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THE BMS EXPEDITION TO CUYABENO, ECUADOR: AN INTRODUCTION

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In 1989 the Council of the BMS responded favourably to a suggestion that, in view of the lack of mycological expertise in most official biological expeditions, the Society itself should organise an expedition to a tropical rainforest. It was to be a *scientific* expedition and a sub-committee of Council was set up consisting of Harry Evans, David Pegler, Thomas Laessøe, Jean Lodge, John Hedger and Roy Watling with Gordon Dickson as Chairman. After several meetings, correspondence and consideration of sites in several tropical countries Cuyabeno in Ecuador was decided upon as the venue. This was largely because John Hedger had visited it regularly and had contact with people who could act as local organisers, a factor which turned out to be of major importance. The headquarters was to be at the field station of the Catholic University of Quito which is situated beside a temporary lake, dotted with the crowns of the trees above the water, laden with Bromeliads and Orchids – a wonderful sight.

Whilst BMS Council agreed a sum for organisational expenses and a subsidy to three students, each individual was responsible for their own expenses. In the end thirty applications were approved of which half were from UK and others from countries including Switzerland, Germany, Belgium, Hong Kong and the United States. An Italian group was obliged to cancel due to withdrawal of funding. Arrangements in Ecuador were handled by a team led by John Hedger and consisted of Titti de Vries, Walter Penelosa, Mauricio Gavillanes and Ricardo Viteri. The party was divided into three groups, each to spend two weeks on site and to carry their own food supply. Members had to take the usual rainforest precautions of carrying compass, whistle and water, travel in pairs, and specify their destination.

Travel to the site consisted of a journey by military transport aircraft or hired bus to Lago Agrio, a three hour trip by coach and a down-river journey by two outboard powered dugouts.

Once there we had quite comfortable beds with mosquito-nets. A large open room was used as a dining room and another was set up as a laboratory where culture techniques and microscopic examinations could be made. Thanks to the skill of Ricardo we even had light for an hour or so most evenings. A drying rack had been built by Vittoriano which used bottled gas; it worked hard all the time. It had been agreed that all duplicate material should be deposited with the University and with the Department of Agriculture.

Our diet of rice was leavened by being mixed with an occasional tin of tuna or even by pirhana when Vittoriano or one of the members could catch one. We drank boiled water and surprisingly few people developed gastroenteritis.

Participants developed many projects ranging from ecological studies of wood and litter decomposer fungi, through culturing of aquatic Hypho-

mycetes and wood decomposers to surveys of palmicolous ascomycetes and entomoparasitic, xylariaceous, and phycomycetous fungi. The first group was led by John Hedger (expedition coordinator) and Gordon Dickson, the organizer for the expedition. The second group was led by Harry Evans, assisted at the beginning by John Hedger, and the third by Jean Lodge and later by John Hedger. All three groups were aided in many ways by the indigenous Siona and Secoya and two Ecuadorian graduate students, Ricardo Viteri and Pablo Yepez.

Our plans to stay at the PUCE field station (research station of Pontifica Universidad Catolica del Ecuador, expanded with money donated by Xenova and Sandoz for the BMS expedition) literally went up in smoke when the station burned to the ground three weeks before the first group was due to arrive. We were kindly accomodated by Cecilia DeVries at the Neotropic Turis Lodge, located across the lake from the field station. Each morning, we travelled to the opposite side of the lake by motorised dugout canoe, and returned to the 'laboratory' at midday or in the afternoon. This occupied a large, open, palm thatched building (see Figs 4 & 5 on page 153) and was supplied with two isolation chambers for culture work. Electricity for microscopes was supplied for several hours each day by a gas powered generator and car batteries.

Ecology and Management of the Reserve

The Cuyabeno Faunistic Reserve (Reserva de Produccion Faunistica Cuyabeno) is on the equator near the border with Colombia (00° 00'N, 76° 10'W), and is about 254,000 hectares in extent. It is under the jurisdiction of the indigenous people, the Siona-Secoya and is managed by the Ministry of Agriculture Department of Conservation and Natural Resources. The elevation at Cuyabeno is about 250 m.

The region has a mean annual rainfall of 3300 mm with some seasonality; April–November tend to be the wettest months and December–January the driest. The mean annual temperature for the region is 24 °C with a seasonal range of 20 to 32 °C leading to high evapotranspiration rates. Using the Holdridge classification, the region is on the border between the Tropical and the Subtropical Moist and Wet life zones (Holdridge et al., 1971) with a cover of evergreen tropical lowland forest.

The forest has three distinctive subtypes in the area, determined by the periods of waterlogging. Rio Cuyabeno, with its headwaters in the Andes, is the main river that flows through the area and drains into Rio Agua Rico; it joins Rio Napo at the Peruvian boundary and eventually flows into the Amazon River. Within the Cuyabeno Reserve, Rio Cuyabeno forms a series of 14 shallow lakes caused by slow drainage in the river system leading to the water being backed up in these lakes. The biggest of these, Lagunda Grande (about 1 km wide), is where the PUCE station and the Neotropic Turis Lodge are located. The lake level fluctuates by up to 4 m, depending on the rainfall in the Andes, often being dry in the low rainfall season, but can get flooded to 1 m depth in 24–48 hours.

Igapo Forest. The dominant plant of the seasonally flooded Igapo forest is an ectomycorrhizal tree in the Leguminosae (Mimosoideae), *Macrolobium acacifolium* (Bentham) Bentham. Some of the trees grow well out into the lake, standing in 3–4 metres of water. Such trees probably establish during dry years, but must grow sufficiently during their first year so as to reach the photic zone of the lake (the upper half metre, because of high tannic acid levels) before the next rainy season. Smaller trees, such as *Genepa* sp. (Rubiaceae) which form the understorey at the lake margins, are also completely submerged when the water levels are high. In a very unusual event, the lakes failed to drain during the dry season preceding our expedition. It was therefore unbelievable that one was canoeing over the tops of saplings which seemed completely healthy in their aquatic environment.

Camangucho Forest. Camangucho forests are almost permanently flooded palm swamps occurring along depressions and stream valleys. The most characteristic tree of the camangucho forest is a huge fan palm, *Mauritia flexuosa* L.f. These swamps became infamous during the expedition for their boot-sucking mud.

Tierra firme. The best developed and diverse forests occur on low ridge slopes and crests that are never flooded, known as tierra firme (i.e., firm ground). In 1994, Valencia *et al.* reported as many as 473 tree species greater than 10 cm diameter at breast height in a one hectare plot of tierra firme forest at Cuyabeno, making it the most diverse lowland tropical forest so far measured. Valencia

et al. had permanently numbered the trees in their study plot, facilitating our identification of host plants based on their list. The forest canopy is stratified, with a scattering of very large emergents above a canopy of lower trees, a series of ill-defined understoreys, and a shrub/sapling/palm/fern ground-layer. The emergent canopy trees include species of figs (*Ficus* spp.), laurels (*Ocotea* spp.) and members of the Sapotaceae (e.g., *Pouteria* spp.).

Fungi at Cuyabeno

John Hedger and Habiba Gitay conducted two ecological surveys of fungi in Cuyabeno in 1988 and 1991. Their (unpublished) results indicated that disruption of the canopy, and rainfall during the two days preceding each survey, strongly affected the abundance of fruiting bodies of agaric litter decomposers, which are numerically dominated by small species such as *Mycena* spp. in Sect. *Sacchariferae*. The previous data of Hedger and Gitay were useful in analysing agaric litter fungal diversity at Cuyabeno (Lodge & Cantrell, this issue). Maria Nuñez (in press) found that some of the aphyllophoraceous fungi growing on small woody litter suspended above the forest floor were likewise ephemeral with the rains, while other species formed structures that protected them from desiccation. Hedger and Gitay (unpub.) had previously suggested that wood colonised by xylariaceous fungi and discomycetes was drier than uncolonized wood, perhaps from fungal activity. The results of Schoeman's study (during this expedition), however, did not indicate a strong difference in moisture between wood with and without ascomycetes overall, although wood colonised by certain species of *Xylaria* might be significantly drier. Hedger and Gitay had found a high degree of resource partitioning among decomposer fungi at Cuyabeno, such that different fungal species assemblages occurred on substrates of different sizes and types; they also found different assemblages on the same substrates depending on whether they were suspended above ground or lying on the forest floor. Analogously, Richardson, Möller and Dreyfuss based on observations made (during the expedition), found significant differences among assemblages of fungi isolated from aquatic habitats depending on where they collected their samples.

The uplifting of the Andes is thought to have led to many speciation events among plants, animals, and possibly fungi. In addition, the Amazonian basin may have retained many ancestral species, thus contributing to the high diversity of the mycota. Indeed, many of the agarics (e.g., Lodge, this issue) and some of the xylariaceous fungi (T. Laessøe, pers. obs.) were undescribed species. The abundance of entomopathic fungi on arthropods at Cuyabeno was previously noted by Hedger and Gitay, and proved to be a source of interesting and potentially useful biocontrol species for Carol Ellison and Harry Evans. A list of 1639 fungi collected during the BMS expedition was compiled by Gordon Dickson and is available on request. Duplicate material from the expedition is being deposited at the Catholic University in Quito (PUCE) and with the Ministry of Agriculture.

List of participants (from UK except where indicated):

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* Participants at the Tropical Rainforest Symposium held at Kew, 18 November 1994.

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