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# Notes on the genus *Decaryochloa* (*Gramineae-Bambusoideae*) from Madagascar

SOEJATMI DRANSFIELD<sup>1</sup>

*Summary.* *Decaryochloa* A. Camus is a monotypic genus with the only species, *D. diadelpha*, endemic to Madagascar. The morphology of habit, inflorescence and spikelet is described. It is remarkable in having the longest floret (4.5 – 5 cm) in the tribe *Bambuseae*. In its determinate inflorescence with the presence of prophylls (sometimes absent), 3 – 4 transitional glumes, and six stamens in the spikelet, *Decaryochloa* appears to be related to *Hickelia* A. Camus, a genus of four species found in Madagascar and Tanzania. The population of *D. diadelpha* at Analamazaotra (Perinet) was recently observed in flower in 1989 and 1992, and was found to be dead in 1994, presumably after gregarious flowering.

## INTRODUCTION

*Decaryochloa* was described from Madagascar by A. Camus in 1946 with one species, *D. diadelpha*. Camus placed the genus in the tribe *Bacciferae* Munro, because the spikelets are all fertile and are not arranged in a capitulum; there are six stamens with large anthers, the palea resembles a fertile glume (lemma) in texture, with two narrow keels and many nerves, the rachilla extension does not exceed the fertile floret, and the fruit is usually large. Camus noted that the arrangement of the androecium is unusual, the stamens forming two groups of three, the filaments of which are joined at the base. The genus is distinguished from some other genera in the tribe, such as *Cephalostachyum* Munro and *Ochlandra* Thwaites, by the unusual arrangement of the stamens and the coriaceous palea.

Camus's observations and the detailed description of the genus and species were based on a series of beautiful collections of flowering specimens in the Paris Herbarium, collected by Decary in 1942 in the Central Domaine (Lakato, Moramanga, Anosibe and Mangoro), east of Antananarivo. Camus indicated a very useful feature for recognizing this bamboo when sterile: the culm sheath and the leaf sheath possess large, prominent auricles bearing long, black, curly bristles.

In this paper the structure of the inflorescence and the spikelet of the genus is discussed, in order to present a complete description and to attempt to establish its placement in the tribe *Bambuseae*. The morphology of vegetative parts is also presented.

I have visited Analamazaotra (Perinet), where this species grows, four times, in 1988, 1989, 1992, and 1994, to collect this and other bamboos. The first visit was to the forest along the road not far from the Andasibe Railway Station and to the Analamazaotra (Perinet) Forest Reserve. *D. diadelpha* was found growing commonly

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together with other bamboos, such as *Nastus* spp. and *Cephalostachyum* spp. At that time none of the bamboos was flowering. On my second visit (1989), a population of *D. diadelpha* in the very much disturbed forest near Andasibe Railway Station was found bearing very young flowers. My third visit (1992) was to an area south-east of the railway station, towards Parc National de Mantady, together with Drs John Dransfield and Henk Beentje (K). Here *D. diadelpha* was found flowering abundantly. During this visit I did not manage to revisit the previously-visited places; thus, at that time it was not known whether the plants in the forest in other places in Andasibe were flowering.

In November 1994, I made a short visit to Perinet. I did not see any plants at all in the forest near the station. Later I realized that the bamboo had died after flowering, because we found that all plants in the Forest Reserve, which were sterile in 1988, were dead. We found only dead or dried culms all over the forest and dried spikelets on the forest floor or on the dead branches. It seems that *D. diadelpha* in Andasibe and Moramanga flowered gregariously over a period of five years from 1989 to 1994 and then died, and thus seems to be monocarpic.

So far *D. diadelpha* has been found only in the submontane forest close to Moramanga and surrounding areas.

#### DECARYOCHLOA

**Decaryochloa** A. Camus, in Bull. Soc. Bot. France 93: 242. 1946. Type: *Decaryochloa diadelpha* A. Camus.

Sympodial bamboo; rhizomes with long necks. Culms erect or slightly geniculate, with the upper part scrambling. Branch bud single at each node, borne just below the supranodal ridge, at the point where the sheath scar curves downwards. Leafy branches 20 – 30 cm long. Inflorescences terminating leafy branches, determinate, racemose with segmented axis, bearing one to several spikelets; bracts, or subtending sheaths, and prophylls present. Spikelet consisting 3 – 4 glumes, one fertile floret and a vestigial rachilla extension; glumes coriaceous, many-nerved; lemma resembling uppermost glume; palea 2-keeled, with a deep longitudinal groove on the back; lodicules not seen; stamens 6, filaments usually free, but often joined at the base; ovary slender with long hairy style, stigmas 3.

**Decaryochloa diadelpha** A. Camus, in Bull. Soc. Bot. France 93: 244. 1946. Type: *Decary* 18375 (lectotype, P, selected here).

Open clumping bamboo; distance between culms about 40 cm. Culms erect with scrambling upper parts, about 10 (or more) m long, straight or slightly geniculate near the base, with relatively thin walls, diameter 2 – 2.5 cm, internodes 30 – 80 cm, covered with black hairs when young, glabrous or glabrescent with age. Branches extravaginal, many at each node, with primary branches dominant and elongating, scrambling over or leaning upon nearby trees. Young shoots covered with black hairs. Culm sheaths comprising two parts: the upper (or sheath proper) with many nerves, covered with light to dark brown

hairs, margins hairy, the lower (the base) without nerves, also covered with dark brown hairs, concealing branch buds, and breaking up readily during the branch development; blades usually erect, tapering to long tips, 11 – 22 × 3 – 3.5 cm near the base, 1 – 2 cm wide at the junction with the culm sheath, densely hairy near the base adaxially, with long hairs along the margins near the base; auricles large, 12 × 5 mm, reflexed, with curly 16 mm long bristles along the edges, pubescent adaxially; ligules 3 mm long, with about 1 cm long bristles. Leaf-blades ovate lanceolate, 5 – 7 × 0.7 – 1 cm (near the base), hairy adaxially especially near the base, otherwise glabrous; sheaths hairy; auricles present with bristles; ligule 1 mm long, with long bristles. Inflorescences 5 – 7 cm long, straight (erect) or curved, consisting of one to four sessile spikelets, each subtended by a bract or sheath with or without blade (with hairy margins); prophylls absent in one-flowered inflorescence, otherwise present, split (two one-keeled prophylls), or not split, 4 – 8 mm long; rachis internodes about 1 cm long, densely hairy. Spikelets 6 – 7 cm long, rachilla internodes very short, 1 – 2 mm long, densely hairy, rachilla extension slender, densely hairy, 10 – 16 mm long, with or without vestigial floret; glumes covered with appressed pale hairs on the back (especially near the base), hairy along one margin, lowermost 13 × 5 mm, acuminate tip, 13-nerved, others rigid, 19 – 20 × 7 – 12 mm, with long pointed tips, with 21 – 23 nerves; lemma coriaceous, rigid, 4.6 – 5 × 1.2 cm, with long acuminate tip, covered with appressed pale hairs on the back, 23-nerved; palea coriaceous, rigid, 4.5 × 1.2 cm, hairy on the back, especially near the base, groove densely hairy, with long bilobed tip; extra structure 4 cm long, densely hairy on the back, especially near the base, margins membranaceous especially towards the apex, apex obtuse, finely serrated; ovary 1 mm long; styles 5 mm (when young) to 3 cm long (including the stigmas); stigmas 3; stamens with short filaments when young, free or joined at the base, elongating with age, free or joined in threes; anthers with blunt tips. Fruits obconical when young, oblong at maturity with hairy flat top, 7 – 14 mm long; pericarp thick, fleshy, filling fruit cavity when young, becoming thinner except the upper part at the apex, not easily separated from seed; young seed oblong, enclosed in pericarp, seed coat papery when young becoming spongy, separated from endosperm and embryo; embryo basal. Figs. 1 & 2.

**DISTRIBUTION.** Endemic in Andasibe, Moramanga, Madagascar.

**SPECIMENS EXAMINED.** MADAGASCAR. Moramanga. Lakato, 3 Sept. 1942 (fl.), *Decary* 18201 & 18326 (P); Anosibe, 5 Sept. 1942 (fl.), *Decary* 18375 (P); Moyema vallé du Mangoro, 9 Sept. 1942 (fl.), *Decary* 18485 (P) (incorrectly cited by A. Camus 1946, as 18405); 12 Feb. 1930 (sterile), *Decary* 7045 (K, P); Andasibe, Analamazaotra, alt. 800 – 900 m, Jan. 1932 (sterile), *Perrier de la Bâthie* 10915 & 10916 (P); i.c., 4 March 1988 (sterile), *Dransfield* SD892 (K, MO, P, TANA, US); 14 Dec. 1989, *Dransfield et al.* SD1116 (fl.) (IOWA, K, MO, P, TANA, US), and SD1117 (sterile) (K, MO, P, TANA); Parc National de Mantady, 24 April 1992 (fl.), *Dransfield et al.* SD1288 (K, MO, P, TANA); Dec. 1905 (sterile), *d'Alleizette* 694 (P); Central Madagascar, c. 1883 (fl.), *Baron* 2554 (K, P). (*Perrier de la Bâthie* 10918, cited in Camus, 1946, is a mixed specimen with *Cephalostachyum madagascariensis* A. Camus).

**HABITAT.** Mountain forest, 800 – 1000 m.

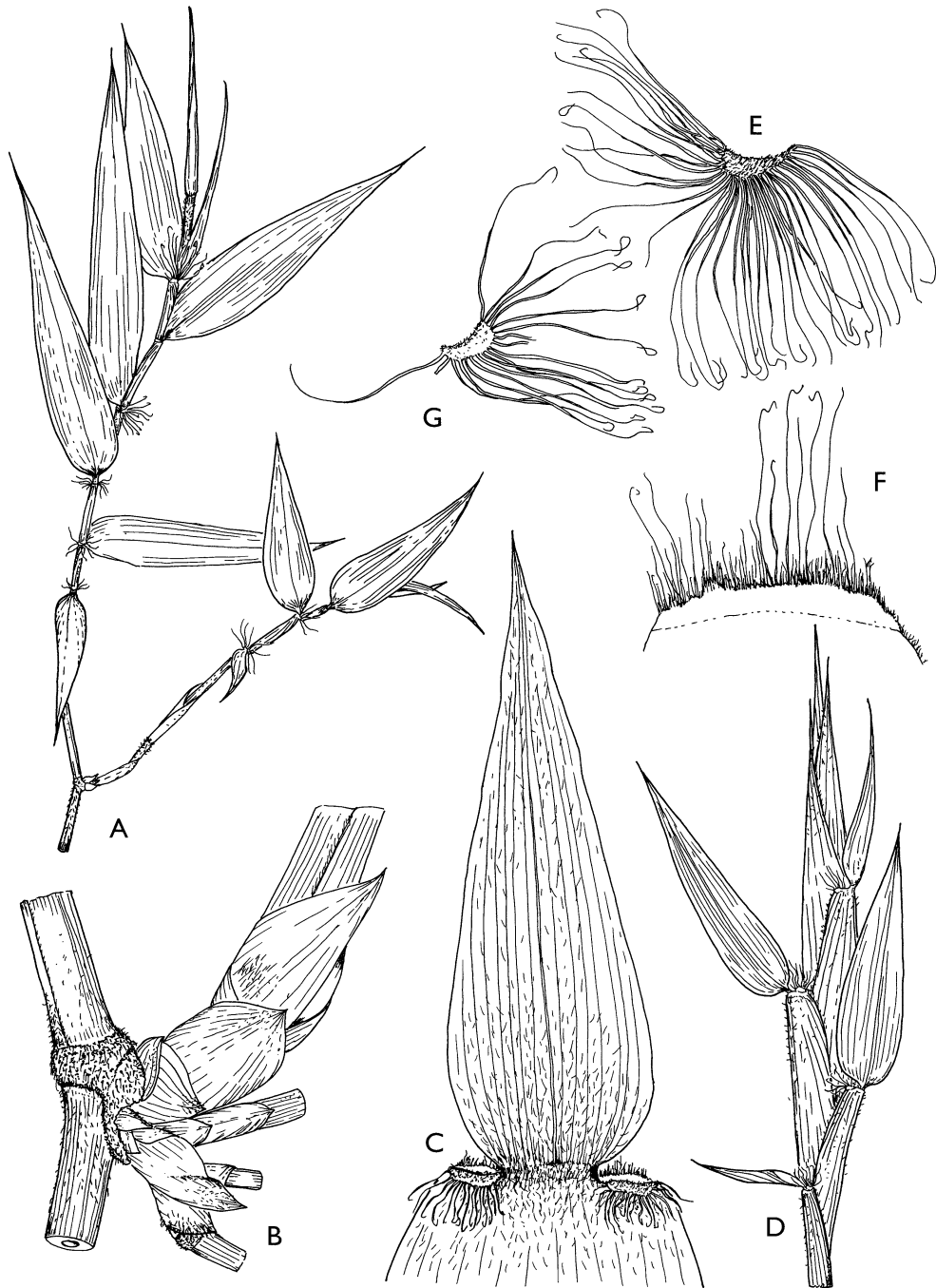


FIG. 1. *Decaryochloa diadelpha*. **A** leafy branches  $\times \frac{2}{3}$ ; **B** branches, also showing base of culm sheath  $\times 2$ ; **C** culm leaf  $\times \frac{1}{2}$ ; **D** young flowering branch  $\times 1$ ; **E** auricle of culm sheath, showing the bristles and hairy auricle  $\times 2$ ; **F** ligule of culm sheath  $\times 2$ ; **G** auricle of sheath of leaf blade with bristles  $\times 3\frac{1}{3}$ . **A**, **D**, **G** from SD1288, **B** from SD1116, **C** from *Perrier de la Bâthie* 10916, **E** & **F** from SD892. Drawn by the author.

## NOTES ON MORPHOLOGY

*Vegetative*

The culms are described by Camus (1946) as scandent. In fact, the culms are erect or slightly geniculate in the lower parts, whereas the upper parts scramble over nearby vegetation. The habit thus resembles that of *Hickelia* A. Camus, a genus of four species found in Madagascar and Tanzania (Dransfield 1994). The upper parts of the culms and the elongated dominant primary branches are very long and slender, and are alike, entangled with each other and trees, so that it is difficult to measure the actual length of the culms.

The branch bud is borne just below the supranodal ridge, at the point where the sheath scar curves downwards. As in *Hickelia* (Dransfield 1994), the position of the branch can suggest that it emerges below the sheath scar or node (Fig. 1B).

The large auricle of the culm sheath and the auricle of the leaf sheath are pubescent, bearing long curly bristles along the edges (Figs. 1E & 1G). In bamboos such auricles with hairy surfaces are not common.

*Inflorescence*

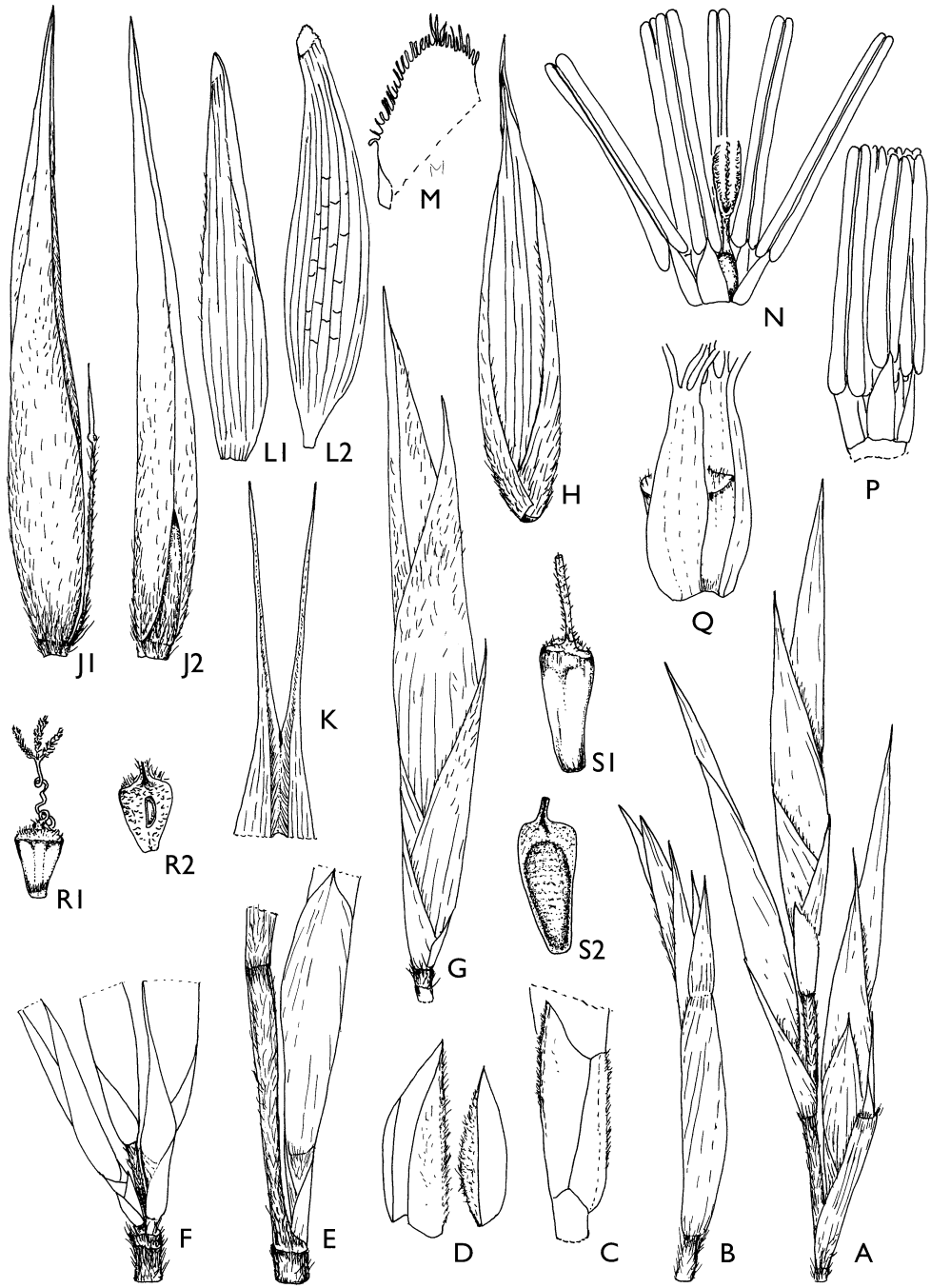
The inflorescence is racemose and determinate, and the axis is clearly segmented. Each node bears a sheath with or without a reduced blade. The inflorescence is borne terminally on a leafy branch and has one to four spikelets.

In inflorescences with a single spikelet, the uppermost internode of the leafy branch is as long as the sheath of the uppermost blade; the internodes above it are much shorter, about one-eighth of the length of this uppermost internode. The sheath of the node above the uppermost leaf blade has the upper part resembling a modified blade (Figs. 1D & 2B). The sheaths or bracts of the nodes above this node have no modified blades, but have long or short acuminate tips. These sheaths or bracts can be regarded as glumes or transitional glumes of the spikelets. There is no lateral branch in the main axis below the glume, and the prophyll is lacking.

In inflorescences comprising more than one spikelet, the axis consists of up to four internodes. Each node bears a sheath, with or without a modified blade, subtending a sessile spikelet with a prophyll at the base (Fig. 2A). The prophyll is usually split into subequal one-keeled structures, hairy along the keels and on the back (Fig. 2D). Occasionally, the lowermost spikelet is accompanied by two smaller spikelets (Fig. 2F). In this case, this lowermost spikelet gives rise to a spikelet at each node of the axis below it. These two spikelets are also supported each by a sheath or bract, and each possesses a prophyll at the base. Buds are not found in the inflorescence.

The floret generally has a lemma and a palea, but in the specimens *Decary* 18201 and *Dransfield* SD1288, an extra structure can be found wrapped inside the palea; it is thinner than the palea, and is densely pubescent especially near the base, and the apex is fringed (Fig. 2L). It is not clear what part of the floret it represents.

In most specimens examined, the filaments are free, except in *Decary* 18375, in which the three filaments are joined together, as described by Camus (1946) (Fig. 2Q). Under the species, Camus (l.c.) mentioned that before anthesis the filaments



are rather thick and joined at the base in threes, and after anthesis the free part of the filaments elongate, while the united parts of the filaments also elongate but remain joined together (Fig. 2Q). When I examined my own collections (SD1116 & SD1288) I could not find stamens with joined filaments, and I began to think that I might be wrong in identifying the collections as *D. diadelpha*. After thorough and careful examination of Decary specimens deposited in Paris, I found that stamens with filaments joined, in two groups, are found in *Decary* 18375 only, whereas in the other Decary specimens the filaments are free. I consider the condition of the joined filaments to be abnormal, as may be the presence of an extra structure inside the palea.

A sterile specimen (*Dransfield et al.* SD1104) collected in Andohahela, Tolagnaro, which may represent another species, is not included in this account. Flowering material of this bamboo is needed.

#### CONCLUSIONS

1. *Decaryochloa* A. Camus is related to *Hickelia* A. Camus, because it has a determinate inflorescence with segmented axis and prophylls, and has 3 – 4 transitional glumes and six stamens in the spikelet. Camus (1946) considered it to be related to *Pseudocoix* A. Camus, a genus which is now a synonym of *Hickelia* (Dransfield 1994). Soderstrom & Ellis (1987) place the above genera in the subtribe *Nastineae* Soderstr. & R. P. Ellis, in the system which is adopted with some modification by Dransfield & Widjaja (1995). Dr. C. Stapleton (K, pers. comm.) has pointed out that a subtribe *Hickelineae* A. Camus was published in 1924 to accommodate the genus *Hickelia*, and should be recognized instead of *Nastineae*. However, as mentioned in my paper on *Hickelia* (Dransfield 1994), it seems wise to defer a subtribal placement, until all genera included in the subtribe *Nastineae* (*sensu* Soderstr. & R. P. Ellis) are critically revised and their relationships reassessed.
2. Camus (1946) did not designate a type specimen of the species. I would like to choose *Decary* 18375 as lectotype even though the description of the stamens does not apply to all specimens examined in the study.
3. Abnormalities are not unknown in bamboos, as demonstrated above and in *Dinochloa prunifera* S. Dransf. from Malaysia (Dransfield 1981). Therefore, as many specimens as possible should be examined when describing a new taxon of bamboo. Features highlighted as diagnostic in *D. diadelpha* by Camus (1946) are shown to be better interpreted as abnormalities, given the much wider range of collections now available and careful field observations.

FIG. 2. *Decaryochloa diadelpha*. **A** inflorescence with 3 spikelets  $\times 1\frac{1}{3}$ ; **B** young flowering branch  $\times 1\frac{1}{2}$ ; **C** & **D** split prophyll  $\times 4\frac{1}{3}$ ; **E** lowermost node bearing one spikelet  $\times 2$ ; **F** lowermost node bearing 3 spikelets  $\times 2$ ; **G** spikelet  $\times 2$ ; **H** lemma  $\times 2$ ; **J1** palea, from the side showing rachilla extension  $\times 2$ , & **J2** palea, from the front showing the extra structure inside it  $\times 2$ ; **K** apex of palea  $\times 6$ ; **L1** & **L2** two types of extra structures, from inside  $\times 3\frac{1}{3}$ ; **M** tip of **L2**  $\times 11$ ; **N** stamens and ovary  $\times 6$ ; **P** stamens with free filaments  $\times 4\frac{1}{2}$ ; **Q** joint filaments  $\times 6$ ; **R1** young fruit  $\times 3$ , and **R2** section of young fruit, showing thick pericarp  $\times 3$ ; **S1** much developed fruit  $\times 3$ , and **S2** section of **S1**, with seed difficult to separate from pericarp  $\times 3$ . **K** from *Decary* 18201, **Q** from *Decary* 18375, **A – J**, **L – P** and **R – S** from SD 1288. Drawn by the author.



4. It seems that *D. diadelpha* has a long flowering period, as indicated by Camus (1946), that is 1939 to 1942, and as witnessed by me, from 1989 to 1994. Collections made before 1939 indicate that the bamboo was sterile. It is not known whether the bamboo flowered between the years 1942 and 1989; no specimens collected during this period have been found. It is hoped that this bamboo will regenerate and thrive again in Analamazaotra.

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