

In July 2007, the conference of the International Association of Bryologists (IAB) was held in Kuala Lumpur, Malaysia. As a post-script, field visits of a few days' duration were organized in some alternative venues, Mt Kinabalu (Borneo), the Cameron Highlands and Singapore Botanical Gardens. My wife Joyce and I were travelling a long way at our own expense to attend the meeting, and therefore decided to extend our stay in Malaysia by a couple of weeks. As this was our first visit, we considered it sensible to remain in the Peninsula, and accordingly made plans to holiday in the Cameron Highlands. After the formalities of the excellent meeting had ended, we collected our hire car and drove northwards through the humid tropical heat on the newly constructed E1 motorway, now the main overland route to Thailand.

The E1 runs through farmlands and plantations

of rubber (*Hevea brasiliensis*) and African oil palms (*Elaeis guineensis*), the last of which we were later to see in monotonous tracts nearer the west coast. At many points we caught glimpses, away to our right, of the cloud-capped mountainous spine (the Banjaran Titiwangsa) of the Malaysian peninsula. On leaving the highway near Tapah, we wound our way up an endless series of zig-zags among battered, smoke-belching lorries, veteran Land Rovers and erratically driven mopeds. For almost the entire 45-km climb to the Cameron Highlands the road clings to thickly forested cliffs with steep drops on one or other side, occasional waterfalls and much evidence of landslides. At frequent intervals, rickety roadside stalls offer the traveller odorous durians, rambutans and other local fruits and vegetables.

Eventually the road reaches the small settlement of Ringlet which marks the start of the Cameron

A bryologist on holiday in the Cameron Highlands

Following an IAB meeting in Malaysia last year, **Jeff Bates** and his wife took to the mountains for a short holiday. Jeff describes some of his finds in this bryologist's paradise.



Highlands resort proper. Beyond Ringlet the road continues to climb through forest, soon passing a small lake with a hydroelectricity scheme and above that, the manicured terraces of the Cameron Bharat tea plantation, one of several in the mountains. Further steep meanders lead, after 10 km, to Tanah Rata, one of the resort's two principal towns and our destination. Here the landscape remains densely forested but flattens off to some extent, and another 6 km of winding road leads to the other major town, Brinchang. These two towns are encircled by five or six forest-covered mountain peaks or gunungs, reaching 2,090 m (6,858 ft) on Gunung Irau (according to the tourist maps). A network of numbered jungle paths provides access into the surrounding forest, much of which is just above the altitudinal limit for leeches, and to the mountain peaks. Most of these may be followed

safely by the hardy naturalist, although many tourists engage a guide.

It is the considerable altitude (>1,300 m) and relatively level landscape, originally discovered by the surveyor William Cameron in 1885, that led to the development of the hill station during British colonial times as a refuge for officials from the heat and humidity of the malarial lowlands. Moisture-laden air moving in from the Indian Ocean rises and cools on meeting the mountains, and causes the characteristic cap-clouds. We found the climate to be comparable with that of a British summer: often quite warm, but also cool in the evenings or at altitude when the mist descended. Each evening we observed the mist

◁ A prospect from near the summit of Gunung Jasar, typical montane forest of the Cameron Highlands. *Jeff Bates*

▽ The author photographing 'that big *Fissidens* thing' – actually a large *Schistochila* (liverwort), Gunung Brinchang. *Jeff Duckett*

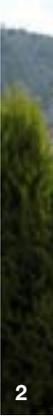


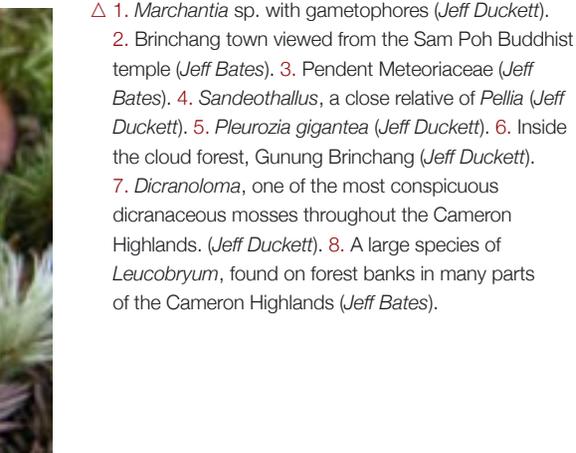
descending from the mountain tops as the humid air cooled and frequently this was preceded by a short thunderstorm that accelerated the process. These conditions enable desiccation-sensitive bryophytes to luxuriate in the Cameron Highlands and the other Malaysian mountain resorts (Fraser's Hill, the Genting Highlands); however, a long history of continuous forest cover is also a factor explaining why this is home to many oceanic bryophytes including some of the classic disjunct species.

What bryophytes can a visitor expect to see in the Cameron Highlands?

First, a warning: the bryophyte names appearing here are provisional ones. They are based on my own very imperfect knowledge of tropical African bryophytes and particularly on comparisons with the illustrations in *Mosses and Liverworts of Mount Kinabalu* (Frahm *et al.*, 1996) and *Mosses and Liverworts of Hong Kong* (So, 1995; Zhu & So, 1996). Furthermore, as this was a holiday trip, my surveying was inconsistent, extensive rather than intensive, and doubtless numerous things were overlooked. Almost every specimen picked up was overgrown to some extent with the smaller Lejeuneaceae and Radulaceae, etc., which in themselves could offer a rewarding life's study!

We had our first appointment with the Malaysian flora at Robinson Falls, easily reached from the eastern outskirts of Tanah Rata. In moist, shady spots on the approach to the Falls, the paved route supports weedy pottiaceous mosses, extensive mats of fertile *Marchantia* spp., smaller patches of fertile *Dumortiera hirsuta* and, on rocks and masonry, bounteous *Hypopterygium*. Granite rocks in the river and Falls, as in almost all the larger water courses of the Cameron Highlands, were thickly beset with plastic sacks and the water itself evidently polluted. Apparently this originates from the

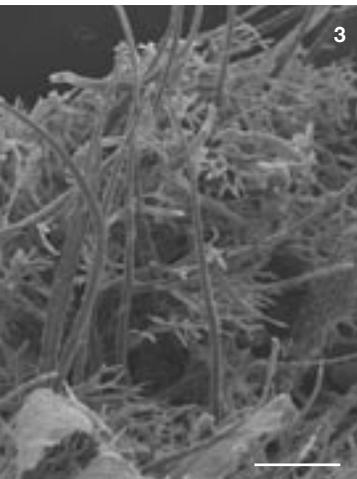
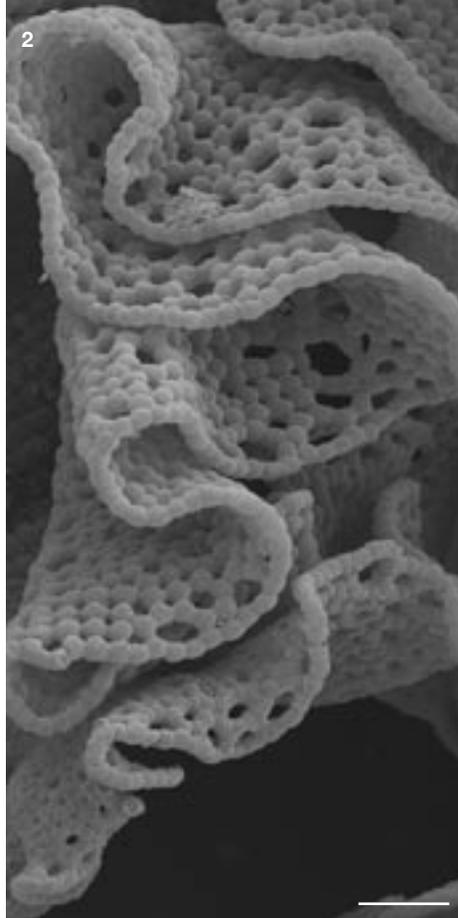




numerous flower farms that abstract vast quantities of water to irrigate literally millions of chrysanthemums and the like in mini-cities of shade-houses and polytunnels tucked away in quiet valleys. Continuing southwards for a few kilometres beyond the Falls along a steep valley side, the trail (no. 9) gives a pleasant introduction to the more lowland (ca 1,300 m) type of rainforest. Here, the richly diverse plant life includes tall broad-leaf trees, palms, wild bananas and bamboos, interspersed with tree ferns and other large ferns, and the trees are bedecked with rattans, lianas, enormous bird's-nest ferns, club-mosses, filmy ferns and a profusion of epiphytic orchids and bryophytes. Loamy banks by the trail supported a medium-sized fruiting *Polytrichum* reminiscent of *P. formosum*, and a much taller *Dawsonia* and the aptly named *Pogonatum macrophyllum* c. spor. Also, on soil was an eye-catching *Leucobryum* with very large individual shoots, but forming rather small and irregular cushions, that we saw repeatedly in the Highlands. Decorticated logs and rocks were colonised by several *Bazzania* spp. (a diverse genus in the Highlands), *Heteroscyphus*, *Kurzia* or *Lepidozia* spp., *Rhacopilum*, *Thuidium*, *Trichocolea* and a conspicuous *Dicranoloma*. Shaded tree roots near the Falls produced *Jubula hutchinsiae* (presumably subsp. *javanica* but lacking gemmae) and elsewhere in better light, the common and distinctive *Mnium*-like tropical moss *Pyrrhobryum spiniforme*. A fine epiphytic *Plagiochila* with ciliate teeth was noted on a sloping trunk together with numerous Lejeuneaceae, including a robust *Lepidolejeunea* with very large notched, ovate underleaves.

The highest paved road in Peninsular Malaysia leads to the summit of Gunung Brinchang (2,000 m), the second highest peak in the Highlands. Here we had agreed to meet up with Professor Jeff Duckett and Dr Silvia Pressel over a

- △ 1. *Marchantia* sp. with gametophores (Jeff Duckett).
- 2. Brinchang town viewed from the Sam Poh Buddhist temple (Jeff Bates).
- 3. Pendent Meteoriaceae (Jeff Bates).
- 4. *Sandethallus*, a close relative of *Pellia* (Jeff Duckett).
- 5. *Pleurozia gigantea* (Jeff Duckett).
- 6. Inside the cloud forest, Gunung Brinchang (Jeff Duckett).
- 7. *Dicranoloma*, one of the most conspicuous dicranaceous mosses throughout the Cameron Highlands. (Jeff Duckett).
- 8. A large species of *Leucobryum*, found on forest banks in many parts of the Cameron Highlands (Jeff Bates).



◁ 1. *Dendroceros cavernosus*.
 2. Scanning electron micrograph (SEM) of perforated thallus of *Dendroceros cavernosus*. Bar, 100 μ m. 3. SEM of the reduced (neotonous) gametophyte of *Ephemeroopsis tijbodensis* (Daltoniaceae). The long protonemal spines are orange in colour. Bar, 200 μ m. 4. *Herbertus* and other liverworts. All images Jeff Duckett

‘steamboat’ supper in a Bringchang restaurant the previous evening, having earlier failed to make contact with the IAB party. An exciting drive, firstly through tea plantations, eventually took us to the mountain-top radio station. The forest here contrasts sharply with that at lower levels. The soil is predominantly composed of peat and the trees are shorter and contorted through being repeatedly blown over and resprouting. Every surface, peat, bark, stone or leaves, is richly carpeted in dense bryophyte growths. Most conspicuous among these were the large and often purple- or orange-coloured leafy liverworts *Herbertus*, *Pleurozia*, *Mastigophora diclados*, *Chandonanthus hirtellus*, *Lepicolea*, *Lepidozia*, *Schistochila* and many *Bazzania* spp., including the hairnet-like wefts of *B. pectinata*. Peaty banks and tree bases also supported *Conoscyphus trapezioides*, *Cryptochila*, *Nowellia*, *Podomitrium*, *Psiloclada clandestina*, *Trichocolea*, the near-leafless shoots of *Zoopsis* and the simple thalloid *Sandeothallus*, looking like a giant *Moerckia*.

Mosses are much less frequent than liverworts in this habitat, but included *Dicranoloma* spp., *Sphagnum* and various pendent Meteoriaceae. Jeff and Silvia soon located epiphyllous *Dendroceros cavernosus* (a hornwort) and the neotonous (reduced to protonema) moss *Ephemeroopsis tijbodensis* which we were later also to find growing on screw-pine (*Pandanus*) leaves near the summit of Gunung Jasar. The attractively tiered but common moss *Campylopus umbellatus* was found in fruit on the disturbed banks of the road along with *Gottschelia schizopleura*, an attractive purplish-tinted leafy liverwort somewhat recalling our own *Adelanthus*. Many of these species had apparently been identified the previous day when the IAB party alighted here and slithered downhill towards Brinchang town. Later, we redeemed ourselves by climbing the mountain on foot, a monumental slog, but rewarded by frequent stops to bryologise and watch birds, and the brief sighting of a monkey at the very top!

Many of the cloud-forest bryophytes (e.g. *Schistochila*, *Mastigophora*, *Lepicolea*) turned out to be quite widespread in the montane forest of the Cameron Highlands. Only *Herbertus* did we fail to notice anywhere else but Gunung Brinchang and its lofty annexe Gunung Irau. Gunung Jasar (1,670 m) to the west of Tanah Rata, provided a wide range of montane forest bryophytes. These included some strikingly large pendulous mosses (probably *Spiridens*) in humid jungle not far from the town, and a fruiting *Pogonatum* with very reduced leafy shoots, consisting mainly of protonema, on hard earth by trail no. 11. Gunung Berumbun (1,812 m), to the east of Tanah Rata, has reasonably well-developed cloud-forest bryophytes towards its summit. Pendulous Meteoriaceae (e.g. *Aerobryidium*, *Meteorium*) are conspicuous in its

summit forest with various large *Plagiochila* and *Frullania* spp. An attractively ciliate-toothed *Schistochila* (possibly *sciurea*) was noted on a rotten log by trail no. 3 a little below the peak and was also seen elsewhere. Towards the end of our visit, we attempted the path (continuation of no. 1) that leads from Gunung Brinchang (via a curious suspension bridge-like entrance) towards the highest peak, Gunung Irau (2,090 m). Entirely within the cloud zone, one soon becomes accustomed to the extraordinary accumulations of bryophytes and humus in the canopy that in places black out the sky and must eventually pull boughs down. The path through this steep and chaotic 'elfin' forest is a veritable assault course. In places almost every step involves contortions to push through capsized trees, their roots tangle repeatedly with your boot laces



< 1. *Lepicolea* (Jeff Bates). 2. *Bazzania pectinata* (Jeff Duckett). 3. *Schistochila* (Jeff Bates). 4. Inside lower altitude montane forest, flanks of Gunung Jasar (path no. 11) (Jeff Bates).

and there are exposed sections on steep slopes. After persevering for some time we eventually abandoned the attempt when the hard-gained path fell away mockingly into the misty abyss for a second time and it became clear that even if we succeeded we would not have the strength to return the same day.

The lower forest nearer the main towns also contains many interesting bryophytes, but there is only space to mention one. It was pleasing to discover fine fruiting material of a *Callicostella* (probably *papillata*; a relative of *Cyclodictyon*), with obtuse, two-nerved leaves and setae with conspicuous 'bristles', growing on a rotten log by a stream (on trail no. 2) near Brinchang, as I had once collected something very similar in a Ugandan Forest. Visits to the lower valleys with their flower and vegetable farms produced yet other species.

Although the Cameron Highlands may lack the alpine kudos of Mount Kinabalu, it is clear that they support a spectacularly rich and luxuriant bryophyte flora with many species in common. Recording and taxonomic work on the bryophytes has already been undertaken by Malaysian and other Asian botanists, and a partial moss flora for the wider region exists in the late Alan Eddy's (1988, 1990, 1996) incomplete *A Handbook of Malesian Mosses*, but the area is also overdue for intensive investigation of the ecology and even physiology of its bryophyte flora. Visiting bryologists will discover that the region is a veritable paradise, but they should also recognize that the comparative ease of access to some of the richest areas presents its own threats. This article has drawn attention to the water pollution resulting from flower farming and other threats are arising from inappropriate hotel developments in the forest and some types of 'eco'-tourism.

My short visit has left me deeply impressed with the vast extent of the natural forest cover in Malaysia; however, I also left the country concerned by the scale of the oil palm plantations which are progressively displacing lowland forest (not to mention *Calymperes* and *Octoblepharetum*). Let us hope that a sensible accommodation can be found between the various competing needs of this rapidly developing nation. As we passed through customs at Heathrow, we may have lacked the 'I have climbed Mt Kinabalu' T-shirts being proudly sported by many of our younger fellow passengers; however, we were quietly satisfied with our many new acquaintances among the beautiful bryophytes, birds and other wildlife in the decidedly uplifting Highlands!

Jeff Bates

Department of Life Sciences, Imperial College London, Silwood Park Campus, Ascot, Berkshire SL5 7PY (e j.bates@imperial.ac.uk)

Acknowledgements

I am indebted to Jeff Duckett for help with the plant names and the photographs.

References

- Eddy, A. (1988). *A Handbook of Malesian Mosses. Volume 1. Sphagnales to Dicranales*. London: HMSO.
- Eddy, A. (1990). *A Handbook of Malesian Mosses. Volume 2. Leucobryaceae to Grimmiaceae and Buxbaumiaceae*. London: HMSO.
- Eddy, A. (1996). *A Handbook of Malesian Mosses. Volume 3. Splachnobryaceae to Leptostomataceae*. London: HMSO.
- Frahm, J.-P., Frey, W., Kürschner, H. & Menzel, M. (1996). *Mosses and Liverworts of Mount Kinabalu*. Kota Kinabalu, Sabah: Natural History Publications (Borneo) Sdn. Bhd.
- So, M.L. (1995). *Mosses and Liverworts of Hong Kong*. Hong Kong: Heavenly People Depot.
- Zhu, R.L. & So, M.L. (1996). *Mosses and Liverworts of Hong Kong. Volume 2*. Hong Kong: Heavenly People Depot.