IX. BENTUANG KARIMUN NATIONAL PARK: INTEGRATED CONSERVATION AND DEVELOPMENT IN INDONESIA

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SUMMARY

The International Tropical Timber Organization (ITTO) has funded a project for the Bentuang Karimun National Park (BKNP) of the Department of Forestry of Indonesia [Project Bentuang Karimun PD 26/93 Rev. 1 (F)]. It started on November 1995 and is implemented by WWF Indonesia. The main objective is to develop a model of natural forest management through a National Park system that not only will serve conservation of species and ecosystems, but will also accommodate other purposes such as the socio-economic development of local and regional communities. This will include:

1) the development of the BKNP as a National Park by conserving the biodiversity values of the area and that of research, educational, recreation and tourism potential of the area;
2) to initiate regional development and promote economic, scientific, educational, cultural, and touristic cooperation between Indonesia and Malaysia, particularly between West Kalimantan and Sarawak.

The BKNP is the largest conservation area in West Kalimantan. The status of this reserve is that of a National Park. It was established on 5 September 1995 by the Minister of Forestry through the Ministerial Decree No.467/Kpts–II/1995. Administratively it belongs to the Upper Kapuas River District. The area lies between approximately 112° 15'–114° 10' E and 0° 40'–1° 35' N and covers an area of c. 8,000 sq.km, c. 1/5 the size of Brunei. The average annual rainfall is between 4,400–4,620 mm and the number of rain days is between 173–198 days per year. The dry season is between June and September, although even then rainfall is still above 100 mm per month. According to Schmidt & Ferguson (1951) it can be classified as a type A area. The topography ranges from hilly to mountainous with an elevation between 200 and 1,960 m altitude and has a very interesting geological history.

Based on field surveys that have been conducted between May 1996 and January 1997, the BKNP has a very high number of ecosystem types. The condition of the vegetation was good with relatively little disturbance. An area that is slightly disturbed is part of the Embaloh watershed where the PARAKU opened the land for their slash and burn agriculture in the 1970s. This now consists of secondary forests in various stages of succession. The other 'disturbed' areas are the two villages, Nanga Bungan and Tanjung Lokang, where land near the river is used for agriculture. These activities are not endangering the biological diversity of the BKNP because the disturbances are moderate.

The biological diversity of the BKNP is high and many species appear to be undescribed. This species diversity is clearly due to the many ecosystem types present. The first step to find the different types of ecosystems was through the interpretation of aerial photos. These showed the presence of lowland Dipterocarp forest, wet-hill forest, montane forest, and moss forest with patches of limestone outcrops in the south-eastern region. Within the Mount Condong complex (1,244 m) there are some swamp forests and this type of forest ecosystem possibly is present in other areas as well. The Dipte-

rocarp forest has a very high species diversity. Genera commonly found are e.g. *Dipterocarpus, Dryobalanops, Hopea, Parashorea, Shorea*, and *Vatica*. Within 23 plots of 10 x 50 m each at least 551 woody plant species were recorded belonging to 175 genera of 68 families. 50 species are endemic to Borneo, e.g. *Amyxa pluricormis*, representing a monotypic endemic genus and a relative of 'kayu gaharu' ('aloe wood': *Aquilaria, Thymelaeaceae*). New records are also *Castanopsis inermis, Chisocheton cauliflorus, Eugenia spicata, Lithocarpus philippinensis, Neouvaria acuminatissima* and *Shorea peltata*. There is no doubt that more new records may be expected from the BKNP.

The high floristic diversity of the BKNP is for instance shown by the trees. There are 280 species and *Shorea* alone has at least 30. The river banks are occupied by especially *Dipterocarpus oblongifolius, Pinanga sp., Saraca declinata*, and *Schefflera sp.*, with a *Myrmeconauclea* growing under the canopy of those trees together with other interesting species as 'soka' (*Ixora sp.*), the parasite *Rafflesia sp.*, the pitcher plants of the genus *Nepenthes*, and species of *Saurauia*. In the herb layer *Begonia* has a high species diversity. *Rhododendrons* with their wide colour variation from white to yellow to orange flowers grow either terrestrial or epiphytic.

The diversity of fauna in the area is also very high. The Zoological nomenclature is according to MacKinnon et al. (1996). Of the primates there are 7 species: Bornean gibbon, 'kelampiau/kawot' (*Hylobates muelleri*), long-tailed macaque, 'kera' (*Macaca fascicularis*), pig-tailed macaque, 'beruk' (*Macaca nemestrina*), orangutan, 'mayas' (*Pongo p. pygmaeus*), white-fronted langur, 'kepuh/hout' (*Presbytis frontata*), maroon langur, 'kelasi/mopuan' (*Presbytis rubicunda*), and tarsier (*Tarsius bancanus*). The distribution of the orangutan is of interest because it is concentrated in the west part of the park, particularly in the Embaloh watershed (Tekelang). The area of Mount Betung (1,152 m) and Mount Condong (1,244 m) has a high population density and the animals are easily seen. This area is the one that borders on the Lanjak Entimau Wildlife Sanctuary in Sarawak, Malaysia. Therefore the trans-frontier reserve 'Lanjak Entimau-Bentuang Karimun Biodiversity Conservation Area' is extremely opportunate, particularly for orangutan conservation.

The species diversity of other mammals in the BKNP is also interesting. There are at least 48 species, e.g. sambar deer (*Cervus unicolor*), leopard cat (*Felis bengalensis*), 2 species of muntjak (*Muntiacus muntjak* and *M. atherodes*), clouded leopard (*Neofelis nebulosa*), mousedeer (*Tragulus napu*), and sunbear (*Helarctos malayanus*). In addition, an otter (*Lutra sumatrana*) has been found in the Mendalan watershed. This species is considered as endangered by the IUCN. Even though it has been reported that Sumatran rhinoceros (*Dicerorhinus sumatrensis*) would still occur here, none were observed during recent field surveys. Small mammals include 17 species of rodents (Rodentia) and 19 bats (Chiroptera). Of the latter the beetle-eating naked bat (*Cheiromeles torquatus*) is of note, which has become extinct in Java.

Observation of birds yielded 234 species from lowland forest habitats. The following nomenclature is according to Smythies (1981). It is expected that the number of bird in the BKNP could rise to up to 300 when the mountains and plateaux have been surveyed. Among the number so far observed, there are 6 new records for Indonesia: the Kinabalu spiderhunter, *Arachnothera affinis everetti*, Whitehead's spiderhunter, *A. juliae*, white-

browed shama, *Copsychus malabaricus stricklandi*, Whitehead's trogon, *Harpactes whiteheadi*, golden naped barbet, *Megalaima pulcherrima*, and the brown-chested jungle flycather, *Rhinomyias brunneata.*

54 bird species protected under Indonesian Wildlife laws have been found in the BKNP e.g. the State Bird of West Kalimantan Province, the helmeted hornbill, 'rangkong gading' (*Rhinoplax vigil*) and the crested wood partridge, 'engayan' (*Rollolus rouloul*) also listed in 'Red Data Book of IUCN'. During the surveys, at least 17 species endemic to Borneo, 2 endemic to the Sunda Islands, 3 species shared by Sumatra and Borneo, and 9 species with a limited distribution have been identified

There were also many Amphibians and Reptiles in small populations. Exceptions are the common and are locally consumed*Limnonectes ibanorum* and *L. leporinus*. At least 44 different amphibians, 19 geckos, 3 tortoises, and 18 snakes have been collected during this first field survey. An interesting collection was a frog that is one of the smallest in the world, *Leptobrachella mjoerbergi*. An adult is only 1 cm long. *Leptolalax hamidi* is a new species to be described by the Japanese expert M. Matsui. Several tree frogs might be new species, as well as a species of *Sphenomorphus* (*Sauria, Scincidae*), and a *Calamaria* (*Serpentes, Colubridae*). One collection from Mount Lawit of *Stoliczkaia borneensis* is the third specimen ever collected. In addition, it has been reported that there are 2 crocodiles, the freshwater crocodile, *Crocodilus raninus* (formerly included in *C. porosus*), and the false gavial, *Tomistoma schlegeli*, in the middle part of the Sibau River, the Bengkal Jabun, which, unfortunately, is outside the borders of the BKNP.

The National Park also has a high diversity of fishes. In the Sibau watershed there are 81 taxa of 34 genera and 16 families. In the Embaloh watershed at least 76 species were caught. Three are endemic to Kalimantan, *Garra borneensis*, the sucker fish *Gastromizon fasciatus*, and 'ikan tupai', *Gyrinocheilus pustulosus*. At least 25 species have a potential to be developed as ornamentals or for consumption. Possible ornamentals are, e.g., *Acanthopsis dialuzona* ('ikan pasir'), *Botia macrantha* ('ulanguli'), *B. hymenophysa* ('pasik'), the carps *Puntius binotatus* ('ikan umpan'), *P. everetti*, *P. tetrazona* ('berbaju'), and *Rasbora dusuniensis*. The 'pasik' (*Botia hymenophysa*), 'ulanguli' (*Botia macrocantha*), and 'berbaju' (*Puntius tetrazona*) are an export commodity. There are many fishes that have an economic potential as source of food, e.g. 'semah' (*Tor douronensis*, 'kulir'; *T. soro, T. tambra*, and *T. tambroides*), gurami, 'kaloi' (*Osphronemus septemfasciatus*), 'kebali' (*Osteochilus hasselti*), and 'tengadak' (*Puntius collingwoodi*). There are at least two new species of *Crossochilus* and *Schimatorhynchus*, each. *Osteochilus pleurotenia* is a new record for the Museum Zoologicum Bogoriense (MZB).

Among the insects the King Brook butterfly (*Trogonoptera brookiana*) is a beautifully colourful species. A special study was made of the Chrysomelidae (Coleoptera). Among the 170 species collected, there are many interesting things, new for Borneo appear to be *Apththonoides, Clavicornaltica, Gastrolinoides, Lipromorpha, Micrantipha, Niasia*, and *Pachenephorus*. At present two new genera have been detected, a Dermestidae and a Dryopidae and undescribed species in *Bruneixellus, Ischalia*, and *Psephenoides*. No doubt, many more are present. There were 25 species of ants of *Hagiomyrma, Myrma, Myrmhopla*, and *Polyrhachis*. For comparison, in the Lambir National Park, Sarawak, during a 2-year survey 17 species of ants were detected. This small sample proves that the BKNP has a wealth of biodiversity.

The BKNP also has an unique assembly of cultures. Autochthonous inhabitants belong to a variety of Dayak peoples: Bukat Mendalam, Bukat Metelunai, Dayak Iban, Kantu', Kayan Mendalam, Punan Hovongan, Tamambaloh, and Taman Sibau. The nearest villages to the BKNP are Desa Toba (Kelayam+Madang+Sadap) with 518 inhabitants, Desa Pulau Manak (Belimbis+Pinjawan) with 535, Desa Sibau Hulu (Tanjung Lasa+Tanjung Pandan/Nanga Potan) with 367, and Desa Bungan Jaya (Belatung +Nanga Bungan+Nanga Lapung+Tanjung Lokang) with 796. Within the BKNP itself there are only 381 persons, and in the near vicinity 1,935. This number is considered to be under the threat limit to the BKNP. On the contrary, this small amount of people may turn out to be a constraint on the development of the Park. For instance, there might well be an insufficient number of experienced field guides to develop the Park into a healthy ecotourist area when at the same time capable craftsmen to make qualitative handicrafts for souvenirs will be much in demand.

These different groups generally live by hunting, gathering and swidden farming for their subsistence. However, some commercial extraction of forest products also takes place. The gathering of aloe wood, 'gaharu' (*Aquilaria malaccensis, A. beccariana*) is becoming more intensive and may disturb its sustainability. A point of worry is that during the botanical surveys of the Bungan, Sibau, and Embaloh watershed, only a single living specimens of 'gaharu' was found. The main cause for extinction is the method of collecting by total uprooting. This observation does not mean that 'gaharu' is becoming completely extinct as these surveys were not a total census. However, 'gaharu' rehabilitation is an obvious requirement, particularly within the Sibau and Embaloh watersheds. These areas will be proposed for rehabilitation zones. Illegal gold mining is present within the BKNP particularly along the upper Kapuas River both in the Kapuas Koheng and Bungan watersheds. Although this gold mining does not cover a large area, it has a significant negative impact on river water downstream. This open mining system will accelerate the speed and intensity of soil erosion already causing a decreasing fish population of e.g. 'semah' (*Tor spp.*). This situation is unfortunate and is worsened by the fact that these illegal 'gaharu' collectors and gold miners are mostly outsiders. Legally, the outsiders should buy minor forest products and minerals from local inhabitants as only these have the privilege harvest and mine these products from their natural habitats, but the actual fact is different.

It is important to know exactly how the locals use, collect, and harvest the non-wood forest products from the surrounding forests and to estimate the impact of their activities. To collect this information, we work together with the Pancur Kasih Foundation, a NGO with experience in participation mapping. In cooperation with the local communities, maps of natural resources can be prepared showing distributions and data on regeneration. Two villages, Nanga Bungan and Tanjung Lokang, already have been mapped and the information obtained will be used to design zoning systems for the Park. Three types of zones are envisaged: a core zone, a used zone, and other zones in the National Park system.

It is important that in this demarcation research areas are included to maintain a check on development and to provide the opportunities for a continuing study of the ecology, succession, dynamics, and biodiversity of tropical ecosystems. Several parts of the BKNP are appropriate for permanent stations. At least three sites seem suitable: the

Tekelan site of the Embaloh watershed, the Menyakan site of the Sibau watershed, and the Bungan site of the Kapuas Koheng watershed. Each area has its own specificity.

The first station, Tekelan, is geologically within the Embaloh formation (KTe) with ecosystems ranging from lowland Dipterocarp forest to sub-montane forest at Mount Condong and Mount Betung with human activity history. This consisted of forest clearance for slash and burn agriculture by the PARAKU in the 1970s. Since then these activities have ceased. The resulting existence of secondary forests with different succession stages is an ideal place for studying forest succession and its interaction with humans. In addition, as said, the site has a high population of orangutan whereby it is also excellent to study their behaviour.

The second station, Menyakan, is intended for the study of undisturbed tropical rain forest dynamics. The ecosystems range from lowland Dipterocarp forest ecosystem to moss forest at Mount Lawit (1,767 m). Geologically it also is within the Embaloh formation (KTe) which covers about 85% of the BKNP geological history.

The third station, Bungan, has different geological histories compared to the previous two. It is geologically within more complex groups composed of Nyaan volcanic rock (Ten), the Kapuas complex (JKlk), Lapung volcanic rocks (Tml), and Sintang Intrusion rock (Toms). The diversity of its ecosystems ranges from lowland dipterocarp to moss forest and limestone forest on Mount Kerihun (1,960 m).

The BKNP has beautiful panoramic views with great appeal to nature lovers. Along the Tekelan River there is a beautiful segment that could be developed into an ecotourism area. The Nanga Menyakan area is an ideal place for the location of a permanent research station that can also function as a 'post guard' to secure the 'Sibau track'. The Sibau River is the easiest gate of access to the BKNP area. It is also the traditional way travelers from Putussibau to Sarawak (Bintulu River), as well as a short cut to the Embaloh River in the West and the Mendalam River in the East. Beside this use in transportation, segments of the Sibau River, Kanyau River, and Nanga Jenait are great possibilities in the development of ecotourism routes. From Putussibau to Sarawak it only takes two days, one day of boating and one day of walking.

The panoramic views along this route are beautiful and vast and dangerous rapids are absent, therefore it is ideal for tourists with limited time and low field experience. On the other hand tourists with ample time and a high sense of adventure can use a route along the Upper Kapuas River into East Kalimantan. In this route three impressive rapids in the Bungan River have to be navigated and the trail leads through the mists of the tropical rain forest of the Müller Range, down to Long Apari on the Upper Mahakam River, East Kalimantan.

Historically, this route was used for the first trans-Bornean expedition lead by the Dutch explorer and botanist Anton W. Nieuwenhuis, attended by his wife, Ms. M.J.T. Nieuwenhuis-Uexküll Güldenband in 1894.

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