

Evaluating Biodiversity: The Batu Apoi Experience

Batu Apoi, a dipterocarp forest in Brunei Darussalam is being developed into the country's first National Park. Universiti Brunei Darussalam-Royal Geographical Society ran a rainforest expedition at the site in order to document the great biological diversity of the reserve, beginning in 1991. This 14-month project and subsequent research have resulted in the collection of many species of plants and animals, indicating that Batu Apoi is richer in species than might be expected from its size. New species of virtually every group of plants and animals have been identified. Many of the plant and animal species are used by the Iban tribesmen, who, thanks to an enactment that prohibits guns in Brunei, hunt employing traditional methods such as traps, snares and spears. A variety of plants are purported to possess pharmaceutical properties, according to local beliefs, many of which do not have botanical names. With revenue generated from overseas investments, besides oil and gas production at home, Brunei Darussalam is in an enviable position in being perhaps one of few countries that has relatively large areas under rainforest cover, but does not need to exploit its forest for timber export. However, immense opportunities that remain in studying and eventually utilizing these forest resources sustainably will be a challenge for the country in the years to come.

INTRODUCTION

Tragically, countries with tropical rainforests and high species diversity do not usually have the means to inventory and eventually utilize these resources sustainably. Thus, species continue to be lost as nations bicker over translating words into action or over technicalities concerning biodiversity conservation and who should pay for it.

The tiny Sultanate of Brunei Darussalam (Box 1), perched on the northwest coast of the continental island of Borneo (Fig. 1) is an exception. Only 5765 km² in area, oil-rich Brunei has a forest cover of over 80%, nearly 60% being undisturbed rainforest. And although not yet a signatory to the Biodiversity Convention, UNCED, 1992, Brunei has one of the finest field studies centers for studying rainforest ecology and biodiversity.

The diversity and, compared to the adjacent Malaysian states of Sarawak and Sabah or the Indonesian part of Borneo (Kalimantan), relative abundance of large animals and pristine forests are due to several factors. Though small in land area, Brunei shows a great variation in topography and geology, and supports many different ecosystems, from lowland dipterocarp forests, to montane forests, freshwater and peat swamps, *kerangas* (Bornean heath forests) and mangroves (Table 1). The small population is largely urban, with a standard of living which is highest in the region. The people, being predominantly Muslims, refrain from eating many forest animals, such as pigs, monkeys, turtles and frogs. In addition, most of the forests in

the country are relatively untouched, Brunei being one of few countries in southeast Asia that does not export timber.

THE BATU APOI RESERVE FOREST

Planning for a field station, named the Kuala Belalong Field Studies Centre (1), that would permit studies on rainforest ecology, were started in 1988 by personnel of the Royal Geographical Society (RGS), London and Universiti Brunei Darussalam (UBD), notably expedition leader, The Earl of Cranbrook of the RGS and UBD's David Edwards. The site eventually selected is above the *kuala* (mouth) of the Belalong river, in the southern half of Temburong District. The total area of the expedition site is approximately 5000 ha, and is composed primarily of lowland dipterocarp forest, a category of forest especially vulnerable due to its accessibility to logging roads and human habitation. Mountain forests are found around the summit ridge of Bukit Belalong (alt. 913 m). The landscape of southern Temburong District is rugged, rising from about 50 m a.s.l. at the north of the reserve, to the highest point, Gunung Pagon (alt. = 3000 m) in the south. From the last 9 km from the road-head at Kampong (village, in Malay) Batang Duri, the Centre is accessible only by longboats powered by outboard engines that are operated by Iban men and women over a total of 25 rapids. The journey takes from half an hour (during the rains, when the river level is high) to about three hours (during the dry period). During heavy rains, the fierce rapids are virtually unnavigable, effectively cutting the Centre off from the rest of the world, except through two-way radio communication. One scientist remarked that Batu Apoi is one of the world's toughest rainforests to conduct fieldwork in, mainly due to its very steep terrain and inaccessibility.

The annual rainfall is estimated to be 2500–4000 mm; individual rain events ranging from 0.1–181.5 mm. Most showers take place from the late afternoon to the early evening. Rainfall is spread throughout the year, although distinct wetter spells are noticeable between October and December; and April to August.

BIODIVERSITY: THE SPICE OF LIFE

The earliest ecological work in the Batu Apoi region was conducted by Ashton some 35 years ago (2). Ashton's botanical research on the mighty dipterocarp forests of the West Ridge of Batu Apoi and other sites in Brunei resulted in publications that remain essential reading for botanists in the region.

From January 1991, RGS and UBD ran a 14-month rainforest expedition that attracted about 75 scientists and graduate students. Fieldwork conducted at the Kuala Belalong Field Studies Centre produced an enormous body of data, which have been computerized into a GIS database (3). The Centre is now open to visiting scientists and graduate students for approved research projects into rainforest ecology and is used by the staff and students of UBD for teaching, training and research.

The central theme of research during the UBD/RGS project, and subsequently, has been biodiversity and its application; al-