Innovative conservation initiatives: Bai Tu Long Bay, Viet Nam

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Abstract. *Viet Nam contains a wealth of biodiversity and is ranked as the 16th most biologically diverse country in the world. The nation's biological resources are currently under threat due to impacts from human populations and a lack of sustainable management. Bai Tu Long Bay is comprised of a variety of habitats and due to its geographical location it plays host to relatively high levels of biodiversity and species endemism. The ecological significance of Bai Tu Long Bay is that it encompasses many of the habitat types that are being lost or degraded within Viet Nam. It contains the northernmost areas of continuous mangrove forest in the country, almost all of which are little disturbed, vital nurseries for fish. As is so often the case, the nature of the threats to biodiversity and the mitigating actions required mean that conservation and sustainable resource use in Bai Tu Long Bay will be best achieved through community participation. That being the case, it was important that a framework for awareness-raising and joint commune-National Park Authority initiatives was set up at the National Park's inception. This is now in place as an outcome of the project.*

BACKGROUND

Bai Tu Long Bay lies within the province of Quang Ninh in northern Viet Nam (20°15.11"-21°30.10"N, 107°46.20"E). It occupies an area to the north of well-known Ha Long Bay and has flooded limestone karst formations of incomparable beauty (Figure 1).

The thousands of emerging rock pinnacles, part of the South China Sea (one of the wonders of the world), were formed when a rise in sea level inundated a limestone landscape already shattered through erosion by rain water and underground streams. Bai Tu Long Bay has large sand and mangrove-fringed islands with lowland tropical forest cover (Figure 2).

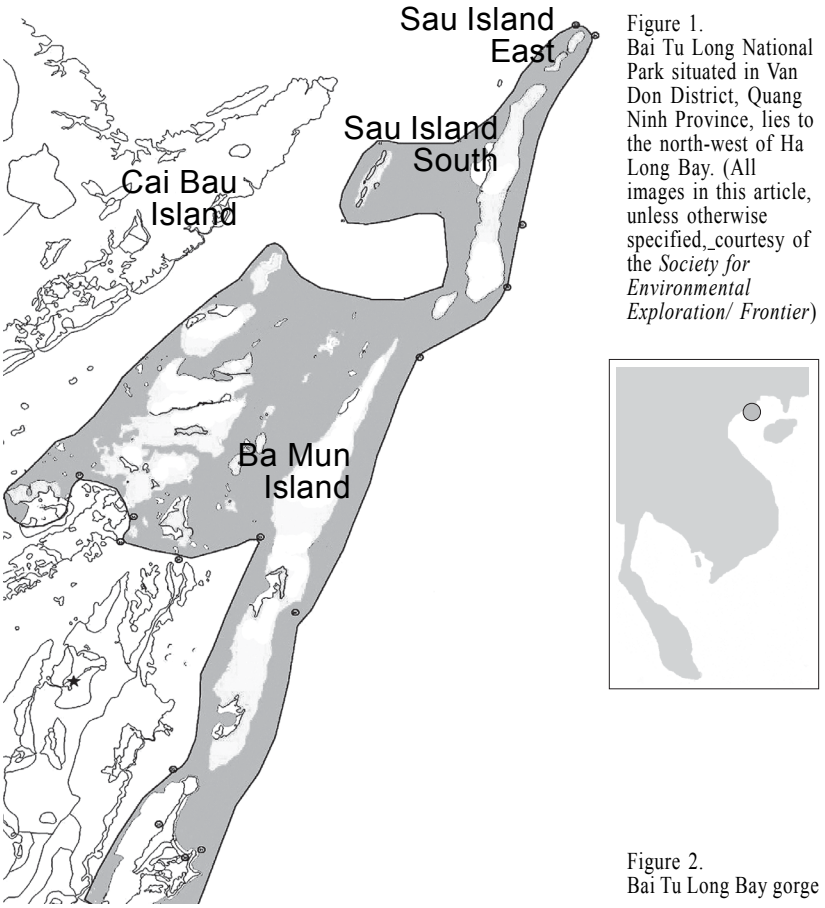


Figure 1.
Bai Tu Long National Park situated in Van Don District, Quang Ninh Province, lies to the north-west of Ha Long Bay. (All images in this article, unless otherwise specified, courtesy of the *Society for Environmental Exploration/ Frontier*)

Figure 2.
Bai Tu Long Bay gorge

The National Park, situated in Quang Ninh province, was established by ratification of the Deputy President on June 1st, 2001. It covers an area of 15,783 ha, incorporates Ba Mun nature reserve and consists of 6 large and 24 small islands, which account for 6,125 ha (terrestrial). The remaining 9,658 ha, comprised of marine and inter-tidal zones, has the status of a Marine Protected Area (MPA). In early April 2002, the National Park was declared open with the establishment of offices on Van Don Island, Van Don District, and Quang Ninh province.

A National Park Authority for Bai Tu Long was established in April, 2002 with a mandate to conserve Bai Tu Long Bay and ensure benefits for the local communities. The inclusion of Bai Tu Long within the protected areas network resulted in a total of 93 special-use forests in Viet Nam, including 12 National Parks, 55 Nature Reserves and 27 Cultural & Historical sites. The total protected area is 985,280 ha or roughly 3% of the national land area (Birdlife International 2001).

BIODIVERSITY TRENDS IN VIET NAM

Viet Nam contains a wealth of biodiversity and is ranked as the 16th most biologically diverse country in the world (WCMC 1992). The nation's biological resources are currently under threat due to impacts from human populations and lack of sustainable management. Tropical forests that once dominated Viet Nam's natural vegetation have undergone a rapid decline in the 20th century. In 1943 approximately 44% of Viet Nam was forested. But presently good quality natural forests cover only 10% of the land area and of this, only 1% could be described as pristine (Collins *et al.* 1991).

There has been a rapid acceleration of habitat destruction and degradation in coastal areas. In the early 20th century Viet Nam was estimated to have approximately 409,000 ha of mangrove. Subsequently the Mekong Delta alone has lost 150,000 ha, much of this in the past two decades, as economic conditions have been created that favour a massive expansion of intensive prawn fisheries (Quarto 2002).

GEOLOGY AND HABITAT DIVERSITY

Bai Tu Long Bay is comprised of a variety of habitats and due to its geographical location it plays host to relatively high levels of biodiversity and endemism. The area has been categorized within the WWF Global 2000 system under the *South China-Viet Nam Subtropical Evergreen Forest Ecoregion* (WWF 2000). The important significance of Bai Tu Long Bay is that it encompasses many of the habitat types that are being lost or degraded within Viet Nam. It contains the northern most areas of continuous mangrove forest in the country, almost all of which are little disturbed, vital nurseries for fish.

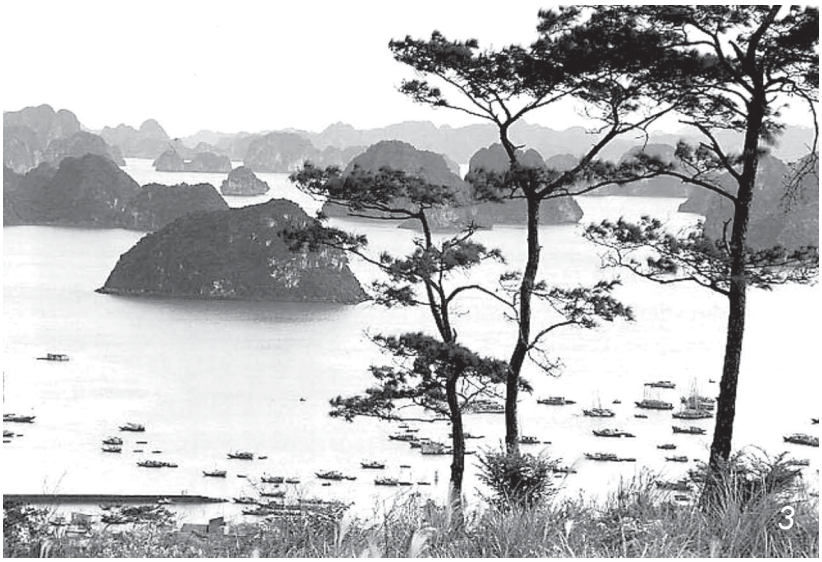
The limestone karst landscape, apart from being of great intrinsic value, provides sheltered bays in which inter-tidal mudflats develop (see Figure 3). Also, subterranean watercourses form caves that house bats and generate microclimates exploited by rare plant communities. Tunnels also link tidal waters to dramatic lagoons, encircled by sheer cliffs within the limestone islands. The inaccessibility of these lagoons means that little is known about these habitats, but such potentially unique environmental conditions may again generate localized and perhaps highly endemic communities.

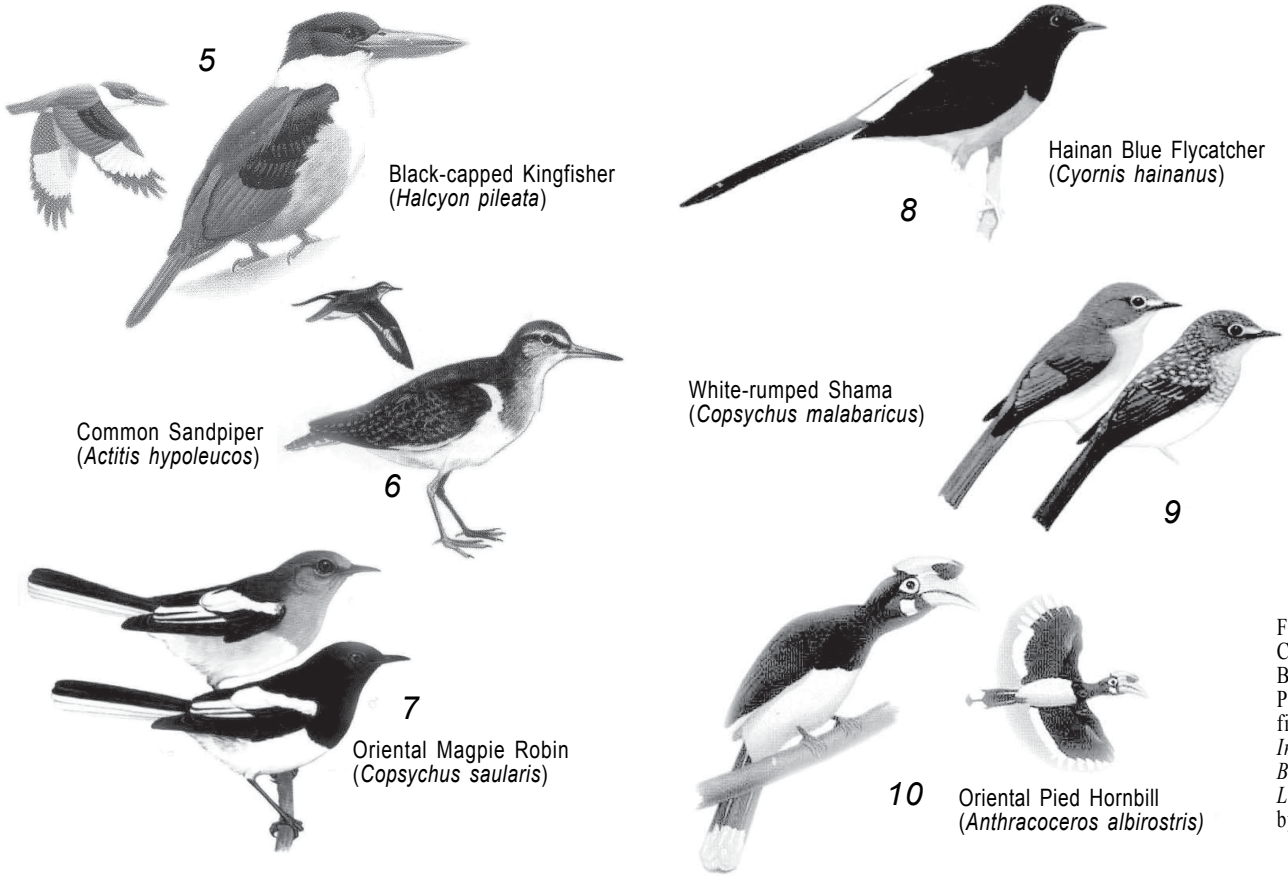
Geology, microclimates, and heavily monsoon-influenced seasonality have given rise to subtle varieties of forest with a mixed dominance of tropical and subtropical species. The natural climax vegetation is described as 'lowland tropical evergreen forest on limestone' and 'low montane broad-leaved evergreen forest' (Thai Van Trung 1978), equating it to 'forest on limestone' and 'sub-montane dry evergreen forest' (Mackinnon and Mackinnon 1986). Traditionally dominant species within these forests include valuable timber tree such as *Hopea chinensis, Erythrophloem fordii, Madhuca subquincuncialis, Vatica odorata* and *Aglaia gigantea.*

In 2002, Frontier-Vietnam conducted biodiversity surveys with the aim of describing the dominant forest types

Figure 3. The National Park covers an area of 15,783 ha, incorporates Ba Mun nature reserve and consists of 6 large and 24 small islands, which account for 6,125 ha (terrestrial). The remaining 9,658 ha (marine) has the status of a Marine Protected Area (MPA).

Figure 4. View of a misty Bai Tu Long Bay showing the limestone karst islands and sheltered bays.





Figures 5-10. Common birds in Bai Tu Long National Park (Images from the field guide *An Introduction to the Birdlife of Bai Tu Long National Park* by Frontier-Vietnam)

occurring within Bai Tu Long Bay National Park and identifying threatened assemblages and species occurring within the study area (Frontier-Vietnam 2004b). A previous plant species inventory for Ba Mun island recorded 494 plant species (Vu Van Can 2000). The vegetation survey plots established by Frontier-Vietnam provide a basis for future monitoring of ecosystem exploitation, regeneration and development.

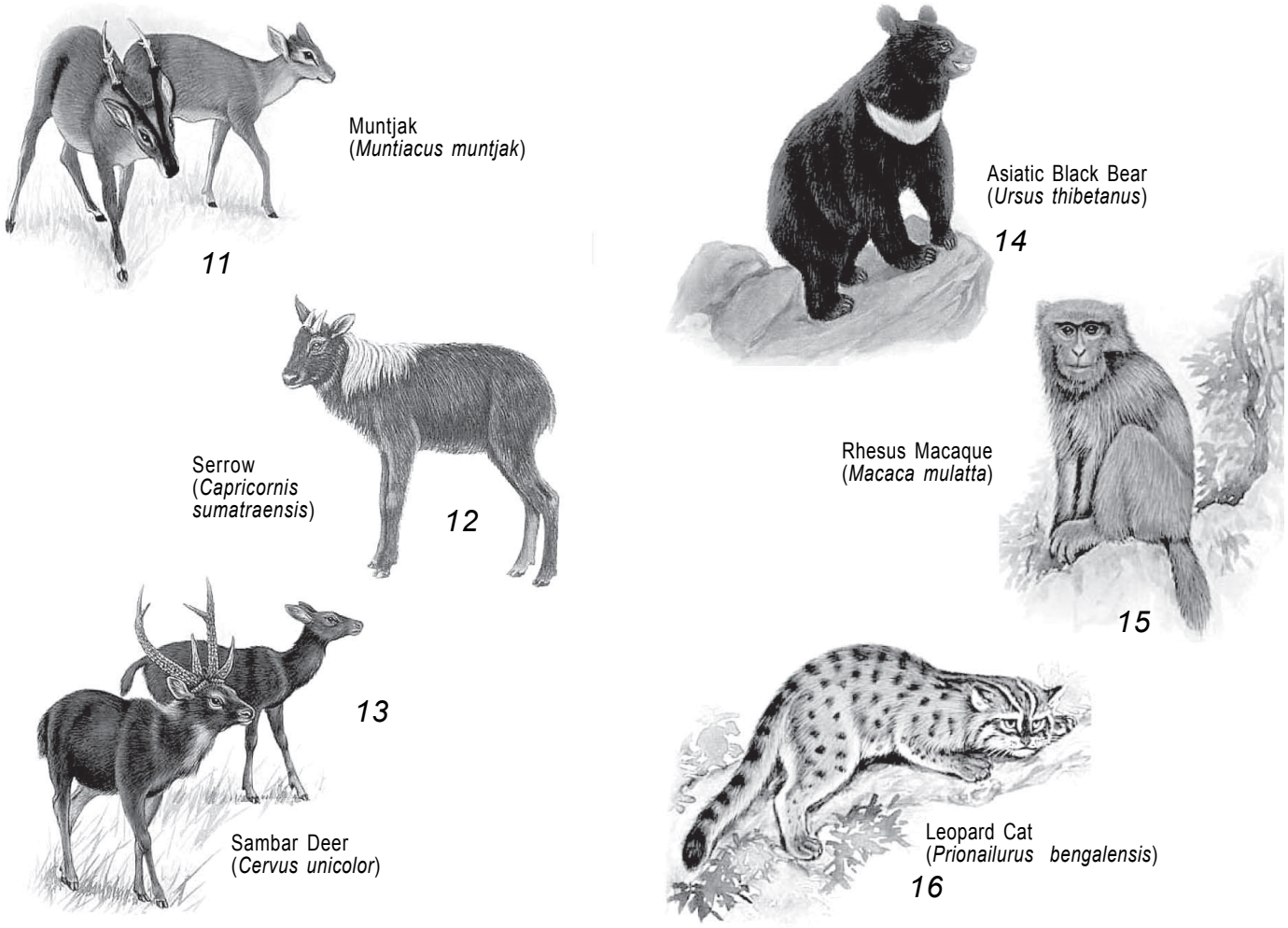
FAUNA

The Bay lies along the East Asian Flyway, a vital migratory path for huge numbers of birds making their way from breeding grounds in the north to over-wintering sites near the equator. A minimum of 4 million wading birds use the flyway annually (The Wetlands Centre Australia 2004). The relatively high proportion (46%) of birds identified as winter visitors (Frontier-Vietnam 2004b) is indicative of the fact that the National Park is likely to provide important stopover feeding and roosting sites. Visitors include waders like the Pacific golden plover (*Pluvialis fulva*), Whimbrel (*Numenius phaeopus*), Bar-tailed Godwits (*Limosa lapponica*), and Black-tailed Godwits (*Limosa limosa*). These species rely on good quality, undisturbed mudflats to gather and feed. The park is also used in winter by a wide variety of other birds, the Garganey (*Anas querquedula*), Raptors including the Peregrine Falcon (*Falco peregrinus*), and Passerines such as Red-throated Flycatchers (*Ficedula parva*) and the Asian Stubtail (*Urosphena squameicep)*.

Black-capped Kingfisher (*Halcyon pileata*) (Figure 5), c.30cm, one of the species in the genus of larger kingfishers, can be instantly recognised by the black crown, white collar throat and breast, and thick deep red (deep-red bill). It is most often seen near the open coastal areas and scrub (its preferred habitat) on Quan Lan island in the National Park's buffer zone, but is a common winter visitor and passage migrant in East Tonkin. The Common Kingfisher *Alcedo atthis* (also common in Europe) is frequently seen.

Common Sandpiper (*Actitis hypoleucos*) (Figure 6) a regular winter visitor and passage migrant throughout South East Asia (SEA), breeds throughout the Palearctic, northern and central Asia. This species utilises many areas of Bai Tu Long Bay, from the mudflats of Minh Chau to the tidal creeks of Ba Mun and the rocky shores of Tra Ngo. It is recognisable by its smallish size (19-21cm), fairly short straight bill, plain brownish upperparts and white underparts with greyish-brown lateral breast patches, separated from the shoulder by a white curved spur, and dull grey-olive legs.

Oriental Magpie Robin (*Copsychus saularis*) (Figure 7) can be seen in gardens, secondary growth and cultivated areas, and in one of its favoured habitats, the mangroves. It is conspicuous, confident and vocal, with a highly varied warbling song. Although smallish in size (19-21cm), it is easily recognised by a glossy black head, white lower breast to vent, tail and wing stripes. It also cocks its tail sharply in a distinctive manner. It breeds from January to September and is a common resident throughout SEA.



Figures 11-19. Mammals found in Bai Tu Long National Park. (Images courtesy of *An Introduction to the Mammals of Bai Tu Long National Park* by Frontier-Vietnam)

Hainan Blue Flycatcher (*Cyornis hainanus*) (Figure 8) is a fairly common resident in much of Indochina's broadleaved evergreen/semi-evergreen forest, bamboo forest, and a passage visitor in coastal East Tonkin. Dark blue back and crown, with a dark throat, fading into a grey breast moving into white vent. c.14cm.

White-rumped Shama (*Copsychus malabaricus*) (Figure 9) is a striking and vocal bird found in the undergrowth of broadleaved evergreen forest, mixed deciduous forest (including secondary growth) and bamboo forest (such as on Ba Mun). It is widespread in range, common on the Indian subcontinent through Thailand and Southeast Asia, in Bai Tu Long Park and the Ban Sen buffer zone. Breeding pairs may be seen between March and September when they nest in the base of trees or bamboo, not more than 2m from the ground. It is easily recognised by the conspicuous white rump, glossy blue-black head, shoulders, wings and tail, and orange-rufous underparts. The male has a long tail making its total length c.28cm (females smaller).

Oriental Pied Hornbill (*Anthracoceros albirostris*) (Figure 10), often seen flying high over broadleaved evergreen forest, and with a range covering different limestone islands in Bai Tu Long Bay. Large (c.70cm total length) but small relative to other hornbills. Black except for a white belly and vent, white face markings and broadly white-tipped outer tail feathers; in flight the black wings have a broad white outer edge. The casque (beak) is yellow with dark markings. Often seen in pairs during the January-June breeding season, but also sometimes in flocks. A locally common resident in Bai Tu Long bay both in the Park and Ban Sen buffer zone.

A number of the mammal species recorded within the park are of conservation concern, particularly larger mammals hunted for their meat (Figure 11). For example, the Muntjak deer (*Muntiacus muntjak*) which is nationally vulnerable (Red Data Book (RDB) 2000), the Serrow (*Capricornis sumatraensis)* nationally and globally categorized as Vulnerable (RDB 2000 and IUCN 2003) and Sambar Deer (*Cervus unicolor*) that is threatened with local extinction (Figure 13). Bai Tu Long Bay is home to the globally Vulnerable Eurasian Otter (*Lutra lutra*) and the Near-threatened Rhesus Macaque (*Macaca mulatta*), which is declining due to habitat destruction Hardiman (2004) (Figure 15). Of the 14 species of bats recorded in the park (Frontier-Vietnam 2004b), three are of global conservation concern: Hutton's Tube-nosed Bat (*Murina huttoni*: Lower risk), Marshall's Horseshoe Bat (*Rhinolophus marshalli*: Lower risk) and the Lesser Great Leaf-nosed Bat (*Hipposideros turpis*: Endangered) (IUCN 2003).

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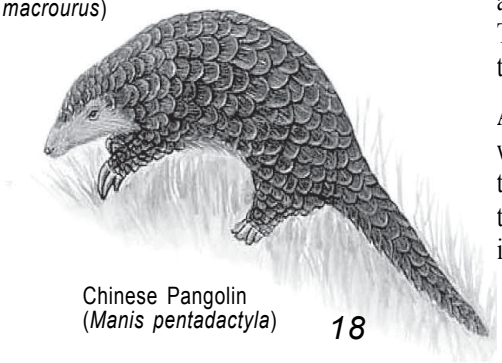
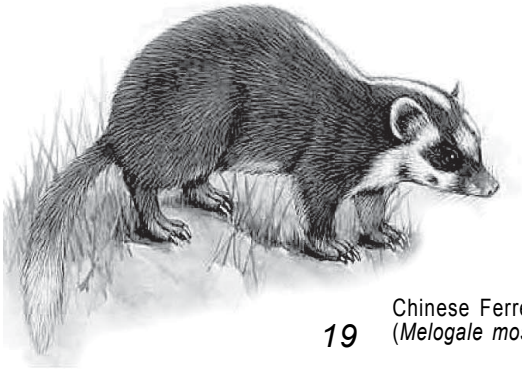
Asiatic Brush Tailed Porcupine
(*Atherurus macrourus*)



Chinese Pangolin
(*Manis pentadactyla*) 18



19 Chinese Ferret Badger
(*Melogale moschata*)

Muntjak (*Muntiacus muntjak*) (Figure 11). Its habitat includes thickly wooded hills and moist mixed deciduous forest up to 2500m above sea level. The antlers are small, usually single spiked and shed during May and June. The upper canines are well developed and used for self-defense. Their call from a distance sounds more dog-like and food consists of various grasses, tree leaves and wild fruits. They appear to breed at all seasons and the rut mainly takes place in the cold season. The gestation period is 180 days and usually 1 or 2 young are born at the beginning of the rains.

Serrow (*Capricornis sumatraensis*) (Figure 12) typically inhabits steep limestone mountains, thickly clad cliffs and generally inaccessible forest. It is a short bodied and long legged animal (shoulder-height ~ 1m) with large donkey-like ears and coarse, rather long body hair. A strongly developed mane is present on its neck and extends well along the middle of the back to the tail. Both sexes have horns and because of their acute sense of smell, eyesight and hearing, combined with their dense habitat, they are difficult to observe.

Sambar Deer (*Cervus unicolor*) (Figure 13) inhabits forested hillsides, preferably near cultivation. However, they also live in woodlands, open scrub, and forest from sea level up to 2500 m. Their coat is coarse and shaggy and the stags have a mane about the neck and throat. Their general coat colour is brown with a yellowish or grayish tinge. Their eyesight is moderate but the sense of smell and hearing are acute and they have an amazing capacity to move silently in the dense jungle despite their huge size. They swim well and their food consists of grass, leaves and a variety of wild fruits. Sambar feed mainly at night and pairing takes place between November and December. The gestation period is 240 days and the young are born at the commencement of the rains, in late May or early June.

Asiatic Black Bear (*Ursus thibetanus*) (Figure 14) which literally means "moon bear of Tibet", favours thickly forested areas in the hills and mountains and moist tropical forests below alpine levels. Their typical territory is about four to eight square miles, but may change depending on available food sources. They prefer to eat meat but due to changes in their habitat, largely caused by human invasion, they eat plants, berries, insects and invertebrates as well.

Rhesus Macaque (*Macaca mulatta*) (Figure 15) most commonly found in western Afghanistan, through India to northern Thailand and Viet Nam. They live in a wide range of habitats showing a great deal of adaptability. Some populations live in flatlands, while others, in northern India and Pakistan, live in the Himalayas at elevations up to 3000 m. They are able to adapt to the hot, dry temperatures characteristic of deserts and to the cold winter temperatures which fall to well below the freezing point. They are omnivorous, and often eat roots, herbs, fruits, insects, and small animals. The gestation period is around 165 days, and they almost always give birth to a single young.

Leopard Cat (*Prionailurus bengalensis*) (Figure 16) is widely distributed throughout Asia, including several islands. It is found as far west as India, and estward to the Philippines. Besides living in a variety of habitats, leopard cats usually live near a reliable water source and are found at high and low altitudes, often in areas of secondary growth. The diet consists mostly of rodents however, they also consume hares, , pigs, lizards, snakes, birds, insects, eels, crabs, and carrion. Populations found in Southeast Asia breed throughout the year. After a gestation of 65-70 days, female leopard cats have a litter of 1-4 young.

Asiatic Brush Tailed Porcupine (*Atherurus macrourus*) (Figure 17) typically inhabits tall forest on limestone mountains and hills with exposed sections of rock and also scrubland at forest edges. Their diet consists of tubers, roots, fruits and leaves. They reproduce 2-3 times per year with 2-3 young per litter. The gestation period is 120-130 days.

Chinese Pangolin (*Manis pentadactyla*) (Figure 18) is found in the forests of southern Asia and Africa. It has characteristic large overlapping scales covering the body, head and limbs, a broad tail, an elongated snout, tiny eyes, and extremely long front claws. When threatened,

Figures 20-21. 20, Boat in Bai Tu Long Bay; 21, Local staff in Bai Tu Long Bay.

pangolins take on a ball shape, allowing their thick scales to act as a defensive armor. Their primary diet consists of ants and termites and the huge foreclaws allow pangolins to rip apart even the toughest of termite mounds or rotting tree trunks to find their prey. After about 130 days of gestation one or two young are produced per litter.

Chinese Ferret Badger (*Melogale moschata*) (Figure 19) can be found from Assam to central China and Viet Nam, and though they prefer tropical and subtropical forests, can also be found in grasslands. The smallest member of the badger family, it weighs about 1 to 3 kg and is 30 to 40 cm long. This species is omnivorous and has a characteristic long bushy tail, large ears, and a slender body. Their diet consists of small rodents, insects, amphibians, and occasionally fruit. They give birth to cubs, which can be born year round but usually arrive in late spring and late autumn. On average, two to three cubs make up a litter.

Anecdotal evidence suggests that Dugong (*Dugong dugon*) in Bai Tu Long Bay have declined. This species was much more common 20 years ago and local fishers reported regular sightings of Dugongs. Numbers have declined worldwide because of uncontrolled hunting and netting for food, hides, oil, bones, and tusks from which ivory artifacts are made as well as due to accidental capture and drowning in shark and fish nets (WCMC 1994). Five species of sea-turtles are found in Vietnam: Olive Ridley (*Lepidochelys olivacea*), Leatherback (*Dermochelys coriacea*), Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*), and Loggerhead (*Caretta caretta*). A green turtle was tagged and released at a recent training workshop (WWF Indochina 2003). Anecdotal evidence suggests 4 species are present in Bai Tu Long, Olive Ridley, Leatherback, Green and Hawksbill. The females nest on the ocean-facing beaches of the easternmost islands. However, the last 20 years has seen a rapid decline in the number of marine turtles breeding in Bai Tu Long Bay and sightings are now rare (Pham Tuan Hung pers. comm.). An upsurge in bottom trawling and gill net fishing has provoked a massive increase in adult mortality (see *Conservation of marine turtles in Viet Nam, page 12).*

The spiraling food demands of an increasing population means that poaching and over-fishing remain significant threats. For instance, even within the boundaries of the National Park, the large mammals confined to dwindling pockets of island forest cover are subject to unsustainable hunting pressure. Fishing techniques employing electric shocks and dynamite indiscriminately kill and destroy coral and marine substrates. Development, pollution and the over-exploitation of the marine resources of coastal areas have a negative impact on migratory bird populations, particularly if they degrade rich inter-tidal foraging areas such as mud flats and sheltered lagoons.

Perhaps the most damaging impact on the terrestrial biodiversity of Bai Tu Long Bay is deforestation. Aside from habitat loss and fragmentation, the selective removal of prized timber species threatens the integrity of forest habitats and species communities that rely on the existence of a complete canopy structure to maintain suitable environmental conditions. Deforestation is primarily driven by a demand for timber products used in house construction, furniture manufacture, and as pit props for the coal mines of Quang Ninh province.

THE IMPLICATIONS OF NATIONAL PARK STATUS

In the past, conservationists and policy makers setting up protected areas have often exhibited an ignorance of, or disregard for, the resource demands of local people and an inability to keep pace with changing patterns of land-use and economic conditions. Although old habits die hard, the tenets of 'fortress' conservation have gradually been eroded by a new community-minded approach that encourages local

people to play a central role in the protection of their own environment. Conservation has also been changed by the advent of economic initiatives that advocate the maintenance of biodiversity by highlighting its monetary value in terms of ecosystem function, tourism and the provision of natural resources. Key features include incentives for local communities to conserve habitats and the will to do so.

These concepts are evident in the management and investment plan drawn up for Bai Tu Long Bay National Park by the government's Forest Inventory and Planning Institute. This plan delineates a core zone, strictly protected to prevent exploitation of terrestrial biodiversity or commercial activity, with exploitation of marine resources heavily controlled and monitored. Flanking the National Park is a buffer zone comprising the settlements (communes) that occupy larger islands to the south and west of the core zone. The terrestrial biodiversity of the islands provides the basis for delineating the boundaries of the park, yet the core zone currently provides no legal protection for important areas of lowland subtropical forest on limestone (a forest type nearly lost from Viet Nam) and marine turtle nesting beaches.

In the absence of pragmatic and holistic conservation and resource management strategies, protected areas become little more than zones on a map. This is intuitively obvious and yet parks and reserves often fail their primary task of conserving biodiversity and natural resources. The bureaucracy of Viet Nam makes for convoluted management structures in which it is difficult to discern poachers from gamekeepers. Budgets for National Park Authority activities are currently set by Quang Ninh Provincial People's Committee, perhaps giving rise to a conflict of interest between the funding for adequate conservation measures and the maintenance of an environment that promotes economic growth.

One of the inevitable consequences of National Park status, particularly in an emerging tourist destination like Viet Nam, is that it will bring an increased number of visitors to the area. Questions arise as to how significant a motivator this might be for the designation of protected area status in developing countries. It is clear that an influx of tourists, particularly foreign tourists, will be economically beneficial but less certain is the issue of sustainability. Both Ha Long Bay and Cat Ba National Park to the south provide evidence of the damaging effects of poorly managed tourism, with waters polluted and terrestrial habitats degraded. The fear is that Bai Tu Long Bay will suffer a similar fate.

BIODIVERSITY AWARENESS

Frontier-Vietnam implemented the *Bai Tu Long Bay Biodiversity Awareness Project* for 27 months 2001-2004, primarily funded by the Darwin Initiative, a component of the Department for Food and Rural Affairs (DEFRA), UK Government. The project was proposed and implemented in response to the need to raise awareness of biodiversity conservation, and to assist in strengthening the National Park Authority (NPA). The main objectives of the project were to facilitate communication between the National Park and the local community, to increase the awareness of threats to biodiversity and their consequences, to promote sustainable use of natural resources, and to raise awareness of the park as a guardian for biodiversity. Two key aspects underpin the strategy of the project: first, participation and partnership of staff members of the National Park in all planning, decision-making, and implementation stages and second, the participation of buffer zone communities through District organisations, commune and village leaders by means of a system of two-way communication and consultation. Under the terms outlined in Viet Nam's National Action Plan on Biodiversity, the NPA is obliged to incorporate an awareness raising component as part of overall planning and policy. The project was designed to aid the facilitation and achievement of this objective. The

Figures 22-23. 22, Ha Long Bay; 23, Inside Sung Sot Cave in Ha Long Bay (Photos by Dr. Kien T. Dang, 2004).

Figures 24-27: 24, Virtual image of an interpretation centre display area; 25, Welcome display at Bai Tu Long National Park Centre; 26, Ribbon cutting ceremony at the centre; 27, Opening ceremonies.

involvement of the NPA at every stage allows the continuation of awareness-raising, during and beyond the life of the project.

The school-based environmental education component provided an opportunity for the NPA to invest in future attitudes towards the National Park itself, the local environment, and conservation issues in the five buffer zone communes. The key feature of this component was the participatory approach to planning, development, and implementation of activities using traditional teaching skills and experience. This approach sees local solutions to local problems as key to effectiveness and sustainability. Planning of the environmental education component actively involved the Conservation Department of the NPA, the Department of Education and Training (DET) and headmasters of the five participating schools. The intention of this programme was not to provide training in teaching methodologies, but to harness the skills that teachers already possess and exploit the 'standard lesson' structure that is currently being used for subjects of the formal curriculum.

A communication channel was created between the communities and the NPA through the medium of a quarterly newsletter. The newsletter provides information regarding park development and activities, acts as a forum for discussion through contributions from the park staff, local people and other interested parties.

An interpretation centre has been developed in a community on the border of the core zone on Minh Chauh Island. The purpose of the centre is to act as a base for awareness-raising activities among buffer zone communes and visitors to the park. Target audiences include national and foreign visitors, local school children, and community groups. The NPA will also use the centre as a future base for awareness-raising activities to outer communes as it is strategically located in the centre of the planned tourism development. It will also be a place where guided tours around the park and admission tickets can be purchased. The displays at the centre cover four main themes: History of Bai Tu Long, Ecology of Bai Tu Long, Threats to the Park, and Meeting Conservation Challenges. A garden and outdoor exhibits highlight the value of species native to Bai Tu Long Bay and of the environment in which the centre is located (Figures 25-27).

A series of workshops were run throughout the project with the aim of increasing the capacity of the NPA to manage the National Park through the provision of training and advocation of the need for detailed planning, impact assessment and regulation. Training workshops covered topics of law enforcement, biodiversity assessment and monitoring, sustainable tourism initiatives and management. The results of the workshops are described in the Frontier-Vietnam reports (2004a, b, c). Participants in the workshops recognised the need for collaboration between different governmental institutions and private interests and that some of the current plans for development in Bai Tu Long Bay are unlikely to be sustainable. Indeed they could further threaten habitats, natural resources and endangered wildlife such as marine turtles.

CONCLUSIONS: A LEGACY OF CONSERVATION?

As is so often the case, the nature of the threats to biodiversity and the mitigating actions required mean that conservation and sustainable resource use in Bai Tu Long Bay will be best achieved through community participation. That being the case, it was important that a framework for awareness-raising and joint commune-NPA initiatives was set up at the National Park's inception. This is now in place as an outcome of the project. The biodiversity survey work and conservation evaluation (Frontier-Vietnam 2003)

helped map the ecological composition of the park and buffer zones. Coupled with awareness-raising, this has helped local people, the NPA, and other stakeholders assess the likely impact of future development and current resource exploitation both ecologically and economically.

Nevertheless a great deal of work remains. The capacity of the NPA to control and monitor resource exploitation in the core zone needs augmentation. Without this, the legal protection afforded to biodiversity by park gazettement is meaningless. The community-based approach adopted by the Awareness Project aims to lift some pressure from the NPA by demonstrating the benefits of sustainable resource use and giving local people an incentive to conserve the park. Whatever the over-riding objectives of certain parties, the project outputs and outcomes have left a legacy within Bai Tu Long Bay and stakeholders have been left in no doubt as to the need to match economic development with biodiversity conservation to create and enable sustainable management decision-making.

ACKNOWLEDGMENTS

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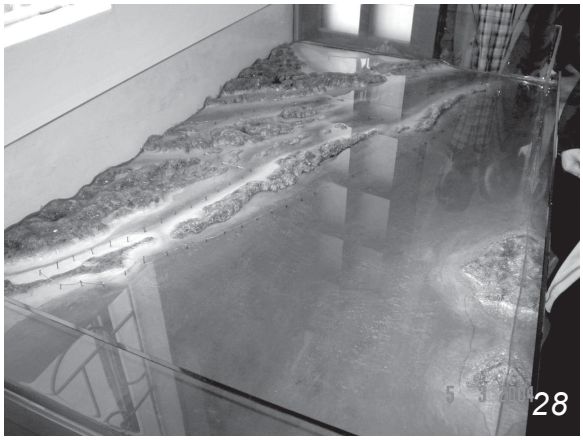

Figure 28.
Model of Bai Tu Long National Park

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Corrections

The authors of "Conservation of Monarch Butterflies in Central Mexico: Protection of a biological phenomenon" in *Biodiversity*, 4(3): 14-20 wish to correct a citation referenced in the article. We apologize to the authors. The correct citation is:

Brower, L.P., G. Castilleja, A. Peralta, J. Lopez-Garcia, L. Bojorquez-Tapia, S. Diaz, D. Melgarejo and M. Missrie 2002. Quantitative changes in forest quality in a principal overwintering area of the Monarch Butterfly in Mexico, 1971-1999. *Conservation Biology* 16(2): 346-360.

Sincerely,

William Toone
Thomas Hanscom