International AROID Society, Inc.

The IAS Newsletter

Vol 31 No 2 - June 2009

A QUARTERLY PUBLICATION FOR MEMBERS OF THE INTERNATIONAL AROID SOCIETY

Table of Contents

The Aroids of the West Sarawak Limestone

by Peter C. Boyce[1] & Wong Sin Yeng[2]

[1] BRT Research Associate, Forest Herbarium (BKF) The Office of Forest and Plant Conservation Research, National Park, Wildlife and Plant Conservation Department, 61 Phahonyothin Rd, Chatuchak, Bangkok 10900 Thailand

[2] Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Samarahan, Sarawak, Malaysia

The limestone (batu kapur in the local Bahasa Melayu) areas of Sarawak are among the most rewarding for searching for aroids, not only in terms of species richness but also species diversity. A particularly striking aspect of the limestone flora is that spatially close areas of limestone, often only a few kilometres distant, often have strikingly different species composition.

Map 1. West Sarawak showing the Bau (pink), Padawan (orange) and Ranchan (blue) limestones. The Bongo Range is marked with a thick arrow.

Over the past few years we have been investigating three areas of limestone in western Sarawak. One area is the Bau series limestones in Kuching Division. Another is the Padawan series that run through the southern parts of Kuching and Samarahan divisions towards the border with Kalimantan (Map 1). These are in the main areas of often very large exposed karst fossliferous limestones dated to the Jurassic and Cretaceous periods. We have also been studying the Ranchan limestones on the outskirts of Serian. These are very old, in parts Permian, argillaceous limestones and mark the eastern-most block of the western Sarawak limestones.

All these limestone areas have high levels of local endemism, notably in the genera *Amorphophallus*, *Alocasia*, *Schismatoglottis*, and *Homalomena*. Additionally, there are suites of species that while not locally endemic in western Sarawak are restricted to limestones wherever they occur in Borneo.


Figure 1. *Amorphophallus brachyphyllus* Hett., a common species on the Bau limestones.


Figure 2. *Amorphophallus eburneus* Bogner, replaces *A. brachyphyllus* Hett. on the Padawan limestones but is absent from the close-by Ranchan series.


Figure 3. *Amorphophallus ranchanensis* Ipor, Tawan, A.Simon, Meekiong & Fuad, endemic to the Ranchan limestones on the outskirts of Serian.

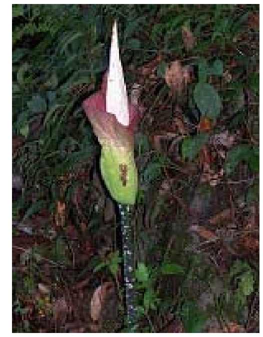
Figure 4. *Amorphophallus hewittii* Alderw., as currently defined a widespread and variable species but perhaps comprising several as yet undescribed species.

Amorphophallus is one of the most striking genera of the Sarawak limestones. The area around Bau hosts *A. brachyphyllus* Hett. (Figure 1), which is replaced by the closely related *A. eburneus* Bogner (Figure 2) on the Padawan series, and by the recently described *A. ranchanensis* Ipor, Tawan, A.Simon, Meekiong & Fuad at Ranchan (Figure 3). The last named is particularly interesting in that its relationships appear to lie with the east Bornean, *A. hottae* Bogner & Hett., rather than with any of the currently known species in western Borneo. However, there exists the distinct possibility that as further work is undertaken in Sarawak yet more species will be discovered that fill the geographical gap between these Western and Eastern taxa. *Amorphophallus hewittii* Alderw. (Figures 4) occurs on all the western Sarawak limestones and, unusually for a limestone-occurring *Amorphophallus*, also occurs on other geologies, including sandstones (as on the Matang Massif and across the Sarawak River at Gunung Muan) and granite (e.g., at Gunung Gading). One possibility is that the limestone elements represent a species distinct from the plants on other geologies.


Figure 5. *Alocasia ridleyi* A.Hay, a limestone-occurring species restricted to west Sarawak but related to limestone-obligate species in Sabah.


Figure 6. *Alocasia ridleyi* A.Hay, in flower and young fruit.


Figure 7. *Alocasia scabriscula* N.E.Br., common in swampy areas in full sun.


Figure 8. *Alocasia scabriscula* N.E.Br., plants can flower and fruit prolifically.

Alocasia is another feature of the Sarawak limestones. *Alocasia ridleyi* A.Hay (Figures 5 & 6) occurs on all three of the western Sarawak limestone formations, although is commonest on the Bau series. *Alocasia ridleyi* is one of a number of similar species restricted to limestone in Borneo. In the same group as *A. ridleyi* is *A. puteri* A.Hay and *A. pangeran* A.Hay, both restricted to Sabah while a related species, *A. scabriuscula* N.E.Br. (Figures 7 & 8) occurs throughout much of Borneo, often in rather swampy places. By comparison, *A. reversa* N.E.Br. (Figures 9 & 10) is restricted to the Padawan series, and is replaced by an as yet undescribed species on the Bau series.


Figure 9. *Alocasia reversa* N.E.Br., a very attractive species from the Padawan limetsones.


Figure 10. *Alocasia reversa* N.E.Br.


Figure 11. *Schismatoglottis nervosa* Ridl., remarkable for the strong veined leaves and powerful terpenoid smell of the crushed tissues.


Figure 12. *Schismatoglottis nervosa* Ridl.


Figure 13. *Schismatoglottis nervosa* Ridl., showing the distinct, longitudinally-ribbed petioles.


Figure 14. *Schismatoglottis bauensis* A.Hay & C.Lee, covering a limestone cliff at the type locality.


Figure 15. *Schismatoglottis bauensis* A.Hay & C.Lee, showing the petiolar sheath with long, free ligules.


Figure 16. *Schismatoglottis bauensis* A.Hay & C.Lee, showing the bright pink innovations.

Both *Schismatoglottis* and *Homalomena* are abundant on the Sarawak limestones, although the patterns of species distribution are far from resolved. A striking feature of the Bau and Padawan limestones is a species of *Schismatoglottis*, *S. nervosa* Ridl., with ribbed petioles and tissues that are strongly aromatic of terpenes (Figures 11, 12 & 13). At Bau, but absent from Padawan and Ranchan, *S. bauensis* A.Hay & C.Lee forms large colonies on vertical limestone cliffs (Figure 14) and is readily identified by the long free ligular portion to the petiolar sheath (Figure 15) and bright pink innovations (Figure 16). *Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi is abundant at all three limestone areas covered here and forms large colonies with bright green cordate leaves and the typical large, clavate appendix that is diagnostic for the species (Figures 17-18). Perhaps the most extraordinary species so far found, *S. convolvula* P.C.Boyce (Figure 19), is very locally abundant on the Padawan limestones.


Figure 17. *Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi, colony on a limestone ledge.


Figure 18. *Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi, showing the distinctive clavate spadix appendix.


Figure 19. *Schismatoglottis convolvula* P.C.Boyce, the only *Schismatoglottis* species found to date with twining and climbing stems.


Figure 20. *Homalomena griffithii* (Schott) Hook.f.

Figure 21. *Homalomena griffithii* (Schott) Hook.f., inflorescence at male anthesis, note the spadix angled forward and the open spathe.

Figure 22. *Homalomena griffithii* (Schott) Hook.f., inflorescence at late male anthesis, with the spadix once again upright and the spathe beginning to close.

Figure 23. *Homalomena insignis* N.E.Br.

Figure 24. *Homalomena insignis* N.E.Br.

Homalomena that commonly occur include *H. griffithii* (Schott) Hook.f. (Figures 20-22) and *H. insignis* N.E.Br. (Figures 23-25). *Homalomena* and *Schismatoglottis* are frequently confused by non-specialists but are readily separable on inflorescence characteristics. In *Schismatoglottis*, the spathe limb is almost always shed during flowering (Figure 26), resulting in an infructescence that is fusiform with an open orifice (Figure 27). When ripe, the persistent lower spathe splits from the top, peeling back and reflexing to reveal the berries which, owing to the female flower zone being fused to the spathe, are held to one side (Figure 28). By comparison, the entire spathe persists into fruiting in *Homalomena* (Figure 29) and, at maturity the spathe splits from the base and curls upwards to reveal the cylindrical cluster of berries on their free stipe (Figures 30 & 31).

Figure 25. *Homalomena insignis* N.E.Br., infructescence.

Figure 26. *Schismatoglottis sp.*, showing the spathe limb shedding during anthesis.

Figure 27. *Schismatoglottis sp.*, showing an immature and a mature infructescence.

Figure 28. *Schismatoglottis sp.*, showing the persistent lower spathe splitting and recurving from the top to reveal the fruits; the fruits are partially adnate to the spathe.

Figure 29. *Homalomena borneensis* Ridl., infructescences showing the persistent spathe.

Figure 30. *Homalomena griffithii* (Schott) Hook.f., infructescences showing the

Figure 31. *Homalomena insignis* N.E.Br., infructescences with the persistent spathe artificially removed just prior to fruit

Figure 32. *Bucephalandra motleyana* Schott.

persistent spathe splitting basally and then flexing upwards to reveal the free infructescence.

ripening.

Figure 33. *Bucephalandra motleyana* Schott, inflorescence at early male anthesis, the spathe limb just beginning to shed.

Figure 34. *Bucephalandra motleyana* Schott, inflorescence at male anthesis, spathe limb shed and lower spathe opened artificially to show the shield-shaped staminodes between the male and female flower zones.

Figure 35. *Piptospatha viridistigma* P.C.Boyce, S.Y.Wong & Bogner.

Figure 36. *Piptospatha viridistigma* P.C.Boyce, S.Y.Wong & Bogner, fruiting spathe showing the splash-cup.

The rheophytic genera *Bucephalandra* and *Piptospatha* are closely related to *Schismatoglottis* and differentiated most readily by lacking a constriction at the junction of the lower and upper spathe, and a splash-cup infructescence, and from each other by spathe colour (white in *Bucephalandra*, pink in most *Piptospatha*), and the presence or absence of shield-shaped staminodes between the male and female flower zones –staminodes being present in *Bucephalandra* and absent in *Piptospatha. Bucephalandra motleyana* Schott is absent north of the Bongo Range and thus does not occur on the Bau limestones; however it is locally abundant on the Padawan and Serian limestones where it often forms large single-species colonies (Figures 32-34). Although *Piptospatha* does occur north of the Bongo Range, for example *P. elongata* (Engl.) N.E.Br. on the Lundu granites, there are no limestone-occurring species until south of the range where the recently described *P. viridistigma* P.C.Boyce, S.Y.Wong & Bogner is locally common on both the Padawan and Ranchan series (Figures 35 & 36).

Figure 37. *Cryptocoryne ferruginea* Engl.

Figure 38. *Cryptocoryne ferruginea* Engl., flowering plant.

Figure 39. *Aglaonema simplex* (Blume) Blume.

Figure 40. *Aglaonema nitidum* (Jack) Kunth.

Cryptocoryne ferruginea Engl. is locally abundant in pools at the base of limestone cliffs in Bau, the leaves are often attractively bullate (Figures 37 & 38).

The suffruticose genus *Aglaonema* is represented only by *A. simplex* (Figures 39 & 40) on exposed limestone, although *A. nitidum* (Jack) Kunth is frequently encountered nearby where the limestone is not exposed; *A. simplex* (Blume) Blume is not restricted to limestone and is a widespread and often very common species. These two species are frequently confused although they are readily separable by inflorescence characters, the most easily observed of which is that the spathe is caducous after anthesis in *A. simplex* but persistent through to almost full fruit maturity in *A. nitidum* (Figures 41-42).

Figure 41. *Aglaonema nitidum* (Jack) Kunth, note the spathe persistent into fruiting.

Figure 42. *Aglaonema simplex* (Blume) Blume, note the spathe shed during anthesis.

Figure 43. *Rhaphidophora foraminifera* (Engl.) Engl., showing the distinctive perforations adjacent to the midrib.

The climbing and hemiepiphytic aroids in Borneo are generally not narrowly endemic, and thus common and widespread species of *Rhaphidophora* and *Scindapsus* are found on limestones. Perhaps the commonest species on limestone is *Rhaphidophora foraminifera* (Engl.) Engl. (Figure 43), which is widespread through the Sunda Shelf, and with its adult leaves conspicuously perforated adjacent to the midrib and the leaf lamina abaxially yellow-pubescent (Figure 44), is readily identifiable. Another common species in the square-stemmed *R. elliptica* Ridl., most often encountered as a juvenile creeping along the forest floor on the lower parts of tree trunks, but occasionally seen as a many-stemmed hemiepiphyte reaching high into the canopy. These square-stemmed *Rhaphidophora* species are still very poorly understood, and it is increasingly likely that there are many species involved but as yet not formally recognized. Although most *Rhaphidophora* occurring on limestone are widespread species, there is at least one exception*, R. tenuis* Engl. (Figure 45), which while closely related to the most widespread species, *R. korthalsii*, is a limestone-obligate endemic to Borneo and easily identifiablei from *R. korthalsii* Schott by the shape of the juvenile shingle-stage leaves, the style of pinnation of the adult leaves, and by the slender spadix (Figures 46-48). Perhaps the most abundant *Scindapsus* in Borneo is *S. longistipitatus* Merr. (Figure 49), closely followed by *S. treubii* Engl., the latter with the juvenile stage often attractively variegated and the adult stage with markedly oblique leaf laminae (Figure 50). Less often seen on limestone is *S. pictus* Hassk. (Figure 51), a species well-established in commercial horticulture and also with often strikingly variegated juvenile plants but, like *S. treubii*, the adult plants lose their attractive variegation.

Figure 44. *Rhaphidophora foraminifera* (Engl.) Engl., showing the leaf lamina abaxially yellow-pubescent.

Figure 45. *Rhaphidophora tenuis* Engl.

Figure 46. *Rhaphidophora tenuis* Engl., juvenile shingle-stage, note the falcate ascending leaves and compare this with the leaves of the juvenile shingle-stage of *R. korthalsii* Schott in Figure 47.

Figure 47. *Rhaphidophora korthalsii* Schott, shingle-stage, compare this with the juvenile shingle-stage of *R. tenuis* in Figure 46.

Figure 48. *Rhaphidophora tenuis* Engl., in flower.

Figure 49. *Scindapsus longistipitatus* Merr.

Figure 50. *Scindapsus treubii* Engl., showing the

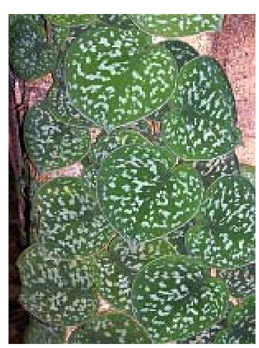

Figure 51. *Scindapsus pictus* Hassk., one of the

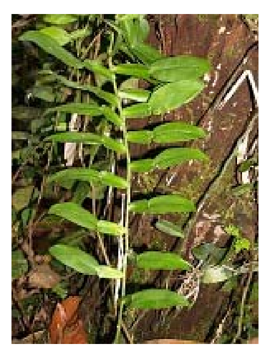

Figure 52. *Pothos scandens* L.

distinctive highly-oblique leaf laminae.

numerous leaf colour expressions.

Figure 53. *Pothos ovatifolius* Engl., juvenile shingle-stage showing the intramarginal veins crossing the primary lateral veins.

Figure 54. *Pothos ovatifolius* Engl., adult flowering stems hanging in a curtain from a limestone cave mouth.

Figure 55. *Pothos ovatifolius* Engl., flowering from a shoot tip.

Figure 56. *Pothos ovatifolius* Engl., mature infructescence.

Figure 57. *Pothos insignis* Engl., climbing specialized flowering shoot.

Pothos species on limestone, with the exception of the enormously variable *P. scandens* L. (Figure 52), tend to be restricted to that particular rock. Throughout Sarawak, *Pothos ovatifolius* Engl. (Figures 53-56) and *Pothos insignis* Engl. (Figures 57-59) are always encountered wherever limestone is present, even if the limestone is essentially almost completely underground, as on the southeastern flanks of the Bungo Range that divides Bau from Padawan. *Pothos ovatifolius* has a highly distinctive juvenile shingle-stage leaf lamina with the signature three intramarginal veins from the base crossing the primary lateral veins, while adult plants form extensive curtains of pendent stems flowering at the shoot tips, and later large infructescences. By contrast, *P. insignis* produces two distinct types of shoot. The clinging leaf shoots are sterile but give rise to clinging shoots clothed with large, somewhat inflated prophylls and cataphylls from between which arrive the inflorescences. These fertile clinging shoots can grow to several meters in length, producing a succession of several hundred inflorescences in flushes over a period of many years.

Amydrium medium (Zoll. & Moritzi) Nicolson, the only species of this small genus in Borneo, is abundant on limestone as well as on virtually every other geology, and distinctive by the perforated and pinnate leaf lamina and white infructescences (Figures 60-62). Unlike virtually every other hemiepiphytic monsteroid, *A. medium* flowers only two or three metres from the ground.

Anadendrum is perhaps the most poorly understood hemiepiphytic genus in Asia. Presently there are only eight published names but in Sarawak alone there appear to be at least 25 species. The limestone-associated species in west Sarawak (Figures 63-65) has the abaxial surface of the leaf lamina matte-glaucous grey, appears to be endemic, and is undescribed. *Anadendrum* is sometimes confused with *Pothos* but lacks the veins crossing the primary laterals and has truncate-topped fruits.

Figure 58. *Pothos insignis* Engl., inflorescence at male anthesis.

Figure 59. *Pothos insignis* Engl., mature infructescence.

Figure 60. *Amydrium medium* (Zoll. & Moritzi) Nicolson.

Figure 61. *Amydrium medium* (Zoll. & Moritzi) Nicolson.

Figure 62. *Amydrium medium* (Zoll. & Moritzi) Nicolson.

Figure 63. *Anadendrum sp.*, note the leaf lamina glaucous-grey abaxially.

Figure 64. *Anadendrum sp.*

Figure 65. *Anadendrum sp.*, the truncate-topped fruits ripening red are diagnostic for the genus.

We finish with a word of warning about working on limestone, especially the karst formations. The rocks weather to produce many knife-edge ribs and sink-holes, these often of some considerable depth and lined with more exceedingly sharp erosion ridges. Additionally the rocks are often extraordinarily slippery and so great care should be taken when clambering over such formations, and especially in testing before putting your weight onto a surface that while appearing solid may, in fact, consist only of a thick layer of leaf litter and humus supported on a few rotten fallen branches over a deep sinkhole. We have both acquired spectacular cuts while working on the limestones.