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Sirochloa, a new bamboo genus from Madagascar (*Poaceae-Bambusoideae*)

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Summary. Sirochloa, a new genus from Madagascar, is described, with one species *S. parvifolia* (Munro) S. Dransf., transferred from *Schizostachyum* Nees. It is characterised by the determinate inflorescence with the presence of subtending bracts and prophylls. The lemma possesses a long awn, and the branch system is unusual in having secondary branches developed most probably independently from the dominant main branch. The genus appears morphologically most similar to *Decaryochloa* A. Camus, a monotypic genus endemic to Madagascar.

There is a beautiful slender bamboo that occurs in great abundance in forest on white sand along the east coast of Madagascar. It often forms curtains of foliage hanging from forest trees. This distinctive bamboo has long been known as *Schizostachyum parvifolium* Munro, which together with *S. bosseri* A. Camus, represent the only members of the genus in Madagascar. However, some of the supposed members of Asiatic bamboo genera (e.g. *Cephalostachyum, Ochlandra, Schizostachyum*) recorded as endemic to Madagascar, have been shown to be generically distinct (Dransfield 1998), and the subject of this paper is no exception.

Schizostachyum parvifolium was described by Munro in 1868 from Madagascar and Mayotte (Comoro Islands). Munro (1868) cited three specimens: *Boivin* 1978 (sterile, two sheets at K) from Nosy-Be in Madagascar, *Gerrard* 74 (with inflorescences) from Madagascar (without locality), and *Boivin* 3030 (with inflorescences) from Mayotte. Of these, one sheet of *Boivin* 1978, *Gerrard* 74 and *Boivin* 3030 all appear to represent the same taxon. In these specimens, the sheath scar is horizontal, and branches are borne above this horizontal sheath scar. The second sheet of *Boivin* 1978 differs in having the sheath scar dipping downwards where the branches are borne, and is not *S. parvifolium*. It belongs to a different genus, most probably *Valiha* S. Dransf.

Throughout his monograph Munro (1868) did not mention type species or type specimens in describing new genera and new species. In the case of *Schizostachyum parvifolium*, I here designate *Gerrard* 74 as the lectotype of this species, because this specimen consists of a piece of the main culm, which is solid, and a node with several leafy branches each terminated by a flowering branch. No locality of *Gerrard* 74 is cited, but Dorr (1997) states that Gerrard collected only from the east coast near Toamasina (Tamatave). Other specimens lack parts of the main culm.

Bentham (in Bentham & Hooker 1883) noted that the placement of this taxon in *Schizostachyum* is doubtful, for it resembles *Nastus* Juss. rather than

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Schizostachyum. *Schizostachyum* Nees has an indeterminate inflorescence, with the presence of pseudospikelets (McClure 1934; Holttum 1958; Dransfield 1983). McClure (1934, 1966) proposed the term pseudospikelet to differentiate it from the proper spikelet that terminates it; the pseudospikelet comprises a prophyll at the base, one or more bracts (or gemmiparous bracts) each subtending a bud, and a proper spikelet. Each bud may develop into another pseudospikelet, and in this way pseudospikelets are produced almost indeterminately — this is the most important character distinguishing an indeterminate inflorescence. In *Schizostachyum* the pseudospikelet usually has two gemmiparous bracts (or bud-bearing bracts); the proper spikelet is usually slender and cylindrical, and consists of one to two (rarely more) florets, and a rachilla extension bearing a rudimentary floret; glumes are not present. The palea has less developed keels, with a narrow or shallow groove on the back. The ovary has a long slender, glabrous, hollow style. The pseudospikelets are arranged in groups or fascicles at the distal nodes of a branch the base of which is leafy, or on wholly leafless branches. The culm produces several to many branches of similar size at each node and there is no dominant primary branch.

In *Schizostachyum parvifolium*, the inflorescence is racemose, about 13 cm long, terminating a leafy branch. Each node of the inflorescence main axis bears a sheath/bract subtending a branch that bears 1 – 3 spikelets; each branch possesses a prophyll (either split or not split), and is terminated by a spikelet. The spikelet consists of three glumes, one fertile floret, and a much reduced rachilla extension. Gemmiparous bracts are not present, and of course pseudospikelets are absent. In this case, the inflorescence of *Schizostachyum parvifolium* is determinate, but with the presence of subtending bracts and prophylls. The palea is 2-keeled and has a deep sulcus on the back; the ovary has a very short style (but elongates later, flat not cylindrical). Based on the structures of the inflorescence and the spikelet, therefore, *Schizostachyum parvifolium* should be excluded from *Schizostachyum*, as already suggested by Bentham (in Bentham & Hooker 1883). I am not able to place this species in any known genus, and propose a new genus *Sirochloa* to accommodate it. The name is derived from *sira*, a Greek word for cord (wire), alluding to the wire-like culms, which are very strong and hard, and *chloe* for grass/bamboo.

As mentioned earlier, Bentham (in Bentham & Hooker 1883) suggested that *Schizostachyum parvifolium* is morphologically most similar to *Nastus*, but Bentham did not mention how it is related. *Nastus* possesses a spikelet containing one fertile floret and a rachilla extension as that in *Sirochloa*, but the new genus differs from *Nastus* in having bracteate determinate inflorescences (with the presence of subtending bracts/sheaths in the inflorescence). *Sirochloa* seems morphologically to resemble *Decaryochloa* A. Camus, endemic in Madagascar, in having a racemose bracteate inflorescence (in *Decaryochloa* the inflorescence often consists of one spikelet only, see Dransfield 1997). It can be differentiated easily from the latter in having a multi-spikelet inflorescence, slender and much shorter spikelet, membrano-chartaceous lemma and palea and three lodicules in the floret. Moreover, the branches in *Sirochloa* are borne above the level sheath scar (see Dransfield 1997). (Table 1).

TABLE 1. Comparative morphology of *Sirochloa* S. Dransf., *Schizostachyum* Nees, *Nastus* Juss., and *Decaryochloa* A. Camus.

	Sirochloa	*Schizostachyum*	*Nastus*	*Decaryochloa*
Nodal line position	horizontal	horizontal	horizontal	dipping markedly at one side
Branches	several to many, middle branch dominant	many, same size	several to many, middle branch often dominant	few, middle branch dominant, situated inside curved nodal line
Inflorescence	determinate bracteate	indeterminate	determinate ebracteate	determinate bracteate
Pseudospikelets	absent	present	absent	absent
Spikelet	one floret	one to several florets	one floret	one floret
Glumes	4	0	5 – 6	3 – 4
Rachilla extension	present, very short, glabrous	present, long, glabrous	present, long, glabrous	present, relatively short, hairy
Lemma	with awn	acuminate, without awn	acuminate, without awn	acuminate, without awn
Palea	keeled, with deep sulcus (glabrous)	± keeled or not	keeled	keeled, with deep sulcus (hairy)
Ovary	style short or long, solid, glabrous	style long, hollow, glabrous	style very short	style long, solid, hairy
Caryopsis	cylindrical, pericarp thin, separated from seed	cylindrical, pericarp thin, separated from seed	not available	oblong, pericarp ± thick, not easily removed from seed

Sirochloa *S. Dransf.*, **gen. nov.** inflorescentia racemosa bracteata determinata *Decaryochloae* A. Camus affinis, sed lemmate et palea membrano-chartacea, stylo brevissimo, lodiculi tribus, cicatrix vaginae horizontali, ramis culmis cicatricem vaginae supra potatis differt. Typus: *Sirochloa parvifolia* (A. Camus) S. Dransf.

Sympodial bamboo, erect then scrambling, culms solid or with a very small lumen, hard, not more than 0.7 cm diam. Branch bud one at each node, borne above the sheath scar, sheath scar somewhat horizontal; primary branch dominant, dormant or elongating; secondary branches many at each node, well or not well developed, borne most probably independently from the primary branch, the same size. Young shoots glabrous. Leaf blades not more than 10 cm long, auricles prominent, slender with long bristles. Inflorescence determinate, racemose, terminating leafy branches, 10 – 13 cm long, with the presence of subtending bracts and prophylls. Spikelet consisting of 4 glumes, one fertile floret and a rachilla

extension; lemma membrano-chartaceous with long awn; palea membrano-chartaceous, with prominent sulcus; lodicules 3, membranous, entire; stamens 6, anther apex bifid; ovary glabrous, with a very short glabrous style when young, then elongating later, stigmas 3.

Sirochloa parvifolia (*Munro*) *S. Dransf.*, **comb. nov.**

Schizostachyum parvifolium Munro, Trans. Linn. Soc. London 26: 136 (1868). Type: Madagascar, *Gerrard* 74 (lectotype K, **selected here**).

Schizostachyum bosseri A. Camus, Bull. Soc. Bot. France 104: 281 (1957). Type: Madagascar, Fenerive, *Bosser* 632 (holotype P, isotype K).

Open clumping bamboo. Culms erect first, upper parts scrambling, about 10 m long, straight; internodes solid or with a very small lumen, very hard (like wire), diameter up to 5 mm, 15 – 20 cm long, usually glabrous and smooth, nodes not swollen, sheath scar more or less horizontal, not dipping downwards. Branch bud one at each node, borne above the sheath scar, the bud developing into many branches with the primary branch dominant, dormant or developing and elongating to quite a considerable length, hanging from the main culm or scrambling and leaning on nearby vegetation, secondary branches short, of the same length. Young shoots glabrous. Culm sheaths comprising two parts, the upper part (or sheath proper) with many nerves, 9 – 12 cm long, 7 – 10 mm wide at the base, glabrous, tapering to narrow apex about 1 mm wide, horizontal, margins often hairy, the base (or the girdle) without nerves, glabrous, rugose, concealing branch buds, and breaking up readily during branch development; blades spreading, linear, 2.5 – 4 cm long, up to 1 mm wide, minutely pubescent above, glabrous below, tapering to long fine tips; ligule laciniate, not more than 1 mm long; auricles not seen or absent. Leafy branches 8 – 22 cm long, bearing 8 – 10 leaf-blades. Leaf-blades lanceolate, 3 – 8 cm long (up to 13 cm in sterile branches), 4 – 9 mm wide, base attenuate, glabrous above, hairy below; sheaths glabrous; auricles slender, linear, 3 – 5 mm long, glabrous, with long bristles along the edges, bristles about 5 mm long; ligule very short, less than 1 mm. Inflorescences terminating leafy branches, 7 – 17 cm long, axis slender, not more than 1 mm in diameter, glabrous, weakly segmented, with 8 – 10 lateral branches, either erect or spreading horizontally, each producing up to 3 branches with very short axis, each terminated by a spikelet; subtending bracts much reduced to hairy scales, about 1 mm long, modified blades not present; prophylls very short, split, not present in the terminal spikelets, terminal spikelets often borne on long 4 – 5 segmented axis, each node of the axis bearing an empty (no bud) subtending bract/sheath. Spikelets 15 – 19 mm long, rachilla internodes very short, glabrous; rachilla extension 2 – 3 mm long, very slender, glabrous, with or without vestigial floret; lower glume 3 × 1 mm, with 1 mm long tip, glabrous abaxially, ciliolate along the margins near the apex, 9-nerved; glume II 4 × 1 mm, with 1 mm long tip, glabrous abaxially, ciliolate along the margins near the apex, 9-nerved; glume III 6 – 7 × 1.5 mm, with 1.5 mm long tip, glabrous abaxially, ciliolate along the margins near the apex, 9-nerved; upper glumes 10 – 11 × 2 mm, with 3 – 4 mm long tip, glabrous abaxially, ciliate along the

margins towards the apex, 9-nerved; lemmas 13 – 5 × 2 mm, with 6 – 8 mm long awn, glabrous abaxially, hairy towards the apex and along the margins, 7-nerved; palea 15 × 2 mm, glabrous abaxially, sulcus glabrous, with long bilobed tip, lobes densely pubescent; lodicules membranous, lanceolate to ovate-lanceolate, about 1 mm long, entire; ovary glabrous, about 0.7 mm long, style very short, or elongating, stigmas simple (not branched), occasionally only 2 stigmas; anthers with bilobed tips. Caryopsis cylindrical, 7 mm long, pericarp thin, easily removed from the seed, embryo basal. Fig. 1.

DISTRIBUTION. Madagascar and Comoro Islands.

SPECIMENS EXAMINED. MADAGASCAR. Nosy-Be, 1849, sterile, *Boivin* 1978 (K, P; mix specimens); Antsiranana, Manongarivo massif, Ambodisakoana, alt. 500 – 1000 m, fl., 20 Oct. 1994, *van der Werf & McPherson* 13541 (K, MO, P); Sambave, N of Mandena, alt. 50 m, sterile , 29 Nov. 1989, *Dransfield* SD1095 (K, MO, P, TAN, US); Maroantsetra, near the airfield, alt. 5 m, sterile, 27 Oct. 1986, *Dransfield et al.* JD6410 (K, MO, P); l.c., sterile, 28 Feb. 1988, *Dransfield* SD884 (K, MO, P); Mananara Avaratra, Antanambe, sea level, fl., 21 April 1992, *Dransfield et al.* SD1287 (K, P, TANA); l.c., sterile, 28 Oct. 1994, *Dransfield et al.* SD1337 (ISC, K, P, TANA); Toamasina, Fenoarivo Est, Tampolo Forest Station, alt. 10 m, fl., 17 Nov. 1999, *Dransfield et al.* JD7742 (K, MO, P, TANA); Toamasina, 1865, fl., *Gerrard* 74 (K, lectotype, here designated); Ile St Marie, Kalalao forest, Lonkintsy, alt. 70 m, sterile, 14 Nov. 1994, *Dransfield et al.* SD1362 (ISC, K, P, TANA, US).

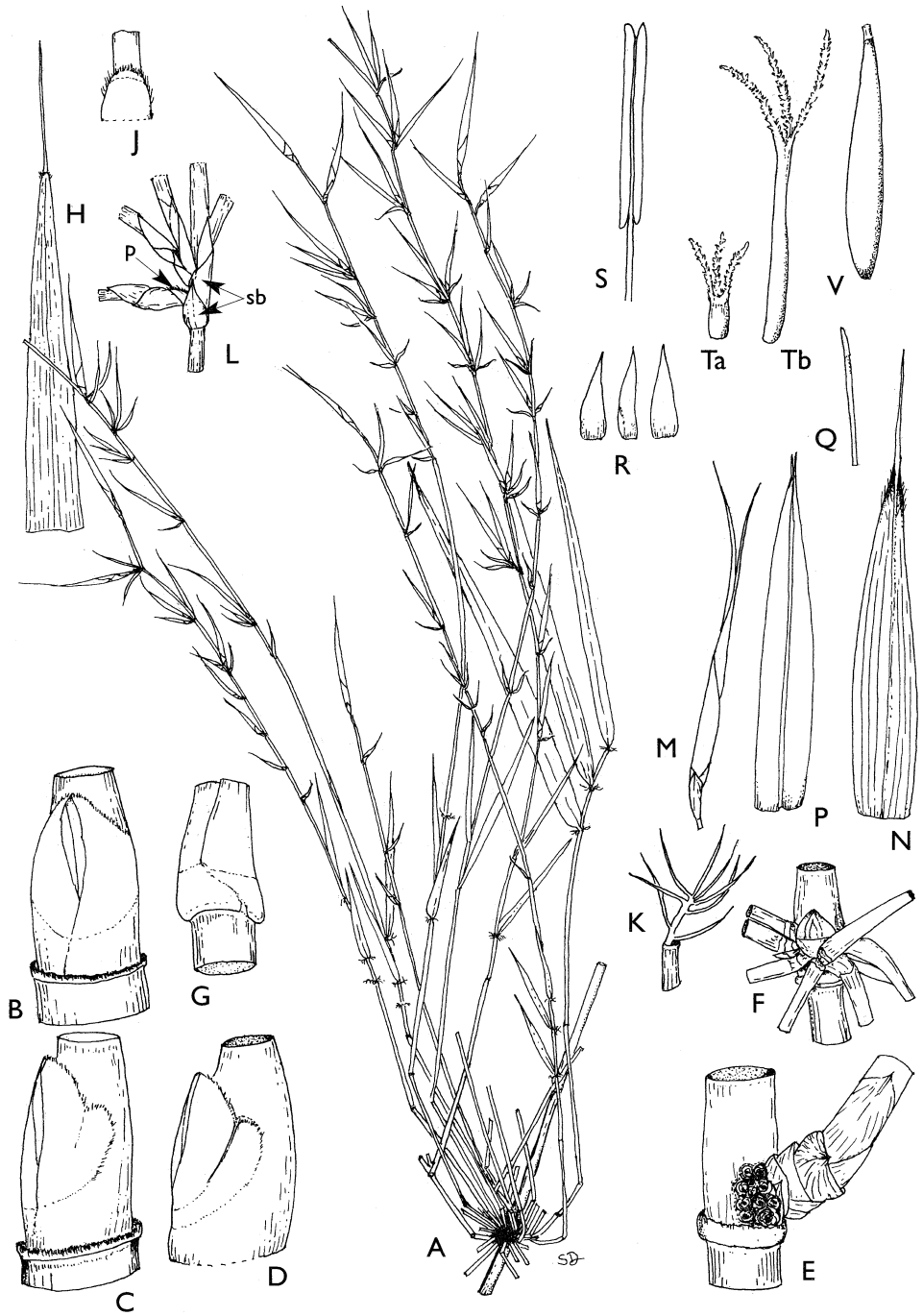
COMORO ISLANDS. Mayotte, fl., 1850, *Boivin* 3030 (K, P).

HABITAT. Very common in beach forest on white sand at low altitude, especially along the east coast of Madagascar, occasionally found a long away from the shore at up to 70 m a.s.l.

Camus (1957) distinguished *Schizostachyum bosseri* from *Schizostachyum parvifolium* in having a long trailing shoot, smaller leaf blades (4 – 6 cm long), and slender inflorescences. In Munro's description of *Schizostachyum parvifolium* the leaf blades are described as 2.5 – 10 cm long; the measurements of 10 cm long, I believe, were taken from the second collection/sheet of *Boivin* 1978 from Nosy Be, which is not the same as the other collection/sheet (see above). In the other specimens of *Schizosatchyum parvifolium* the leaf blades are 3 – 7 cm long. In the recent collections, the leaf blades vary in length, in the flowering specimens they are smaller than those in the sterile ones. Most of the terminal spikelets of the inflorescence branches in *Bosser* 632 have fallen off, and the inflorescences appear to look more slender than those in *Gerrard* 74. Therefore *Schizostachyum bosseri* A. Camus is conspecific with *Schizostachyum parvifolium* Munro, and I thus include *Schizostachyum bosseri* A. Camus as a synonym of *Sirochloa parvifolia* (Munro) S. Dransf.

The species can be recognized by its almost solid and hard culms with branches borne above the sheath scar, small leaf blades, and the long slender auricles of the leaf blades with long bristles (Fig. 1K).

As mentioned in the description, there is one branch bud at each node, and this bud will develop into many branches with the middle branch dominant. At an early stage the bud is triangular and the margins of the prophyll are not joined. Inside this prophyll there are one middle or central bud and another two bud primordia,



one at each side of the central bud (Fig. 1D). At a later stage of development, the bud primordia grow outwards, so the bud has become broadly ovate (Fig. 1C). The main or central bud will either elongate or remain dormant to become a primary branch (Fig. 1E & 1F). The two side buds seem to be borne independently from the main bud on a flattened surface (1D), and produce secondary branch buds, which will develop into small leafy branches of the same size, about 10 – 30 branches on each side of the middle branch (Fig. 1A). They often remain dormant or undeveloped (Fig. 1E). In the very young part of the culm (such as young shoots), these side buds are not seen; either they have not developed yet, or they are never formed/produced. This feature has not been recorded before and is not found in other bamboo genera. In *Chusquea* species, the subsidiary branches are borne around or below the central bud, and they do not share a prophyll with the main bud (Clark 1989).

In a very young spikelet, the ovary is very short and has a very short style with three stigmas (Fig. 1Ta). During development, the top of the ovary and the base of the style elongate to form some sort of a long style, usually bearing three stigmas, but occasionally only two stigmas can be found.

Flowering behaviour in *S. parvifolia* is not known. During my collecting trips between 1988 and 1996 only one flowering specimen was found and collected from the coastal region, south of Mananara Avaratra. Here the forest is dominated by this bamboo, which forms a mass curtain in surrounding trees. In Tampolo Forest Station, Fenoarivo, Toamasina, one clump of this bamboo was found flowering in 1999 (John Dransfield, pers. comm.).

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FIG. 1. *Sirochloa parvifolia*. **A** branches bearing inflorescences × $^2/_3$; **B** branch bud (culm sheath removed), front view × 3; **C** branch bud, side view × 3; **D** branch bud, prophyll removed, showing secondary side bud × 3; **E** secondary buds not fully developed, middle branch elongating × $1^1/_2$; **F** secondary branches elongating, middle branch dormant × $2^1/_3$; **G** base of culm leaf × $1^1/_2$; **H** culm leaf (taken from young shoot) × $^2/_3$; **J** ligule of culm leaf × 6; **K** auricle (simple type) on sheath of leaf-blade × 6; **L** branches in flowering branch, showing subtending bracts/sheaths (**sb**) and prophylls (**p**) × 6; **M** spikelet × 3; **N** lemma with awn × $4^2/_3$; **P** palea × $4^2/_3$; **Q** rachilla extension × 10; **R** lodicules × 10; **S** stamen × $15^2/_3$; **Ta** young ovary with short style × $15^2/_3$; **Tb** developed ovary with elongate style × 10; **V** caryopsis × $4^2/_3$. **A** from *Gerrard* 74 (lectotype), **B – E**, **H** & **J** from *Dransfield* SD884, **F** from *Dransfield* SD1362, **K – V** from *Dransfield* JD7742. Drawn by the author.

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