

Yayasan Sabah

Danida

Management of Maliau Basin Conservation Area
Sabah, Malaysia

TECHNICAL ASSISTANCE REPORT No. 53

**Report on Gingers
in Maliau Basin Conservation Area
June 2002**

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Background

The plant family Zingiberaceae currently includes 20 genera and almost 200 species in Borneo. Gingers are non-woody plants even though some of them can be up to 8 m tall. They constitute an important component of the herbaceous ground flora in tropical rain forests up to 2000 m above sea level and are often dominant in gaps or in disturbed forests. Most species are terrestrial but a few can be found epiphytic or exclusively on rocks.

About the author

I have a PhD in tropical botany and have been studying herbaceous plants on the forest floor of tropical rain forest in S America, Africa, and particularly Asia. I have a special interest in the ginger family and is also doing taxonomic work especially on the genus *Etlingera*.

As well as being a researcher, I have been a member of the Technical Advisory Group in the 'Management of Maliau Basin Conservation Area, Sabah, Malaysia Project' since October 1999.

The objectives of the activity in Maliau Basin Conservation Area

- 1) to compile a list of documented species of gingers. Of special interest are those with restricted range.
- 2) to train the Botany Team of the Maliau Basin Conservation Area Project in collecting and identifying gingers.
- 3) to give a general boost to botanical activities in Maliau Basin.

Time table

The Maliau Basin and adjacent areas were visited twice:

- 1) An initial survey in Oct. 2000: Agathis Camp, Camel Trophy and the area north of here towards the waterfall, Bambang Camp and trail leading back to Agathis. Field work 3–7 Oct. (five days in total).
- 2) A follow-up visit in Mar 2002: Agathis Camp, and Belian Camp and areas in between mainly in secondary forest. Field work 27–29 Mar. (three day in total).

Methods

The survey was conducted using standard botanical collection procedures. Flowers were fixed in spirit, and leaves and inflorescences dried at the facilities already established at Agathis Camp early in the project. Notes, drawings and photographs were made in the field.

One set of all specimens were deposited at the State Herbarium in Sepilok (SAN), additional sets were deposited at Forest Research Institute Malaysia (KEP), University Malaysia Sabah, and in Danish (AAU) or other European herbaria (K, L, E).

Participants

Maliau Basin Botany Team: Linus Banggilon, Kho Ju Ming, Edward Alimin, Sawantan Katulai & Henry Baindang. Sidkan was unable to participate but issues were discussed with him elsewhere.

The first visit overlapped with that of Jacob Andersen and Jens Kanstrup, Danced-sponsored MSc students from Denmark.

Results

Thirty species of gingers are currently documented in the Maliau Basin Conservation Area based on the present work. The most species rich genera are *Etilingera* and *Amomum* with seven species each. The result is probably biased as the investigator has a special interest in the former genus. Two species of *Etilingera* appears to be new to science. E. sp. A was found only in the forest N of Camel Trophy Hut. Unfortunately, it cannot be described as the anthers were eaten by a snail. The second species (B) has also been collected in Brunei, Danum Valley, and Tawau Hills NP and will be described soon. The species of *Boesenbergia* (Poulsen 1833) has been found in several other localities in Sabah but does not key out in the publication by Rosemary Smith (1987a) and may be new also.

Other plan families were also collected, but not all these have been named at the present, as specimens are still with experts for identification.

Conclusion

Status of ginger species richness

The species richness of gingers documented with the present effort of 8 field days is an average compared to other sites in Borneo but additional species are likely to be found given more time. One additional species of *Boesenbergia* was observed but not collected as no flowers were found, and also the genus *Hornstedtia* is not appearing in the list even though it has been seen in Maliau Basin. Thus it can be estimated that perhaps 50 species of gingers may be easily found in the Maliau Area. Most of these seems to be common at other sites also. However, *Etilingera* sp. A. has so far not been documented outside the Maliau Basin, but it is too early to conclude that this as an endemic rarity.

Status of botanical activities

The Botany Team received focused training on ginger collecting and identification. The facilities established for drying specimens during the botanical surveys conducted under the supervision of Dr Cam Webb (see separate report of a much more substantial botanical activity) were still in good order except for the pressing straps. As a follow up after the visit, new straps have been ordered.

To facilitate the identification of gingers, relevant literature was photocopied and passed to the Botanical Team in April 2002 (see list below).

Relevant literature on the family Zingiberaceae in Borneo

Beaman, J.H. & Beaman, R.S. 1998. The plants of Mount Kinabalu: Gymnosperms and non-orchid monocotyledons. Natural History Publications (Borneo), Kota Kinabalu. 220 pp.

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- Cowley, J. 1996. Zingiberaceae; Costaceae. pp. 353–354 and pp. 413–423 in Coode, M.J.E., Dransfield, J., Forman, L.L., Kirkup, D.W. & Iris, M.S. (eds) A checklist of flowering plants and gymnosperms of Brunei Darussalam. Ministry of Industry and Primary Resources Publications, Brunei Darussalam. 450 pp.
- Cowley, J. 1998. Two new species of *Boesenbergia* (Zingiberaceae) from Brunei Darussalam. Kew Bull. 53: 623–629.
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- Nagamasu, H. & Sakai. 1996. *Amomum roseisquamosum* (Zingiberaceae), a new epiphytic ginger from Borneo. Edinb. J. Bot. 53:39–42.
- Newman, M.F. 2001. Nomenclatural notes on Zingiberaceae. Edinb. J. Bot. 58: 173–174.
- Poulsen, A. D. 1993. Two new species of *Boesenbergia* (Zingiberaceae) from Borneo. Nordic Journal of Botany 13: 289–294.
- Poulsen, A. D., J. Mood & Ibrahim, H. 1999. Three new species of *Etilingera* (Zingiberaceae) from Borneo. Nordic Journal of Botany 19(1): 139–147.
- Sakai, S. 1997. Flora of Zingiberaceae and Costaceae in Lambir Hills National Park, Sarawak, Borneo. Pp. 69–85 in: Inoue, T. & Abang Abd Hamid (eds), Genral flowering of tropical rain forests in Sarawak. Center for Ecological Research, Kyoto University. 251 pp.
- Sakai, S. & Nagamasu, H. 1998. Systematic studies of Bornean Zingiberaceae I. *Amomum* in Lambir Hills, Sarawak. Edinb. J. Bot. 55: 45–64.
- Sakai, S. & Nagamasu, H. 2000a. Systematic studies of Bornean Zingiberaceae II. *Elettaria* of Sarawak. Edinb. J. Bot. 57: 227–243.
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- Smith, R.M. 1989a. Two new additional species of *Amomum* from Borneo. Notes Roy. Bot. Gard. Edinb. 45: 337–339.
- Smith, R.M. 1989b. A new *Alpinia* from Sabah. Notes Roy. Bot. Gard. Edinb. 45: 341–343.
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APPENDIX A. *Gingers (the plant family Zingiberaceae) sorted alphabetically according to genus and species. In brackets after the scientific name is given the collection number. Notes on each species include description, locality, forest type, coordinates, elevation, and distribution of voucher specimens (SAN = State herbarium in Sandakan; KEP = National Herbarium at Forest Research Institute Malaysia, Kepong; AAU= University of Aarhus, Denmark; E=Edinburgh, Scotland; K = Kew, England; and S=Stockholm, Sweden.*

***Alpinia ligulata* K. Schum.** (Poulsen et al. 1820)
Terrestrial herb 1 m. Belian Camp. Secondary forest. Side of stream bed (4 degr. 45 min N; 116 degr. 58 min E). 250 m. Deposited at: SAN.

***Amomum coriaceum* R.M. Sm.** (Poulsen et al. 1830)
Terrestrial, stilt-rooted, 1.5 m. Agathis Camp. Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN.

***Amomum dimorphum* M.F. Newman** (Poulsen et al. 1653, 1811)

Terrestrial herb in clump, 2–3.5 m. Sometimes stilt-rooted. Base of leafy shoot reddish-brown, 4–5 cm in diam, lower 2 m leafless. Stem yellow-green, lamina dark green, midrib yellow, lamina plain green below. Inflorescence at base, erect, flowers white, fruits green to pale yellow (when ripe). Arillus with sour taste, seeds brown. 1) Km 3.5 from gate towards Maliau Basin Conservation Area. Roadside in open area (4 degr. 37 min N; 116 degr. 56 min E). 440 m. Deposited at: SAN, KEP, Universiti Malaysia Sabah, AAU. 2) 700 m along trail from Bangbangan camp to Camp 88. Regenerating landslide area (4 degr. 46 min N; 116 degr. 55 min E). 600 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU.

***Amomum testaceum* Ridl.** (Poulsen et al. 1823)

Terrestrial herb to 3 m. Bracts pale brown. Small stream near road between junction and Belian Camp. Secondary forest. Wet slope of stream bed (4 degr. 44 min N; 116 degr. 59 min E). 300 m. Deposited at: SAN, KEP.

***Amomum* sp. A** (Poulsen et al. 1815)
Terrestrial herb, 1 m, in clump, ±stilted. Stem reticulate, petioles 2 cm, bracts brown. Belian Camp. Secondary forest, relatively intact, about 15 m above river. (4 degr. 45 min N; 116 degr. 58 min E). 250 m. Deposited at: SAN.

***Amomum* sp. B** (Poulsen et al. 1816)
Terrestrial herb, 1 m, in clump. Stem glabrous, leaves sessile, bracts brown. Belian Camp. Secondary forest, relatively intact, about 15 m above river. (4 degr. 45 min N; 116 degr. 58 min E). 250 m. Deposited at: SAN.

***Amomum* sp. C** (Poulsen et al. 1819)
Terrestrial herb, 4–5 m in loose clump, ca. 20 cm between shoots. Peduncle 60–160 cm, scales and bracts reddish, flowers orange, infructescence ca. 15 cm diam, fruit 2.5 cm by

3.5 cm, soft spiny. Belian Camp (4 degr. 45 min N; 116 degr. 58 min E). 250 m.
Deposited at: SAN, KEP, AAU.

***Amomum* sp. D**

(Poulsen et al. 1824)

Terrestrial herb to 2 m. Rhizome long-creeping. Young fruits spiny, pale pink. Sungai Gajah, near road between junction and Belian Camp. Secondary forest. Side of stream bed (4 degr. 44 min N; 116 degr. 59 min E). 280 m. Deposited at: SAN, KEP, Universiti Malaysia Sabah.

***Boesenbergia pulchella* (Ridl.) Merr**

(Poulsen et al. 1652)

Terrestrial herb to 40 cm. Tubers 5 by 2 cm. Lower sheath purple to speckled purple. Petiole green, lamina obovate (broadest just above the middle), plicate, plain green, base unequally cordate, pale below, young leaves purplish tinged below. Fertile bracts green, flowers not seen. Trail from Bangbangan camp to Maliau Falls (4 degr. 46 min N; 116 degr. 55 min E). 550 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU.

***Boesenbergia* sp. aff. *flavorubra* R. Sm.**

(Poulsen et al. 1833)

Terrestrial herb in clump, less than 30 cm. Flowers white, labellum white with yellow patch surrounded by two red lines. Agathis Camp. Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN, KEP, AAU.

***Burbridgea schizocheila* Hort.**

(Poulsen et al. 1825)

Epiphyte. Flowers pale orange, fruit green. Agathis Camp. Virgin forest, nature trail near camp. On log above Sg. Agathis (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN, KEP, AAU.

***Costus speciosus* Sm.**

(Poulsen et al. 1828)

Terrestrial herb, 3.5 m. Calyces purple red, flowers white. Agathis Camp. Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN.

***Elettaria* sp. A**

(Poulsen et al. 1636)

Terrestrial herb. Rhizome long-creeping. Base of petioles reddish. Inflorescence creeping; flowers white. 100 m along trail to Aliyas Camp going north from Camel Trophy Hut towards waterfall (4 degr. 44 min N; 116 degr. 53 min E). 1050 m. Specimen at: SAN.

***Elettaria* sp. B (? same as 1636)**

(Poulsen et al. 1812)

Terrestrial herb to 1.5 m, in clump. Stem green, leaves plicate, pubescent below. Inflorescence creeping. Bracts pale red, drying brown; dorsal petal reddish, labellum white with yellow center, stamen red. Belian Camp. Secondary forest, relatively intact,

close to small rocky stream (4 degr. 45 min N; 116 degr. 58 min E). 250 m. Deposited at: SAN, KEP, Universiti Malaysia Sabah, AAU, E.

***Elettaria* sp. C**

(Poulsen et al. 1832)

Terrestrial herb to 1 m. Rhizome creeping: 20 cm between shoots. Inflorescence long-creeping, flowers 20–60 cm from base of stem. Calyx reddish, petals and labellum white, stamen yellow-green. Agathis Camp. Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN, KEP, AAU.

***Elettariopsis kerbyi* R.M. Sm.**

(Poulsen et al. 1831)

Terrestrial herb to 1 m, rhizome short-creeping. Lamina dark green, plicate. Agathis Camp. Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN.

***Etlingera brevilabrum* (Val.) R.M. Smith**

(Poulsen et al. 1646)

Terrestrial herb. Rhizome long-creeping. Leafy shoot 1.5 m, leafless 1 m, with 10-12 leaves. Base egg-shaped. Sheath glabrous, green, lamina dark green, pale below; young leaves with purple blurry patches. Inflorescence subterranean, bracts loose, white, flowers 5-6 per inflorescence, red except for white stigma. Trail between Camel Trophy Hut towards Bangbangan Camp, ridge top (4 degr. 46 min N; 116 degr. 55 min E). 600 m. Specimen at: SAN, KEP, AAU, K.

***Etlingera fimbriobracteata* (K. Schum.) R.M. Sm.**

(Poulsen et al. 1654, 1809)

Terrestrial herb. 2-3 -(5) m. Rhizome long-creeping. Stem red. Inflorescence basal. Bracts pale brown to purple. Calyx red; flowers yellow, anther crest and stigma red. 1) 700 m along trail from Bangbangan camp to Camp 88. Regenerating landslide area (4 degr. 46 min N; 116 degr. 55 min E). 600 m. Specimen at: SAN, KEP, AAU. 2) Road between Luasong and Maliau Basin. Wet slope in open area (4 degr. 36 min N; 117 degr. 15 min E). 200 m. Deposited at: SAN.

***Etlingera punicea* (Roxb.) R.M. Sm.**

(Poulsen et al. 1810)

Terrestrial herb to 4 m. Rhizome long-creeping. Sheath reticulate, green. Inflorescence deeply imbedded in the soil, Flowers red, labellum yellow with red margin and red bifid apex. Vernacular name in Dusun: tuhau. Stem eaten. Road between Luasong and Maliau Basin. Roadside in secondary, open forest, base of slope (4 degr. 32 min N; 117 degr. 2 min E). 340 m. Deposited at: SAN.

***Etlingera rubromarginata* A.D. Poulsen & Mood**

(Poulsen et al. 1647, 1821)

Terrestrial herb to 4 m, rhizome long-creeping: 40–50 cm between shoots. Stem green with red blotches. Bracts white with red edges, flowers pink with yellow center, lateral lobes with fine, white edge; anther pink, stigma pale pink. 1) Trail from Bangbangan camp to Maliau Falls (4 degr. 46 min N; 116 degr. 55 min E). 550 m. Specimen at: SAN, AAU. 2) Sabah, small stream near road between junction and Belian Camp Secondary forest. Wet slope of stream bed (4 degr. 44 min N; 116 degr. 59 min E). 300 m.

Deposited at: SAN, KEP, Universiti Malaysia Sabah, AAU, E.

***Etilingera sessilanthera* R.M. Sm.**

(Poulsen et al. 1651, 1826)

Terrestrial herb to 2.5 m. Rhizome long-creeping. Sheaths glabrous. Lamina dark green, slightly dull, midrib yellow, margin red. Sometimes tinged red below. Inflorescence subterranean arising from rhizome close to or distant from base. Bracts brownish-red, petals pink, labellum dark red with central yellow bifid patch not extending to the apex.

1) Trail from Bangbangan camp to Maliau Falls (4 degr. 46 min N; 116 degr. 55 min E). 550 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU.

2) Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN.

***Etilingera* sp. nov. A**

(Poulsen et al. 1637)

Terrestrial herb 1-1.8 m. Rhizome long-trailing. Base of leafy shoot c. 2 cm in diam. Sheath green, reticulate. Ligule pubescent, unilobed; petiole less than 1 cm; base unequal; lamina plain green, below yellow-green and pubescent. Inflorescence from rhizome, subterranean. Peduncle 2 cm; bracts loose, white, upper with white tips. Flowers red; labellum elongate. Stamens missing (eaten by snail). 2 km along trail to Aliyas Camp going north from Camel Trophy Hut towards waterfall (4 degr. 44 min N; 116 degr. 53 min E). 1050 m. Specimen at: SAN, KEP, AAU.

***Etilingera* sp. nov. B**

(Poulsen et al. 1822)

Terrestrial herb 3-4 m, rhizome long-creeping. Base of stem red. Sterile and fertile bracts greenish brown, flowers orange, margin of labellum lobe yellow, anther and stigma orange. 29 flowers per inflorescence. Small stream near road between junction and Belian Camp. Secondary forest. Wet slope of stream bed (4 degr. 44 min N; 116 degr. 59 min E). 300 m. Deposited at: SAN, KEP, AAU.

***Globba atosanguinea* Teijsm. & Binn.**

(Poulsen et al. 1829)

Epiphyte on log. Bracts red, flowers orange-yellow. Agathis Camp. Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN.

***Globba pendula* Roxb.**

(Poulsen et al. 1814)

Terrestrial herb, 0.7 m. Flowers yellow. Belian Camp at Maliau Basin Conservation Area. Secondary forest, relatively intact, close to small rocky stream (4 degr. 45 min N; 116 degr. 58 min E). 250 m. Deposited at: SAN.

***Plagiostachys albiflora* Ridl.**

(Poulsen et al. 1813)

Terrestrial herb to 1 m, in clump. Fruits pale green. Belian Camp. Secondary forest, relatively intact, close to small rocky stream (4 degr. 45 min N; 116 degr. 58 min E). 250 m. Deposited at: SAN.

***Plagiostachys parva* J. Cowley** (Poulsen et al. 1645)

Terrestrial herb, rhizome creeping. Sheaths pubescent. Petiole 1-5 cm. Lamina plain green with yellow-green line along midrib, bullate, pubescent below; young leaves red. Inflorescence 3 cm from base, young flowers red. Trail between Camel Trophy Hut towards Bangbangan Camp, ridge top (4 degr. 45 min N; 116 degr. 54 min E). 800 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU.

***Plagiostachys strobilifera* (Bak.) Ridl.** (Poulsen et al. 1827)

Terrestrial herb to 1.2 m, in loose clump. Buds bright red, calyx red, petals, stamen and stigma red, labellum orange, lateral lobes with red lines. Agathis Camp. Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN, KEP, AAU.

***Plagiostachys* sp.** (Poulsen et al. 1834)

Terrestrial herb in clump. Leaves lightly plicate. Infl./infrct. 20 cm above the base. Dorsal petal white, labellum yellow, fruit red. Agathis Camp. Virgin forest, nature trail near camp (4 degr. 42 min N; 116 degr. 54 min E). 600 m. Deposited at: SAN.

***Zingiber* cf. *flagelliforme* J. Mood & I. Theilade** (Poulsen et al. 1817)

Terrestrial herb, 1 m. Sungai Gajah, near road between junction and Belian Camp Secondary forest (4 degr. 44 min N; 116 degr. 59 min E). 280 m. Deposited at: SAN, KEP.

APPENDIX B. *Other plants than gingers collected in the Maliau area sorted alphabetically according to genus and species. In brackets after the scientific name is given the collection number. Notes on each species include description, locality, forest type, coordinates, elevation, and distribution of voucher specimens (SAN = State herbarium in Sandakan; KEP = National Herbarium at Forest Research Institute Malaysia, Kepong; AAU= University of Aarhus, Denmark; E=Edinburgh, Scotland; K = Kew, England; and S=Stockholm, Sweden.*

BEGONIACEAE

Begonia sp.

(Poulsen et al. 1655)

Lithophyte, prostrate. Petiole reddish-brown, lamina leathery, dark-green to pinkish (when young), pale green below. Peduncle red. Flowers white. Buds pinkish. Maliau Basin, trail above Bangbangan Camp, rocky outcrop (4 degr. 46 min N; 116 degr. 55 min E). 650 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU, SING.

BURMANNIACEAE

Burmattia sp.

(Poulsen et al. 1633)

Saprophyte, 10-12 cm above ground. Flower white with yellow tip. Material in alcohol only. Maliau Basin. Plateau above rim, kerangas forest. Km 2.6 between Agathis Camp and Camel Trophy Hut (4 degr. 43 min N; 116 degr. 54 min E). 1140 m. Specimen at: SAN, KEP, UMS, AAU, K.

GESNERIACEAE

Didymocarpus sp.

(Poulsen et al. 1638)

Terrestrial herb with woody base, stem ascending. Leaves at one level, dark green with a silvery margin ± pronounced; pale below; base of young leaves yellow-green. Inflorescence 10-15 cm; peduncle reddish-brown. Calyx brown; corolla white with two yellow lines. Maliau Basin. 2 km along trail to Aliyas Camp going north from Camel Trophy Hut towards waterfall (4 degr. 44 min N; 116 degr. 53 min E). 1050 m. Specimen at: SAN, KEP, AAU, E.

MARANTACEAE

Phacelophrynium aurantium Clausager & Borchs. in ed. (Poulsen et al. 1649, 1818)

Terrestrial herb 0.6–1.2 m. Purplish-brown hairs, particularly at base and margin of sheath. Leaves plain green, below pale. Bracts bright orange, flowers pale orange. 1) Maliau Basin. Trail from Bangbangan camp to Maliau Falls (4 degr. 46 min N; 116 degr. 55 min E). 550 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU. 2) Sungai Gajah, near road between junction and Belian Camp. Secondary forest. Side of stream bed (4 degr. 44 min N; 116 degr. 59 min E). 280 m. Deposited at: SAN, KEP, Universiti Malaysia Sabah, AAU.

Phacelophrynium maximum (Bl.) K. Schum.

(Poulsen et al. 1650)

Terrestrial herb c. 2 m. near river. Leaves dark green, pale green below. Bracts cream (when fresh or new). Flowers cream-pale, orange at tip. Maliau Basin. Trail from Bangbangan camp to Maliau Falls (4 degr. 46 min N; 116 degr. 55 min E). 550 m.

Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU.

***Phrynium villosulum* Miquel**

(Poulsen et al. 1656)

Lamina variegated yellow-green / dark green. Lower surface: midrib brown, variegated pale green / dark green. Young leaves purplish tinged below. Flowers not seen. Maliau Basin. Agathis Camp (4 degr. 42 min N; 116 degr. 55 min E). 650 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU.

***Stachyphrynium borneense* Ridl.**

(Poulsen et al. 1648)

Terrestrial herb, 40-70 cm, rhizome creeping, 1-4 leaves per shoot, shoots in tufts, Lamina dark green, pale green below, up to 30 by 10 cm; bracts red when fresh, flowers white. Maliau Basin. Trail from Bangbangan camp to Maliau Falls (4 degr. 46 min N; 116 degr. 55 min E). 550 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU.

MELASTOMATACEAE

***Sonerila* sp. A**

(Poulsen et al. 1635)

Epiphyte. Upper surface dark purple; bright purple below. Maliau Basin. Plateau above rim, kerangas forest. Km 2.6 between Agathis Camp and Camel Trophy Hut (4 degr. 43 min N; 116 degr. 54 min E). 1140 m. Specimen at: SAN, S.

***Sonerila* sp. B**

(Poulsen et al. 1640)

Terrestrial herb, creeping. Stem ascending, reddish. Leaves dark green, pale below, sometimes with white lines. Flowers pink. Fruits brown. Maliau Basin. 2 km along trail to Aliyas Camp going north from Camel Trophy Hut towards waterfall (4 degr. 44 min N; 116 degr. 53 min E). 1050 m. Specimen at: SAN, KEP, AAU, S.

***Sonerila* sp. C**

(Poulsen et al. 1641)

Terrestrial herb. Stem ascending to erect. Flowers pink. Fruits brown. Maliau Basin. 2 km along trail to Aliyas Camp going north from Camel Trophy Hut towards waterfall (4 degr. 44 min N; 116 degr. 53 min E). 1050 m. Specimen at: SAN, KEP, AAU, S.

ORCHIDACEAE

***Aphyllorchis* sp. A**

(Poulsen et al. 1642)

Saprophyte 15-20 cm, ovary purple, petals cream-white. Material in alcohol only. Maliau Basin. Trail between Camel Trophy Hut towards Bangbangan Camp, ridge top (4 degr. 45 min N; 116 degr. 54 min E). 900 m. Specimen at: SAN, KEP, AAU, K.

***Apostasia* sp. B**

(Poulsen et al. 1643)

Terrestrial herb. Maliau Basin. Trail between Camel Trophy Hut towards Bangbangan Camp, ridge top (4 degr. 45 min N; 116 degr. 54 min E). 900 m. Specimen at: SAN, KEP, Universiti Malaysia Sabah, AAU.

POLYGALACEAE

***Epirixanthes* sp. A**

(Poulsen et al. 1632)

Saprophyte, c. 7 cm above ground. Stem reddish; flowers cream-white. Material in



1. *Etlingera brevilabrum* – a common ginger in gaps. This form is all red with a white stigma.



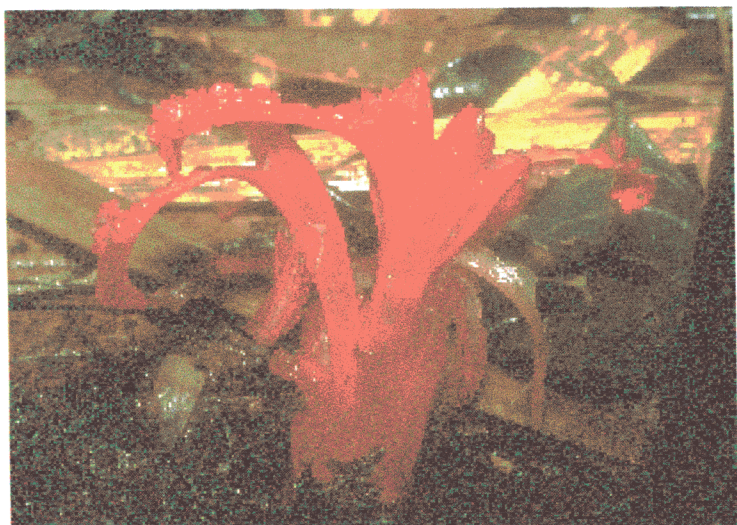
2. *Etlingera sessilanthera* – was found near the Maliau Falls.



3. *Etlingera rubromarginata* – bracts are white with a conspicuous red margin.



4. *Etlingera* sp. – this may be a new species and has also been documented from other places.



5. *Etlingera* sp. – this species was found near Camel Trophy and may represent a new species. Unfortunately, a snail had eaten all the stamens and more material is much needed.

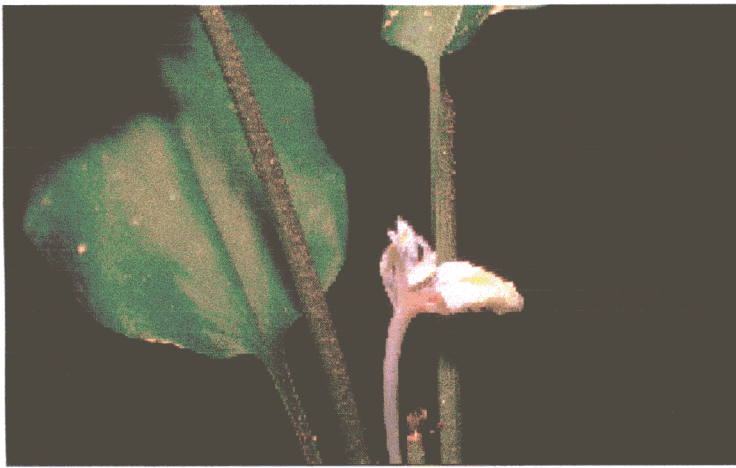




6. A species of *Begonia* (Begoniaceae).



7. A species of *Didymocarpus* (Gesneriaceae).



8. A species of *Bosenbergia* (Zingiberaceae).



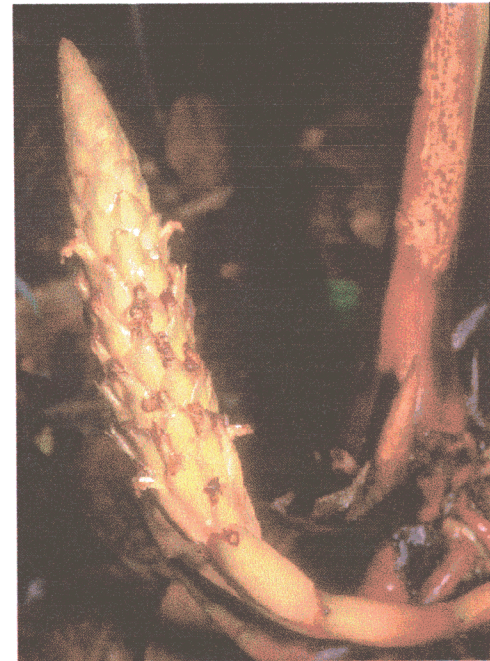
9. *Schizaea digitata* – a fern growing on ridges.



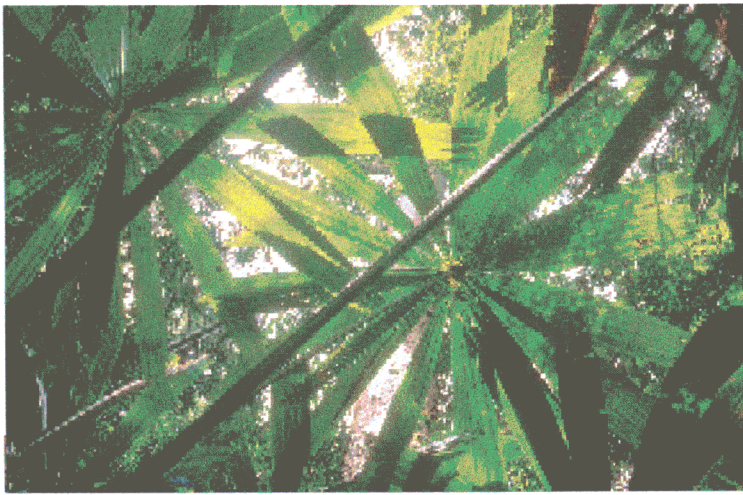
10. *Burmanna* – a saprophyte (Burmanniaceae).



11. *Epirixanthes* – a saprophyte (Polygalaceae).



12. *Amomum dimorphum* (Zingiberaceae).



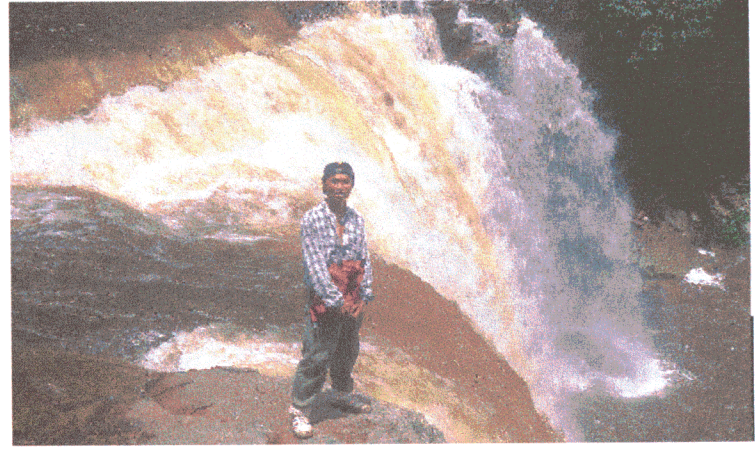
13. *Pholidocarpus majadum* Becc. – a palm.



14. *Agathis borneensis* Warb. – at Camel Trophy.



15. Jacob Andersen and Edward Alimin studying a rattan (*Calamus sarawakensis* Becc.).



16. Linus Bangillon at Maliau Falls.



17. Jens Kanstrup, Katrine Holm-Nielsen, Axel Dalberg Poulsen, Linus Bangillon, Edward Alimin, and Kho Ju Ming in Maliau Basin.



18. Linus Bangillon, Edward Alimin, and Kho Ju Ming in Maliau Basin.