill (1923) claimed that this species was indistinguishable from *S. elmeri*, it differs from *S. elmeri* by the non 3-nerved leaflets, longer calyx tube with longer imbricate lobes and pods with thin valves which is unique among the Philippines' endemic species. The epithet *zschokkei* is named after Mr. Theo. C. Zschokke, asst. superintendent of forestry, Hawaii.

11. Insufficiently known species

***Strongylodon crassifolius* Perkins**

Strongylodon crassifolius Perkins, *Fragm. Fl. Philipp.* 1: 85 (1904); Merrill in *Philipp. J. Sci.* 5: 115 (1910); Merrill, *Enum. Philipp. Pl.* 2: 306 (1923).

Type: Philippines: Luzon: Bataan Prov.: Mariveles, *Warburg 12899* (B-†, not seen, most likely destroyed. No material available for neotype).

A climber; stem firm, glabrous with long, stout, woody circinnate tendrils. Leaves 24-27 cm long; common petiole 9 cm long, glabrous; leaflets 3, long ovate, very shortly and obtusely acuminate, rounded at the base, with petiolules 1 cm long, glabrous, coriaceous, entire; main nerves 7-9 pairs, ascending, interarching near the edge, above faint, beneath prominent; length 13.5-16.5 cm, width 6-7 cm. Inflorescence in copious long racemes with many 1-4-fid. fascicles of pedicellate flowers, arising from produced nodes. Calyx glabrous, 7 mm deep, campanulate, teeth unequal, broad, short, rounded, the two lateral ones the largest, bracteolate at base; bracteoles caducous. Corolla 3.5 cm long, standard ovate-lanceolate, callose at base of lamina, acute, the short, obtuse, wings closely attached to the lamina of the narrowly lanceolate, curved keel. Vexillary filament free. Ovary glabrous, stalked, surrounded at the base by a slightly toothed discus, 1-2-ovuled; style filiform.

Note: None of the specimens examined from the Philippines in this study matched the description of *S. crassifolius*. Merrill (1910) did not see the type specimen when he visited Berlin, and neither did the author have a chance to examine it. The type specimen has probably been destroyed.

From the description, *S. crassifolius* appears near to *S. lucidus* and *S. caeruleus*. From the former, it differs by the leaflets with more pairs of lateral nerves, 7-9 in *S. crassifolius* against 3-4 in *S. lucidus*, and the corolla is larger. From the latter, it differs by the number of ovules, 1-2 in *S. crassifolius* against 3-5 in *S. caeruleus*. The brachyblast is 1-4-flowered in *S. crassifolius* and 4-14 in *S. caeruleus*.

Since this name has priority over most *Strongylodon* epithets, except when it would be a synonym of *S. lucidus*, and no specimens match the description, the author treats it for the time being as an insufficiently known species.

12. Excluded species

The morphological characters of *Strongylodon perrieri* are so different from those of the other species (Table 6) that *S. perrieri* should be raised to generic state. But before a decisive conclusion is drawn, the author treats it for the time being as an excluded species.

***Strongylodon perrieri* R. Viguier Figure 5; Tables 1,6.**

Strongylodon perrieri R. Viguier in Not. Syst. 14. 175 (1950).

Type: Madagascar: Mangoro, *H. Perrier 18194* (holotype: P).

Climbing shrub, old branches dark brown, terete, glabrous, lenticellate; young branches hairy, *stipules* setaceous, caducous. *Leaves* pinnately 3-foliolate, estipellate; rachis hairy, subjugal part 4-4.5 cm long, suprajugal part 1.3-2 cm long; terminal leaflets ovate, obtuse-acuminate at apex, rounded at base, slightly hairy at both surfaces, with alternate lateral nerves in 2-3 pairs, 5.5-6.5 cm long, 3.8-4 cm wide; lateral leaflets ovate, obtuse-acuminate at apex, symmetric and rounded or slightly cordate at base, sparsely hairy at both surfaces, 4.5 cm long, 3 cm wide; petiolules rugose, hairy, 3-4 mm long. *Inflorescence* axillary nodose pseudoraceme, 43 cm long; peduncle with brown stiff hairs, 10.5 cm long, much shorter than axis; axis with brown stiff hairs; brachyblast with brown stiff hairs, cylindrical, 3 mm long, 1 mm wide, 2-3-flowered; bracts setaceous, 2 mm long; bracteoles setaceous, inserted at the lower portion of pedicel; pedicel with brown stiff hair, 13-14 mm long. *Flowers* scarlet, about 2.5 cm long; calyx with distinctive hypanthium, 7-8 mm long, 5-lobed, hairy at the outer surface and at the upper part of inner surface; lobes triangular, obtuse, the upper 2 lobes slightly connate, 1 mm long, the lowest lobe longer, 1.2 mm long; standard elliptic, hairy at apex of outer surface, 17 mm long, 13 mm wide, emarginate at apex, with claw 6 mm long, without appendages; wings oblong, obtuse or retuse at apex, auricled at base, hairy at outer surface, 16 mm long, 4 mm wide, with claw 6 mm long; keel petals oblong, obtuse at apex, auricled at base, hairy at lower part of outer surface, 19 mm long, 6 mm wide, with claw 6 mm long; stamens 10, diadelphous, vexillary stamens free, anthers, dorsifixed, oblong, longitudinally slit, 1 mm long; pistil without discoid nectary; stipe long-hairy, 4 mm long; ovary linear, 12-ovuled, long-hairy, 8 mm long, 1 mm wide; style hairy below, 10 mm long; stigma terminal. *Pods* unknown.

Distribution: Endemic in Madagascar.

Table 6: Morphological differences between *Strongylodon* and *S. perrieri*.

| Characters | <i>Strongylodon</i> | <i>S. perrieri</i> |
|-----------------|---|---|
| Branch | terete, sulcate or striate | terete, neither sulcate nor striate |
| Stipule | ovate or triangular, caducous, leaving a distinctive scar | setaceous, without leaving a scar |
| Stipels | present | absent |
| Bracteoles | ovate, inserted at base of calyx tube | setaceous, inserted at lower portion of pedicel |
| Hypanthium | indistinct | distinct |
| Standard | apex acute, with 2 appendages above the claw | apex emarginate, without appendages |
| Wing | about half as long as standard, glabrous | nearly equal to standard, hairy |
| Keel | beaked or acute, at apex, glabrous | obtuse at apex, hairy |
| Discoid nectary | present | absent |
| Style | long | short |

Habitat: In forest.

Altitude: 200 m.

Flowering: Oct.

Fruiting: Unknown.

Specimens examined: See type.

13. Acknowledgements

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