



**ANDAMAN & NICOBAR ADMINISTRATION
DEPARTMENT OF ENVIRONMENT & FORESTS**

**MANAGEMENT PLAN FOR
CAMPBELL BAY NATIONAL PARK
(FOR THE PERIOD 2021 TO 2031)**

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FOREWORD

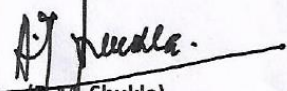
The Campbell Bay National Park has got the distinction of being one of the first National Parks in India created within the area of a Biosphere Reserve and has within its limits one of the best remaining habitats of the tropical rainforest in the world. The National Park also constitutes the catchment area for five perennial river system of the Great Nicobar Island namely Galathea River, Jubilee River, Alexandra River, Dogmar River and Amrit Kaur River all of them of which drains into the sea.

The tropical evergreen forests, southern hilltop tropical evergreen forests, littoral forests and mangrove forests found in the Park constitute the habitats for many rare and endemic species of flora and fauna like tree fern (*Sphaeropteris spp.*), Nicobar Crab Eating Macaque (*Macaca fascicularis umbrosa*), Nicobar Wild Pig (*Sus scrofa nicobaricus*), Nicobar tree shrew (*Tupaia nicobarica*), Nicobar Megapode (*Megapodius nicobariensis*), etc. The habitat of the Park also include the nesting areas of endangered Sea Turtles like Leather Back Turtle, Green Sea Turtle, Hawksbill Turtle and Olive Ridley Turtle. The coastal ecosystem of the Park has been significantly damaged due to the impact of tsunami which happened on December 26, 2004.

The Management Plan of the Park envisages dividing the Park into various zones like Core Zone, Traditional Use Zone & Eco-tourism Zone for management purposes and proposes different theme plans covering the entire area of the Park like Habitat Improvement Plan, Protection Plan and Conservation Plan. The Management Plan also includes detailed strategies for Eco-development of the fringe areas of the Park, for encouraging Eco-tourism in the area and for research and monitoring of the biological resources available in the Park.

I place on record my deep appreciation for the efforts made by Shri Thomas Varghese, IFS, DCF and his dedicated team of officers & staff for envisaging and meticulously preparing the Management Plan. I also appreciate the pain & efforts taken by Shri M. Rajkumar, IFS, CCF, Dr. G. Trinadh Kumar, IFS, CCF & Shri A.K. Paul, IFS, DCF for having carefully gone through the manuscripts and giving the Management Plan its final shape.

Port Blair
July, the 23rd, 2021


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PREFACE

Campbell Bay National Park (CBNP) presents a varied natural panorama of unique combination of rich virgin evergreen tropical forests extending from sea coast to the hill tops. Being closer to equator, the tropical ecosystem of CBNP is so enormous, complex, delicate and fragile supporting a unique combination of floral and faunal assemblage, high degree of endemism and fragile ecosystems.

Campbell Bay National Park is unique in terms of species diversity, inland tropical evergreen forest flora, aquatic flora and fauna. Some of the important endemic fauna found in and around the Park namely Nicobar Wild Pig, Crab-eating Macaque, Nicobar Tree Shrew, Nicobar Spiny Shrew, Sea Turtles and Nicobar Megapode requires special conservation efforts in view of the proposed major developments in the surrounding areas of the National Park. The birds, reptiles, fishes and other lower animals such as insects, butterflies, many of which are endemic, along with plant and aquatic biodiversity, are very well represented in the National Park. The area due to its tropical humid climate, being closer to the equator; insular nature of the territory; the physical isolation of the islands, the impact of both South-West and North-East monsoons has given rise to dense and varied vegetation cover. This has also contributed to the evolution of rare and distinct flora which shows much closer affinity with the Malaysian and Indonesian floras. Conservation of such a rich biodiversity is a challenging task and needs special attention. The present Management Plan adheres to such delicate conservation issues including the assessment of biotic pressure on the Protected Area.

Chapter-I of the Management Plan provides information of the area and its significance. Chapter-2 provides information on boundaries, geology, rock, soil, Terrain, Climate, Hydrology & Water sources, status of wildlife, its distribution and habitat.

Chapter-3 provides an account of the history and past system of management, rights and concessions, impact of tsunami on faunal and floral diversity and the information on the previous Management Plan.

Chapter-4 describes Socio-economic situation and cultural practices.

Chapter-5 provides the objectives and problems.

Chapter-6 highlights the strategies, plans for conservation and management of important species of fauna and flora.

Chapter-7 provides details on Ecotourism, Interpretation and Conservation education.

Chapter-8 describes the steps to be taken in research, monitoring and training.

Chapter-9 deals with the Organization and Administration.

Chapter-10 deals with budgetary requirements.

There are 17 Annexures providing supplementary information.

Surely this document would provide valuable information not only to the Park officials and the staffs for effective management of this Protected Area but also to researchers, scientists, environmentalists and wildlife enthusiasts.

Campbell Bay
30th November, 2021.

Divisional Forest Officer
Nicobar Division

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In the preparation of the Management Plan of Campbell Bay National Park this Division has received significant assistance and contributions from various organizations and individuals.

I greatly acknowledge the continuous support and guidance provided by Shri.D.M.Shukla, IFS, Principal Chief Conservator of Forests & Chief Wildlife Warden, A&N Islands in preparing the Management Plan of Campbell Bay National Park.

I greatly acknowledge the guidance provided by Shri. Tarun Coomar, IFS, PCCF (ANI), Shri. P.Subramanyam, IFS, PCCF, Shri. Ashok Kumar Biswal, IFS, APCCF, Shri. Yogesh, IFS, PCCF (Retd.), Shri. Kamal Dutta, IFS, APCCF, Shri. K.Ravichandran, IFS, CCF, Dr.G.Trinadh Kumar, IFS, CCF, Shri. M.Rajkumar, IFS, CCF, Shri. Shajan Paul, IFS, CF (Retd.), Shri.Yesu Ratnam, IFS, CF (Retd.) and Shri. Sanjay K.Waradkar, IFS, CF (WL) in preparing the Management Plan of Campbell Bay National Park.

Assistance provided by Scientific Institute like ZSI and BSI are highly appreciated. I look forward to receiving their continued support in the years to come. Contribution of Dr.Chandrakasan Sivaperuman, Officer-in-Charge, Zoological Survey of India is greatly acknowledged.

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The assistance provided by Shri. Anil Kumar, Forest Ranger, Shri. John William, Dy Ranger, all the staffs of the Divisional office and GIS Cell of PCCF's office, Vansadan is greatly acknowledged.

Campbell Bay
30th November, 2021

Shri. Thomas Varghese, IFS, DCF
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ACRONYMS

GIS	=	Geographic Information System
WL	=	Wildlife
CBNP	=	Campbell Bay National Park
GNBR	=	Great Nicobar Biosphere Reserve
UNESCO	=	United Nation Educational Scientific & Cultural Organization
CRZ	=	Coastal Regulation Zone
IUCN	=	International Union for Conservation of Nature
KM	=	Kilometer
IIRS	=	Indian Institute of Remote Sensing
CITES	=	Convention on International Trade of Endangered Species
NWP	=	Non Wood Produce
BSI	=	Botanical Survey of India
ZSI	=	Zoological Survey of India
WTO	=	World Trade Organization
UNEP	=	United Nations Environment Programme
ANET	=	Andaman & Nicobar Environmental Team
CARI	=	Central Agricultural Research Institute
WII	=	Wildlife Institute of India
FSI	=	Forest Survey of India
ICFRE	=	Indian Council of Forestry Research & Education
SACON	=	Salim Ali Centre for Ornithology and Natural History
BNHS	=	Bombay Natural History Society
CWLW	=	Chief Wildlife Warden
E-W Road	=	East-West Road
N-S Road	=	North-South Road
RF	=	Reserve Forest
PF	=	Protected Forest
ACF	=	Assistant Conservator of Forests
DCF	=	Deputy Conservator of Forests
DFO	=	Divisional Forest Officer
FR	=	Forest Ranger
RO	=	Range Officer

CHAPTER 1

Introduction to the Area

1.1 Name, Location, Constitution and Extent

The Campbell Bay National Park (CBNP) is situated in the Northern side of Great Nicobar Island, the southernmost island of the Andaman and Nicobar archipelago and is the first National Park declared in the Nicobar group of Islands. The entire area which comprises the CBNP was declared as Protected Forest vide Notification No.37/67/F.No. G/635 Vol.III dated 05th April, 1967 (Annexure I). The area of CBNP and other forest area of GNI was notified as proposed Reserved Forests under the provisions of the Indian Forest Act, 1927 vide A&N Administration's Notification No. G/635/2 dated 15th March, 1971 (Annexure II).

The CBNP is spread over an area of approximately 426.23 Sq. Kms. It extends up to the coastline stretching from the peripheral limits of the Nicobarese village in the West through Ganges Harbour and Murry Point upto southern part of Trinkat Champlene Bay in the North to the Mouth of Alexandra River in Balle Bay through the confluence of its tributary up to Reddy Swamp along the Galathea River in the South. The area was declared as a Reserved Area under the "Andaman & Nicobar Islands (Protection of Aboriginal Tribes) Regulation, 1956" and rules made there under vide Notification No. ANPATR/3(1)/1 dated 2nd April, 1957 (a plain copy of the order with all amendments is attached as Annexure III). The whole area of CBNP lies within the core zone of the Great Nicobar Biosphere Reserve (GNBR) which was constituted on 6th January, 1989 by an announcement made by the then Honb'le Prime Minister Late. Shri Rajiv Gandhi, during the Island Development Authority Meeting at Car Nicobar, sanction of which was conveyed by the Government of India vide their letter No 3-22010/14/89-CSC dated 13.01.1989 which deemed to have come into force with effect from 6th January, 1989 (a plain copy of the order is attached as Annexure IV).

The CBNP was constituted under Section 35(1) read with Section 2(29) of the Wildlife (Protection) Act, 1972 (Act No.53 of 1972), by Andaman & Nicobar Administration vide Notification No.CWLW/WL/38/1801 dated 18th March, 1992 and the final notification declaring the above said area as National Park under Section 35(4) read with Section 2(29) of the Wildlife (Protection) Act,1972 was issued in the Official Gazette vide Notification No.97(B)/96/F No CWLW/WL/31/1188 dated 22nd November, 1996 (Annexure V).

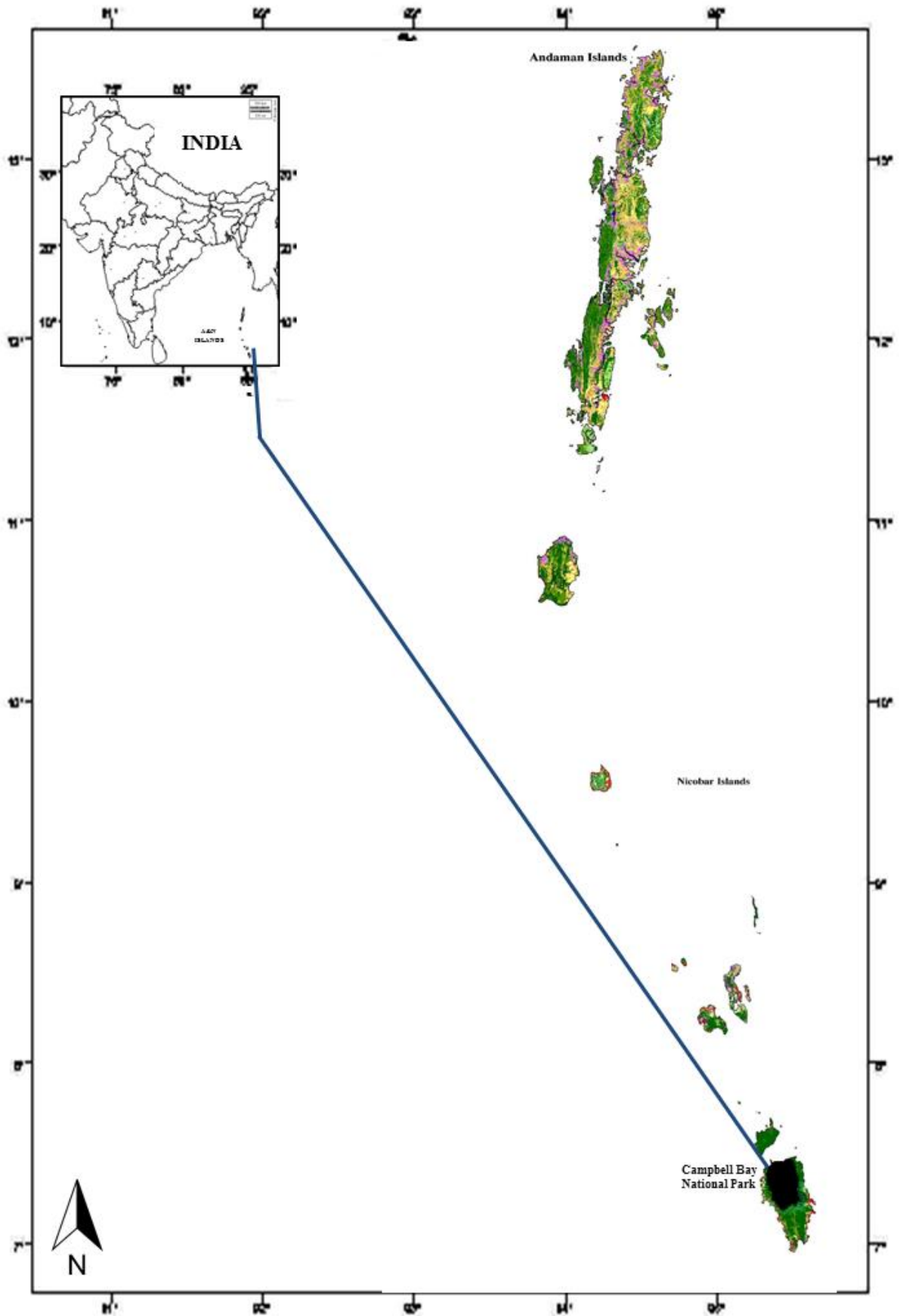


Fig 1.1 Location of Campbell Bay National Park

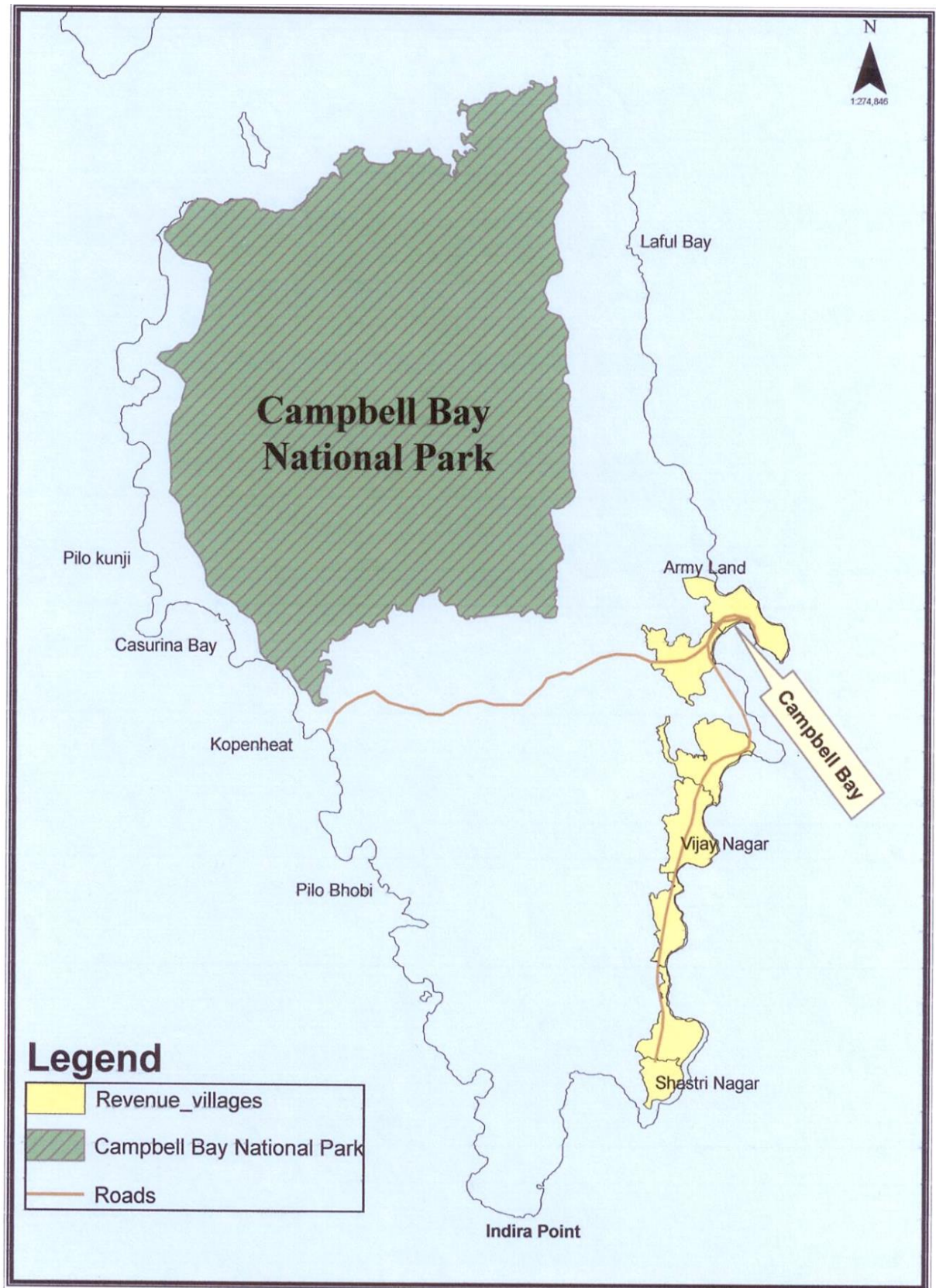


Fig 1.2 Map of Great Nicobar Island showing location of Campbell Bay National Park

1.2. Approach and access

Great Nicobar, the southernmost land mass of India (situated between 6° 45' and 7° 15' N latitude and 93° 38' and 93° 55' E longitude) lies about 482 Kms south of Port Blair, the headquarter of the Union Territory of Andaman & Nicobar Islands and about 287 Km from Car Nicobar, the headquarter of Nicobar district(Fig.1.1). The administrative headquarter of Campbell Bay National Park (Fig 1.2) is at Campbell Bay, which is approachable from Port Blair by helicopter/ ship service. Port Blair is approachable from Delhi, Kolkata, Vishakhapatnam and Chennai by air and from Kolkata, Chennai and Vishakhapatnam by sea routes.

1.3. Statement of significance

The Campbell Bay National Park has got the distinction of being one of the first National Park created within the area of a Biosphere Reserve (i.e GNER). CBNP presents a varied natural panorama of unique combination of rich virgin evergreen tropical forests extending from sea coast to the hill tops. Tropical humid climate with heavy rainfall facilitates dense floristic growth with insane vigor. Being closer to equator, the tropical ecosystem of CBNP is so enormous, complex, delicate and fragile supporting a unique combination of floral and faunal assemblage, high degree of endemism and fragile ecosystems.

CBNP forms the main watershed area for the major rivers and its tributaries. The area under CBNP has 5 perennial rivers originating from Mt. Thulier. Galathea is the largest river and drains in the southern portion of Great Nicobar Island into Galathea Bay. The Jubilee River flows towards North. Other three rivers namely Alexandra, Dogmar and Amrit Kaur flows towards West. This is the only island with characteristic perennial rivers as a source of freshwater among the islands of Andaman & Nicobar.

Important endemic fauna found in CBNP are Nicobar wild pig, Crab eating macaque, Nicobar tree shrew and Nicobar Megapode. CBNP also forms one of the best remaining habitats of tropical rainforest in the world. Declaring Campbell Bay National Park, the Andaman and Nicobar Administration has shown its concern for the in situ conservation of unique biological diversity which was the main objective of declaring the major portion of the Great Nicobar Island as Biosphere Reserve in 1989 under the Man and Biosphere programme launched by the UNESCO.

CHAPTER 2

Background information and attributes

2.1 Boundaries

Campbell Bay National Park is located within the core zone of Great Nicobar Biosphere Reserve (GNBR). The Northern limits of the National Park lies along the coastline of the Great Nicobar Island, about 30 Km long, which is at many places pierces into the island from inland bays from the peripheral limits through Ganges Harbour in the West, Murry Point upto South and Trinkat Champlene Bay in the North.

The eastern limit starts from the mouth of stream that flows into Andaman Sea at the Southern Part of Trinkat Champlene. In the north; follows upstream, gets on the top of the Chaturvedi Range; thence runs southwards along the ridge separating the eastern and western drainages and connecting the peaks at 386m, 446m and 404m altitude up to the source of the Galathea River (opposite to Ranganathan Bay), then follows along the Galathea River southward up to the Reddy Swamp, where it takes east west turn. This moves along the Galathea River in east-westerly direction forming the southern boundary, till the river takes North-South turn. Then it follows East-West line till it touches the tributary of the Alexandra River, thence along the tributary to its confluence with Alexandra River and then follows the main Alexandra River upto its estuary in Balle Bay. In the West it lies along the western coastline outside the peripheral limits of villages of Kuches, Reumang, Rehchang, Reketat, Pulobed, Pulokunji extending upto the mouth of Alexandra River (Fig 2.1).

2.2 Geology, rock and soil

2.2.1 Geology

Great Nicobar Island is a continuation of Arakan Yoma range of Myanmar in the North to Sumatra of Indonesia in the South. The Andaman and Nicobar archipelago, to which Great Nicobar Island belong, is a projection of a long narrow submarine range with only the peaks of which are visible above sea. Geologically quite young in age (upper Mesozoic- 100 million years ago), the mountain range has a narrow deep oceanic furrow on the Western boundary which abuts on the main Indian plate on the West. The geomorphology of CBNP is shown in Fig. 2.2.

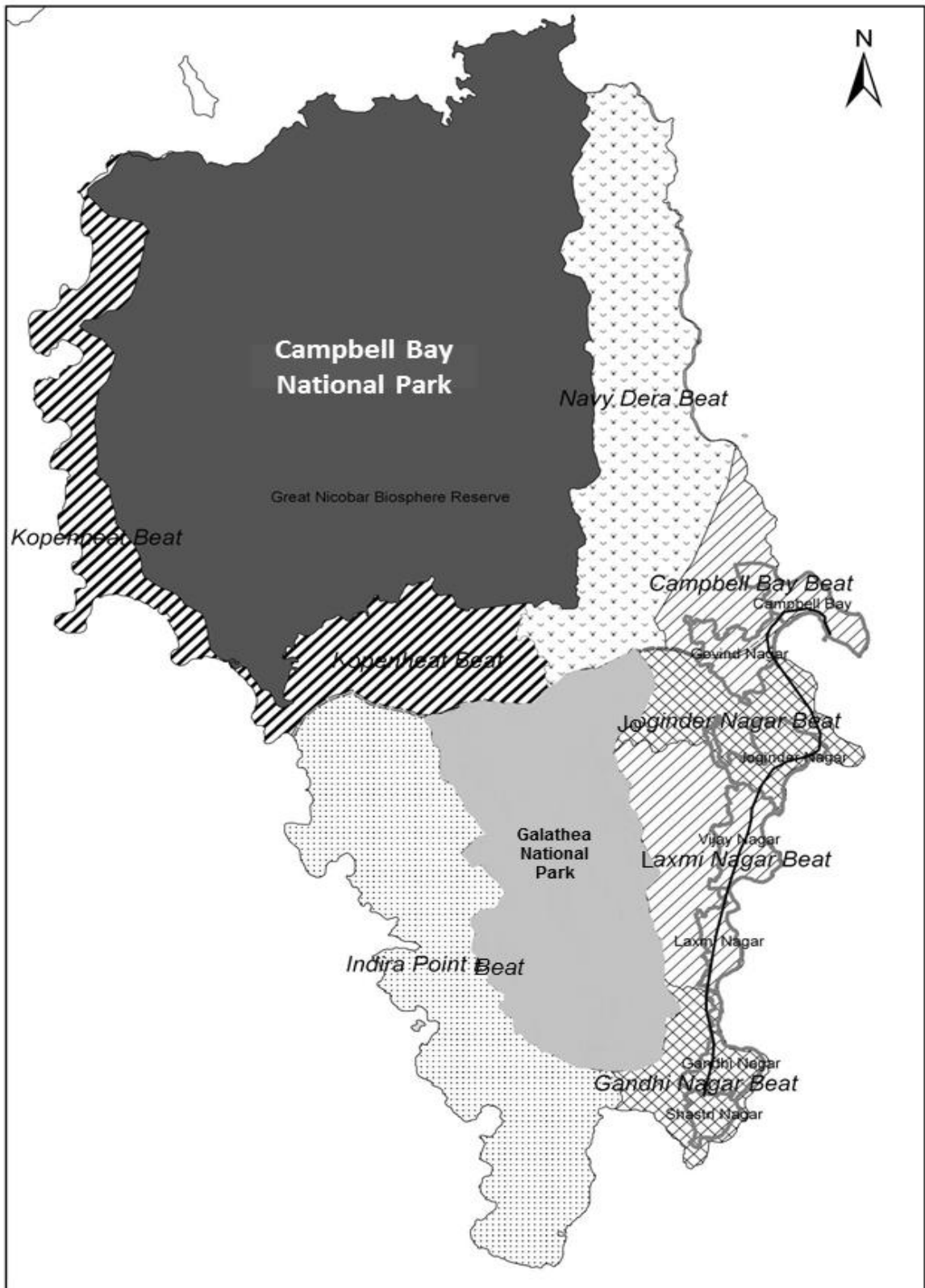


Fig. 2.1 Boundaries of Campbell Bay National Park

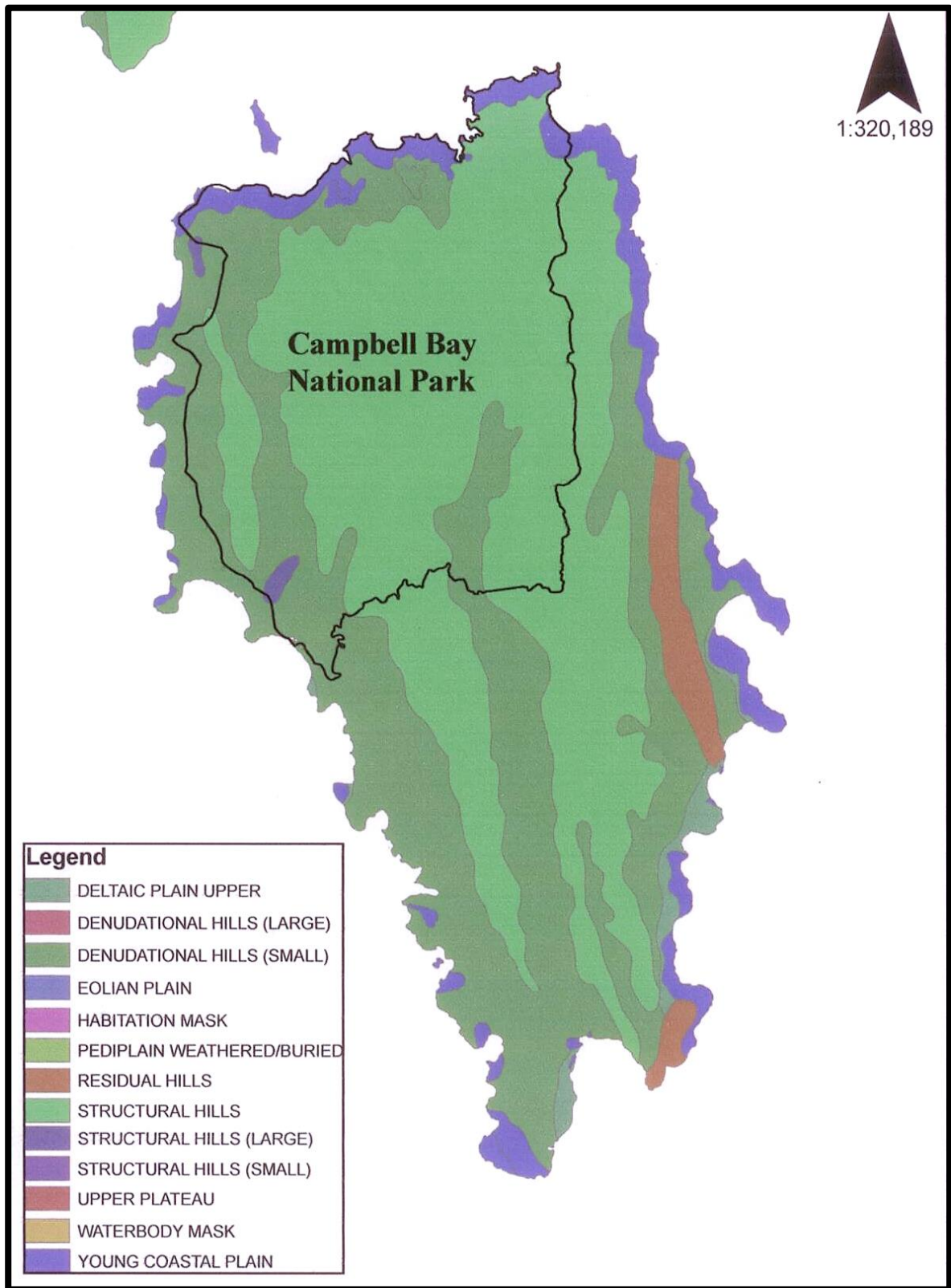


Fig. 2.2 Geomorphology of Campbell Bay National Park

2.2.2 Rock

The Island is composed of mainly sedimentary rocks with a minor amount of igneous rocks including the volcanic and plutonic variants. The rocks range in age from Pre-Cambrian to even sub-recent-recent deposit. There are three important geological formations for the entire southern group of Nicobar Islands. First, eruptive serpentine and gabber formations; secondly marine deposits of younger tertiary age composed of sandstone, slates, clay marls and plastic clay; and thirdly, coral reef formations of recent origin. The rock formations are of younger tertiary age and are geologically similar to the South-West coast of Sumatra. There are some sandstone hills on the northern coast. The principal nature of rocks is soft micaceous and sandstone; and is younger in origin than the Andamans.

The oldest rock exposed in the area includes the pillow lava and acid volcanics of the ophiolite suite. The pillow lava is rarely inter-bedded with radiolarian cherts giving an age of upper cretaceous. The igneous rocks form an insignificant part of the island. These are succeeded by the Mithakhari group of rocks. The Precambrian meta-sediments including Quartzite, Quartzsericite Schists, Cherts etc. occur as dissected boulders in the olistostrome zone as well as detrital clasts in the conglomerate zone of the Mithakhari group. The Mithakhari group rocks are also very insignificant. The major part of the area (about 80 %) is covered with the rocks of the Andaman flysch. Thick bedded sandstone intercalated with thinly bedded silt stone forms the major rock type in the Andaman flysch. Beautiful sedimentary structures like flute cast, current bedding flame structure graded bedding convolute structure are well documented in these rocks.

The rocks form broad synclines and anticlines of which one of the limbs is frequently inverted. The Archipelago group of rocks is represented by chalk, claystone, sandstone and limestone. The Archipelago group of rocks form blanket over the older rocks and are very mildly deformed. All these rocks are covered by Pleistocene to recent deposits. The shale conglomerate and shale lime stone are generally developed at the coastal tract of the island.

2.2.3 Soil

The soils of the park are immature, loose in texture, poor in drainage and low in moisture retaining capacity. They are made chiefly of soft micaceous sandstones, silt stones and clay beds with minor occurrence of basaltic rocks and gravelly sandstone beds. Sandy

alluvial soils resulting from the deposition of fine material from the higher slopes in the saline swamps and creeks, support the mangrove forests that fringe the islands sheltered coasts and inland creeks. The coralline alluvium on the beaches along the coasts supports rich tree vegetation. In flat lands along stream banks, the soil is fresh water alluvium. The rich grey, brown and red soils derived from the calcareous sandstones support the luxuriant tropical forest vegetation. Heavy clays to clay loams are found mostly in valley areas. Soil depth varies with slopes, shallow soils characterizing higher elevations and deep soil in the valleys and river sides. The profile shows no visible stratification into horizons (Fig 2.3). The high rainfall causes an almost continuous percolation of water through the streams and beaches into the sea and the soils have very low moisture retaining capacity. Humus or organic matter is comparatively poor even in the hill forests, they being washed away by the heavy rainfall backed by the steep slopes and loose texture of soils. The soils are highly permeable and thus strongly leached. There is no humus enrichment of the rain forests because of rapid decomposition of organic matter. Thus the soils of the rain forests of CBNP are generally poor in nutrient content which is characteristic feature of the tropical 'Ombrophilous' forests. This is due to the fact that in tropical rain forests favourable climatic conditions facilitate quick mineralization and dead biotic materials and the released nutrients are immediately absorbed by the roots of dense vegetation. Therefore, the amount of nutrients in the soil at any point of time is considerably reduced. The entire nutrient capital necessary for the continuous growth of this lush type of tropical vegetation is tied up in the living plant itself.

2.3 Terrain

The area comprising Campbell Bay National Park has an overall rugged terrain with very narrow flat lands along the sea coasts and hill ranges running in North South direction. Parallel ridges of folded sedimentary rocks meet the radiating and sub parallel ridges originating from Mt. Thullier (642 m above msl) with peaks rising 300-642 m above msl. From the hills 5 ranges radiate viz. Das, Chaturvedi, Nanda, Shani and Mani. A coastal plain 1-3.5 Km usually fringes this undulating terrain in the North coast with raised old coral rags. The hill ranges gives a spectacular panoramic view of the islands.

The coastline of CBNP, which form the northern boundary, is indented at few places and creeks penetrate into the island from inland bays. The bay mouths are studded with several damaged and partially submerged rocky pinnacles which become visible at low tide. The principal bays along the north coast are Trinkat Champlong and Ganges Harbour.

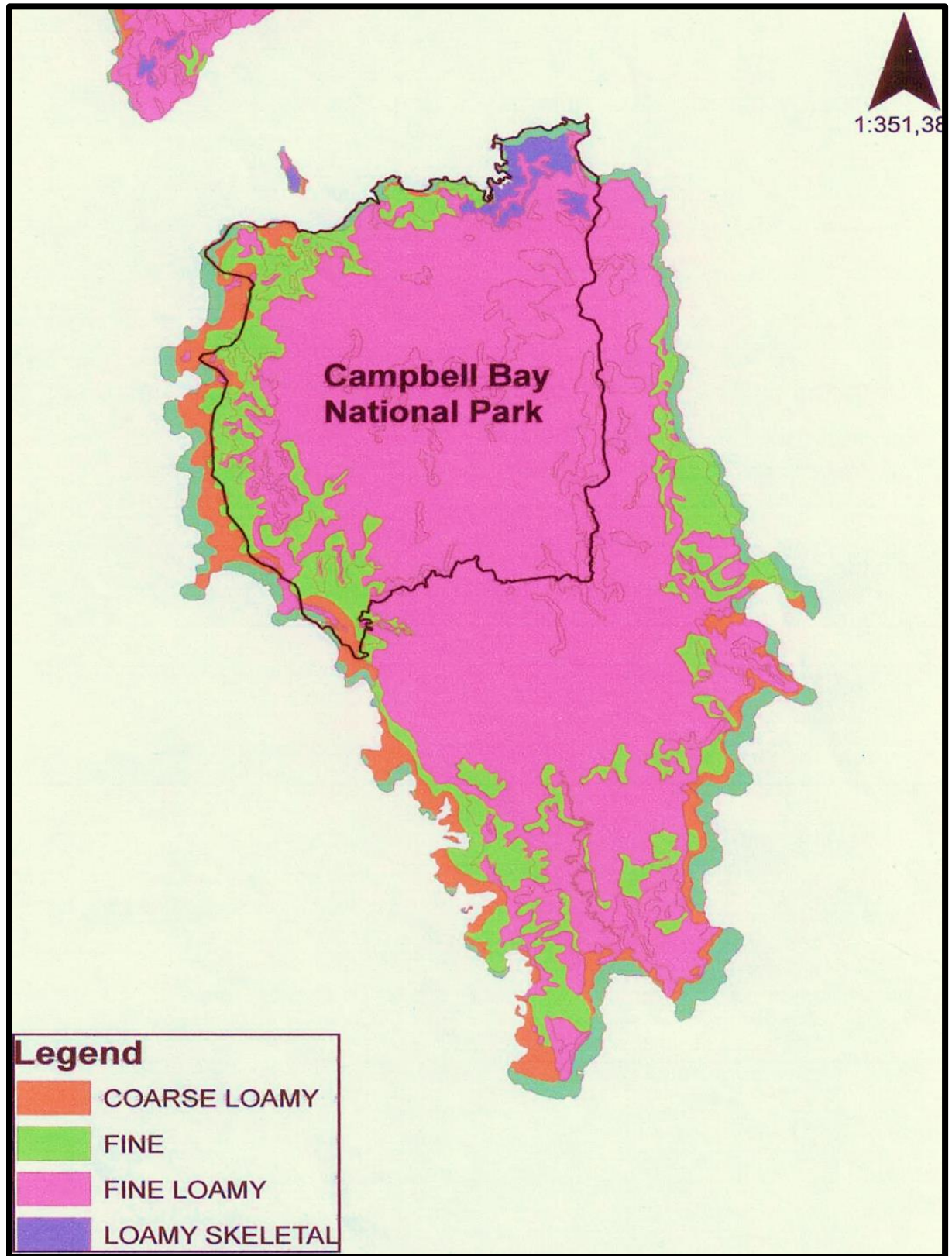


Fig. 2.3 Soil Types of Campbell bay National Park

2.4 Climate

The monsoonal regime of South-East Asia governs the climate of Campbell Bay National Park. The climate is nearly equatorial and humidity is very high. The Park experiences both South West and North East monsoon. The place being near to equator, CBNP experience squall of short duration. The park is subject to gales and cyclonic winds blowing west to east and east to west, changing with the monsoons and sudden depression in the sea around. Remnants of typhoons from China move westwards and affect the climate during NE monsoon and during October-November.

2.4.1 Temperature

The temperature variation is very less. The temperature ranges from 22°-32°C. April is the hottest month of the year. Rains moderate the temperature between May and December and there is no moisture stress during this period. The temperature recorded at Campbell Bay from January, 2008 to December, 2016 is presented in Annexure - VI.

2.4.2 Rainfall pattern and distribution

Most of the rains are brought about by the monsoons. The Park experiences both South West and North East monsoon, the former contributing major bulk of the precipitation. The South West monsoon normally begins in April and lasts till October. The North East monsoon starts in November and remains till end of December. The winds at first blow from South East and later veering to North East are very strong and are frequently accompanied by rain. Monsoon months are April to December. The period of January to March experiences fairly dry weather. The average annual rainfall varies from 2700mm to 3,700 mm and precipitation occurs over 8 months in a year with 180 rainy days on an average. Heaviest rainfall occurs from June to August, during which high winds gales, and cyclones occur. Rainfall data in respect of Great Nicobar Island and other adjacent Islands are given in Annexure –VII (A) and VII (B) respectively.

2.4.3 Humidity

The Relative Humidity varies from 65 per cent to 91 per cent. Humidity is very high for most part of the year with an average relative humidity of about 82 %. This is because of topography, maritime environment, dense vegetation and rapid cycling of water where some part of isolation is used in evaporation of water (latent heat of evaporation) and the heat is dissipated into the atmosphere as the water vapour condenses into water droplets (latent heat of fusion). The thermodynamics of alternate cooling and heating buffers the environment.

The highest humidity is experienced from May to November during South West monsoon. It is also found that the Relative Humidity is higher in the evening than in the morning. The details of Relative Humidity recorded at Campbell Bay are presented in Annexure –VIII.

2.4.4 Wind and Cyclones

The Park receives strong south-westerly winds between the months of April and October. After South West monsoon ends in October, the islands receive light winds from south or southeast. Heaviest rainfall occurs from June to August, during which high winds gales, and possibly cyclones occur. A second spell of strong winds is received from North East between November and December. At times wind speed exceeds 25 km/hour but the usual range is between 5 - 15 Km/hour. North Easterlies starts from November and usually accompanied by squally weather and severe cyclone. Cyclones seldom pass over the island although originating in the Andaman Sea and passing North. But they affect weather condition of the island. However, tropical storms make the islands vulnerable to calamities and at that time sea remain very rough.

2.5 Hydrology & Water sources

The Park has 5 perennial rivers originating from Mt. Thullier, the highest point within the Park (Fig 2.4). Galathea River is the largest and the widest and drains south into Galathea Bay (a Sanctuary for sea turtles & crocodiles). Jubilee River flows to the North. The rivers Alexandra, Dagmar and Amrit Kaur flow to the West. All of these rivers drain into the sea. Besides these, there are some small but perennial streams like Magar nallah, Prem Bahadur nallah which drain the eastern coastal cliffs of the island. This is the only National Park which enjoys unrivalled position of having such freshwater resources in the entire Andaman and Nicobar islands where perennial rivers flow. The Park normally experience precipitation for more than eight months in a year. Heavy rainfall accompanied by luxuriant and thick vegetation in the area; presence of perennial rivers and streams and ground water aquifers make the Park almost free of drought.

2.5.1 Tides and currents

Hight of tides ranges from 1.5 mts to 2.5 mts. The combined effect of tides, surface currents and freshwater run-off brings turbid water in the creeks and give rise to the regeneration of various mangrove species along the banks of the creek which in turn supports numerous freshwater and marine organisms.

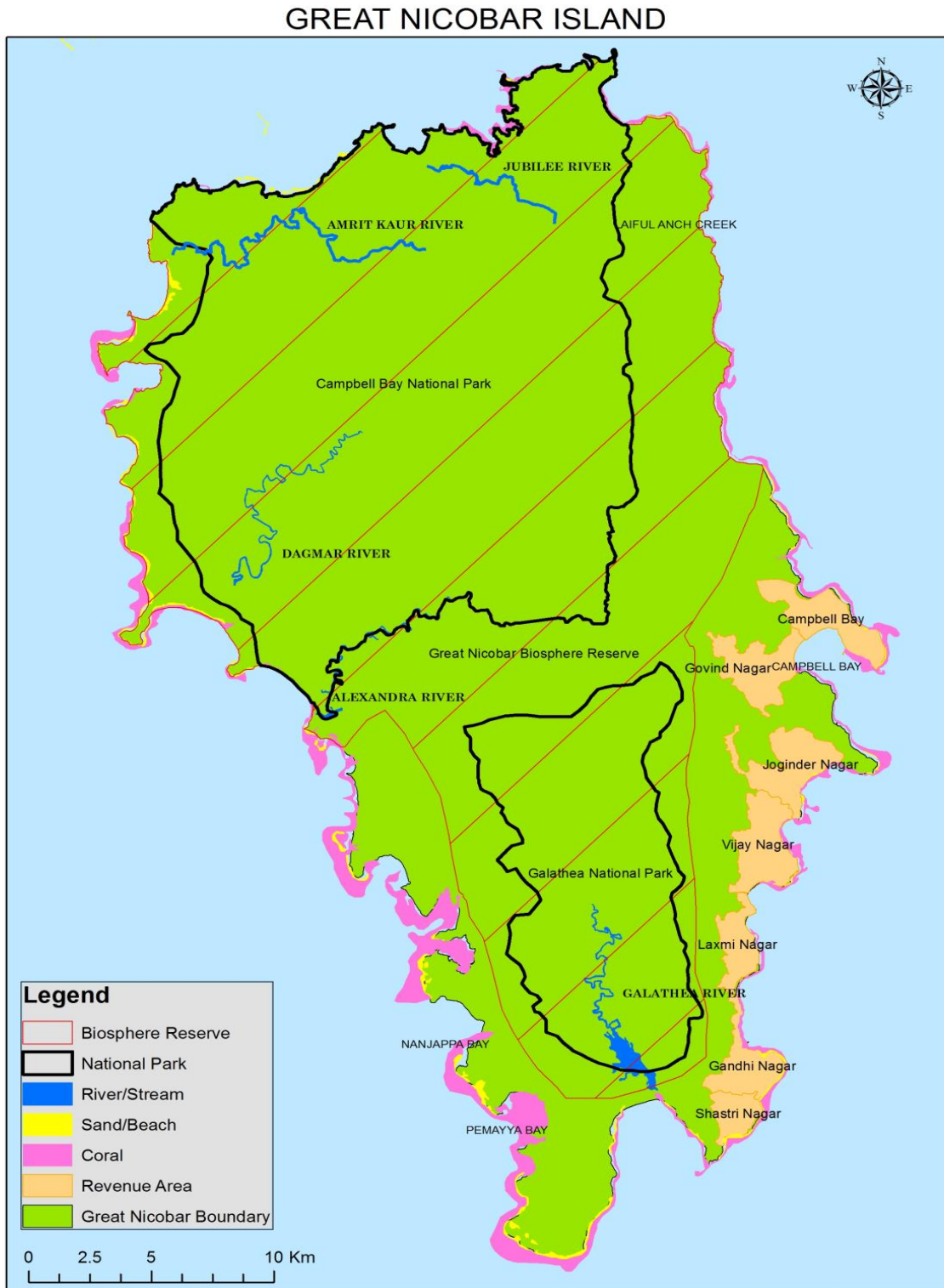


Fig. 2.4 Hydrological Map of Campbell bay National Park

2.6 Range of wildlife, status, distribution and habitat

In terms of species diversity, inland tropical evergreen forest flora, aquatic flora and fauna of the Park, is quite rich in case of CBNP. Large terrestrial mammalian fauna is not well represented here due to the long geographic isolation of this island. But the birds, reptiles, fishes and other lower animals such as insects, butterflies, many of which are endemic, along with plant and aquatic biodiversity, are very well represented in the CBNP. Some of the important endemic fauna found in the park are Nicobar Wild Pig, Crab-eating Macaque, Nicobar Tree Shrew, Nicobar Spiny Shrew and Nicobar Megapode. This National Park also has some of the best remaining habitats of tropical rain forests in the world. The flora is also distinct in this area which can be visualised by the fact that the genera *Otanthera* and *Astronia* of Melastomataceae, *Cyrtandromea* of Scrophulariaceae, *Cyrtandra* of Gesneriaceae, *Stemonurus* of Icacinaceae, *Rhopaloblaste* from Arecaceae and *Spathoglottis* of Orchidaceae and many more species are endemic to Great Nicobar Island. Majority of the endemics are placed in the Red Data Book of the IUCN.

2.6.1 Vegetation

The vegetation of the Park is unique due to its tropical humid climate, being closer to the equator; insular nature of the territory; the physical isolation of the islands and the impact of both South-West and North-East monsoons has given rise to dense and varied vegetation cover. This has also contributed to the evolution of rare and distinct flora which shows much closer affinity with the Malaysian and Indonesian floras. About 25% of the species of vascular plants show widespread distribution in all the neighboring areas including mainland India, Burma, Thailand, Malaysia and Indonesia while 45% plants show distribution only towards Malaysia and Indonesia. Thus these islands form phytogeographically a transition zone with the neighboring bio-geographic zones of South East Asia in floristic point of view

The vegetation shows high degree of endemism owing to its geographic location and physical isolation. More than 30 endemic species including tree ferns like *Sphaeropteris albo-setacea* (*Cyathea albo-setacea*) and *Sphaeropteris nicobarica* (*Cyathea nicobarica*) are encountered in the island. Many endemic orchid species are also present in this park. There are 4 species of Gymnosperms belonging to 3 genera and 3 families. In terms of endemism, the members of the families Euphorbiaceae, Rubiaceae, Arecaceae and Annonaceae show high representation in Great Nicobar Island and Campbell Bay National Park.

The Melastomaceous genera *Otanthera* and *Asrtonia*, the Gesnariaceous genus *Cyrtandra*, *Stemonurus* of the Icacinaceae, *Rhopaloblaste* of the Arecaceae, *Spathoglottis* of the Orchidaceae, *Sphaeropteris*, *Coptophyllum* occurring here are absent in the Andaman Islands. Some of the floristic elements have close relatives in Burma, Thailand, Malaysia and Indonesia which are represented by genera viz. *Burmannia*, *Cyrtandroemia*, *Dillenia*, *Garcinia*, *Phrynium*, *Ryparosa* etc. Number of potential and economically important species including *Nypa fruticans* and *Vanilla andamanica* grows wild in the Isles. Among the 108 families representing the angiospermic flora of this island, Euphorbiaceae, Rubiaceae, Orchidaceae and Cyperaceae and Poaceae are more predominant in terms of density as well as number of species. The gymnosperms are represented by 4 species belonging to 3 genera and 3 families. The Pteridophytic group contributes to a great extent to the plant diversity and richness of the flora comprising of 77 species of which the population of tree fern (*Sphaeropteris*) constitute a major fraction of the vegetation along the hilly slopes of the interior forests.

The vegetation of CBNP can be broadly classified into Inland and Littoral. The inland vegetation comprises of Low Land Swamp and Evergreen forest, while the Littoral forests occur along the narrow coastal belt. In Great Nicobar Island, the evergreen forest and mixed evergreen forest forms the most dominant classes (Fig 2.5). Area analysis revealed that 94.65% of the evergreen forests lies between 60-80 percent forest density whereas mixed evergreen forests are under medium density, i.e. 40-60 per cent. Extensive ground data analysis reveals that tropical evergreen forest has highest species diversity. Importance of each species weighted in view of its uniqueness and economic value reflects that mixed evergreen forest and lowland swamp forest have intermediate diversity level. The similarity analysis indicated that Andaman evergreen and mixed evergreen forest types shows 23.64 percent similarity in floral components. Mixed evergreen and lowland swamp forest also have significant similarity (14.89 %) in composition. High value of the index between evergreen and littoral forest (22.05) highlights the fact that forest has quite a number of common species. Diversity is attributed to edaphic and climatic factors. The flora of Great Nicobar Island has elements from the Indo-Chinese and Indo-Malayan regions and 648 species have so far been reported which include angiosperms, pteridophytes and gymnosperms belonging to 422 genera and 142 families. Of the 648 species of plants, 48 species of endemics and 85 species of non-endemics occurring in Great Nicobar are rare and endangered [Annexure IX].

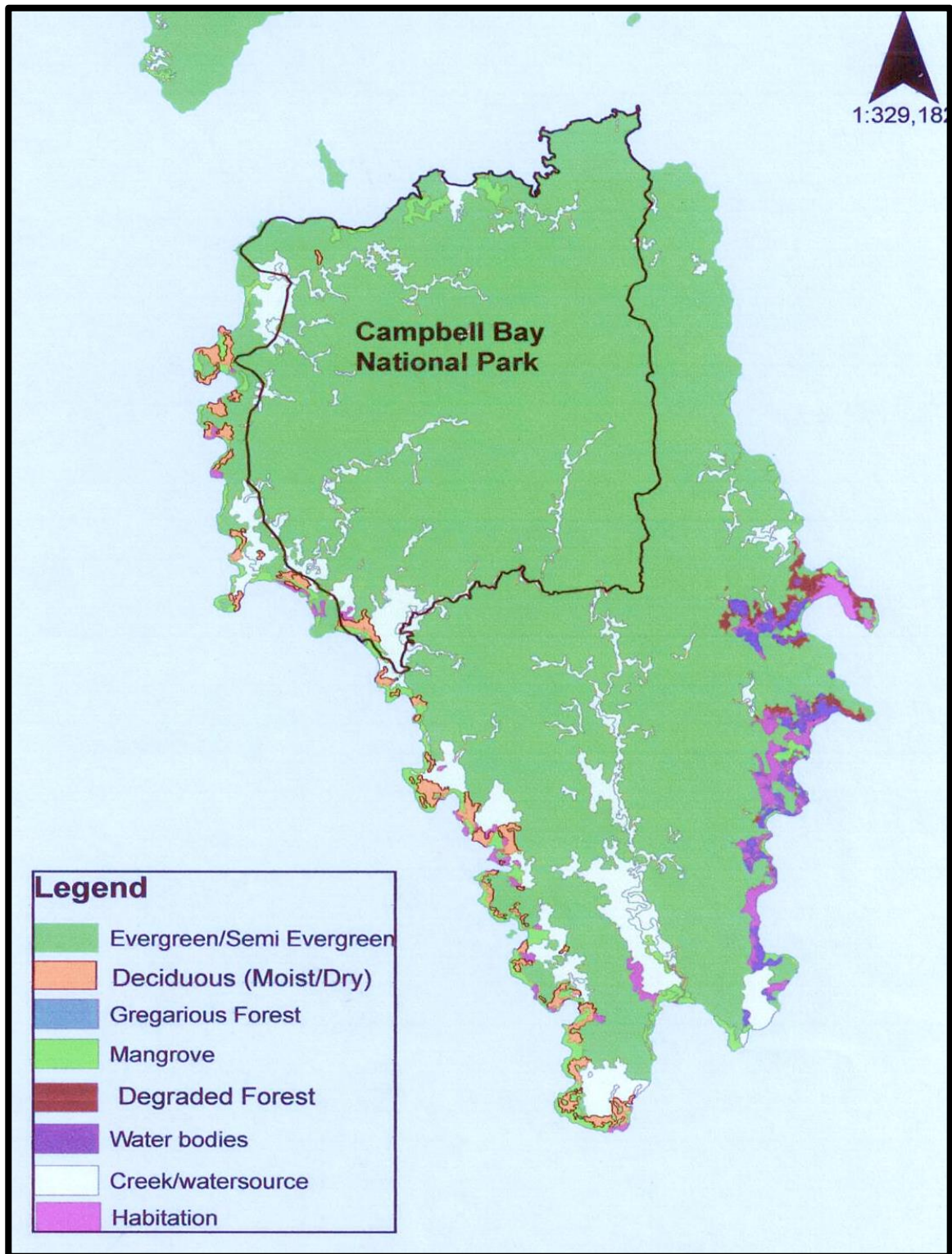


Fig. 2.5 Forest Types of Campbell Bay National Park

2.6.1.1 The biogeographic classification

Rodgers and Panwar (1988) while evaluating the adequacy of the existing network of Wildlife Protected Areas divided the entire subcontinent into 10 different biogeographic zones and placed Andaman & Nicobar Islands under the biogeographic zone of 'Islands'. The zone was further divided into provinces 9A-Andaman Islands and 9B-Nicobar Islands and the CBNP is placed under the region Great Nicobar as per this classification.

2.6.1.2 Forest types and their composition

Climate of this locality is tropical moist in nature. Slope and aspects are not prominent here to determine the forest type. The influence of soil therefore is more conspicuous and marked in giving rise to different type of forests which otherwise would be uniform as sustained by the climate. Therefore, the two main factors that influence the forest type here are climatic factor and edaphic factor. The damp and humid climate of this low latitude has eliminated deciduous type of forest although deciduous trees are frequently interspersed, especially in the sunny localities. Evergreen trees thus form the bulk of the forests. Vegetation of these islands has been classified by Champion and Seth into different types depending upon the nature of soil, tidal influence, moisture retainability and floristic composition. However, these forest types are not distinctly demarcated, but on the other hand they imperceptibly merge into one another and form an intimate mixture. The forest types which are formed under the influence of edaphic and climatic factors are classified broadly as follows;

- (i) Tropical Evergreen Forests (1A/C2)
- (ii) Southern hill-top Tropical Evergreen Forests (1A/C3)
- (iii) Littoral Forests (4A/L1)
- (iv) Tidal Swamp Forests (Mangrove Forest) (4B/TS2)

Mixed Evergreen Forest and Fern breaks were available in patches in the Tropical Evergreen Forests. Low level Evergreen Forests (Coral Reef Forests) can be noticed in many places with Littoral forests.

A brief description on each forest types with its composition is given below:

(i) **Tropical evergreen forests(1A/C2)**

The lower latitude of the park having high temperature and heavy precipitation supported by virgin soil has given rise to luxuriant growth of Moist Tropical Evergreen

Forest. Characteristically this type of forest is covered with dense vegetation of variety of trees, shrubs and climbers. The soil is always moist, fertile and rich in humus content formed by decayed vegetation. Some type of demarcation in different storey can be made viz. Top Canopy comprising of tall gigantic trees; Second storey comprising of comparatively smaller trees reaching a height up to 20 to 30 m and often laden with climbers and woody lianas followed by shrubby layer of undergrowth and finally the ground vegetation, consisting mostly of herbaceous plants.

Floristics

Tree species

1. Top storey: *Calophyllum soulattri*, *Horsfieldia irya*, *Ficus* spp., *Mangifera* spp., *Peltophorum pterocarpum*, *Planchonella firma*, *Andenathera pavonia*, *Canarium euphyllum*, *Sterculia macrophylla*, *Palaquim semarum*, etc.
2. Middle storey: *Garcinia xanthochymus*, *Lasianthus* spp., *Pinanga manii*, *Dillenia andamanica*, *Casearia grewiaefolia*, *Memecylon* spp., *Antidesma* spp., etc.
3. Under growth (shrubby trees & shrubs): *Glycosmis pilosa*, *Ixora cuneifolia*, *Hunteria zeylanica*, *Hedyotis paradoxa*, *Psychotria andamanica*, *Macaranga* spp. *Mallotus* spp., *Sphaeropteris albo-setacea* (tree fern).
4. Ground floor (herbaceous plants): *Eranthemum* spp., *Strobilanthes glandulosus*, *Aglaonema nicobaricum*, *Ophiorrhiza mungos*, *Oplismenus campositus*, etc.
5. Epiphytic plants:
6. Ferns: *Antrophyum callifolium*, *Asplenium nitidum* and *Pyrrosia adnascens*, *Drynaria quercifolia*.
7. Orchids: *Dendrobium* spp., *Aerides emericii*, *Trichoglottis quadricornuta*, etc.
8. Lianas and climber: *Haematocarpus validus*, *Gnetum scandens*, *Dinochloa andamanica* (Climbing bamboo), *Poikilospermum suaveolens*, *Calamus* spp., and *Korthalsia laciniosa*.

(ii) Southern hill-top Tropical evergreen forests(1A/C3)

This forest grows in different substrata, and those growing on calcareous sandstone will have to be distinguished from those which grow on Polyscistine-clay and on plutonic rocks. The forest growth on shady side of the ridges is like those that grow on plutonic rocks. Higher ridges are covered by stunted forests wherein trees are not crowded. The forests however do not cover the whole of the formation but, abruptly terminates just below the top of hilly platonie although broad strips of tropical forest found across the whole

Island. The trees at the upper limit rather suddenly become stunted, as if unfavourable exposure has checked their growth and given them the appearance of having reached the best of tree growth. Above all the trees, palm towers majestically above other trees and form the palm forests. The lofty and larger trees are chiefly the followings:-

Artocarpus gomeziana, *Radermachera pinnata*, *Sterculia macrophylla*, *Tournefortia* spp., *Garcinia* spp., *Calophyllum soulattri*, *Lagestroemia ovalifolia*, *Planchonella* spp., *Amoora wallichii*, *Horsfieldia irya*, *Fagraea auriculata*, *F. racemosa*, *Pometia pinnata* in abundance. *Ficus* spp., *Gonostylus macrophyllus*, *Terminalia* spp., *Dillenia* spp., *Calophyllum* spp., *Elaeocarpus* spp., *Albizia retusa*, *Cryptocoryne ciliata*, *Gardenia* spp., *Chydenanthus excelsus*, *Alstonia macrophylla*, *Litsea glutinosa*.

Amongst smaller trees the followings are conspicuous: *Tarenna weberaefolia*, *Barringtonia racemosa*, *Sideroxylon attenuatum*, *Fagraea racemosa*, *Myristica elliptica*, *Aporosa villosa*, *Artocarpus* spp., *Macaranga* spp., *Sterculia* spp., *Albizia* spp., *Garcinia* spp., *Glycosmis mauritiana*, *Leea* spp., *Gnetum gnemon*, *Pandanus leram*, *Areca catechu* here grows quite wild especially in the lower and marshy localities. The most frequent climbers are: *Dinochloa andamanica*, *Merremia peltata*, *Aristolochia tagala*, *Gnetum* spp., *Calamus andamanicus*, *Pothos* spp., *Ipomoea* spp., etc.

Main shrubs are *Petunga racemosa*, *Hedyotis* spp., *Hornstedtia fenzlii*, *Tarenna weberaefolia*, *Psychotriaspp.*, *Cyrtandroemia nicobarica* and tree fern - *Sphaeropteris albo-setacea*. Other common shrubs are: *Oxyceros longiflora*, *Saurauia bracteosa*, *Cyrtandroemia nicobarica*, *Melastoma affine* etc.

The most common grasses and sedges are: *Cyperus rotundus*, *Hypolytrum memorum*, *Scleria* spp., etc. Ferns are plentiful but apparently not much varied as regards species. Most commonly frequented ones are: *Nephrolepis* spp., *Angiopteris evecta*, *Lindsaea tenera*, *Pteris vittata*, *Diplazium esculentum*, *Selaginella caudate*. Common epiphytic ones are *Asplenium nidus*, *Asplenium falcatum*, *Davallia denticulata* etc. Orchid species are *Aerides emericii*, *Spathoglottis plicata*, *Trichoglottis* spp, *Corymborkis veratrifolia*, *Phalaenopsis* spp., *Pholidota pallida*.

(iii) Littoral forests (4A/L1)

The Littoral forest start from the sea Beach and stretches for some distance in the interior. The term beach forest also adopted in general use. There is no clear cut demarcation between these forests. During very high tide the forest floor is inundated with seawater.

Floristics of the forests are as follows:-

1. Tree species: *Heritiera littoralis*, *Chydenanthus excelsus*, *Barringtonia racemosa*, *Syzygium samarangense*, *Mangifera camptosperma*, *Peltophorum pterocarpum*, *Ficus microcarpa*, *Ficus rumphii*, *Neisosperma oppositifolium*, *Terminalia bialata*, *Terminalia procera* etc.
2. Shrubby Vegetations: *Ardisia solanacea*, *Hedyotis paradoxa*, *Allophylus dimorphus*, *Tabernaemontana* spp. *Ixora* spp.etc.
3. Herbaceous Vegetations: Very poorly developed with *Oplismenus compositus*(a grass) and *Hetaeria obliqua* (a ground orchid).
4. Epiphytic ferns and Orchids: *Antrophyum callifolium*, *Drynaria quercifolia*, *Phymatosorus scolopendria*, and spp. of *Pholidota*, *Luisia* and *Dendrobium*.

The front side of the littoral forest facing sea and which occurs along the beach as well as a little interior contains shrubs and climbers in plentiful, while trees are of rare occurrence. It can also be termed as beach forests and further it can be sub-divided into the following Zones on the basis of its proximity to the sea giving rise to distinctly different type of vegetation.

- a) Herbaceous beach which occasionally gets washed up by the sea is covered with many algae and grasses followed by the thick coverage of the creeper *Ipomoea pes-caprae* intermingled with *Ischaemum* and *Thuarea* grasses and sedge like *Cyperus pedunculatus*.
- b) Shrubby beach is in a little interior mainly marked by the dense gregarious growth of *Scaevola sericea* some time with association of *Atlantis monophylla*, *Cordia subcordata*, *Sophora tomentosa* and spiny strangler of *Caesalpinia bonduc*.
- c) Woody beach has the most common species of *Barringtonia asiatica* in association with *Pongamia pinnata*, *Calophyllum inophyllum*, *Hernandia nymphaeifolia*, *Guettarda speciosa*, *Hibiscus tiliaceus*, *Thespesia populnea* with sparse ground cover of *Dracaena angustifolia*, *Crinum asiaticum*, *Tacca leontopetaloides* etc.
- d) Pandanus beach dots into the woody beaches with gregarious growth of *Pandanus odoratissimus* in association with few palms. Epiphytic fern *Asplenium nidus* and epiphytic orchids *Dendrobium crumenatum* and *Trichoglottis cirrhifera* are most common in Beach forest.

A typical Low level evergreen forests (coral reef forests) is found in the coastal area and as the name indicates, these forests occupy the raised coral-reefs which usually stretch out beyond the

dunes and are sometimes of comparatively larger extent. The sub-stratum being calcareous and of a very permeable nature, these differ greatly in their constituent from the Tropical Forests.

Floristics of such forests are given below:-

a) Trees: *Alstonia kurzii*, *Ficus* spp., *Terminalia catappa*, *T. bialata*, *T. citrine*, *Artocarpus gomeziana*, *Neolamarckia cadamba*, *Dehaasia candolleana*, *Lagerstroemia ovalifolia*, *Garcinia* spp, *Horsfieldia* spp., etc.

b) Small trees: *Orophea katschallica* are in abundance, *Glycosmis mauritiana*, *Aglaia sylvestris*, *Amoora wallichii*, *Oxalis imbricata*, *Apodytes andamanica*, *Ixora* spp., *Petunga racemosa*, *Morinda citrifolia*, *Mallotus* spp etc.

c) Shrubs: Of the shrubs, conspicuous are *Psychotria* spp., *Ixora grandifolia* etc. *Areca catechu* is abundant here and is selfsown. *Pandanus leram* usually accompany the beetle nut palm.

d) Climbers: *Dinochloa andamanica* and other species like *Alangium* are in abundance often accompanied by fleshy *Pellionia procrudifolia*.

e) Ferns mostly found are *Davallia denticulata*, *Vittaria elongata*, *Antrophyum callifolium*, *Asplenium macrophyllum* and *Nephrolepis* spp. and many other orchids.

(iv) Tidal swamp forests (Mangrove forests)(4B/TS2)

Plants that can thrive in brackish water flourish well along inland creeks. This type of forest is mostly found at the mouth of major rivers like Galathea, Dagmar and Alexandra as well as along the sheltered bays and creeks. *Rhizophora apiculata*, *Bruguiera gymnorrhiza* are the two major components of mangrove forest. *Sonneratia caseolaris* is the other species commonly found in this forest. A little interior along the shady muddy banks *Nypa fruticans* and occasionally *Acanthus volubilis* is found. Climbers frequently met with in this forest are: *Derris trifoliata*, *Sarcolobus globosus* and *Finlaysonia obovata*. Noteworthy epiphytic orchid in this forest is *Ceratostylis subulata*.

There exist five big perennial rivers in CBNP. The vegetation at the mouths of these rivers is typical of mangrove forest with plants like *Rhizophora mucronata*, *Bruguiera gymnorrhiza* and *Sonneratia caseolaris*. Some distance interior along the confluence on either sides of the rivers *Nypa fruticans* are found on the fringes along with reeds and grasses. A typical Riverine forest can also be seen even up to 3 to 4 km up river till the water continues to be brackish. Beyond this level vegetation gradually changes. On either sides of the river valleys and also on the lower hill ranges meadows with reeds followed by dense

forest is found. The ground cover in this type of forest is poor, but wherever it is open grasses, sedges, marshy plants and reeds like *Phragmites karka* come up.

The common floristic composition of this type of forest is enumerated below:

1. Large Trees: Tall trees that are commonly found in such river valleys are *Chisocheton nicobarianus*, *Syzygium flocciferum*, *S. gratum*, *Ficus rumphii*, *Ficus* spp., etc.
2. Smaller Trees: *Antidesma* spp., *Chisocheton longistipitatus*, *Elaeocarpus macrocerus*, *E. aristatus*, *Cynometra ramiflora*, *Litsea monopetala*, *Fagraea racemosa*, *Aphanamixis polystachya*, *Symplocos* spp., etc.
3. Shrubs: under growth consist mostly of *Jasminum acuminatissimum*, *Mussaenda villosa*, *Grewia calophylla*, *G. acuminata*, *Zizyphus rugosa*, *Leea indica*, *L. grandifolia*, *Macarranga peltata*, *M. nicobarica*, *Clerodendron* spp., etc. Tree ferns- *Sphaeropteris albo-setacea* and the giant leaved fern- *Angiopteris evecta* are also found and grow luxuriantly.
4. Climbers and Creepers: *Merremia peltata*, *Tinomisium petiolare*, *Clematis smilacifolia*, *Uvaria lurida*, *Calamus andamanicus*, *Dinochloa andamanica*, etc.
5. Reeds, sedges, Grasses etc.: *Phragmites karka* (reed), *Echinochloa crusgalli*, *E. colona*, *Coix lacryma-jobi*, *Scleria terrestris*, *Fimbristylis* spp., *Polygonum Chinense*, *Polygonum barbatum*, etc.

The forests of CBNP are at present in their pristine glory and none of the area is under great anthropogenic influence. So all the faunal elements found in different ecosystems are living in a habitat most suitable for their growth and the food requirements of the faunal elements are met with in these forests in abundance. As stated above number of plant species from Great Nicobar Island has ethno-botanical significance. The aboriginal tribes of Great Nicobar, Shompens are using 11 species of medicinal plants to meet out their remedial measures. Details of all such important species is provided in Annexure-XVI.

2.6.1.3 Species and communities of conservation importance

(i) Rare & Endangered Endemic and Non-Endemic Taxa

Of the 648 species of plants found in Great Nicobar Island, 28 species are endemic to Great Nicobar Island only, 87 species are endemic to A&N Islands, 32.25% of the species are non-endemic and are not found in mainland India. Many of them are rare and endangered (45 endemic and 85 non-endemic) and need to be conserved for future.

(ii) Pteridophytic flora

The Pteridophytic group contributes to a great extent to the plant diversity and richness of the flora comprising of 77 species of which the populations of tree fern (*Sphaeropteris*) constitute a major fraction of the vegetation at certain places along the hilly slopes of the interior forests. This needs to be conserved as most of these habitats in other parts of the world are lost.

(iii) Mangroves

Mangroves are salt tolerant forest ecosystems found mainly in tropical and sub-tropical inter-tidal regions of the world. They are trees or shrubs that have the common trait of growing in shallow and muddy salt water or brackish waters, especially along quiet shorelines and in estuaries. In another words, mangroves are the tidal forests of coast wetlands, existing in the inter-tidal zones of sheltered shores, estuaries, tidal creeks, backwaters, lagoons, marshes and mud-flats of the tropical and sub-tropical regions of the world. The word ‘*Mangroves*’ is used to refer to the plants and also to the forest community, is an adjective like ‘Mangrove tree’. These ecosystems are also otherwise called as *tidal forests, oceanic rain forests* or *coastal woodlands*.

Mangroves in the Great Nicobar Island were estimated to occupy an area of 17 Sq. Km, before the tsunami of December, 2004. But majority of the areas were damaged and at present, these areas are getting naturally regenerated with few species. Around 14 species of mangroves belonging to 10 genera are found in Great Nicobar Island. Mangrove forests are highly productive ecosystems and have many ecological functions. More than 500 species of insects and Arachnids, 229 species of crustaceans, 212 species of Molluscs, 50 species of nematodes, 33 species of polychaetes, and 150 species of planktonic and benthic organisms are known from Indian mangroves.

2.6.2 Animals

A total of 304 species of fauna belonging to 22 species of mammals (including 3 marine mammals), 62 species of birds, 38 species of reptiles, 8 species of amphibians, 52 species of butterflies, 24 species of odonates, 2 species of scorpions, 20 species of spiders and 76 species of aquatic hemipterans are present in Campbell Bay National Park (ZSI, 2015).

2.6.2.1 Mammals

Major terrestrial mammals reported from CBNP are Nicobar Crab-eating Macaque, Nicobar Wild Pig, Nicobar Spiny Shrew and Nicobar Tree Shrew. Occurrence of bats and rats in these islands can be explained by the fact that the bats are endowed with the power of flight to negotiate the expanse of the sea barrier between the islands and the nearby continental land mass of South East Asia, whereas rats could have easily migrated to these islands through rafts, canoes, ships, etc. Nevertheless, some of these mammals, under changed ecological set up of the islands have evolved into endemic species. List of Mammals recorded from CBNP and GNI are listed in Annexure X. A brief description of few important mammals are given below: -

(i) Nicobar Crab-eating Macaque (*Macaca fascicularis umbrosa*)

The Long-Tailed Macaque is the only nonhuman primates found on Nicobar Islands (Umapathy *et al.*, 2003). In 2000, a total of 88 groups, having a mean size of 36 monkeys, were recorded in Great Nicobar, Little Nicobar and Katchal Islands (Umapathy *et al.*, 2003) in which 53 groups observed in Great Nicobar Island. However, in 2006 a total of 40 groups, including 814 monkeys were recorded in Great Nicobar, Little Nicobar and Katchal Islands while assessing the impact of the Tsunami on the Long-Tailed Macaque of Nicobar Islands (Sivakumar, 2010) in which 22 groups were observed in Great Nicobar Island with mean group size of 20.35Nos. Majority of the monkey groups are found along the coastal areas (Umapathy *et al.*, 2003). The macaque population of Nicobar Islands sharply decreased due to eradication of coastal forests in 2004 tsunami (Sivakumar, 2010). As per the ZSI's reports based on the study conducted in 2011a total of 34 groups of macaques including 1133 individual monkeys were sighted and the group size varying from 8 to 127 individuals (mean 33.32 ± 4.82 SE). The study conducted by the SACON in 2013 -2014 detected 36 groups, 5 groups and 38 groups of macaques in Great Nicobar, Little Nicobar and Katchal respectively. The mean group size of macaques found in Great Nicobar was 39.83 ± 17.47 SD and Katchal was 43.50 ± 26.15 SD.

Great Nicobar has different terrain types with different elevation pattern. High number of macaque group was recorded at the altitude range between 201 and 250 feet. The lowest group recorded shared two altitudinal ranges are 351-400 feet and >600 feet. Most of the macaque group were seen in road side near the villages and sea shore areas where agricultural activities being practiced for coconut and banana cultivation, probably which makes easy foraging for macaques. The daily activities and behaviour of primates differ between residential, non residential and undisturbed areas. Large group size, poor habitat

quality, seasonal variation in food availability may affect their daily activity budget. The continuous movement is the highest portion of daily activity noticed. They spend most of their time for moving as they are mainly frugivorous and occupy more space. Availability of food source significantly affects their movement in daily activity pattern. Sometimes these animals visit human settlement areas and raid crop land, coconut farms and banana farms which lead to their destruction. It shows that macaque spent most of their time in moving due to insufficient and diminishing natural food sources in their habitat. Besides continuous movement, feeding was observed as one of the major activities of macaque during such movements. The main sources are fruits, flowers, tender leaves, insects, crabs, beetles, butterflies, some spiders, grasshopper etc. Usually macaque feed insects in the afternoon period between resting and grooming. Resting is another activity observed. Resting includes activities like sleeping, lying down and sit idle. Macaques were observed resting on tree branches, dead woods, bushes, rocks and some times resting on the roads. Also they use to take a few minutes rest after walking continuously. Rainy season and unusual climate directly affect their feeding and moving activities and increase their resting activity. During night time macaques sleep on the top of tree branches. This behaviour indicates that the macaque protect themselves from the predators. The only known predator is reticulated python as no other higher predators are found in Great Nicobar Island, but the anthropogenic activity and domestic predators like dogs also affects their normal activities.

Grooming activity is observed after resting. Most of their grooming activity occurs at the time of resting period. It was predominantly observed in the late afternoon when the macaques return to the home range. At the time of grooming one monkey picks up lice from other's body. Most of the individuals often prefer to self groom rather than social grooming. Social grooming is highly noticed between adult female and adult male. Vocalization behaviour has also been observed among macaques. When the agonistic interaction occurs between the group individuals, dominant adult male produce loud call and all other individuals sound continuously. In general macaque produce loud calls especially for grabbing and snatching food items and fighting with their group member. In addition during agonistic interaction within the group or entrance of predatory animals such as dogs in their territory macaque make vocalization. Normally vocalization can be treated as warning signal to protect themselves from predators. During human activities in their range, macaque produce different sounds and mainly the subadults seem to be most active as they climb very quickly and keep other individuals alert. Members of the group after hearing the vocal call

warning climb higher ground to escape or hide in bushes. Male macaques were found to produce vocal calls while grooming after mating. Playing activity is another behaviour noticed in macaques. Juveniles play more than subadults. Usually playing behaviour is observed more in the late afternoon. Wrestling, chasing, tickling, swinging on the tree branches, pulling their tails to play with one another and invert hanging and jumping are the playing categories. Few trees like jamun, guava, pandanus, cauarina and coconut are used for playing. Activity showing sexual behaviour like mating last for few seconds only. Agonistic behaviour is also noticed among the macaques. Chase, grab, hit, bite and fight are type of agonistic behaviour noticed. Chasing and biting occur sometime between the males and subadults. Macaques also show aggressive activities against human beings especially women and children.

Maximum numbers of groups prefer tropical evergreen forest and minimum number of groups found in semi evergreen and littoral forest. Tropical evergreen forest provides them protection from domestic predators. However, they depend on nearby villages or human settlements, agricultural areas like coconut plantation and other vegetables, fruits cultivated areas for their foraging in general (ZSI, 2015).

(ii) Nicobar Wild Pig (*Sus scrofa nicobaricus*)

Blyth, (1893) described Nicobar wild pig *Sus scrofa nicobaricus*. Miller 1902 noted from Dr. Abbot (his letter dated April 23, 1901 to Miller) that Nicobar wild pig *S. scrofa nicobaricus* endemic to Nicobars was originally *Sus cristatus* of the mainland. Nicobar Wild Pig is omnivorous and eats tubers, crops, roots, offal, carrion and even insect larvae and lives on inland forest. This species is listed in Schedule III of the Wildlife Protection Act of 1972. Primitive tribal groups hunt Nicobar Wild Pig for its meat.

(iii) Nicobar tree shrew (*Tupaianicobarica*)

Nicobar treeshrew (*Tupaianicobarica*) is an endemic mammal restricted in its distribution to Great and Little Nicobar islands in the Andaman Sea. The name of the genus was derived from a Malay word "tupai" meaning squirrel. It is a species under Tupaiidae family. They have a slender body and a long tail and well developed senses of hearing, smell and vision. Tree Shrews have the highest brain to body mass ratio of any animal, even higher than humans. In 1858, Novara Expedition team reported the Nicobar Tree Shrew (*Tupaianicobarica*) for the first time from Nicobar Islands and in Great Nicobar it was found to be very abundant (Tikader & Das, 1985). Later a subspecies of Tree Shrew was recognized by Miller in 1902 from Great Nicobar (*Tupaia nicobarica nicobarica*). Nicobar

Tree Shrew is basically insectivorous and lives on thick vegetation. The species is diurnal in nature and mainly arboreal. They spend most of the time on the ground and in low bushes. They are omnivorous and feed on fruits, seeds, leaves and insects.

Nicobar treeshrews spend more than 60% of the day on foraging, followed by resting or sleeping (12%). The proportion of time spent on major activities was significantly different across different time periods, with much of the feeding activity in the mornings and evenings. Nicobar treeshrews were observed largely solitarily or as breeding pairs. The species is found in moderate numbers both in the littoral forests as well as in the rainforests in the interior of the island. Although formally classified as endangered (on account of its restricted range), the species is common locally (Meera, 2008). Natural habitat of this species is subtropical or tropical dry forest.

2.6.3 Avian Fauna

In Andaman and Nicobar Islands 284 species and sub species has been reported with 30 endemic species. In which, Great Nicobar Island is having 62 species falling under 14 orders and 23 families. Endemic species like Nicobar Megapode, Great Nicobar Serpant Eagle, Nicobar Parakeet, Nicobar Jungle flycatcher, Nicobar scops-owl and Nicobar Imperial pigeon recently added in their list (Annexure-XI).

(i) Nicobar Megapode (*Megapodius nicobariensis*)

The Nicobar megapode, also known as ‘thermometer bird’ is a monomorphic mound building megapode, endemic to the Nicobar Islands. Two subspecies are recognized: North Nicobar Scrubfowl *Megapodius nicobariensis nicobariensis* (Blyth 1846) and South Nicobar Scrubfowl *Megapodius nicobariensis abbotti* (Oberholser, 1919). *Megapodius nicobariensis abbotti* is endemic to the Great Nicobar Islands (Great Nicobar, Kondul, Little Nicobar, Megapod, Menchal, Meroe, Trax, and Treis Islands). *Megapodius nicobariensis abbotti* is believed to have disappeared from all areas colonised by mainlanders (Dekker, 1992), but they continue to survive in small remnant pockets (Sankaran, 1995). Megapodes are the most peculiar of all Galliformes which show an aberrant strategy of incubating eggs in mounds of sand and leaf litter where heat is generated by microbial decomposition (Dekker2007). Prior to tsunami, the species was found in greatest concentrations in littoral forests due to the propensity of megapodes to build incubation mounds close to the beach (Sivakumar 1999).

Active mounds were considered for population estimation. Mounds of megapodes are categorised basically into three types: Type A-regular in shape and built on an open spot away from trees; Type B-irregular in shape and built against the buttress or stem of a large

living tree; Type C-also irregular in shape but built against, around, under or over a dead rotting tree stump or log. Mounds are considered active if the soil was loose and there were signs of recent digging by megapodes, regarded as abandoned if the mound was compact, hard and impenetrable with a stick and vegetation growing on it. Mounds were considered inactive, if there was no sign of recent digging and when the soil was loose without any vegetation on it. Size (Volume) of the mound and average number of birds that use a mound are two pre-requisites for estimating the population of megapodes. According to Dekker (2007), all megapode species are strong flyers and they can easily cover vast areas of open water, even at the chick stage. A study report of 1994 (Sankaran 1995) estimated 1161 number of active mounds i.e 2322 number of breeding pairs in Nicobar District. A post tsunami study by Sivakumar (2007,2010) estimated 394-788 breeding pairs to occur in Nicobars District. The survey conducted by SACON (2009-2011) identified 40 active mounds located along 73 km long coastal habitats and it is estimated that 376 mounds to occur along 687km coastline of Nicobar Islands within the known distribution range of megapodes. Approximately, 376-752 breeding pairs of Nicobar Megapode were estimated to occur in Nicobar Islands when one pair per mound is set as the lower limit and two pairs per mound was set as the upper limit. In Great Nicobar Island active mounds have been noticed at Kopenheat, Kasingdon and Trinket Bay area.

2.6.4 Reptiles

A total of 20 species of reptiles were recorded (2 species of turtles, 1 species of lizard, 4 species of gecko, 3 species of skink, 8 species of snakes, 1 species of water monitor lizard and one species of crocodile) (Annexure-XII). Salt water crocodiles are regularly seen in the creeks situated in the Northern boundary. Reticulated pythons spotted and rescued from human inhabitation were released in the dense forest area near southern portion of the National Park. Road kills are very frequent in case of Water Monitor lizard (*Varanus salvator*) and other reptiles/ amphibians outside the PA. Brahminy worm snake (*Ramphotyphlops braminus*), Nicobar bronze back (*Dendrelaphis humayuni*) and Dog-faced water snakes (*Cerberus rynchops*) are reported from Campbell Bay National Park. Daniel's forest lizard (*Bronchoceladanieli*) is also reported from CBNP (ZSI, 2015).

2.6.4.1 Sea Turtles

In Andaman and Nicobar Islands four species of sea turtles and one species of freshwater turtle are reported. Beaches found on the Northern side of the PA are good habitat for the sea turtles. These include sea turtles namely the leatherback turtle (*Dermochelys*

coriacea), the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*), and the olive ridley (*Lepidochelys olivacea*) and the Freshwater turtle (*Cuora amboinensis* (Daudin, 1801) *kamaroma*(Rummler & Frtiz, 1991).

(i) Leatherback turtle (*Dermochelys coriacea*)

Leatherback turtle is the biggest turtle amongst the four turtles which visit the beaches of Great Nicobar Island. The Carapace is elongated about 140-170 cm long, with seven prominent dorsal ridges. Scutes always absent. Mostly black in colour with white spotting; pink or bluish spots on base of neck and flippers. Head is triangular; two maxillary cusps. The Forelimbs are extremely long and plastron is relatively small. The average weight of Leatherback turtles is 500 kg and track is 150 – 200 cm wide, deep and broad, with symmetrical diagonal marks made by forelimbs, usually with a deep median groove from the long tail. They prefer wide beaches with steep slope, rock free deep water approach. Leatherback turtles lay about 80-100 egg and individual egg measures 5 cm in diameter. The leathery turtle is more oceanic than other species of marine turtles. It lives mainly on jelly fish and is believed to be deep sea feeders.

(ii) Green Sea turtle (*Chelonia mydas*)

The Carapace of Green Sea turtle is broadly oval measuring about 90-120 cm in length, margin scalloped but not serrated. The Costal scutes are four pairs in numbers and brown with radiating streaks in juveniles. Head shape is anteriorly rounded and has one pair of Prefrontal scales. The limbs are with single claw on each flipper and plastron is white in hatchlings and yellowish in adults. The Green Sea turtle is weighing about 250 kg and track is 100 – 130 cm wide, deep, with symmetrical diagonal marks made by forelimbs. Adults olive green are brown above, with spots or blotches or streaks of brown or black. The hatchling is dark blue-black. It feeds on marine algae and sea grass. Green sea turtle prefer large, open beaches to small cove beaches. The beaches in Great Nicobar Island are one of the preferred beaches for nesting. They lay about 100-120 eggs and individual egg measures about 4.5 cm in diameter.

(iii) Hawksbill turtle (*Eretmochelys imbricata*)

The Carapace shape of Hawksbill turtle is oval and length is about 80-100 cm. The carapace is strongly serrated with posterior margin with thick overlapping (imbricate) scutes. The Costal scutes are four pairs in number. Colour is brown, boldly marked with amber and brown variegations. The head shape is narrow, straight bird like beak. Hawksbill turtle have two pair prefrontal scales. The limbs having two claws on each flipper and plastron are light

yellow to white in colour. The average weight of Hawksbill turtle is about 150 kg and track is 70 - 85 cm wide, shallow, with asymmetrical (alternating) oblique marks made by forelimbs. Hawksbill turtle prefer narrow beaches on islands. Hawksbills also often nest under overhanging vegetation. They lay about 120-150 eggs and individual egg is 3.5 cm in diameter. It is omnivorous, but inclined to be largely carnivorous, feeding on sponges and other invertebrates and on fish as well.

(iv) Olive ridley turtle (*Lepidochelys olivacea*)

The Carapace of Olive ridley turtle is short and wide. It is smooth but elevated and measuring about 60-70 cm in length. The Costal scutes are five to nine, asymmetrical. Colour is mid to dark olive green. The head is large, triangular with two pair prefrontal scales. Olive ridley is having two claws on each flipper and plastron having pore near rear margin of infra marginals; creamy yellow. The olive ridley is weighing about 50 kg and track is 70 –80 cm wide, light, with asymmetrical, oblique marks made by forelimbs. They prefer tropical shores and barrier islands, often near river mouths. Andaman and Nicobar is also a preferred site for nesting along with the rest of India. They lay about 100-120 eggs and individual egg measuring about 4 cm in diameter. It is omnivorous. Feeds on crabs, other crustacean, and soft parts of mollusks.

Previous surveys and studies in these islands have recorded India's best nesting beaches for species namely leatherback, green turtle and hawksbill turtles. Extensive feeding grounds for hawksbill and green turtles have also been confirmed (Bhaskar, 1993; Andrews *et al.*, 2001) the hawksbill population in the Andamans and Nicobars are the largest for India and most important for the Northern Indian Ocean region. The leatherback nesting population in the Nicobar is one of the four colonies that exceeds 1000 individuals in the Indo-Pacific, and hence of global significance (Andrews *et al.*, 2001)

The freshwater Asian box turtle (*Cuora amboinensis* Daudin, 1801) was reported by Das (1996) in Great Nicobar Island. It is commonly called Malayan box turtle; the species is currently listed as Vulnerable in IUCN Red list due to its heavy exploitation for the international food, pet, and medicinal trade. There is an apparently large illegal trade in the species, and many regional populations appear to be decreasing rapidly, requiring closer monitoring (Schoppe and Das, 2011).

2.6.4.2 Salt Water Crocodile (*Crocodylus porosus*)

The mangrove fringed creeks along the coast are suitable habitats for salt water crocodiles. Nesting sites of salt water crocodiles are usually in mangrove forest patches. Salt water crocodile is a schedule-I species under Wildlife (Protection) Act, 1972. Tribals consume its meat as such proper protection, monitoring and conservation efforts are to be enhanced for saving the species.

2.6.4.3 Water Monitor lizard (*Varanus salvator*)

The Park support a good population of water monitor lizard, which is listed as a Schedule-I species under Wildlife (Protection) Act, 1972.

2.6.4.4 Reticulated Python (*Broghammerus reticulatus*)

Reticulated Python (*Broghammerus reticulatus*) is the rare and least known snake in India. The only one python species reported from Andaman and Nicobar Islands. It is found in the Central Nicobar (Katchal, Kamorta, Nancowry) and South Nicobar (Little Nicobar and Great Nicobar Islands) of Nicobar group of Island. Reticulated pythons are listed in Schedule-I, protected under the Indian Wildlife (Protection) Act, 1972 and also listed as Appendix-II in CITES but not evaluated in IUCN Red list. The Reticulated python was recorded by various researchers from Great Nicobar Island (Blyth, 1846; Biswas and Sanyal, 1977, 1980; Bhaskar and Rao, 1992; Vijayakumar *et al* 2006). Recently survey was conducted by ZSI in the Great Nicobar Island, and two snakes were reported to be observed. Occasionally it enters in the farmland of the adjacent villagers and sometimes eats the chickens.

2.6.5 Amphibians

Approximately ~202 species amphibians are reported in the country and they show a high level of endemism i.e. 59 %. Andaman and Nicobar Islands contributes 18 species, of which 8 species under a single order known from Great Nicobar Island of which three are endemic species. Some of the species, namely *Bufo melanostictus* (Indian toad) of Family Bufonidae, *Microhyla heymonsi*, *Limnonectes doriae*, *L. shompenorum*, *L. cancrivorus*, *Rhacophorus leucomystax* (Tree Frog), *Rana nicobariensis*, *R. erythraea*, *R. chalconota*, *Taylorana hascheana*, *Polypedates insularis* are reported from GNI.

2.6.6 Invertebrates

Campbell Bay National Park is home to many invertebrates ranging from terrestrial butterflies to leaches. This is attributed to wide variety of habitats found in the Park. One

important invertebrate species is Giant Robber Crab (*Birgus latro*) which is a well adapted hermit crab. It is diurnal and nocturnal in habits. This large crab grows up to 30cm long and 22cm wide. Its body is covered with hard plates and has long and strong legs for controlling all types of works. The animals feeds on smaller worms, crustaceans and mollusks. It also climbs coconut trees and feeds on their nuts by tearing the fibrous cover and breaking the shell open. A wide variety of molluscs is found in CBNP, but faces the problem of over exploitation. Some species of bivalves of the genus *Tridacna* are example of this. The *Tridacna gigas* (Giant Clam) is the largest living bivalve mollusc. Also this is one of the most endangered clam species native to the shallow coral reefs of the South pacific and Indian Oceans. They can weigh more than 200kg. *Tridacna gigas* lives in flat coral sand or broken coral and can be found at a depth of as much as 20m. They can be seen in the reef flat areas of the Island. Crustaceans also are not studied in this park till date, and diversity needs to be studied for species of Crabs, Hermit crabs and Prawns.

2.6.7 Freshwater Fishes

These are not freshwater fauna as such, but consist of adaptable marine fish species. The fluviatile fish fauna here have been derived from the surrounding sea rather than from any other territory. Fish fauna of the rivers of CBNP are not properly explored. The list of freshwater species recorded from the rivers of CBNP is given in Annexure XIII.

2.6.8 Coral reefs

Coral reefs are one of the most biologically productive, diverse and dynamic among all natural ecosystems. Corals are ancient animals that date back to 400 million years. Over the past 25 million years they have evolved into modern reef building forms. The coral reefs not only provide a sanctuary to a myriad marine life but also play a key role in protecting the coastline from erosion. Northern boundary of the National Park is sea and various streams originated from the Protected area flows into it. Studies on the coral reefs of the National Park is limited. The large number of holes and crevices in a reef provide abundant shelter for fish and invertebrates and also provide solid substrata for many bottom living organism namely clams, sponges, sea weeds, sea anemones, algae etc. The scleractinian corals of Indian waters are highly diverse than other parts of the tropical reefs. A total of 110 species of scleractinian corals belonging to 8 families were reported from in and around the Great Nicobar Island during a survey conducted by ZSI in 2010. Scleractinia corals have a richer diversity when compared to the other reefs. Among them the family Acroporidae is dominant

as it is represented by 43 species including the genus *Acropora* (28 species) and *Montopora* (8 species).

2.7 Habitat Quality, Quantity and Key areas

Coastlines, tropical evergreen forests and inland water creeks form major habitats for Campbell Bay National Park. Coastline on Northern boundary of CBNP is interspersed with sandy beaches and rocky patches. The beaches are nesting grounds for sea turtles and birds like terns in general. Different types of crabs, invertebrates like worms, bivalves etc. live in this habitat. During low tide, large areas of the intertidal zone gets exposed, revealing the diversity of corals, mussels, limpets, algae, sea grasses and many other flora and fauna. Sea turtles like Leatherback, Hawksbill, Olive Ridley and Green sea turtles visit these beaches during their nesting season. Salt water crocodiles inhabit in the mouths and creeks of rivers and beaches. The terrestrial habitat supports a number of animal species and also acts as breeding grounds for birds.

2.7.1 Impact of tsunami, 2004

The tsunami caused complete destruction or significant damages to terrestrial vegetation and coastal ecosystems between the beach and the hill, up to a height of 10-12 msl. Earthquake and tsunami has changed the coastline, destroying promontories, straightening smaller indentations, and joining adjacent bays. In some cases, bays have merged, with the promontories in between fragmented into islets. Coastlines have receded towards the hills, at places by several hundred metres, often resulting in very little or no land between the hills or high ground and the sea. Several new islands have been broken off the main islands. The worst affected of habitats were those at sea level, the mouths of creeks and rivers, and up to the hills they originate from, were completely denuded of vegetation. Thus mangroves, *Nypa* formations, riverine vegetation along nallahs and tidal creeks were the worst affected where over 90% of these have been physically uprooted, and in many areas there is no sign that mangroves and their associates were present. Equally badly affected were the freshwater wetlands and marshes that turned to saline or brackish, some of these are now part of the sea. Littoral forests have been variably damaged. The damage by uprooting of trees was enormous, and undergrowth and middle stories were far more likely to get stripped completely than old growth trees. In the belt that was affected by the tsunami, over 90% of the vegetation has been scorched due to salt stress and is devoid of leaves. Hills have been affected at the bases till run up heights, and in the badly affected areas, the vegetation has been completely stripped to bare ground (Sankaran et al., 2005).

CHAPTER 3

History and past system of management

3.1 General

The Great Nicobar Island is the southernmost island of Andaman and Nicobar Islands located about 482 km south of Port Blair, the capital of the Union Territory. The total geographical area of the island is 1044 Km² with a length of 55 Km from Murray Point in the North to Indira Point in the South. The greatest width of about 30 km is in the north which narrows down to about 3 km in the southern tip.

Some of the earlier explorations of Great Nicobar Islands were mainly of botanical, geological and oceanographic significance. During the year 1845-47, the Austrian Frigate headed by Dr. Von Hochstetters, a geologist, studied the geology and geography of the Nicobar Islands and M. Jelinek, a member of the team, collected a few plants from the Nicobar Islands. Between 1847-1849 Commodore Steen Bille made the famous expedition of the Danish Corvette 'Galathea' and touched the GNI and collected some plants which were enumerated together with an account of the vegetation and was published in Danish language in 1849. Subsequently N. Wallich translated it into English in 1850. In 1863, Rev. Parish botanized the islands and his collections were deposited in CAL and K herbarium. S. Kurz described several new plants from the Nicobar Islands and gave a detailed sketch of the vegetation following his systematic exploration between 1866 and 1876.

Sir David Prain (1891) conducted a series of botanical explorations to these islands and described the vegetation of Nicobar. Boden Kios (1903) visited these islands and wrote a book on local plants used by the tribal communities. During 1952, Sahni visited GNI and assessed the timber wealth of the island. Around 150 species were described by him in 1953 from GNI and an account on mangroves of GNI in 1958. Thothathri made an expedition to GNI to assess the plant wealth in 1966 and published the detail on 335 species on botanical point of view.

During 1976-79, Balakrishnan visited the islands and described many species including endemic and rare ones from GNI. A list of rare, endangered and endemic plants of whole Andaman & Nicobar Islands was published by him in 1977-78. He had done extensive studies on wild population of Arecanut, Coconut and their distribution.

3.2 Past history

The area comprising CBNP forms part of the area declared as Tribal Reserve within the coastline of Great Nicobar Island, since 1957. The Mongoloid Shompen tribe of about 200-250 in number lives in Great Nicobar Island scattered inside the forests particularly along the rivers and streams. They are shy in nature and avoid contact with outsiders. They live around and along the perennial freshwater rivers. Their huts are made of palm and pandanus leaves. The Shompens are hunters and food gatherers leading a seminomadic life. They cultivate yams, pandanus, coconuts, arecanuts and bananas. They maintain small herds of pigs and also hunt wild pigs with spears and do fishing using harpoons. Nicobarese, another group of Mangoloid tribes live in groups along the west coast at Afra Bay. Nicobarese are horticulturists. Coconut, pandanus, banana, papaya, yam and other starchy roots and tubers are their principal items of crop. They also do hunting and fishing. Pig rearing is traditional among Nicobarese. Their huts are made of wooden logs, stems of areca palm, coconut palm etc. while the roof is thatched with grass, canes and coconut leaves.

Since 1831 till 1869 Nicobar was under the Danish administration. Before the British annexed Nicobar to their colonial fold the Danes were in command. In 1831 the Danes had established their dominion over Nicobar especially in the Southern Groups close to the Great Shipping channel of Far East and tried to establish Dairy Farms in the Nancowry group of Islands. For that purpose they clear felled big chunks of forests in five Islands adjoining Nancowry harbour for raising fodder for their dairy. They imported good variety of Milch Cattle. But they had to give up the Dairy project ultimately, because of the hazards of virulent malaria, inclement weather and unhygienic conditions resulted in death of cattles.

In Great Nicobar, the Shompens were first contacted by the Danish explorer Radesionin 1831. It is believed that the Dravidians had somehow influenced this race in Great Nicobar, may it be due to the Island being close to the shipping channel which the Dravidians used to master during Chola period or through the sailors of a ship wreck. Shri Vedapan Soloman, a Christian Missionary from Madras lived in Car Nicobar during early 20th Century as an agent of the British Rule. He used to be the official magistrate of the British Govt. and also acted as Port Commissioner, Meteorological Observer, Teacher, Catechist and Doctor. He and his wife together brought about a significant change in the life of the Nicobarese. In 1952 Shri Richardson, Bishop for the diocesan of Nicobar, also became the first Member of Parliament representing Andaman and Nicobar Lok Sabha Constituency.

Nicobarese used to disturb the shipping line for quite some time before the Britishers stepped in. They had scuttled many vessels and murdered a number of Crew visiting their Islands. This culminated in attack of the Brig. Futen Islam in 1866 near Great Nicobar and 21 Crew members were murdered. This prompted the British to establish penal settlement in Nicobar. First site selected was in Kamorta Island in Nancowry Harbour. In 1866 about 262 prisoners were brought towards Kamorta as part of the settlement project. But they had to abandon the project due to the outbreak of malaria. Since then, till independence, Nicobar Islands slumbered under the British Rules and ruled by an agent stationed at Car Nicobar. During Second World War these Islands were conquered by Japanese in 1942 and remained under their rule till 1945.

No effective forestry activities were taken up in Nicobar mainly because of the communication bottleneck and lack of infrastructure. During 1957, entire Nicobar group of Islands were notified as Aboriginal Tribal Reserve under Andaman and Nicobar Islands (Protection of aboriginal tribal) Regulation 1956 which prohibited entry in to the reserve without prior permission. CBNP for which the present plan is being presented forms part of this Tribal Reserve. In late fifties, a Forest Division was started at Kamorta with an Assistant Conservator of Forest as in-charge. Other than raising some experimental plots and reforesting the grasslands, not much works could be taken up. In 1967, about 600 ha of forest land in Katchal Island was clear felled for raising rubber plantations with an objective to rehabilitate the repatriates from Ceylon, mostly plantation labourers.

During 1965, when it was decided to set up a settlement of the ex-servicemen in Great Nicobar Island, a portion of Great Nicobar Island was de-reserved out of Tribal Reserve. Ex-serviceman settlement was taken up in the year 1966 onward and continued till 1977. About 305 families of ex-serviceman were settled in Campbell Bay and 8045 ha of land was deforested. The economy of the settlers is based on agricultural production and fishing. Paddy, coconut, arecanut and spices constitute the major agricultural production. Rice is grown on a subsistence basis. Income generating horticulture crops include coconut plantations and arecanut plantations. Fishing is done mainly by the fisher-folk communities who migrated from Andhra Pradesh and have settled in Campbell Bay and Shastri Nagar. During late 1970's and 80's timber was harvested by many private agencies for meeting domestic requirements. Now a days there is no commercial extraction of timber from Great Nicobar Island due to the ban on felling in Andaman & Nicobar Islands imposed by the Hon'ble Supreme Court of India.

3.3 Review of past management

Forest Department came into existence in 1883 and the initial forestry operation was irregular felling in accessible areas. Plantations of important timber species such as Padauk and Teak were raised. In 1891, the then Inspector General of Forests, H. C. Hill visited Andaman & Nicobar and directed to prepare Forest Working Plans and suggested measures to carry out natural regeneration in extraction coupes. In 1921, clear felling system was introduced, but on finding the system unsuitable for these islands, selection system was restored after a couple of years.

The first Working Plan was prepared by F.H Todd in 1906. The second Working Plan was prepared by M.C.C. Bonnington in 1914. The third Plan of 1925 was completed by H.S.Deans only in 1936. Due to technical reasons, the plan was avoided and an interim Working Scheme was prepared by B.S.Chengappa for the period 1936 to 1939. This marked the beginning of scientific forest management in the isles. In 1948, Chengappa was appointed as Conservator of Forests (Working Plan) and he prepared a new Working Plan for the period from 1952 to 1968. However due to influx of refugees from East Pakistan, the plan prescriptions could not be followed, as large tracts of forests were diverted for rehabilitating the refugees.

None of the above working plans covered the Nicobar group of Islands. When a separate territorial division was formed viz. Little Andaman Forest Division with headquarters at Little Andaman included the Nicobar group of Islands. Andaman & Nicobar Islands Forests & Plantation Development Corporation Ltd. was established for raising forest plantations, extraction, logging and marketing in the year 1977. Harvestable forests were leased out to ANIFPDC Ltd in Little Andaman. Subsequently Nicobar Forest Division was established and the Headquarters was shifted to Campbell Bay. The Division was under the jurisdiction of Conservator of Forests (Southern Circle) till 01.04.2005. A separate wildlife wing was started in 1977 in line with enactment of Wildlife Protection Act, 1972. Wildlife wing was later merged with the territorial division on 01.04.2005 and brought under the control of Conservator of Forests (Wildlife). Area of Campbell Bay National Park was never managed under a Silvicultural system. Hence management till date is purely conservation and protection oriented. However, it was observed that any attempt to establish monoculture plantations in these islands led to erosion and degradation. Forests in Great Nicobar Islands/ Campbell Bay National Park remained virgin in its composition and cradle a number of rare

and endemic species. Most of the forests in CBNP remained untouched due to its geographic location and inaccessibility.

3.4 Rights and concessions

Entire area of Great Nicobar Island excluding the area between the co-ordinates in the Eastern coast of Great Nicobar Island (longitude 93°50'East to 93°57'East and latitude 06°53' North to 07°02' North) constitute Tribal Reserve. No rights and concessions conferred on settler population in Campbell Bay NP. However, Shompens and Nicobarese are allowed unfettered right over the forests to collect forest products for their bonafide domestic use.

3.5 Impact of tsunami on faunal and floral diversity

Tsunami of December 26, 2004 caused considerable damage to the marine and low lying habitats of Andaman and Nicobar group of islands including the Great Nicobar Islands. Earthquake and tsunami devastated the littoral forests and the marine biodiversity of GNI. Earthquake caused the permanent inundation of landmass approximately by 1m. The effect of tsunami was recorded on the terrestrial animals of coastal areas. Tsunami affected population of terrestrial animals like Nicobar Long Tail Macaque, Megapode and Turtles during the first year of studies. Also it was observed that the recuperation of corals after tsunami was found in this island and density of coral varied from 10 to 16 colonies/10m²area with the species diversity (H') of 1.98 – 2.85 (ZSI, 2015).

Though the Great Nicobar Island was very close to the epicenter of tsunami, it was protected to some extent because of its hilly terrain but the coastal areas have been affected much. In general, the south-west and south-eastern sides of the island have been worst affected when compared to the north and north-eastern sides, which are more hilly and steep in nature towards the seaward side. The pre-tsunami data shows about 871.40 ha of mangroves in the Great Nicobar, while the post-tsunami data show only 339.70 ha, leaving 531.70 ha of mangroves to the killer waves. The estimate indicates that 61% of mangroves of this island have been affected badly (Sridhar et al., 2016).

3.6 Management Plan for the period 2008-2013

First Management Plan for Campbell Bay National Park was prepared by Dr. P Viswakannan in 2008. The plan was made with a vision to preserve the habitat of CBNP in its natural state. The zone plan proposed in this management plan involved catchment area preservation zone, mangrove and littoral forest conservation zone, habitat management zone

and buffer zone. Suitable management interventions helped the ecosystem and habitat to evolve in its natural state. While addressing the rights of tribal communities, the Park was retained less of human interferences as suggested in the plan.

Eco-Tourism zone was proposed for the Campbell Bay National Park to support limited eco-tourism activities. Basic infrastructure facilities were proposed for the benefit of visitors and local public. But the number of visitors remains less due to remoteness of the island from main island groups. The plan suggested for undertaking research activities on vital areas of conservation and habitat management. During the plan period, enormous research works were undertaken by various agencies especially ZSI, BSI, SACON and various Universities. These studies helped the park managers to address various management issues with a scientific backup. Further, the staff amenities and facility for transportation has been improved during the plan period. But communication facility including VHF communication need to be improved. The period of the plan was over by 2013. New Management Plan for next 10 years is proposed and preparation is underway. During this interval, CBNP was managed according to the Annual Plan of Operations (APO's) approved for Nicobar Forest Division and Great Nicobar Biosphere Reserve.

3.7 Wildlife Conservation strategies and their evolution

The Andaman & Nicobar Islands union Territory Biodiversity Strategy and Action Plan (Jayaraj and Andrews, 2005) recommended identification and establishment of new Protected Areas, consolidation of existing PAs, strengthening of infrastructure with a wildlife wing, survey of mangroves and survey & delineation of coral reefs.

CHAPTER 4

Socio-economic situation and cultural practices

4.1 Introduction

There is a Nicobarese settlement within the CBNP at Afra Bay and few Nicobarese settlements outside the Park area. Shompens are residing in the southern and central part of the National Park. The tribes living here solely depend on the forest and marine resources as this area also forms part of the tribal reserve. The Shompens are semi-nomadic food gatherers and hunters while Nicobarese raise horticulture crops like coconut and arecanut besides hunting/ fishing.

4.2. Biotic interaction

The Nicobarese and the Shompens are the original inhabitants of Great Nicobar Island. Nicobarese are still dependent on forests to an extent while Shompens are nomadic and primitive tribes adapted to forest life. All their folk medicines and other requirements are met from the forest. Nicobarese and Shompens are considered as two distinct ethnic groups, though they have the same origin from the common Mongoloid stock of S.E. Asia. Details of both these tribes are as under.

4.2.1 Nicobarese

Prior to tsunami there were 11 Nicobarese villages located outside the CBNP along the west coast in the Great Nicobar Island. The Nicobarese are horticulturists, and the second indigeous tribe, residing mostly in coastal areas of Great Nicobar Bisphere Reserve. Coconut, pandanus, banana, papaya, yam and other starchy roots and tubers are their principal items of crop. They also depend for food on hunting and fishing. Pig rearing is an important traditional job of Nicobarese. The Nicobarese live in villages located along the coast. The huts are made of wooden logs, stems of areca palm, coconut palm etc. while the roof is thatched with grass, canes, bamboo and coconut leaves. After tsunami most of them were shifted to Campbell Bay in shelters and presently staying at Campbell Bay -60family (224Nos.) and Afra Bay -47family (191Nos.). Tribals are having 7Nos. of Engine Dhinghy and 9 Nos of Hoddy (canoe). The Directorate of Shipping Service provides regular service of Speed Boat for the movement of local passengers from Campbell bay to Afra bay. Fishing, Coconut cultivation and its harvesting are main activities.

4.2.2 Shompens

The Mongoloid Shompen Tribe, about 219 in number, is living within the GNI. They are shy in nature and avoid contact with outsiders. They live around and along the perennial freshwater rivers and construct huts using palm and pandanus leaves. The Shompens are hunters and food gatherers leading a semi-nomadic life with stone-age civilization. They cultivate yams, pandanus, coconuts, arecanuts, bananas etc. They maintain small herds of pigs and also hunt wild pigs with spears and fish with harpoons. These primitive aboriginals use a host of edible plants; make use of various plants and their parts for construction, cover, brush, dugout canoes, utensils, fishing harpoons, mat and baskets. Shompens inhabiting Jhaunala, Laful, Shompen hut and Kopenheat areas have revealed some interesting plants for medicinal uses. Six wild relatives of betel vine have been recorded from the northern part of Great Nicobar Island. Four of them are most likely belong to the species *P. betel* L. while the other two nearer to *P. clypeatum* Wall. And *P. flavimarginatum* if not conspecific with them. It is interesting to note that all these six forms are chewed by the local tribe Shompens.

4.3 Plants as food source

The large orange coloured fruits of *Pandanus leram* var. *andamanensium* constitute the staple food of the Shompen tribe. They grow in large numbers in the coastal beach forests. The fruits are boiled and the orange coloured pulp surrounding the individual fruit is separated and made into 'Pandanus Cheese' which is eaten with honey. Tubers of *Dioscorea* spp. and *Tacca leontopetaloides* constitute a part of the staple food of the tribals. There are many other wild plants consumed by the local people. These are pods of *Canavalia maritima*, *C. cathartica*; Tubers of *Colocasia esculenta* (as vegetable); Leaves of *Flagellaria indica* & *Ipomoea aquatica* (as vegetable); fruits of *Terminalia bialata* and *Syzygium samarangese* (as raw).

Hunting and illegal felling is not very frequent in CBNP. Threat of livestock grazing and other biotic interferences are almost nil inside CBNP. Invaders from outside the country came to this island attracted by the sea and timber wealth. Frequent intrusion of poachers from neighboring countries like Thailand, Myanmar, and Indonesia was reported. Now this intrusion is under control due to strong surveillance from Coast Guard and Navy.

4.4 Impact of tsunami on aboriginal tribes

On 26th December 2004, an earthquake of intensity 8.9 on Richter scale badly hit this Island followed by tsunami causing heavy damages to human lives and property. Major casualties have been reported from tribal settlements in the west-coast of Great Nicobar. North western coast of Great Nicobar was subjected to massive damage and the mouth of Alexandra and Dagmar Rivers were washed out. Nypa formations and riverine forests were also got destroyed. Surveys indicated that the coastline in several areas have been affected severely with the intrusion of seawater even upto 4 km at certain locations.

CHAPTER 5

Vision, objectives and problems

5.1 The Vision

“In situ conservation of flora and fauna, complete protection of natural habitats for ecological wellbeing and ensuring livelihood security of the dependant communities and developing Campbell Bay National Park as a centre of excellence in conservation and nature education”

5.2 Objectives of management

The area was declared as a National Park with the main objective of protecting the ecological processes and essential life supporting systems. The area represents the least disturbed region existing more or less in its natural state. It houses a significantly diverse flora and fauna, including centres of endemism and genetic richness. Two indigenous tribes viz. Shompen and Nicobarese inhabit inside the Forests. The Sea falls on the north side of the PA and its eastern and southern boundary adjoins the Protected Forests. Local fishermen are extracting fish from the sea and the creek surrounding the PA. Safeguarding the ecosystem will provide suitable habitat for nesting (i.e., proper nesting ground for various animals). There is a need to reduce the direct pressures on the biodiversity of the PA and to conserve all the species and its habitat, protect them effectively from natural as well as anthropogenic pressures, prevent establishment of invasive species, promote eco-tourism, create awareness among masses and promote research, survey and monitoring. The following objectives are formulated on the basis of the values recognized and prioritized earlier.

5.2.1 Long term objectives

The long term objectives of management are;

- i) To provide complete protection to the breeding and feeding grounds of rare and endangered species of flora and fauna.
- ii) To maintain biodiversity of the park and allow the species to evolve and function undisturbed in natural state of the environment.
- iii) Habitat management and restoration of threatened habitats including coastal and marine ecosystem.

- iv) Species oriented conservation converging on endemic, rare, endangered and vulnerable categories.
- v) To sustain ecosystem services of the CBNP.
- vi) To support and maintain watershed functions and preserve catchment areas of CBNP.
- vii) To address the rights of the tribal people while safeguarding the park from adverse human interventions.
- viii) To promote sustainable ecotourism activities within and around the CBNP.
- ix) To prepare a visitor management plan for CBNP.
- x) To create awareness among the general public, visitors and students by intensive nature education programs.
- xi) To generate data for future management and planning through scientific studies in order to support management of CBNP.

5.2.2 Short term objectives

The short term objectives are defined for achieving the long term objectives.

- i) To ensure physical protection for CBNP by strengthening protection units and using advanced surveillance measures including communication aids and satellite data.
- ii) *In situ* conservation of flora and fauna of the park and to conserve them.
- iii) Protecting of watercourses including lakes, rivers and streams of CBNP in their natural state.
- iv) To undertake scientific research on rare, endangered and vulnerable species of CBNP and to obtain data and information for continuous monitoring of population of such species using advance techniques without causing any damage to the flora, fauna or habitat.
- v) To address the rights of the tribals residing in and around CBNP and organize entry point activities for welfare of the tribal population.
- vi) Undertake capacity building and training programs for executive staff particularly on advanced wildlife techniques and sophisticated instruments and aids.
- vii) To conduct nature awareness camps for school children of Campbell Bay to enlighten them on need of conservation of nature and environment.
- viii) To provide advanced management techniques including software tools for analysis and interpretation of data and its management.

- ix) To develop a mobile application for CBNP for regular feeding of data including boundary status, natural water sources, occurrence and distribution of species, impacts from human and other causes etc. by the patrolling staff.
- x) To collect data for effective monitoring of the effect of the scientific management study.

5.3 Problems in achieving objectives

- i) Possible intrusion and camping of foreign poachers from outside the international borders.
- ii) Poor communication facility at GNI and less developed wireless communication.
- iii) Slow pace of development of the island due to remoteness of the area and additional cost involved in transportation of stores.

CHAPTER 6

The Strategies

The biodiversity of Campbell Bay National Park remains unexplored due to its isolated geography and inaccessibility to a great extent. External interferences are also very limited except in Afra Bay and Northern coastline. Hence more focus may be on biodiversity and conservation aspects of Campbell Bay National Park ensuring physical protection from internal and external risks. In order to achieve the objectives appropriate strategies are to be adopted like protection and conservation of the ecosystems through protection of boundaries, creating zones and its management through proper planning and implementation. Habitat improvement plans will help in reducing the human and animals conflicts in the zone of influence.

6.1 Boundaries

The final notification No. 97 (B)/96/F CWLW/WL/31/1188 dated 22nd November, 1996 (Annexure-IV) contains description of boundaries of the National Park. Northern boundary of the Park lies along the coastline of Great Nicobar Island. Initiative was made to demarcate Eastern boundary of the Park, but due to difficult and hilly terrain the work is not completed. Boundaries in West and South are to be demarcated on ground. The ecological boundary is beyond the notified area of the National Park. Wild animals move from the Protected Forests to the PA and vice versa. Few villages are situated in the notional ecosensitive zone of 10km. All the existing boundary pillars shall be verified and maintained. Record shall be maintained both at Range Office and Divisional Office level. If required out sourcing can be done to undertake various delineation works. Routine inspection shall be done for checking illegal activities and encroachments.

6.2 Zonation

The purpose of zonation of the National Park is to protect and preserve sensitive components of the ecosystems while facilitating compatible activities. The zonation ensures that areas of high ecological importance evolve naturally with minimal human interference. It also promotes sustainable use, protection of diverse habitats and preservation of important natural resources.

The objectives of the zonation in the Campbell Bay National Park are to:

- i) Reduce stresses from human activities by establishing areas like Protection zone, Tourism zone, Conservation zone that restrict access to sensitive wildlife populations and habitats.
- ii) Minimize conflicting use.
- iii) Eliminate damage to critical and sensitive habitats by restricting human activities in all the zones.
- iv) Prevent heavy concentration of uses that degrade natural resources.
- v) Provide undisturbed monitoring sites for research and development.

6.3 Zone plans

6.3.1 Core zone

Whole area of the Campbell Bay National Park mostly consists of undisturbed virgin forests of uniform intensity and is part of the core zone of Great Nicobar Biosphere Reserve, except the zone of ecotourism and traditional use. Hence the idea of core-buffer strategy has less relevance in its management. Therefore the whole area of the National Park is proposed to be managed as a core zone except the area to be managed under ecotourism, traditional use. Except research, monitoring of biodiversity, habitat restoration and protection measures, no other activities is proposed to be permitted in the core zone. Hence it is important to strengthen the protection activities. Strict protection of the core zone will result in spillover and migration of the faunal and floral wealth to the adjacent zones.

6.3.2 Multiple Use Zone

Nicobarease tribes were rehabilitated, at Afrabay situated in the northern side of the CBNP, after the Tsunami occurred in 2004. Evaluation required is to be carried out for better management. Matter is to taken up with appropriate authority regarding their traditional use of the area. The present weir is to be improved for augmenting more water for the consumption of the Tribals. As per requirement the water sources available in and around the Afrabay shall be tapped and made available to the local tribes. The Shompens are seminomadic tribe as such permitted to use the required resources available inside the National Park in a sustainable manner.

6.3.3 Eco Tourism zone

Eco-tourism zone is proposed at one location namely Mount Thulier. The area falls within the trek path from Navy Dera to Mt. Thulier is proposed as a zone for eco-tourism activity in Campbell Bay National Park. Details of the various strategies adopted for tourism have been dealt separately under the chapter Ecotourism. Other activities including nature education and site visits shall be arranged to 10km. Ecotourism structures if any needed will be provided outside the Park at Navydera and 10km East-West Road.

6.3.4 Permissible activities in various zones of CBNP

The activities which can be permissible in various zones of Campbell Bay National Park are listed in Table 6.1.

Table 6.1 Important permissible activities in Campbell Bay National Park

	Habitat Monitoring	Species Monitoring/ recovery program	Eco-tourism	Research with permit	Fishing	Mining/ Quarrying
Core Zone	Permitted	Permitted	Trekking through designated trek paths	Permitted	Prohibited	Prohibited
Multiple Use Zone	Permitted	Permitted	Permitted	Permitted	Permitted	Prohibited
Eco Tourism Zone (Mt. Thulier trek path)	Permitted	Permitted	Only trekking permitted	Permitted	NA	Prohibited

6.4 Theme Plans

6.4.1 Habitat improvement Plan

Habitat improvement is to be planned for the entire CBNP and overlaps with all other zones. The plan to be taken up in this zone is meant for biodiversity conservation and ecological research/ studies. Preparation of a Biodiversity Register and a Data bank on RET species of Campbell Bay NP are proposed as major activities under the theme plan.

The National Park is noted for its rich biodiversity and more prone to natural and anthropogenic disturbances. Disastrous impacts were found on the coastal ecosystems due to the tsunami which occurred in December 2004 and due to rehabilitation activities the terrestrial ecosystems are also affected in many places. The impacts observed on the coastal ecosystems are physical uprooting of coastal forests and mangroves, scorching of littoral vegetation due to salt stress from sea water inundation, dying out of mangroves due to perennial submergence of the pneumatophores, seawater inundation of inland freshwater

bodies, destruction of marshes and creeks, damages to the coral reefs. Due to destruction of coastal vegetation and fruit bearing species like Pandanus few animals like Nicobar monkey lost its habitats and now found mostly roaming in the settlement areas for foods and shelter. Another species namely Nicobar Magapode lost most of its habitats due to the destruction of the coastal forests. Most of the turtle nesting beaches were reduced in size. Considering the importance of various species steps are to be taken to provide them safe nesting ground and better habitats on the coastal areas. In many places the beaches are backed by vegetation of Littoral forest at the mouth of perennial streams. The following activities are to be practiced for better habitat improvement.

(i) Eco-restoration of Nesting Beach.

A few plant species have started colonising and expanding in the beaches and as a result the width of the beach area is getting reduced, which can result in shrinkage of area used by turtle and other species for nesting. It is necessary to monitor and check the expansion on the beach so as to restrict their spread towards sea-ward side and a minimum of 100 m width from high tide line is to be kept clean and free from any obstruction for easy management of turtle nesting. Action is also to be taken to check the growth of Ipomea which is fast invading the sea beach & thereby reducing the beach area. Garbage comes and settles on the beach due to wave action. Lot of organic debris is washed down along the beach during monsoon through the nallahs, which flows from the National Park. The beach should be kept clean particularly during the nesting season to facilitate nesting. This particular work requires special attention to ensure that the garbage is not deposited along the beach.

In view of conserving the local & natural biodiversity the introduction of exotics, many of which usually became obnoxious are to be eliminated. Such introductions intentionally or accidentally pose a great threat to turtle breeding and to the habitats of other indigenous species. The beach areas restored under this programmes shall be planted with Littoral Species like Poon (*Callophyllum innophyllum*), Karanj (*Pongamia spp*), Arguna (*Cycas andamanensis*) or other species which are naturally available at the site. There has also been infestation by various exotic species of weeds, particularly *Eupatorium* which could prove to be a major deterrent to the regeneration of degraded forest areas. It is therefore proposed that no exotic species of fauna or flora should be introduced into the park. Accordingly, suitable standard operating procedures (S.O.Ps) will be developed for the purpose.

It is suggested that species which are well adapted to harsh condition as such as windy environment, intense sunlight, high salinity and less soil nutrition can be given priority in the restoration programs. Once these pioneer species are established, they are expected to enhance the habitat status in terms of soil nutrient, soil moisture and light requirements to pave way for the colonization of mature forest species that are less adaptive to harsh condition. *Barringtonia* species which is showing low regeneration should also be given priority in planting programs. Fruit bearing species like edible pandanus is to be given preference in the coastal areas which will be a good diet for the monkeys.

(ii) Mangrove restoration

Restoration of mangroves is to be attempted in areas like Afra bay in the creeks situated at the north side of the National Park where the mangroves were found damaged in large extent. Good mangrove vegetation also help in containing the movement of the Crocodiles in and around the human settlement.

(iii) Establishment of Nurseries

The National Park comprises as many as several forest types of Andaman & Nicobar Islands. Some of the forest types are very specific and requires special attention for regeneration and reproduction like, mangrove forest, littoral forests etc. In addition to that there is requirement of seedling for habitat improvement and reclamation of damaged land. Therefore action needed to be taken to establish location specific small nurseries for proper and scientific management of the sanctuary.

As stated above the Nicobar long tailed Monkey lost most of its habitat due to destruction of the coastal ecosystems and depletion of fruit bearing forest species. Movement of Monkeys in the settlement areas in search of food has now resulted in to a conflict situation. In order to mitigate the situation the coastal habitats are to be restored by raising plantation of coastal species including fruit bearing forestry plants for the consumption of monkeys. Since the coastal area in the National Park is limited therefore in order to manage the species coastal plantations are proposed for Eastern coast of the Great Nicobar. As per requirement proper fences may be erected on all sides of the plantation for better protection in the initial period of establishment.

6.4.2.1 Protection plan

The Campbell Bay National Park shall be divided into five beats for administrative purpose as detailed in Fig.6.1, based on major watershed and dendritic channels. During the

first and second year of this management plan, the beats shall be notified and five protection camps to be established in respective beats in due course of time.

Table 6.2. Existing Head Quarters and proposed new protection beats for CBNP

Forest Division	Range	Proposed New Beats
Nicobar Division	1. Wildlife Range, Campbell Bay	1. Mt. Thulier 2. Jubilee 3. Amrit Kaur 4. Dagmar 5. Alexandra

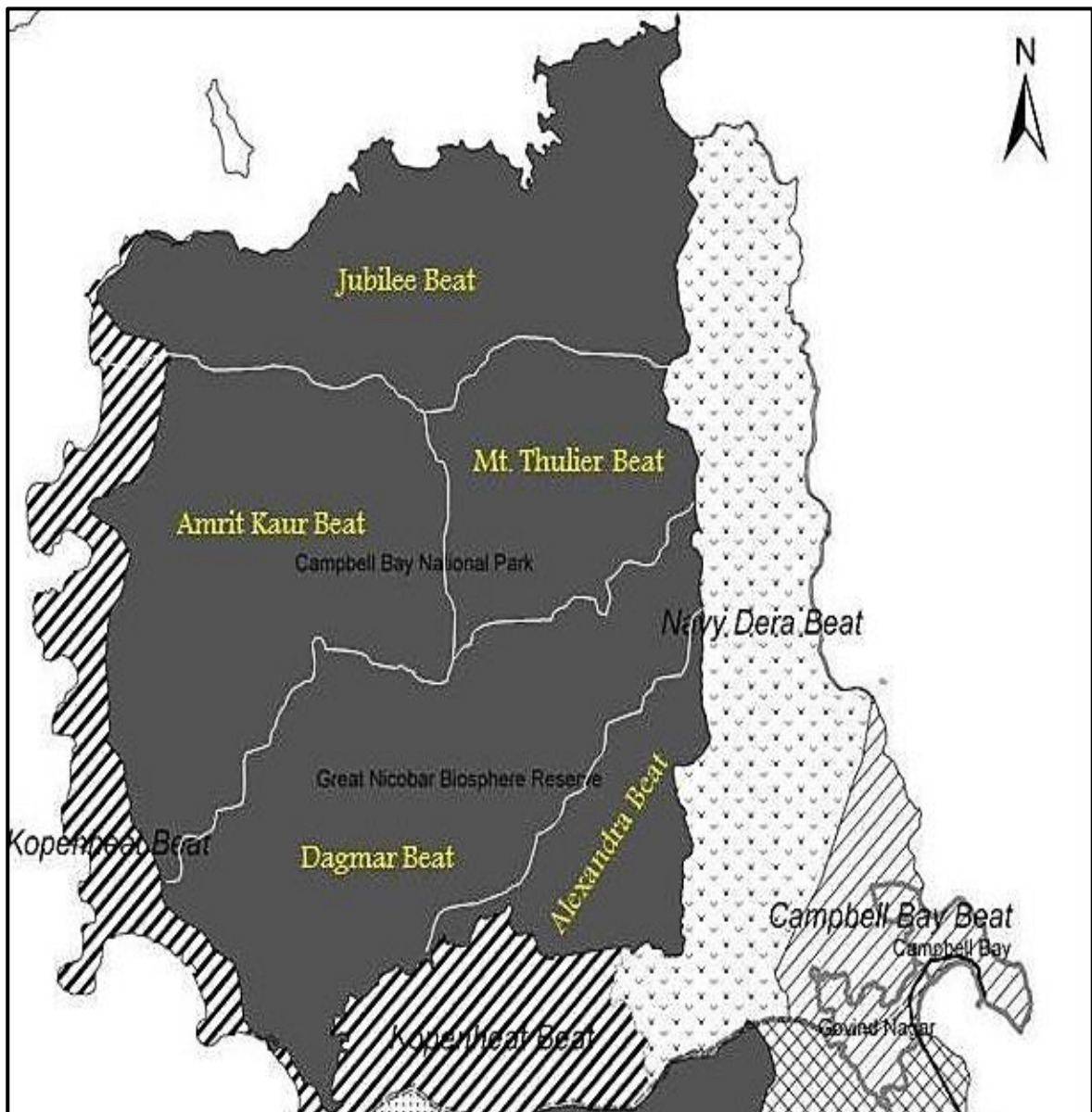


Fig. 6.1 Proposed beat classification for Campbell Bay National Park (based on watershed)

Table 6.3 Proposed new protection camps and staff strength for CBNP

Beats	Protection camps	Proposed staff strength			
		Deputy Ranger	Forester	Forest Guards	Watchers (3 shifts/day)
1. Mt. Thulier	Navy dera	0	1	2	8
2. Jubilee	Afra Bay I	0	1	2	8
3. Amrit Kaur	Afra Bay II	0	1	2	8
4. Dagmar	Kopen Heat	0	1	2	8
5. Alexandra	16 Km EW Road	0	1	2	8
VHF Control Room at Campbell Bay		1	1	2	0
Total		1	6	12	40

No permanent protection camps are proposed inside the Park and all establishments should be made outside the Park in Revenue land or Protected Forest. Temporary protection Camps will be established at different location namely 10Km, Navydera, Afrabay and Copenheat.

Protection camps need to be equipped and strengthened with basic office cum accommodation facility, communication system, solar powered electricity connection, engine dinghies/fiber boats for transport, camping gears and provision of ration etc. VHF communication system shall be improved. One Engine Dhinghy shall be stationed at Afra Bay protection camp. VHF Control Room at Wildlife Range, Campbell Bay will help the protection camps for effective communication and co-ordination of the activities round the clock. Smart phone application can help monitoring, patrolling by the field staff and will improve management efficiency. It is proposed to expand the communication/patrolling efficiency by providing minimal wireless infrastructure/ satellite phones in every protection camps/ Beat offices.

Table 6.4 Existing facilities of communication at Campbell Bay

Stock particulars			Proposals during the plan period		
Base set	Mobile	Wireless	Base set	Mobile	Wireless
0	1	0	03	05	10

Table 6.5 Details of patrolling vehicles, boats and dinghies at Campbell Bay

Description	Present strength	New proposals
Engine dinghi	3	2
Sea-worthy boats	0	1
Motor boats (fibre)	1	2
Patrolling jeeps	1	2
Trucks	1	1
Motor cycles	1	4

Table 6.6 Other stock proposals

Stock particulars				Proposals during the plan period			
DGPS	SLR Cameras	Night vision binoculars	Tents	DGPS	SLR Cameras	Night vision binoculars	Tents
0	1	0	2	1	5	10	6

6.4.2.2 Aerial surveillance

Helicopters are better means for aerial inspection over inaccessible forest area as well as for disaster management. In order to facilitate this, a Helipad is proposed to be constructed at Afra Bay, Western Coast of the CBNP during the plan period. This would not only help regular patrolling over the area by Forest Department and other law enforcement agencies, but also help any rescue operations during emergencies in future under disaster management.

Campbell Bay National Park is governed by the Wildlife (Protection) Act, 1972, therefore, no resource exploitation and trade related activities other than protection/ eco-restoration/ research and monitoring have been prescribed. Appropriate infrastructure facilities for each protection staff need to be established at the headquarters and other stations of the Park during the plan period. In addition to the existing patrolling vehicle and vessels, it is proposed to procure two fast fiber boats and first aid kits for patrolling staff. Budget allotment for these boats may include operational and maintenance cost. One more patrolling vehicle as well as a smaller vessel (engine dinghi) may be procured for Wildlife Range for effective patrolling activities. Each of the camps shall be provided with Walky talkie, spot lights, camping gear etc. Intelligence information may be collected in coordination with all the law enforcement agencies. Feasibility of utilising the Drones for aerial surveillance will be explored. It is proposed to procure two drones for the Protection purpose for the Campbell Bay National Park.

6.4.3 Conservation plan

Some of the species found in the Campbell Bay National Park are unique and in threatened state due to biotic pressure and development activities continuing around the National Park. Specific Conservation and recovery Plan is to be prepared and implemented for all such important species.

6.4.3.1 Nicobar Megapode (*Megapodius nicobariensis*)

Nicobar Megapode is protected under Schedule I of the Indian Wildlife (Protection) Act, 1972 whereby hunting and trade are prohibited. However, as per the Section 65 of the Indian Wildlife (Protection) Act, 1972, nothing in this Act shall affect the rights conferred on the Scheduled Tribes of the Nicobar Islands in the Union territory of Andaman and Nicobar Islands by notification of the Andaman and Nicobar Administration, No.40/67/F, No.G635, Vol. III, dated the 28th April, 1967. Hence, the ethnic tribes of the Nicobar Islands (Nicobarese and Shompen) are allowed to continue hunting wild animals including the Megapodes.



Following measures shall be adopted for conservation and management of this endemic species of Nicobar group Islands in Campbell Bay National Park

- i) Creation of database about the population status and location of active mounds.
- ii) Study to assess vulnerability of the species.
- iii) Regular patrolling and deploying camera traps to monitor the active mounds.
- iv) Declare Nicobar Megapode as flagship species of CBNP.
- v) Support camera trap based behavioral studies on Nicobar Megapode.
- vi) Capacity building and skill development programs for field staff in effective management of Nicobar Megapode population.
- vii) Areas outside CBNP may also be brought under surveillance for effective protection and prevention of poaching.
- viii) Considering the importance of the Nicobar Megapodes both insitu and exsitu conservation programmes may be planned for the species.
- ix) No tourism or developmental activities shall be permitted in places adjacent to active mounds of Nicobar Megapodes.
- x) Annual census to monitor the population and active mounds of Nicobar Megapode.
- xi) Publishing a field guide on management of Nicobar Megapode population.

6.4.3.2 Sea turtles

A turtle comes across different types of habitats during its life time. Breeding migration of sea turtles can range from hundreds to thousands of kilometers. Courtship and mating occurs in the offshore waters. Sandy beaches are the nesting grounds. Incubation is regulated by metabolic heat and sun. Hatchlings emerge after 50-70 days of incubation. Gender of the hatchlings is determined by incubation temperature as higher temperature leads to female hatchlings. Hatchlings use visual cues to find sea waves. Once into the water, the hatchlings orient to wave direction and uses geomagnetic cues to find target path. Shallow water serves as developmental ground for the juveniles. Thus both onshore and offshore habitats are closely associated with sea turtles. Upkeep and maintenance of these habitats including protection during breeding season determines the success of sea turtle conservation. Key for identification of different species of turtles is given in Annexure XIV.



Sea turtles are threatened by several ways; (1) Direct threat to sea turtle populations in terms of nest predation and mortality due to incidental catch in fishing nets. (2) Threats to nesting beaches from sand mining spread of oil particles and beach pollution due to domestic garbage and sea debris.

In the Andaman Islands, the ban on hunting of turtles came into force in 1977; sea turtles were protected under Schedule I of the Wildlife (Protection) Act, 1972. Four types of sea turtles viz. Olive Ridley, Hawksbill, Leather back and Green Sea turtles use the northern coasts of CBNP for nesting. CBNP has particular ecological importance in respect of conservation breeding of sea turtles especially Leather back sea turtles. Suggested measures for conservation of sea turtles during the plan period are;

- i) Complete protection of nesting grounds of sea turtles and safeguard the beaches from anthropogenic disturbances.
- ii) Seasonal protection camps to be established to ensure round the clock protection at all nesting beaches of Great Nicobar Island apart from northern side of the National Park.
- iii) Establishing artificial hatcheries for protection of the nests which are susceptible to damage by predation, waves, tidal activities or sand erosion.
- iv) Hold off natural predators like water monitor lizards and dogs from feeding the eggs.
- v) Routine cleaning drives help to keep the nesting beaches free from wastes and garbagges.

- vi) Installation of fish aggregating devices near to the nesting beaches to act as feeding grounds for the hatchlings.
- vii) Ban sand mining, beach armoring and planting exotics in coasts.
- viii) Collection of data on morphometry, nesting, hatchery and hatchlings of Sea turtles.
- ix) Research on available technologies to track movement of turtles.
- x) Awareness campaign among fisher folk community on conservation needs.

6.4.3.3 Nicobar long tailed macaque (*Macaca fascicularis umbrosa*)



Nicobar Long tailed macaque is a Schedule I species endemic to Nicobar group of islands viz. Great Nicobar, Little Nicobar and Katchal in habitats like mangroves, inland and littoral forests. Population of Long Tailed Macaques is almost stable in Great Nicobar Islands. Conflicts are common in respect of this species and therefore importance shall be given in mitigating human-macaque conflicts in Campbell Bay. Proposals during the plan period are;

- i) Support research on population dynamics of Nicobar Long Tailed Macaques.
- ii) Study the group behaviour of Nicobar Long Tailed Macaques.
- iii) Research on routine movements of the species, food habits and social behavior.
- iv) Support research on nature and intensity of human wildlife conflict in connection with the population of Nicobar long tailed macaques in and around Campbell Bay NP.
- v) Constitution of 'joint task forces at village level' including forest personnel, PRI members and local public to minimize damages from Macaques.

- vi) Assistance to villages by providing labourers to drive macaques away from human areas.
- vii) Compensation packages for major damages if any, caused by the species to agriculture crops.
- viii) Creating awareness among public on conservation importance of the species.
- ix) Restrict human settlements adjoining to identified forest area to minimize the loss.

6.4.3.4 Nicobar tree shrew (*Tupaianicobarica*)



Nicobar treeshrew (*Tupaianicobarica*) is an endemic mammal restricted in its distribution to Great and Little Nicobar islands in the Andaman Sea. It is a species under Tupaiidae family. They have a slender body and a long tail and well developed senses of hearing, smell and vision. Tree Shrews have the highest brain to body mass ratio of any animal, even higher than humans. Nicobar Tree Shrew is basically insectivorous and lives on thick vegetation. The species is diurnal in nature and mainly arboreal. They spend most of the time on the ground and in low bushes. They are omnivorous and feed on fruits, seeds, leaves and insects.

Nicobar treeshrews spend more than 60% of the day on foraging, followed by resting or sleeping (12%). The proportion of time spent on major activities was significantly different across different time periods, with much of the feeding activity in the mornings and evenings. Nicobar treeshrews were observed largely solitarily or as breeding pairs.

The following are the proposals for the plan period.

- i) Continuous monitoring and population assessment of the species.
- ii) Awareness campaign among local and native tribes for conservation.

- iii) Long term research and monitoring to generate data for conservation planning.
- iv) Strict enforcement of wildlife laws.

6.4.3.5 Reticulated Python (*Broghammerus reticulatus*)



The population was unknown due to lack of observation. These snakes were considered as endangered locally because the local and native persons used to killed them for food. Habitat destruction due to catastrophic and anthropogenic activities made this species seriously affected.

The following are the proposals for the plan period.

- v) Continuous monitoring and population assessment of the species.
- vi) Awareness campaign among local and native tribes for conservation.
- vii) Long term research and monitoring to generate data for conservation planning.
- viii) Strict enforcement of wildlife laws.

6.4.3.6 Coconut (Robber) Crab (*Birguslatro*)



Giant Robber Crab or coconut crab (*Birguslatro*) is the largest land crab and one of the important species of the invertebrate fauna of Andaman and Nicobar Islands. The species lives in tree hollows and fallen trunks and feeds on coastal nuts, fruits, dead fish and others that are washed ashore. The hermit crab is practically an air breather but it spends its juvenile period in the sea and it gradually shifts to terrestrial life. As it advances in age and grows in size, it develops a carapace of its own on the abdomen. Unlike the hermit crabs, the coconut crab does not require the protection of any external shell and the abdomen is also not asymmetrical. The robber crab has developed strong pincers or chelipeds, with which it can tear the fibrous covering of the coconut and break open the shell. The species climbs coconut trees to break nuts and then dehusk and eat. The Robber Crab was the worst affected species in Nicobar Islands by tsunami since it almost exclusively inhabits a very narrow strip of littoral forests adjoining the shore. It has been reported that the species has become very rare in Nicobar islands which indicates that there is severe decline in population of the species in its range due to habitat destruction caused by tsunami. Extensive surveys of the species is to be conducted in the 100m wide strip of littoral forests adjoining the shore to assess its status and necessary action needed for its conservation by protecting and improving its habitat.

6.4.3.7 Rudraksh (*Elaeocarpus species*)

Rudraksh tree (*Elaeocarpus*) belongs to the order Oxalidales, family Elaeocarpaceae and genera *Elaeocarpus*. Eight species are present in Andaman & Nicobar Islands in one genera among which three species viz *E. macrocerus*, *E. Petiolatus* and *E. Aristatus* are present in GNI. Ideal humidity and temperature are the reasons. Among these *E. macrocerus* produces seeds which are more or less similar to that of true Rudraksha (*E. sphericus*). Two species *E. macrocerus* and *E. petiolatus* are rare in evergreen inland forests. The seeds of *E. Petiolatus* are the smallest and more suitable for and sold at high price. Most of the *Elaeocarpus* family members have indolizidine alkaloid compounds, having ability to inhibit the enzymatic activity of glycosidase (Wiert, 2006).



Regeneration of Rudraksh is a difficult process due to the slow sprouting of the seeds. Depending on the humidity of the soil, usually it takes 1-2 years for the seed to sprout. Propagation through seeds can be enhanced by stratification of seeds with 1% H_2SO_4 , mechanical scarification or sun scorching for continuous five days to break dormancy. Vegetative propagation using meristems treated with IBA (1200ppm) and NAA (400ppm) for two hours can be tried as it increases sporulation and formation of new shoots. The shoots have to be planted in raised beds on forest soil (Bhuyan et al., 2002). Extensive collection of seeds from forests and adjoining areas has adversely affected natural regeneration of the species. Further, Shompen tribes bring seeds of *Eleocarpus* from forests and barter with middle men/ shop keepers for tea, tobacco etc. Certain measures are suggested for conservation of the species in its natural habitat and ensuring effective natural regeneration.

The following are the proposals during the plan period.

- i) Completely ban collection of Rudraksh seeds from inside the forests except that for the purpose of seedlings and conducting research trials.

- ii) Rudraksh plot at Magar Nallah shall be maintained as a research plot for conducting research trials for betterment of the species in Great Nicobar Islands.
- iii) Research on pollen viability, pollination, fruit setting, primary and secondary dispersal methods etc. shall be done.
- iv) Seeds collected from outside the National Park area and core zone of Great Nicobar Biosphere Reserve can only be allowed for trading .

6.4.3.8 Orchids

As per the available study report about 31 species from 27 genera under Orchidaceae family is available in Great Nicobar Island. Both In- situ and Ex-situ conservation programme is required for protecting the species. More study and research will be undertaken to understand those species and for protecting them.

6.4.3.9 Tree Ferns

Two important species of Tree ferns endemic to this area namely (i) *Sphaeropteris albo-setacea* (*Cyathea albo-setacea*) and (ii) *Sphaeropteris nicobarica* (*Cyathea nicobarica*) needed to be conserved in situ and further study and research will be taken up. Action is to be taken for identification and preparation of inventory. Measures will be taken up for its protection. Both species will be included under long term monitoring plan for its conservation.

CHAPTER 7

Ecotourism, Interpretation and Conservation education

7.1 Introduction

Natural beauty and cultural heritage represent a competitive advantage for many years and this is true in the case of Andaman & Nicobar Islands. Ecotourism is all about creating and satisfying urge for nature, about exploring tourism potential for conservation and development and about avoiding its negative impacts on ecology, culture, recreation and aesthetic values. Ecotourism requires close cooperation between natural resources managers and the local residents. Structured planning and proper implementations of the programme and management of the ecotourism resources will not only help in conservation of unique resources but will contribute immensely in the improvement of the local economy of these islands in the long run. National Wildlife Action Plan suggested that regulated, low impact tourism has the potential to be a vital conservation tool as it helps to win public support for wildlife conservation.

Sekhar Singh Commission report (2002) accepted by Hon'ble Supreme Court of India stated that *"No concrete or permanent infrastructure for tourism should be built in any forest area in the islands. Tourist activities in forest areas should be restricted to tented accommodation or temporary wooden/prefabricated structures that can be dismantled easily and moved to another site. These areas should remain under the control of the forest department, who should be responsible for ensuring that the quantum and type of tourism is such that it does not in any way degrade the forests or other ecosystems"*.

Campbell Bay National Park has a unique combination of terrestrial, mangrove and riverine ecosystems. It presents varied natural panorama with unique lush evergreen dense tropical forests extending from sea coast to the hill tops. These floral and faunal assemblages along with high degree of endemism make this CBNP a distinct one. Due to various reasons, 'limited or low-impact' ecotourism activities are suggested for CBNP in this plan. Regulated eco-tourism in the form of nature education and interpretation tours (as against commercial tourism) is proposed for Campbell Bay National Park which will make positive contribution to conservation of nature, natural and cultural resources and stimulate private conservation efforts.

In addition to its rich biodiversity value, the Campbell Bay National Park provides ample opportunities which may have significant impact on the socio-economy of people living in the vicinity of this Protected Area. The long sandy beach at Navy dera and the nature trails to Mount Thulier from Navy dera are good attractions for visitors. Increase in number of tourists improves the economy of local villages adjoining the National Park as it may provide new employment opportunities to local inhabitants in the nearby villages. The youth may be employed as tourist guide.

7.2 Objectives

- i) Promote responsible eco- tourism which not only enrich the experience of the visitor but also win support for the National Park and for nature and biodiversity conservation.
- ii) Develop multiple opportunities for eco-tourism and enjoyment, facilities like guided and un-guided nature trails, information centers, with proper signage will help in spreading the message of conservation among people & will also justify the Department's mandate & its role in the entire conservation plan.
- iii) Usage of local material and involvement of local people to the extent possible in all the eco-tourism related activities which will also boost economy of people residing near the National Park & will also provide ample opportunity for local unemployed youth including the tribals.
- iv) Provide wilderness experience to visitors through regulated ecotourism activities like trekking, nature walk and day camps.
- v) Develop Campbell Bay National Park as a centre for conservation awareness and nature awareness programs.

7.3 Issues / Problems

There is a great potential in this National Park to attract a large number of visitors including tourists, nature lovers, wildlife enthusiasts, researchers, environmentalists etc. But due to remoteness and inadequate communications combined with the status of tribal reserve it is advisable to initiate only low volume ecotourism activities in the current plan period. The major issues like geographic isolation and inaccessibility can be mitigated by the increase of a few Ships and induction of a 25seater small flight daily from Port Blair to Campbell Bay and establishing fuel Depot for providing fuel to the flights at Cambell Bay.

There are two tribal populations namely Shompens and Nicobarease residing inside the National Park. The Shompens are semi-nomadic and food gatherers who reside in the

central and south-west part of the National Park. Whereas the Nicobarese reside in shelters at Afra Bay in the northern part of the National Park who were involved in agriculture practices apart from fishing. Nicobarese are involved in all types of works from agriculture to construction activities. Considering the facts that increased agriculture practices and other developmental activities may put adverse impact on the biodiversity of the area it is necessary to involve them in ecotourism activities which can provide a sustainable livelihood to them.

Since major areas under the National Park are declared as Tribal reserve it is restricted for the visitor's entry. Thus it is advantage to empower Nicobarese and other inhabitant of the local communities to manage ecotourism, generate incentives through alternate and additional livelihood options.

7.4 The Strategies

7.4.1 Identification of Zone

Three Zones are identified in the National Park for the eco-tourism activities.

- i) Eco-tourism facilities will be developed on one ha area overlapping with multiple use zone at Afra Bay situated in the northern side of the CBNP which can be managed by the Nicobarese community and the visitors who possess the tribal pass can experience traditional tribal culture and can visit the Afra Bay beach. Eco-tourism activities like canoeing in traditional canoes (Hoddy) may be organised for visitors combined with nature walk in the nearby Forest areas.
- ii) Two ha area near 10km East West road is to be developed with eco-tourism activities containing Interpretation Centre, watch tower, nature trails, camping places with water and toilet facilities. All other required facilities will be developed there for conducting nature camps for the use of students and general public.
- iii) A track path is to be created from Navy dera to Mount Thulier which will provide the visitors a glimpse of various tropical forests in the National Park and the extent of biodiversity it contains. One ha area at Navy dera is to be developed into a base camp with all ecotourism facilities like camping place, rain shelters, umbrella huts, watch towers, tree huts, bird watching areas, changing rooms and toilet facilities.

Ecotourism programme for Navy dera is as follows:-

Name of the program	Details of the Program
Navy Dera to Mt. Thulier trekking	<ul style="list-style-type: none"> ➤ Trek groups of limited members shall be allowed for trekking from Navy Dera to Mt. Thulier with prior permission of the Chief Wildlife Warden, A&N Islands. ➤ One guide shall accompany the trek groups. ➤ Timing: 4 am to 6 pm. ➤ Duration: 5 ½ hours approximately. ➤ Informtion on various guidelines, species and forests may be provided on the trek route through proper interpretation.

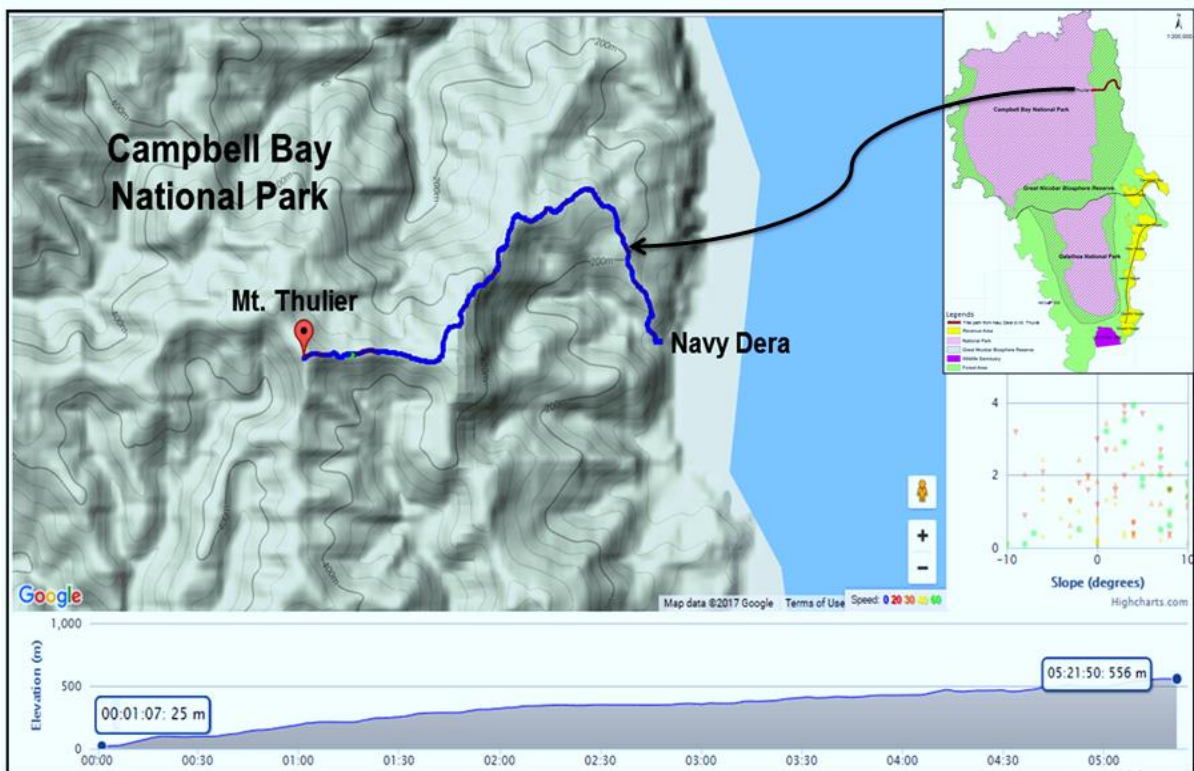


Fig. 7.2. Location and terrain features of Navy Dera to Mt. Thulier trek path

7.4.2 Infrastructure Development.

- (i) A visitor’s information centre may be established at Campbell Bay for the benefit of the visitors.
- (ii) A gateway shall be made for CBNP at 16 Km East West Road adjacent to the Type I twin Quarters/ protection camp.
- (iii) A dormitory facility shall be developed at Campbell Bay for accommodating 10 persons.

- (iv) One watch tower may be established at bird watching site at 11km.
- (iv) Provide appropriate vehicles for the visitor mobility.
- (vi) Designated vehicles shall only be allowed to take visitors upto this point
- (vii) A base camp is to be established at Navy dera with all ecotourism facilities like camping place, rain shelters, umbrella huts, watch towers, changing rooms and toilet facilities.
- (viii) An ecotourism camp with all ecotourism facilities is to be developed at Afra Bay with active participation of the Nicobarese community.

7.4.3 Regulations, monitoring and evaluation

Visitor programs / activities within the boundaries of the PA are fully under the control of the PA management as such a comprehensive visitor management plan shall be developed for Campbell Bay National Park and Great Nicobar Island in respect to following points.

- Determine the exclusive season for permitting the trekking activity
- Provision of tourist guides with the trek groups and their training.
- Publicity on trekking and interpretation programs at CBNP.
- Strict obedience of Do's and Don'ts by all.
- Involvement of local people as guides.
- Fixed timing for trekking activity.
- Simplifying the procedure to get permission from Chief Wild Life Warden for trekking.
- Scope of online filling of forms and uploading the ID proof details.
- Any other relevant issue related to trekking activities in Campbell Bay National Park.
- Publicity of this national Park needs to be done both through electronic and print media such as newspaper, radio and Doordarshan, public hoardings and banners, distribution of free pamphlets etc
- Tour packages through private entrepreneurs may be encouraged with regular terms and conditions
- Web based advertisement may attract lots of tourists.

Regulations in the plan shall also address the responsibilities to be shouldered by the visitors and the use of protected area facilities and rules to be observed by other personnel while within the protected area. None of the agencies should be free to use their discretion whether they be government or private enterprise.

So far, no carrying capacity study has been conducted with respect to maximum visitors the area can support with minimum ecological damage. Carrying capacity for visitation will be assessed and fixed during the first year of the Plan.

The nature camps shall be conducted as per guidelines approved by Chief Wildlife Warden. The periodic revision of the same in due course will also be done while conducting nature camps. No visitors will be permitted to carry the vehicle beyond the restricted area. No visitors may be permitted inside the National Park without a trained guide. Plastic is totally prohibited in the Park and this will be ensured by the guides and staff on duty. Visitor's book is to be maintained at Information centre and the feedback is to be obtained. Visitors should be monitored and pressures on habitat and infrastructure should be evaluated, including the efficiency of regulations in providing tourism related experience and education. The results of the evaluation should be used for improving strategies.

The PA management shall publish annual report on nature education and visitor management.

The Eco-tourism in the National Park shall be organized through engagement of guide. The guide shall accompany each group of visitors to give them information about Biodiversity of the National Park, key species & brief about such species, what to do and what not to do in the sanctuary. The guide shall be imparted with basic training on hospitality management and basic knowledge about National Park & its activity. The Management authority shall be responsible for activity of the guide inside sanctuary and their charges to be paid by the tourist.

CHAPTER 8

Research, monitoring and training

8.1 Introduction

Although Campbell Bay National Park was constituted in the year 1996 but not much study has been done regarding various aspects of flora and fauna or wildlife management. Major gaps identified in the information were inadequate documentation of small mammals, reptiles, amphibians, fish and invertebrates, weeds etc, gaps in information on flora and fauna and inadequate dissemination of available information. An institutional mechanism for conducting research, collation and dissemination of information is required. Liaison with academic and research institutions and involvement of staff will also improve the database required for management.

Studies like mapping of vegetation, wildlife health monitoring, documentation of flora and fauna including RET and endemic species, population monitoring of selected flora and fauna, habitat utilization and movement pattern of invasive species that have negative impact on ecosystem, spatial and temporal distribution of water sources, mapping of water sources, drainage map, etc. can be done with the help of experts from respective fields. The present practice of recording of animal sightings by field staff, weather data collection, annual population estimation, documentation by camera traps etc. shall be continued and the data updated and analysed for more effective management.

8.2 Research

Research should have minimal impact on the physical environment of CBNP. No wildlife shall be harmed during research work. No specimen shall be collected from inside the National Park. There should not be any hindrance to dependent tribal population due to research activities. The research suggestions during the plan period are;

- i) Scientific study and documentation including the field status of RET species.
- ii) Conduct studies on population dynamics, movement pattern, natality, mortality, habitat requirements and breeding biology of Nicobar Megapode, Nicobar Long Tailed Macaque, Salt Water Crocodile, Sea turtle, Water Monitor Lizard, Robber Crab and other important species.
- iii) Participatory study to identify and demarcate zone of influence in CBNP due to grazing, fuel wood and NTFP collection.

- iv) Study on sustainable method of cultivation and harvesting of species of medicinal and religious values outside the park area.
- v) Study the extent and impact of Wildlife damages especially that by Nicobar Long Tailed Macaques.
- vi) Study on intrusion, regeneration and extent of exotic species around the Park and methods of phased removal in order to preserve the species composition of CBNP.
- vii) Study on the ecology and ecosystem dynamics of coastal and littoral forests.
- viii) Documentation of traditional knowledge associated with aboriginal tribal groups of Great Nicobar Islands.
- ix) Study on wildlife habitats in respect of flora-fauna interactions.
- x) Study the changes in lifestyle and kind of interaction among Shompens.
- xi) Generate Baseline data base of CBNP using the Remote sensing and GIS platforms
- xii) Monitor the changes in coastlines and drainage patterns of CBNP using remote sensing data.
- xiii) The Park Authority shall conduct studies on the important species, its population, behaviour and other details for its better management and may engage persons or Institutions for the above purpose.

8.2.2 Agencies for research in CBNP

Agencies which can be permitted to undertake research in CBNP are Forest Survey of India (FSI), Botanical Survey of India (BSI), Zoological Survey of India (ZSI), Andaman Nicobar Environmental Team (ANET), Pondicherry University, Central Agricultural Research Institute (CARI), National Institute of Ocean Technology (NIOT), Wildlife Institute of India (WII), Indian Council for Forestry Research and Education (ICFRE), Salim Ali Centre for Ornithology and Nature conservation (SACON) and Bombay Natural History Society (BNHS). Other institutions and universities may also be considered when turn up with better research proposals.

8.2.3 Permission to conduct research in CBNP

Detailed research proposals may be submitted to the Chief Wildlife Warden for review and approval. The Divisional Forest Officer, Nicobar Division shall necessarily be the co-investigator in all research works carried out in CBNP and copy of the research reports and data shall be submitted to Park authorities once the research is over.

8.2.4 Establishing a Research unit

A permanent research unit comprising of DFO, ACF, Range officer and Research Associates etc. will be set up at Campbell bay with all facilities for conducting research activities of managerial implications and relevance. It shall be the duty of research unit to plan, conduct and monitor research activities for the better and scientific management of the Park, to compile and collate the findings and to disseminate the results to field through suitable measures. The primary objective of the unit will be to develop a baseline data to plan activities of the park in various sectors like protection, nature education, ecotourism etc. They may publish educational materials for distribution among the staff to improve their skills in management and to public to motivate them to conserve nature and natural resources. The Research Unit shall undertake the following works:-

- i) Compilations of research reports on CBNP annually and publish it on the Website.
- ii) Developing field identification key for flora of Cambell Bay National Park.
- iii) Development of digital herbarium for Campbell Bay National Park.
- iv) Publishing a compendium on Small mammals of Campbell Bay National Park.
- v) Development of a Bird Atlas for Campbell Bay National Park.
- vi) Development of a field guide on butterflies and moths of Campbell Bay.
- vii) Organize annual census programs at Campell Bay National Park.
- viii) Plan and organize skill upgradation programs for field staff in data collection and management.
- ix) Identify advanced software programs for analysis of field data and procurement of the same for Campbell Bay National Park.
- x) Depute Officers, Staffs, Research Associates and Wildlife Assistant for training on advanced software programs meant for Biodiversity mapping.

8.3 Monitoring

Objective of monitoring is to establish the baseline information on natural resources and other components of the ecosystems and to measure changes over time. Following activities are suggested during the plan period for effective monitoring of CBNP habitat.

- i) Develop a protocol for monitoring health of the habitat, if required can be done in association with ZSI/ BSI.
- ii) Monitor the changes in composition, density and distribution of mangrove forests in CBNP and GNI with the help of FSI data.

- iii) Monitor resource dependency of local people once in three years.
- iv) Monitor the weather parameters especially rainfall pattern and temperature and to install a weather station at Campbell Bay.
- v) Monitor vehicular movement through East-West Road.
- vi) Monitor the number of visitors and to assess carrying capacity in due course of time.
- vii) Monitor population dynamics of wildlife through advanced census techniques.
- viii) Monitor the effect of natural events like cyclones, storms, earthquakes, tsunami etc.
- ix) Monitor the incidence of zoonotic diseases that can cause changes in ecosystem.
- x) Monitor the ground water level and water quality in CBNP and surroundings.
- xi) Monitor watershed function of CBNP and changes in drainage patterns.
- xii) Monitor the species composition and changes in forest density through Remote sensing (RS)& GIS.
- xiii) Monitor the incidences of wild fire during dry season.
- xiv) Permanent Monitoring Plots are to set-up for Terrestrial ecosystem (250m X 250m) and for Marine ecosystem (100m X100m) with collaboration with scientific institutions like BSI and ZSI and to periodically monitor once in three years the floral and faunal components, forest cover to understand the impact of climate change and to adopt mitigation measures accordingly.

8.3.1 Monitoring of Sea turtles

Yearly variations in nesting population size are not a good index of population dynamics unless data are collected for a sufficiently long period. As nesting females are the only part of the population that are readily accessible as they crawl out on to nesting beaches where they can be counted. Nearly all estimates of population size in sea turtles are based on nesting beaches and number of reproductive females. However, the entire coast cannot be monitored on a daily basis. Surveys of such extensive coastlines are to be conducted by covering the entire coast at least once, and it will be effective to divide the coast into sectors and sample them at different levels according to importance. Extensive nesting beach survey can be adopted for monitoring the sea turtles. The presence of sea turtle is noticed in the northern sea coast of the Park but for better conservation it is necessary to provide protection to all major identified turtle nesting sites of Great Nicobar Island. Creation of protection camps and regular monitoring involving the collection of details on the morphological characteristics and other details on the sea turtles will provide help in the efforts of conservation. Data sheet for extensive nesting beach survey is given in Annexure XV.

8.4 Census methods

8.4.1 Salt water crocodile

The method of census adopted to count the crocodilian species shall be individual total count by direct day and night time sighting/counting. The participants shall be made into groups for different segments comprising of the creeks, creek-lets, rivers and nallahs. Each unit shall be provided with a census kit (map showing the area including river and creeks, route to follow, binocular, spot light/powerful torch light with cells, notebook, pen/pencil, day and night census forms, V.H.F. etc.). Data of day and night counts shall be compiled in order to generate inferences.

8.4.2 Crab eating Macaque, Nicobar Wild Pig and other wildlife

Transect method is proposed for census of Crab eating macaque, Nicobar wild pig and other wildlife of CBNP. The census shall be conducted in 10 per cent area of each habitat types of the National Park. Straight line transects may be laid down and sample plots of suitable sizes shall be made at an interval of every 50m. Sightings shall be recorded in the data sheets with time of sighting and number of individuals sighted/ groups.

8.4.3 Nicobar Megapode and other birds

Total count is to be done for Nicobar Megapode. Number of individuals, number of active mounds, frequency of nesting within a season, size of mounds and hatchling success etc. are to be recorded for understanding the population dynamics and reproductive biology of the species. For remaining bird species of CBNP, sampling based index method may be adopted. Observations shall be recorded in prescribed data sheets.

8.5 Training

- i) Training programs in association with National agencies/ Universities for the park managers and research unit on advanced wildlife techniques and management skills.
- ii) Training for staff on wildlife rescue operations.
- iii) Training for field staff on basic first aid.
- iv) Advanced training for field staff on intelligence gathering, identifying wildlife articles, collection and handling of biological materials, identification of flora and fauna, census techniques, weapon handling, unarmed combat, wildlife acts, rules etc.
- v) On-the-job training for the field staff to enhance cognitive development and skill based knowledge.

CHAPTER 9

Organization and Administration

9.1 Objectives

Main objective of administration is to ensure that technical and administrative staff required to manage the Park effectively are approved, developed and posted. Improvements in financial organizational systems will aim for financial sustainability for the National Park.

9.1.1 Organizational structure

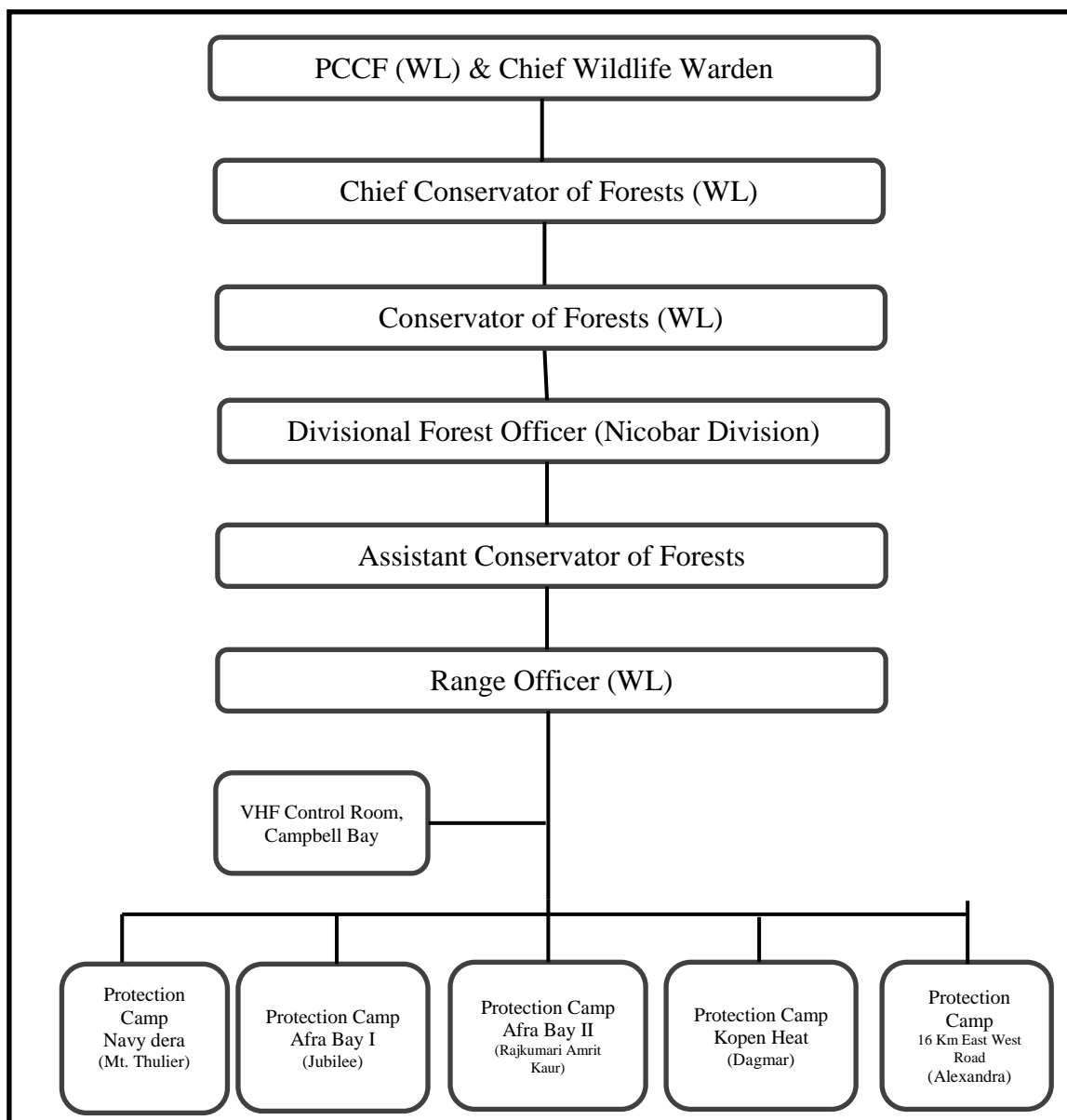


Fig. 9.1 Organizational structure of Campbell Bay National Park

9.2 Responsibilities

Office of the Chief Wildlife Warden, Andaman & Nicobar Islands controls the overall administration of the National Park. Chief Conservator of Forests (WL) is the ex-officio Director of the Park. Divisional Forest Officer (Nicobar Division) has overall responsibility for implementation of the Management Plan. DFO (ND) will develop a field guide with schedule of operations for the implementation of management plan and distribute to Assistant Conservator of Forests (ND), Range Officer (WL), Deputy Ranger and other protection staffs every year. DFO (ND) shall make arrangements to supply control forms to the Range Officer (WL), Deputy Ranger and Foresters and compile the information about the Park. DFO (ND) shall prepare Annual Plan of Operations every year in the first quarter of each year for the subsequent financial year and implement it after obtaining the approval of the Chief Wildlife Warden. Divisional Forest Officer (ND) shall take action for reviewing the Management Plan after ten years.

Assistant Conservator of Forests shall assist DFO (ND) in implementation of the Management Plan in true spirit. Range Officer (WL) shall be in charge of whole CBNP and responsible for the protection and management of the park implementing the provisions of Indian Forest Act, 1927, Wildlife (Protection) Act, 1972, Forest Conservation Act, 1980, Environment Protection Act, 1986, Biodiversity Act, 2002, Forest Rights Act, 2006 and the CRZ Notifications in this jurisdiction. He/ She will be responsible for upkeep and maintenance of records, control forms, amenities, vehicles, buildings, camps, boundary pillars etc. Range Officer shall be responsible for managing the eco-tourism sites and the visitors by implementing the principles of Visitor Management Plan. Deputy Ranger/Forester will be in charge of the VHF Control Room at Campbell Bay and coordinate the patrolling activities in the Park.

9.2.1 Proposed activities

- i) Survey and demarcation of the boundaries of Campbell Bay National Park.
- ii) Demarcation of Beat boundaries for effective management.
- iii) Erection of boundary pillars and base concreting.
- iv) Developing a combing plan for routine patrolling in and around Campbell Bay National Park.
- v) Plan to address Human-Wildlife conflict in consultation with the local self-government institutions and line departments.

9.3 Staff strength

Existing staff strength of Nicobar Division is not sufficient to meet the requirement of field staff for CBNP. Therefore separate staff strength may be sanctioned exclusively for the CBNP. The proposed field staff strength for Campbell Bay National Park is given in Table 9.1. This may be given utmost priority for ensuring proper co-ordination and effective implementation of the plan prescriptions.

Table 9.1 Proposed staff strength exclusively for Campbell Bay National Park

SI No.	Designation	Proposed strength
1.	Range Officer	1
2.	Deputy Ranger	1
3.	Foresters	6
4.	Head Forest Guards	2
5.	Forest Guards	10
6.	Wildlife Biologist	1
7.	Research Associates	2

9.4 Staff amenities

Staff amenities need to be improved in Campbell Bay for the welfare of the field staff and labourers. Assets as per Table 9.2 are proposed to be made during the plan period.

Table 9.2 Proposed staff amenities/ buildings during the plan period

Description	New proposals	Existing
Camp office cum residence at 10 Km	1	0
VHF Control Room at Campbell Bay	1	0
Permanent protection camps	5	0
Inspection Bungalow at 10 Km	1	0
Dormitory facility for 10 persons	1	0
Watch towers	2	1
Check posts	1	0
Interpretation center	0	1
Visitor's Information Center	1	0
Type III quarter	1	1
Type II twin quarters	3	2
Type I twin quarters	3	2

9.5 Awards and recognition for the field staff

Field staff shall be recommended for Lt. Governor's commendations and other awards for exceptional contributions in the field of forestry and wildlife management. In addition, best field staff from among the men and women shall be separately selected by a committee chaired by the Chief Wildlife Warden and Chief Conservator of Forests (WL), Conservator of Forests (WL), and Divisional Forest Officer (ND) as members. The award shall consist of a citation, certificate and cash award of Rs. 2500/ each. The awardees shall be felicitated during the valedictory function of Wildlife Week Celebration every year.

CHAPTER.10

Budget

Table 10.1 Budget outlay for Campbell Bay NP (for the plan period 2021-22 to 2030-31)
(Rupees in lakhs)

Sl. No.	Item of works	2021-22		2022-23		2023-24		2024-25		2025-26	
		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin
1. Protection plan											
A. Non-recurring											
1	C /o Type-I Quarter	-	-	-	-	1	30	-	-	-	-
2	C /o Type-II Quarter	-	-	2	50	-	-	-	-	-	-
3	C /o Type-III Quarter	-	-	-	-	-	-	1	52	-	-
4	C/o Permanent Protection camp	-	-	1	20	-	-	-	-	1	20
5	C/o watch Tower .	-	-	-	-	1	15	-	-	1	15
6	C /o Inspection Bungalow.	-	-	-	-	-	-	1	50	-	-
7	Establishment of temporary Protection camps.	-	-	2	10	2	10	1	5	2	10
8	Procurement of mini truck for patrolling	-	-	1	12	-	-	-	-	-	-
9	Procurement of engine dinghi with inboard engine	-	-	1	5	-	-	1	5	-	-
10	Procurement of motor bikes	-	-	2	2	-	-	2	2	-	-
11	Procurement of seaworthy boat	-	-	-	-	-	-	1	500	-	-
12	Procurement of fibre boats	-	-	1	10	-	-	1	10	1	10
13	Procurement of Cameras, Night Vision Binoculars, Drones etc.	-	-	LS	2	LS	20	LS	2	LS	2
14	Improvement of VHF Network	-	-	LS	10	LS	5	LS	5	LS	5
15	Procurement of tents & other equipments for protection	LS	5	LS	5	LS	5	LS	5	LS	5
Total(A)		5		126		85		636		67	
B. Recurring											
1	Hiring of seaworthy boat/ E.dinghy for coastal patrolling	-	-	LS	5	LS	5	LS	5	LS	5
2	Wages for field staff	LS	15	LS	15	LS	15	LS	15	LS	15
3	Compensation for major damages caused by wildlife	LS	3	LS	5	LS	5	LS	5	LS	5
4	Maintenance of boats/vehicles/ Protection Camps/ POL etc.	LS	5	LS	10	LS	20	LS	20	LS	20
5	Procurement of arms and ammunitions	-	-	LS	4	-	-	LS	4	LS	2
Total(B)		23		39		45		49		47	
Total (A+B)		28		165		130		685		114	

II.Ecotourism, Interpretation and Conservation Education												(Rupees in lakhs)	
A. Non-recurring		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin		
1	Signages and information boards	LS	2	LS	2	LS	2	LS	2	LS	2		
2	Development of trek path and nature walking trail	LS	2	LS	5	LS	5	LS	5	LS	5		
3	Dormitory facility at Interpretation Centre, C/Bay.	-	-	LS	30	-	-	LS	30	-	-		
4.	Construction of eco-huts	-	-	2	8	1	4	1	2	-	-		
5.	Visitors information centre	-	-	-	-	1	10	1	10	1	5		
Total(A)		4		45		21		49		12			
B. Recurring		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin		
1	Maintenance of nature walking trail	LS	2	LS	3	LS	3	LS	3	LS	3		
2	Maintenance of visitor facilities	LS	2	LS	3	LS	3	LS	3	LS	3		
3	Organizing nature camps and awareness programs	LS	2	LS	2	LS	2	LS	2	LS	2		
4	Publication of brochures and information materials	LS	1	LS	1	LS	1	LS	1	LS	1		
Total(B)		7		9		9		9		9			
Total (A+B)		11		54		30		58					
III.Research, Monitoring and training												(Rupees in lakhs)	
A. Non-recurring		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin		
1	Procurement of Automatic Weather Station and other equipments like DGPS.	-	-	LS	10	LS	20	LS	2	LS	2		
2	Preparation of Biodiversity Register/ Data bank on RET species	LS	3	LS	3	LS	3	LS	3	LS	3		
Total(A)		3		13		23		5		5			
B. Recurring		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin		
1	Annual census of Wildlife	LS	2	LS	5	LS	5	LS	5	LS	5		
2	Monitoring of invasive species	LS	1	LS	1	LS	1	LS	1	LS	1		
3	Updating and maintenance of database of CBNP	LS	1	LS	1	LS	1	LS	1	LS	1		
4	Training expenses/ awards	LS	1	LS	1	LS	1	LS	1	LS	1		
Total(B)		5		8		8		8		8			
Total (A+B)		8		21		31		13		13			
Grand Total		47		240		191		756		148			

Table 10.1 Budget outlay for Campbell Bay NP (for the plan period 2021-2031) Cont.

(Rupees in lakhs)

Sl. No.	Item of works	2026-27		2027-28		2028-29		2029-30		2030-31		GRAND TOTAL 2021-31
		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	
1. Protection plan												
A. Non-recurring												
1	C /o of Type-I Quarters	1	30	-	-	-	-	-	-	1	30	90
2	C /o of Type-II Quarters	-	-	-	-	1	35	-	-	-	-	85
3	C /o of Type-III Quarters	-	-	-	-	-	-	-	-	-	-	52
4	C/o Permanent Protection camp	-	-	2	40	-	-	2	40			120
5	C/o watch Tower	1	15	-	-	-	-	-	-	-	-	45
6	C /o Inspection Bunglow.	-	-	-	-	-	-	-	-	-	-	50
7	Establishment of temporary Protection camps.	-	-	1	5	1	5	1	5	1	5	55
8	Procurement of mini truck for patrolling	-	-	-	-	1	12	-	-	-	-	24
9	Procurement of E.dinghi with inboard engine	1	5	-	-	-	-	1	5	-	-	20
10	Procurement of motor bikes	-	-	4	4	-	-	-	-	-	-	8
11	Procurement of seaworthy boat	-	-	-	-	-	-	-	-	-	-	500
12	Procurement of fibre boats	-	-	1	10	-	-	-	-	1	10	50
13	Procurement of Cameras, Night Vision Binoculars,Drones etc.	LS	2	LS	2	LS	2	LS	2	-	-	34
14	Improvement of VHF Network	LS	2	LS	2	-	-	-	-	-	-	29
15	Procurement of tents & other equipments for protection	LS	2	-	-	LS	2	-	-	LS	2	31
Total(A)		56		63		56		52		47		1193
B.Recurring												
1	Hiring of seaworthy boat / E.Dhinghy for coastal patrolling	LS	5	LS	5	LS	3	LS	3	LS	3	39
2	Wages for field staff	LS	15	LS	15	LS	15	LS	15	LS	15	150
3	Compensation for major damages caused by wildlife	LS	3	LS	3	LS	3	LS	3	LS	3	38
3	Maintenance of boats/ vehicles / Protection Camps/ POL etc.	LS	10	LS	10	LS	10	LS	10	LS	10	125
4	Procurement of arms and ammunitions	LS	2	-	-	LS	2	-	-	LS	2	16
Total(B)		35		33		33		31		33		368
Total (A+B)		91		96		89		83		80		1561

II.Ecotourism, Interpretation and Conservation Education												(Rupees in lakhs)	
A.Non-recurring		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin		
1	Signages and information boards	LS	2	LS	2	LS	2	LS	2	LS	2	20	
2	Development of trek path and nature walking trail	LS	5	LS	5	LS	2	LS	2	LS	2	38	
3	Dormitory facility at Interpretation Centre, C/Bay.	-	-	-	-	-	-	1	5	-	-	65	
4.	Construction of eco-huts	1	4			1	4	1	4	1	4	30	
5.	Visitors information centre	-	-	-	-	-	-	1	5	-	-	30	
Total(A)		11		7		8		18		8		183	
B.Recurring		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Total	
1	Maintenance of nature walking trail	LS	3	LS	3	LS	3	LS	3	LS	3	29	
2	Maintenance of visitor facilities	LS	3	LS	3	LS	3	LS	3	LS	3	29	
3	Organizing nature camps and awareness programs	LS	2	LS	2	LS	2	LS	2	LS	2	20	
4	Publication of brochures and information materials	LS	2	LS	2	LS	2	LS	1	LS	2	14	
Total(B)		10		10		10		9		10		92	
Total (A+B)		21		17		18		27		18		275	
III.Research, Monitoring and training												(Rupees in lakhs)	
A.Non-recurring		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin		
1	Procurement of Automatic Weather Station and other equipments like DGPS.	LS	2	-	-	-	-	LS	2	-	-	38	
2	Preparation of Biodiversity Register/ Data bank on RET species	LS	3	LS	3	LS	3	LS	3	LS	3	30	
Total(A)		5		3		3		5		3		68	
B.Recurring		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Total	
1	Annual census of Wildlife	LS	5	LS	5	LS	5	LS	5	LS	5	47	
2	Monitoring of invasive species	LS	1	LS	1	LS	1	LS	1	LS	1	10	
3	Updating and maintenance of database of CBNP	LS	1	LS	1	LS	1	LS	1	LS	1	10	
4	Training expenses/ awards	LS	1	LS	1	LS	1	LS	1	LS	1	10	
Total(B)		8		8		8		8		8		77	
Total (A+B)		13		11		11		13		11		145	
Grand Total		125		124		118		123		109		1981	

Note: Phy- Physical target; Fin- Financial target; LS- Lumsum.

ANNEXURES

ANNEXURE - I

अण्डमान तथा
ANDAMAN AND



निकोबार राजपत्र
NICOBAR GAZETTE

असाधारण
EXTRAORDINARY
प्राधिकार से प्रकाशित
Published by Authority

No. 3, Port Blair, Wednesday, April 5, 1967 / Chaitra 15, 1889

PART I

FOREST DEPARTMENT

ANDAMAN AND NICOBAR ADMINISTRATION
(Forest Department)

NOTIFICATION

Port Blair, the 11th March, 1967 / Phalguna 20, 1888.

No. 37/67/F. No. G./635. Vol. III - Whereas the forest lands described in the Schedule below are not included in any reserved forest :-

And whereas it is necessary to make a formal enquiry into and record the nature and extent of the rights of Government and of private persons in or over the said forest lands, as required by sub-section (3) of section 29 and the proviso thereto of the Indian Forests Act, 1927 and that such enquiry and record will occupy such length of time, as in the meantime to endanger the rights of the Government ;

Now, therefore, in exercise of the powers conferred by sub-sections (1), (2) and the proviso to sub-section (3) of section 29 of the said Act read with the Government of India, Ministry of Home Affairs Notification No. 69/49/50-AN dated the 7th November, 1951; pending such enquiry and record as mentioned in paragraph 2 above I, Mahabir Singh, Chief Commissioner, Andaman & Nicobar Islands, hereby declare the said forest lands to be protected forest to which Chapter IV of the said Act shall apply with effect from the date of publication of this Notification in the Gazette. The declaration so made shall not abridge or affect any existing rights of any individuals or communities in the said forest lands.

SCHEDULE

Name of Islands.	Area in Sq. miles.
1. Car Nicobar	49.0
2. Chowra	3.2
3. Teressa	39.1
4. Bomboka	5.2
5. Katchal	67.3
6. Camorta	72.6
7. Triakata	14.0
8. Nancowry	25.8
9. Pulu Millo	0.5
10. Little Nicobar	61.4

Name of the Islands.	Area in Sq. miles.
11. Kondul ...	1.8
12. Great Nicobar ...	403.3
13. Batte Malv ...	0.80
14. Tillangchong ...	6.50
15. Isles of Man ...	—
16. Meroc ...	0.20
17. Trak ...	0.10
18. Treis ...	0.10
19. Meachal ...	0.50
20. Kabra ...	0.20
21. Megapod Island ...	—
22. Pigeon Island ...	—

MAHABIR SINGH,

Chief Commissioner,
Andaman and Nicobar Islands.

By order and in the Name of the Chief Commissioner

J. C. VARMAH,

Secretary (Forests) to the Chief Commissioner,
Andaman and Nicobar Administration.

PART II

ANDAMAN AND NICOBAR ADMINISTRATION

Chief Commissioner's Secretariat

NOTIFICATION

Port Blair, the 20th March, 1967/Phalanna 29, 1888

No. 22/67/F.No. 67/13-39/66-67-J. — The following Central Acts are published for general information :—

1. The Constitution (Nineteenth Amendment) Act, 1966
2. The Constitution (Twentieth Amendment) Act, 1966

By order

B. C. ACHARI

Asst. Secretary to the Chief Commissioner

**Andaman and Nicobar Gazette
EXTRAORDINARY
Published by Authority**

Port Blair, the 15th March, 1971/12th Phlaguna 24, 1892

ANDAMAN AND NICOBAR ADMINISTRATION

(Forest Department)

NOTIFICATION

Port Blair, the 15th March, 1971/ Phlaguna 24, 1892

No. G/635/2. – In exercise of the powers conferred by clause [a] of sub-section 1 of section 4 of the Indian Forest Act, 1927 [Act, XVI of 1927, the Chief Commissioner, Andaman and Nicobar Islands is pleased to declare that it has been decided to constitute the areas specified in the Schedule below in the Nicobar Group of Islands as reserved forests and under clause [e] of the said sub-section to appoint Shri B.B. Tandon, Additional Deputy Commissioner, Car Nicobar, as the Forest Settlement Officer to inquire into and determine the existence, nature and extent of any rights alleged to exist in favour of any person in or over any land comprised within such limits, or in or over any forest produce, and to deal with the same as provided in Chapter II of the said Act.

SCHEDULE

1. The entire area of the following islands:-

i]	Batti Maliv	ix]	Ni-Ai Rock	xvi]	Walker Island
ii]	Tillangchong	x]	Miroe	xvii]	Cane Rock
iii]	Paira Rock	xi]	Trak	xviii]	Reef Rock
iv]	Isle of Man	xii]	Treis	xix]	Cerhores Rock
v]	Arthur	xiii]	Kabra	xx]	Snake Rock
vi]	Twin Islet	xiv]	Pigeon	xxi]	Pin Rock
vii]	False Island	xv]	Megapod	xxii]	Boat Rock
viii]	Mangrove Islet				

2. The area of Car Nicobar Island excluding the area of the following 17 villages:-

i]	Mus	vii]	Tee Top	xiii]	Malacca
ii]	Kinmai	viii]	Chnckchukia	xiv]	Malacca Headquarter
iii]	Big Lapaty	ix]	Kinyuoka	xv]	Arong
iv]	Small Lapaty	x]	Tapoin	xvi]	Kakana
v]	Block Headquarters	xi]	Perka	xvii]	Kinies
vi]	Sawai	xii]	Tamaloo		

3. CHOWRA ISLAND

The area under this island excluding the area of the following.

i]	Ocheat	iii]	Chougkamong	v]	Tahaiah
ii]	Kuitaseek	iv]	Raihon		

4. BOMPOOKA ISLAND

The area under this island excludes the area of village Bompooka.

5. TERESSA ISLAND

The area under this island excluding the area of the following 12 villages:-

i]	Bengali	v]	Miniyak	ix]	Kanahinet
ii]	Aloorang	vi]	Kinvi	x]	Enam
iii]	Kalasi	vii]	Kalara	xi]	Allora
iv]	Safed Bala	viii]	Chuckmachi	xii]	Luxi

6. KATCHAL ISLAND

The area under this island excluding the area of the following 28 villages:-

i]	Kapanga	xi]	Kulatapang	xx]	Changlanui
ii]	Kupinga	xii]	Halhalchi	xxi]	Mapayala
iii]	Jansingh	xiii]	Kalhola	xxii]	Hoipoh
iv]	Jhoola	xiv]	Riyachung	xxiii]	Changtamniluni
v]	Hitlat	xv]	Kusa	xxiv]	Utkona
vi]	Est-Bay Katchal	xvi]	Knyatapa	xxv]	Kamriyak
vii]	Matatapu	xvii]	Hointon	xxvi]	Kaahuwa

viii]	Delli	xviii]	Lainakap	xxvii]	Kuimiki
ix]	Lalamunat	xix]	Tapanj	xxviii]	Hintona
x]	Cheneyang				

7. CAMORTA ISLAND

The area under this island excluding the area of the following 21 villages:-

i]	Kakana	viii]	Maru	xv]	Kalatapu
ii]	Pilpilow	ix]	Bandarkhari	xvi]	Knot
iii]	Alpinpon	x]	Tamach	xvii]	Payuha
iv]	Daring	xi]	Alukiah	xviii]	Ramja
v]	Chanol	xii]	Masalatapu	xix]	Munak
vi]	Karan	xiii]	Changua	xx]	Bada Inak
vii]	Bumpal	xiv]	Alpintung	xxi]	Chota Inak

8. TRINKET ISLAND

The area under this island excluding the area of the village Trinket.

9. NANCOWRIE ISLAND

The area under this island excluding the area of the following 16 villages:-

i]	Champin	vii]	Altheak	xii]	Alika
ii]	Hinuang	viii]	Linuanga	xiii]	Inrah
iii]	Malacca	ix]	Kabila	xiv]	Lapat
iv]	Albituouch	x]	Neang	xv]	Hintona
v]	Ethoi	xi]	Payaka	xvi]	Alreak
vi]	Tapong				

10. PILOWMILLOW ISLAND

The area under this island excluding the area of the village Pilomilow.

11. KONDUL ISLAND

The area under this island excluding the area of the village Kondul.

12. GREAT NICOBAR ISLAND

The area under this island excluding the area of the following 12 villages:-

i]	Pulobhabi	v]	Kotinyon	ix]	Koken
ii]	Pukokapinhi	vi]	Ptitye	x]	Inhenyobi
iii]	Kasinpath	vii]	Chingenh	xi]	Pulopaham
iv]	Koi	viii]	Pulopucco	xii]	Campbell Bay Settlements

13. LITTLE NICOBAR ISLAND

The area under this island excluding the area of the following 17 villages:-

i]	Pulopanja	vii]	Mislana	ciii]	Kiyang
ii]	Ilhoya	viii]	Infock	civ]	Bewai
iii]	Inlock Pattia	ix]	Pulobha	cv]	Pulo Ulo
iv]	Machachua	x]	Pea	cvi]	Pulobahuan
v]	Anil	xi]	Hoin	cvi]	Pulotohic
vi]	Akupa	xii]	Pattia		

H.S. BUTALIA,
Chief Commissioner,
Andaman and Nicobar Island
By order and in the Name of the Chief Commissioner,

BACHAN SINGH,
Forest Secretary
Andaman and Nicobar Administration.

**Andaman and Nicobar Gazette
EXTRAORDINARY
Published by Authority**

No.3, Port Blair, Tuesday, April 2, 1957

**OFFICE OF THE CHIEF COMMISSIONER,
Andaman and Nicobar Islands
NOTIFICATION**

Port Blair, the 2nd April, 1957

No. ANPATR/3(1)/1 – In exercise of the powers conferred by sub-section (1) section 3 of the Andaman and Nicobar Islands (Protection of Aboriginal Tribes) Regulation, 1956, (Regulation No. 3 of 1956), the Chief Commissioner, Andaman and Nicobar Islands, is pleased to declare each of the following areas to be a reserved area, namely:-

a) ¹[South Andaman:-

The part of South Andaman Islands situated in the west of the imaginary boundary line including coastal water upto 3 K.M starting from the mouth of Constance Bay proceeds north upto north west corner of village Tirur and thence proceeds towards east-north and joins Andaman Trunk Road at a point 2 K.M south of Miletalak from where the boundary proceeds towards north upto Middle strait point along the western side of Andaman Trunk Road having a 200 metre belt excluding village areas of Miletalak and all allotted land of Jirkatang area. From middle Strait point the boundary proceeds towards north via Needhan reach, enclosing Bluff and Spike Islands, to Yeratil Jig] ²[and new survey No. 2265/5 area measuring 1000 Sq. Metres situated at Aberdeen Village, Port Blair, Andaman District].

1. Substituted vide Notification No. 107/7/F.No.40.243/78-TW dated 19th July, 1979 for “ The area in South Andaman to the east of an imaginary line starting north-eastwards from the mouth of Constance Bay along Bajalunta Jig to the Southern tip of Cholunga Range and then proceeding northwards to Mount Cadell and from there eastward to Pochange Creek and thence along the eastern coast of South Andaman Island proceeding to a point approximately 600228 (omitting James, Kyd and other islands and islets) and thence from that point northwards along an alignment to be aligned by the Andaman and Nicobar Islands Forest Department taking into consideration the suitability of terrain and water points to join Putatang Jig and thence northwards along Putatang Jig and Amitla Soicha Passage of Middle Strait along the east coast of South Andaman excluding Belle Island, Bonig Island, Oral Kaicha and Baby Island proceeding to Yeratil Jig via Needham Reach and Port Anson enclosing Bluff and Spike islands”

2. Inserted vide Notification No. 1-467/86-TW dated 2nd November 1989.

b) ¹[Middle Andaman:-

The part of the Middle Andaman Islands situated in the western side of the imaginary boundary line including coastal water upto 3 KM starting from Yeratil Jig and proceeds towards north-east excluding village areas of Kadamtala and touches Andaman Trunk Road at a point 12 K.M north of Uttara jetty and passes alongside the road leaving 200 metre belt upto 24 km point of the Andaman Trunk Road from Uttara Jetty and thence due north through jungle upto a distance of 6 K.M and then towards north-east from a distance of 7 K.M and further proceeds due north for 11 km and then joins Wolaga Boilu Creek. Thereafter the boundary line proceeds north-west through the boundary Wolaga Boilu Creek upto the point 1/3 K.M from the northern tip of the village Hanspuri and skirt around South West and southern side keeping the same half a km distance from village Hanspuri extending and culminating ultimately at Bush Police Camp No. 32 facing the Luice Inlet including entire Wolaga Boilu, Melagar Boilu and Mar Boilu Creeks].

c) The enter area comprised in, and enclosed within the coast line of each of the following islands.

- i) ²[***]
- ii) North Sentinel
- iii) Cinque
- iv) Passage
- v) Sisters
- vi) Brothers

vii) South Sentinel and other islands and islets situated south wards in the territory of the Andaman and Nicobar Islands upto and including Little Andaman ³ [except the area on the eastern coast of Little Andaman Island located within the following co-ordinates:

LONGITUDE – between the longitude 92° 28 minutes East and 92° 35 minutes East.

LATITUDE – between latitude 10° 34 minutes North and ⁴ [10° 34 minutes 30 seconds] North].

viii) ⁵ [Strait Island]

1. Substituted vide Notification No. 107/7/F.No. 40.243/78-TW dated 19th July, 1979 for “ The area in Middle Andaman to the west of an imaginary line emerging from South Andaman and proceeding northwards from Yeratil Jig to ⁶ [Bush Police Post No. 4 (Maps reference 772425) and thence due west to the coast below point June (Map reference 625029)] along the Bush Police Line subject to an adjustment that the line may coincide with an alignment to be aligned by the Andaman and Nicobar Islands Forest Department in Porlob and Boroin Yol areas between the Yeratil Charalungta Bush Police Posts provided that sufficient land is left to the west of such alignment on the eastern side of the Range to provide enough hunting ground to Jarawas while they are on the move and bearing in mind the suitability of such alignment, from the point of view of water and terrain, as a patrol path.
2. The word “Rutland” omitted vide Notification No. 65/73/F.No. 81-14/72-J.1 dated 24th May, 1973.
3. Inserted vide Notification No. 62/72/F.No.81-9/71-J (1) dated 20th April, 1972.
4. Substituted vide Notification No. 108/77 F.No.15-222/76/-J (1) dated 27th May, 1977 for 10° 44 minutes”
5. Inserted vide Notification No. 95/72/81-15/72-J (1) dated 28th June, 1972.
6. Substituted vide Notification No. AN PATR/3(1)1 dated 1st. December, 1959 for “Ranger’s Channel”
 - d) The entire area comprised in, and enclosed within the coast line of each of the following islands but excluding the area comprising the air field in Car Nicobar and the ports of Camorta and Car Nicobar ¹ [and the area located between the co-ordinates mentioned below in the eastern coast of Great Nicobar Island.

LONGITUDE – the area between longitude 93° 50 minutes East and 93° 57 minutes East.

LATITUDE – the area between latitude 6° 53 minutes North and 7° 2 minutes North]

i]	Car Nicobar	viii]	Trinket	xv]	Little Nicobar
ii]	Batti Malv	ix]	Nancowry	xvi]	Pulo Milo
iii]	Chowra	x]	Katchal	xvii]	Great Nicobar
iv]	Tillangchong	xi]	Meroe	xviii]	Kondul
v]	Teressa	xii]	Trak	xix]	Kabra
vi]	Bompoka	xiii]	Treis		
vii]	Camorta	xiv]	Menchal		

T.G.N. AYYAR
Chief Commissioner, A & N Islands
[F.1-89(1)/56-G]
G.P.43/57

Govt. of India
Ministry of Environment & Forests
PARYAVARAN BHAWAN C.G.O COMPLEX
LODI ROAD, NEW DELHI - 110003

No.J-22010/14/89-CSC

January, 13, 1989.

To

The Chief Secretary,
Andaman and Nicobar Administration,
Port Blair.

Sub: Establishment of Biosphere Reserve at Great Nicobar Island

Sir,

1. The Government of India has identified potential sites for preserving biological diversity with the following broad objectives:-
Conservation of representative samples of ecosystem;
Provision of long-term conservation of genetic diversity in-situ;
Promotion of basic and applied research work and training.
2. The Great Nicobar Island represents the tropical rain forests in Andaman & Nicobar Islands Biogeographic region. In accordance with the guidance with the guidelines on the subject, a project document for setting up of a Biosphere Reserve in Great Nicobar Island was prepared by the Ministry of Environment & Forests based on the report prepared by the Botanical Survey of India. This has been considered in detail by the Andaman & Nicobar Administration and the Government of India.
3. The matter has been considered in detail by the Government of India in consultation with the Andaman & Nicobar Administration and it has been decided to set up the Biosphere Reserve in the Great Nicobar Island. The Biosphere Reserve will be deemed to have come into being with effect from January 6, 1989.
4. The total geographical area of the Great Nicobar Island is approximately 1,044 sq.kms. The total area of the Biosphere Reserve is about 885 sq. kms. The boundary and zonation into core and buffer zones of the Biosphere Reserve are given at Annexure-I. The details of the area to be earmarked for manipulation activities such as forestry, agriculture, etc. eco-restoration, agro-forestry, aquaculture, etc. will be worked by project authorities.
5. The following will be the important aspects of the Great Nicobar Biosphere Reserve:-
 - a) The core and the buffer areas and manipulation activities which may be permitted in the buffer zone will be in conformity with the general guidelines for biosphere reserve. A detailed map will subsequently be submitted by the Union Territory Administration.
 - b) The core zone of the Biosphere Reserve will be kept absolutely undisturbed except for the already existing settlements, if any.
 - c) The constitution of the Biosphere Reserve by itself will not in any way change the status of legal ownership of the land and forests.
 - d) There will be a Biosphere Reserve Management Council with the composition given in Annexure-II.

- e) The Government of India will provide financial assistance for approved items of expenditure included in the Action and management Plan to be prepared by the A&N Island Administration. This may broadly come under the following heads:-
- Survey
 - Conservation
 - Protection
 - Eco restoration
 - Education & Awareness
- f) There will be a Research Committee as per composition shown in Annexure-III.
- g) The subject of research and the institutions identified for the purpose are shown in Annexure-IV. There may be additions and alterations in the list, when necessary.
- h) The Andaman & Nicobar Administration will set up a local Committee for coordination of the activities of various departments in the Biosphere Reserve area.
- i) The Andaman & Nicobar Administration will nominate an Officer as Director of the Biosphere Reserve. He may be an existing functionary who may not necessarily be an exclusive functionary for this purpose.

Yours faithfully

(K.P. Geethakrishnan)
Secretary to the Government of India

Copy to:-

1. Lieutenant Governor, Andaman & Nicobar Administration, Port Blair.
2. Secretary, Planning Commission, Yojana Bhawan, New Delhi.
3. Joint Secretary (Shri J.N. Chaubey), Prime Minister's Office, South Block, New Delhi.
4. Chief (Science), Planning Commission, Yojana Bhawan, New Delhi.
5. Additional Secretary (Shri P.P. Srivastava), Ministry of Home Affairs, North Block, New Delhi.
6. IGF/ASB/JSE/JS/(WL)/JSA/JSP/JSB/JA&FA.

(K.P. Geethakrishnan)
Secretary to the Government of India

(Annexure-I)

ZONATION – GREAT NICOBAR ISLAND BIOSPHERE RESERVE

General description and boundary

The Great Nicobar Island is the southernmost island of Andaman and Nicobar archipelago and lies between 6 45' and 7 15' N latitudes and 93 38' and 93 55' E longitudes, about 482 kms. south of Port Blair. The total geographical area is approximately 1,044 sq.kms. (55 kms long between Murray Point in north to Pygmalion Point in the south and having a width of about 30 kms in the north which narrows down to only about 3 kms. in the southern tip). The island presents varied natural panorama covered with virgin lush evergreen dense tropical forests extending from sea coast to the tip of hills.

Zonation

The total area covered by the Biosphere Reserve is 885 sq. kms. Entire northern part of the island and the area between the Alexandra river (west coast) to Chengappa Bay (east coast) will be Zone-I (area 520 sq. kms. As core Zone – I and 90 sq.kms. as its buffer zone). The southern part between the two hill ranges (Sahni range and Mani range) including the river Galathea is Zone- II (area 185 sq. kms. As core zone-II and 90 sq. kms as its buffer zone).

**ANDAMAN AND NICOBAR GAZETTE
EXTRAORDINARY
Published by Authority**

No.102 (B), Port Blair, Friday, November, 22, 1996

ANDAMAN AND NICOBAR ADMINISTRATION SECRETARIAT

NOTIFICATION

Port Blair, the 22nd Nov., 1996.

No. 97(B)/96/F.No.CWLW/WL/31/1188 – Whereas, In exercise of the power conferred by sub-section (1) of Section 35 read with sub-section (29) of section 2 of Wildlife (P) Act, 1972 (Act No.53 of 1972, the Lieutenant Governor (Administrator), Andaman & Nicobar Islands, by reason of the ecological, faunal, flora, geomorphological and Zoological association or importance, has declared his intention vide A&N Administration's Notification No. CWLW/WL/38/1801 dated 18th March, 1992, to constitute the area specified in the schedule to this Notification as "Campbell Bay National Park" for the purpose of protecting, propagating and developing Wildlife therein and the environment;

And whereas, the above said area has been declared as Reserved Forests under the provisions of the Indian Forest Act, 1927 vide A&N Administration's Notification No. G/632/2 dated 15th March, 1971.

Now, therefore, In exercise of the powers concerned by sub-section (4) of Section 35, read with sub-section (29) of Section 2 of the Wildlife (Protection) Act, 1972, the Lieutenant Governor (Administrator) Andaman & Nicobar Islands hereby declares the above said area as specified in this schedule below as "Campbell Bay National Park" with effect from the date of Publication of this Notification in the Official Gazette.

SCHEDULE

Area: 426.23 Sq. km (Approximately) at Great Nicobar Islands in the A&N Islands.

Description of boundary:

The boundary of the Campbell Bay National Park will be as follows:

North: Northern coastline of Great Nicobar Island.

East: Starting from the mouth of the streamlet that flows into Andaman Sea at the southern Part of Trinket – Champlene Bay; follows upstream, gets on the top of the ridge (now named as Chaturvedi Range); thence runs southwards along the ridge separating the eastern and western drainages and connecting the peaks at 386 metre, 446 metre and 404 metre altitudes upto the source of the Galathea River (opposite to Ranganathan Bay), thence follows along the Galathea River southward upto the Reddy Swamp, where it takes east-west turn.

South: along the Galathea River in east-westerly direction, till the river takes North-South turn. Thence it follows the artificial east-west line till it touches the tributary of the Alexandra River, thence along the tributary to its confluence with Alexandra River and thence follows the main Alexandra River upto its estuary in Balle Bay.

West: Along the western coastline outside the peripheral limits of villages of Kuches, Reumang, Rehchang, Reketat, Pulobed, Pulokunji extending upto the mouth of Alexandra River

Dr. M. Channa Reddy
Administrator,
Andaman & Nicobar Islands

By order and in the name of the Lieutenant Governor,

Sd/-
(C.P. Oberal)
Secretary (Environment & Forests)
Andaman and Nicobar Islands

ANNEXURE- VI

**MEAN TEMPERATURE (IN DEGREE CELCIUS) RECORDED AT CAMPBELL BAY, GREAT
NICOBAR ISLAND FOR THE PERIOD FROM 2008 TO 2016**

YEAR	2008	2009	2010	2011	2012	2013	2014	2015	2016
Month	⁰ C	⁰ C	⁰ C	⁰ C	⁰ C	⁰ C	⁰ C	⁰ C	⁰ C
January	28.2	29.2	28.0	27.6	28.2	27.8	29.2	29.4	29.0
February	28.0	29.2	27.6	27.4	29.2	28.0	30.2	31.2	31.0
March	27.6	30.6	28.6	29.6	29.0	29.2	29.8	29.2	29.0
April	27.4	31.4	31.0	29.2	28.2	30.0	29.4	28.2	29.0
May	28.2	28.4	30.2	30.2	27.6	30.2	30.2	29.8	30.1
June	28.4	27.6	29.0	28.4	27.0	29.2	29.4	29.1	29.0
July	28.2	27.2	28.2	27.8	28.2	28.4	28.6	28.5	28.3
August	28.6	27.8	28.2	28.8	29.4	28.6	29.8	29.2	29.0
September	29.2	27.4	29.2	29.2	28.2	29.4	30.2	30.0	30.0
October	28.0	27.2	28.8	27.6	29.4	27.8	28.2	28.4	28.5
November	27.0	27.6	27.6	28.6	28.2	28.2	29.4	29.0	29.5
December	28.2	27.8	28.6	29.6	28.4	28.4	28.6	28.5	28.0

ANNEXURE-VII(A)

MONTHLY RAINFALL RECORDED AT CAMPBELL BAY DURING 2008- 2016 (in mm)

YEAR	2008	2009	2010	2011	2012	2013	2014	2015	2016
Month									
January	53.0	176.6	177.4	281.0	424.2	364.8	270.0	273.3	212.2
February	08.0	13.2	05.6	87.8	222.4	191.7	48.4	68.0	93.1
March	256.2	97.4	34.6	341.0	100.1	03.4	09.8	32.1	46.2
April	124.4	238.8	116.2	74.4	216.4	143.6	74.0	104.0	88.3
May	140.6	483.0	186.2	261.8	437.5	542.8	281.8	373.5	312.4
June	161.4	201.4	486.2	195.8	242.2	191.7	397.7	304.2	386.0
July	359.9	217.1	390.4	325.4	488.8	222.6	350.2	296.3	274.0
August	215.0	238.4	354.1	209.7	82.8	475.4	159.3	168.1	148.4
September	163.8	225.8	162.4	272.0	464.8	320.8	495.0	386.3	384.0
October	263.4	178.6	192.0	278.3	256.8	188.0	436.0	232.0	268.1
November	384.8	401.6	438.4	279.1	353.8	180.4	440.7	267.2	312.0
December	420.4	292.2	446.8	507.4	392.9	728.6	608.3	452.1	618.5
Total	2550.9	2764.1	2990.3	3113.7	3682.7	4453.8	3571.2	2957.1	3143.2

ANNEXURE VII (B)

MONTHLY RAINFALL RECORDED IN NICOBAR ISLANDS FROM 2016 to 2021
(From January 2016 up to November 2021)

(in mm)

Year Month	Nicobar Group of Islands											
	Car Nicobar						Nancowrie					
	2016	2017	2018	2019	2020	2021	2016	2017	2018	2019	2020	2021
January	42.0	524.4	105.0	235.8	15.0	88.2	397.8	718.2	298.2	118.0	13.4	139.9
February	25.0	4.0	19.0	9.0	16.4	22.6	167.4	45.0	204.8	61.6	8.1	78.0
March	0.0	49.5	6.0	9.2	0.0	160.6	0.0	57.6	22.0	51.8	1.2	43.5
April	0.0	110.6	269.0	68.3	34.6	171.8	13.2	103.0	186.4	50.3	64.5	121.9
May	102.6	375.0	307.0	380.1	251.9	253.1	180.2	252.6	243.5	115.9	207.1	205.6
June	564.3	185.0	491.7	585.2	599.1	164.4	339.2	151.0	102.4	129.3	307.3	212.9
July	166.5	206.6	143.4	231.8	219.8	361.8	56.7	84.6	93.2	185.8	78.9	271.1
August	226.5	271.6	123.0	280.5	235.4	489.6	254.5	195.6	91.0	153.4	87.8	384.4
September	696.9	278.0	231.5	368.2	553.4	437.6	278.9	248.6	71.4	190.1	242.6	300.2
October	324.0	170.0	274.2	170.0	184.2	404.8	251.3	222.8	216.2	195.2	275.6	129.7
November	219.7	280.7	165.8	185.7	173.9	270.2	119.9	310.5	175.4	303.3	234.4	202.0
December	552.7	530.0	344.6	71.4	171.2		659.8	402.2	298.0	189.6	319.3	
Total	2920.2	2985.4	2480.2	2595.2	2454.9	2824.7	2718.9	2791.7	2002.5	1744.3	1840.2	2089.2

Source: Metrological Dept.A&N Islands.website.

ANNEXURE VIII

MEAN RELATIVE HUMIDITY RECORDED AT CAMPBELL BAY DURING 2008- 2016

YEAR Month	2008	2009	2010	2011	2012	2013	2014	2015	2016
	S/Wind	S/Wind	S/Wind	S/Wind	S/Wind	S/Wind	S/Wind	S/Wind	S/Wind
January	88.20	76	80	80	88	80	79	68.75	83.85
February	80.77	79	78	82	83	79	80	73.66	79.26
March	80.35	74	78	86	82	84	81	84.11	79.29
April	82.73	78	74	83	83	82	83	86.33	79.48
May	80.68	76	76	85	88	85	84	84.72	86.12
June	86	78	93	85	80	81	80	83.13	88.81
July	88	79	88	88	84	86	82	85.56	86.41
August	86	80	87	83	82	82	84	82.41	85.80
September	82	77	85	85	84	83	86	86.71	88.13
October	84	75	82	90	86	81	87	86.90	87.72
November	88	75	86	92	87	88	85	85.06	77.35
December	74	78	86	93	79	78	82	83.96	77.37
Annual Average	83.39	83.39	77.08	82.75	86	83.83	82.42	82.61	83.3

ANNEXURE IX

LIST OF RARE AND ENDANGERED ENDEMIC PLANTS

S.No.	Plant Species	Remarks
1	<i>Cyathea nicobarica</i> N.P.Balacr.&R.D.Dixit	TC
2	<i>Clematis smilacifolia</i> Wall.ssp.andamanica Kapoor	TC
3	<i>Artabotrys nicobarianus</i> D.Das	TC
4	<i>Pseuduvaria prainii</i> (King) Merr.	TL
5	<i>Uvaria nicobarica</i> Raiz. & K.C.Sahni	TC
6	<i>Cyclea pendulina</i> Miers	Rare
7	<i>Chisocheton nicobarianus</i> Debnath &Sreeg.	Rare
8	<i>Nicobariodendron sleumeri</i> Vasud.& T.Chakrab.	TC
9	<i>Tetrastigma andamanicum</i> (King) Suesseng.	Rare
10	<i>Leea grandifolia</i> Kurz	Rare
11	<i>Mangifera nicobarica</i> Kosterm	TC
12	<i>Connarus nicobaricus</i> King	TC
13	<i>Terminalia procera</i> Roxb.	Rare
14	<i>Otanthera nicobarensis</i> T.&B.	Rare
15	<i>Coptophyllum nicobaricum</i> (Balacr.) Deb.& Rout.	TC
16	<i>Ixora cuneifolia</i> Roxb.var.macrocarpa Kurz	TC
17	<i>Ixora tenuifolia</i> Bremek	TC
18	<i>Ophiorrhiza nicobarica</i> Balacr.	TL
19	<i>Psychotria platyneura</i> Kurz	Rare
20	<i>Psychotria tylophora</i> Kurz	Rare
21	<i>Tarenna weberaefolia</i> (Kurz) Balacr.	Rare
22	<i>Embelia microcalyx</i> Kurz	Rare
23	<i>Chilocarpus denudatus</i> Bl.var. <i>nicobaricus</i> Gang.& T.Chakrab.	TC
24	<i>Genianthus horei</i> Vasud.	Rare
25	<i>Cyrtandroemia nicobarica</i> Balacr.	Rare
26	<i>Cyrtandra burttii</i> Balacr.	TC
27	<i>Cyrtandra occidentalis</i> Balacr.&Burtt.	TL
28	<i>Strobilanthes glandulosus</i> Kurz	Rare
29	<i>Nothophoebe nicobarica</i> T.Chakrab.&Vasud.	TC
30	<i>Drypetes bhattacharae</i> T.Chakrab.	Rare
31	<i>Macaranga nicobarica</i> Balacr.& Chakrab.	Rare
32	<i>Mallotus oblongifolius</i> (Miq.) Muell.-Arg. var. <i>Rubriflorus</i> T.Chakrab.	Rare
33	<i>Trigonostemon villosus</i> Hook.f.var. <i>nicobaricus</i> T.Chakrab.	TC
34	<i>Elatostema novarae</i> Kurz	TC
35	<i>Pellionia procradifolia</i> Kurz	Rare

36	<i>Anoectochilus nicobaricus</i> Balakr.& Chakr.	TL
37	<i>Aerides emericii</i> Reichb.F	Rare
38	<i>Dendrobium shompenii</i> B.K.Sinha & P.S.N.Rao	Rare
39	<i>Phalaenopsis speciosa</i> Reichb.F	Rare
40	<i>Pomatocalpa andamanicum</i> (Hk.F.)Sm.	Rare
41	<i>Trichoglottis quadricornuta</i> Kurz	Rare
42	<i>Vanilla andamanica</i> Rolfe	Rare
43	<i>Phrynium paniculatum</i> Balakr.	TL
44	<i>Calamus dilaceratus</i> Becc.	TC
45	<i>Calamus nicobaricus</i> Becc.	TC
46	<i>Calamus unifarius</i> Wendl.var.pentong Becc.	Rare
47	<i>Rhopaloblaste augustata</i> (Kurz) Moore	TC
48	<i>Aglaonema nicobaricum</i> Hk.F.	TC

TC- Type collection only; TL - Recollected from type localities only

ANNEXURE X

LIST OF MAMMALS

S.No.	Common Name	Species name
	Order :Eulipotyphla	
	Family: SORICIDAE	
1	Nicobar Shrew	Crocidura nicobarica Miller,1902
2	Nicobar Treeshrew	Tupaia nicobarica (Zelebor,1869)
3	Nicobar Tree Shrew	Tupaia nicobarica surda Miller,1902
	Order: Chiroptera	
	Family:PTEROPODIDAE	
4	Greater Short-nosed Fruit Bat	Cynopterus sphinx scherzeri Zelebor,1869
5	Nicobar Flying Fox	Pteropus faunulus Miller,1902
6	Large Flying Fox	Pteropus vampyrus (Linnaeus,1758)
	Family: EMBALLONURIDAE	
7	Black-bearded Tomb Bat	Taphozous melanopogon Temminck, 1841
8	Naked-rumped Pouched Bat	Taphozous saccolimus Temminck, 1838
	Family:HIPPOSIDERIDAE	
9	Nicobar Leaf- nosed Bat	Hipposideros nicobarulae Miller,1902
10	Fulvous Leaf nosed Bat	Hipposideros fulvus Gray,1838
	Family :VESPRTLIONIDAE	
11	Lesser Asiatic Yellow House Bat	Scotophilus kuhlii Leech,1821
	Order: Primate	
	Family :CERCOPITHECIDAE	
12	Crab- eating Macaque	Macaca fascicularis umbrosa Miller,1902
	Order:Cetartiodactyla	
	Family: DUGONGIDAE	
13	Dugong	Dugong dugon(Muller,1776)
	Family: DELPHINIDAE	
14	Short-beaked Saddleback Dolphin	Delphinus delphis Linnaeus,1758
	Order: Artiodactyla	
	Family: SUIDAE	
15	Nicobar Wild Pig	Sus scrofa nicobarica Miller,1902
	Order: Rodentia	
	Family: MURIDAE	
16	Miller's Nicobar Rat	Rattus burrus (Miller,1902)
17	House Rat	Rattus rattus(Linnaeus,1758)
18	Oriental House Rat	Rattus tanezumi (tamminck,1844)

ANNEXURE -XI

LIST OF BIRDS

Sl.No	Common Name*	Scientific Name*	Residential Status
	Phaethontiformes		
	ARDEIDAE		
1.	Little Egret	<i>Egretta garzetta</i> (Linnaeus,1766)	R/LM
2.	Pacific Reef-Egret	<i>Egretta sacra</i> (Gmelin,1766)	R
3.	Purple Heron	<i>Ardea purpurea</i> Linnaeus,1766	R/LM
4.	Great Egret	<i>Egretta alba</i> (Linnaeus,1758)	R/LM
5.	Intermediate Egret	<i>Egretta intermedia</i> (Wagler,1829)	R/WM
6.	Eastern Cattle Egret	<i>Bubulcus coromandus</i> (Boddaert,1783)	R/LM
7.	Chinese Egret	<i>Egretta eulophotes</i> (Swinhoe,1860)	WM
8.	Indian Pond-Heron	<i>Ardeola grayii</i> (Sykes,1832)	R/WM
9.	Chinese Pond-Heron	<i>Ardeola bacchus</i> (Bonaparte,1855)	WM
10.	Nicobar Little Green Heron ^{ENS}	<i>Butorides striatus spodiogaster</i> Sharpe,1894	R
11.	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i> (Linnaeus,1758)	PM
12.	Nicobar Malayan Night-Heron ^{ENS}	<i>Goraschius melanolophus minor</i> Hachisuka,1926	R
13.	Yellow Bittern	<i>Ixobrychus sinensis</i> (Gmelin,1789)	WM
14.	Chestnut Bittern	<i>Ixobrychus cinnamomeus</i> (Gmelin,1789)	R
	Anseriformes		
	ANATIDAE		
15.	Lesser Whistling-Duck	<i>Dendrocygna javanica</i> (Horsfield,1821)	R/LM
16.	Jerdon's Baza	<i>Aviceda jerdoni</i> (Blyth,1842)	R/LM
17.	White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i> (Gmelin,1788)	R
18.	Nicobar Crested Serpent-Eagle ^{ENS}	<i>Spilornis cheela malayensis</i> Swann,1920	R
19.	Great Nicobar Serpent-Eagle ^E	<i>Spilornis klossi</i> Richmond,1903	R
20.	Nicobar Sparrowhawk ^E	<i>Accipiter butleri</i> (Gurney,1898)	R
21.	Besra Sparrowhawk	<i>Accipiter virgatus</i> (Temminck 1822)	WM
22.	Grey-faced Buzzard	<i>Butastur indicus</i> (Gmelin,1788)	WM
23.	Western Osprey	<i>Pandion haliaetus</i> (Linnaeus,1758)	V
	Falconiformes		
	Falconidae		
24.	Common Kestrel	<i>Falco tinnunculus</i> Linnaeus, 1758	WM
25.	Amur Falcon	<i>Falco amurensis</i> Radde, 1863	WM
26.	Peregrine Falcon	<i>Falco peregrinus calidus</i> Latham, 1790	WM
	Galliformes		
	MEGAPODIIDAE		
27.	South Nicobar Megapode ^{ENS}	<i>Megapodius nicobariensis abbotti</i> Oberholser, 1919	R
	PHASIANIDAE		

28.	Nicobar Blue-breasted Quail ^{ENS}	<i>Excalfactoria chinensis trinkutensis</i> (Richmond, 1902)	R
	Gruiformes		
	RALLIDAE		
29.	Nicobar Blue-Breasted Rail ^{ENS}	<i>Gallirallus striatus nicobariensis</i> Abdulali, 1967	R
30.	Corn Crake	<i>Crex crex</i> (Linnaeus,1758)	V
31.	Great Nicobar White-breasted Waterhen ^{ENS}	<i>Amaurornis phoenicurus midnicobaricus</i> Abdulali,1979)	R
32.	Ruddy-breasted Crake	<i>Porzana fusca</i> (Linnaeus,1766)	WM
33.	Watercock	<i>Gallixrex cinerea</i> (Gmelin,1789)	R/LM
34.	Purple Moorhen	<i>Porphyrio porphyrio</i> (Linnaeus,1758)	R
35.	Common Moorhen	<i>Gallinula chloropus</i> (Linnaeus,1758)	R
36.	Common Coot	<i>Fulica atra</i> Linnaeus,1758	R/LM
	Charadriiformes		
	CHARADRIIDAE		
37.	Pacific Golden-Plover	<i>Pluvialis fulva</i> (Gmelin,1789)	WM
38.	Grey Plover	<i>Pluvialis squatarola</i> (Linnaeus,1758)	WM
39.	Little Ringed Plover	<i>Charadrius dubius</i> Scopoli,1786	WM
40.	Lesser Sand Plover	<i>Charadrius mongolus</i> Pallas,1776	WM
41.	Greater Sand Plover	<i>Charadrius leschenaultii</i> lesson,1826	WM
	SCOLOPACIDAE		
42.	Bar-tailed Godwit	<i>Limosa lapponica</i> (Linnaeus,1758)	WM
43.	Eurasian Whimbrel	<i>Numenius phaeopus</i> (Linnaeus,1758)	WM
44.	Eurasian Curlew	<i>Numenius arquata</i> (Linnaeus,1758)	WM
45.	Common Redshank	<i>Tringa totanus</i> (Linnaeus,1758)	WM
46.	Common Greenshank	<i>Tringa nebularia</i> (Gunner,1767)	WM
47.	Green Sandpiper	<i>Tringa ochropus</i> (Gunner,1758)	WM
48.	Wood Sandpiper	<i>Tringa glareola</i> Linnaeus,1758	WM
49.	Terek Sandpiper	<i>Xenus cinereus</i> (Guldenstadt,1775)	WM
50.	Common Sandpiper	<i>Actitis hypoleucos</i> Linnaeus,1758	WM
51.	Ruddy Turnstone	<i>Arenaria interpres</i> (Linnaeus,1758)	WM
52.	Sanderling	<i>Ereunetes albus</i> (Pallas,1764)	WM
53.	Little Stint	<i>Ereunetes minutes</i> (Leisler,1812)	WM
54.	Curlew Sandpiper	<i>Erolia ferruginea</i> (Pontoppidan,1813)	WM
	GLAREOLIDAE		
55.	Oriental Pratincole	<i>Glareola maldivarum</i> J.R.Forester,1795	WM
	LARIDAE		
56.	Lesser Crested Tern	<i>Thalasseus bengalensis</i> Lesson,1831	WM
57.	Black-naped Tern	<i>Sterna sumatrana</i> Raffles,1822	R/LM
58.	Little Tern	<i>Sternula albifrons</i> Pallas,1764	WM
59.	Whiskered Tern	<i>Chlidonias hybria</i> (Pallas,1811)	WM
60.	Brown Noddy	<i>Anous stolidus</i> (Linnaeus,1758)	WM
	Columbiformes		
	COLUMBIDAE		
61.	Blue-rock Pigeon ^{IN}	<i>Columba livia</i> Gmelin,1789	R
62.	Nicobar Wood- Pigeon ^{ENS}	<i>Columba palumboides nicobaria</i> (Abdualali,1964)	R

63.	Nicobar Cuckoo-Dove ^{ENS}	<i>Macropygia rufipennis tiwari</i> Abdulali,1979)	R
64.	Nicobar Emerald Dove ^{ENS}	<i>Chalcophaps indica augusta</i> Bonapate,1855	R
65.	Nicobar Pigeon	<i>Caloenas nicobarica</i> (Linnaeus,1758)	R
66.	Nicobar Green-Pigeon ^{ENS}	<i>Treron chloroptera</i> (Blyth,1846)	R
67.	Nicobar Imperial-Pigeon ^E	<i>Ducula nicobarica</i> Blyth,1858	R
68.	Pied Imperial- Pigeon	<i>Ducula bicolor</i> (Scopoli,1786)	R
	Psittaciformes		
	PSITTACULIDAE		
69.	Nicobar Parakeet ^E	<i>Psittacula caniceps</i> (Blyth,1846)	R
70.	Andaman Red-Cheeked Parakeet ^{ENS}	<i>Psittacula longicauda tytleri</i> (Hume,1874)	R
71.	Nicobar Red-Cheeked Parakeet ^{ENS}	<i>Psittacula longicauda nicobarica</i> (Gould,1857)	R
	Cuculiformes		
	CUCULIDAE		
72.	Large Hawk-Cuckoo	<i>Hierococcyx sparverioides</i> (Vigors,1832)	WM
73.	Indian Cuckoo	<i>Cuculus micropterus</i> Gould,1837	R
74.	Common Cuckoo	<i>Cuculus canorus</i> Linnaeus,1758	SM
75.	Asian Emerald Cuckoo	<i>Chrysococcyx maculatus</i> (Gmelin,1788)	V
76.	Andaman Asian Koel ^{ENS}	<i>Eudynamys scolopacea dolosus</i> Ripley,1946	WM
77.	Nicobar Oriental Scops-Owl ^{ENS}	<i>Otus sunia nicobaricus</i> (Hodgson,1836)	R
78.	Nicobar Scops-Owl ^E	<i>Otus alius</i> Rasmussen,1998	R
	Caprimulgiformes		
	CAPRIMULGIDAE		
79.	Grey Nightjar	<i>Caprimulgus jotaka</i> Temminck & Schlegel,1844	WM
	APODIDAE		
80.	White-bellied Swiftlet ^{ENS}	<i>Collocalia esculenta affinis</i> Beavan 1867	R
81.	Andaman Edible-nest Swiftlet ^{ENS}	<i>Aerodramus fuciphaga inexpectatus</i> Hume,1873	R
82.	Little Swift	<i>Apus affinis</i> (J.E.Gray,1830)	SM
	Coraciiformes		
	ALCEDINIDAE		
83.	Common Kingfisher	<i>Alcedo atthis</i> (Linnaeus,1758)	WM
84.	Nicobar Oriental Dwarf Kingfisher ^{ENS}	<i>Ceyx erithaca macrocarus</i> Oberholser,1917	R
85.	Nicobar Stork-billed Kingfisher ^{ENS}	<i>Pelargopsis capensis intermedia</i> Hume,1874	R
86.	Black-capped Kingfisher	<i>Halcyon pileata</i> (Boddaert,1783)	R/LM
87.	Nicobar White Collared Kingfisher ^{ENS}	<i>Todiramphus chloris occipitalis</i> (Blyth,1846)	R
	MEROPIDAE		
88.	Blue-tailed Bee-eater	<i>Merops philippinus</i> Linnaeus,1766	WM
	CORACIIDAE		
89.	Andaman Dollarbird ^{ENS}	<i>Eurystomus orientalis gigas</i> Stesemann,1913	R

	Passeriformes		
	PITTIDAE		
90.	Nicobar Hooded Pitta ^{ENS}	<i>Pitta sordida abbotti</i> Richmond,1903	R
	HIRUNDINIDAE		
91.	Barn Swallow	<i>Hirundo rustica</i> Linnaeus,1758	WM
92.	House Swallow	<i>Hirundo tahitica</i> Gmelin,1789	R
93.	Red-rumped Swallow	<i>Cecropis daurica</i> Linnaeus,1771	WM
	MOTACILLIDAE		
94.	Forest Wagtail	<i>Dendronanthus indicus</i> (Gmelin,1789)	WM
95.	Western Yellow Wagtail	<i>Motacilla flava bema</i> (Sykes,1832)	WM
96.	Grey Wagtail	<i>Motacilla cinera</i> Tunstall,1771	WM
	CAMPEPHAGIDAE		
97.	Ashy Minivet	<i>Pericrocotus divaricatus</i> (Raffles,1822)	S
	PYCNONOTIDAE		
98.	Andaman Red- Whiskered Bulbul ^{ENS}	<i>Pycnonotus jocosus whistleri</i> Deignan,1948	R
99.	Nicobar Bulbul ^E	<i>Ixos nicobariensis</i> Moore,1854	R
	IRENIDAE		
	LANIIDAE		
100.	Brown Shrike	<i>Lanius cristatus</i> (Linnaeus,1758)	WM
101.	Philippine Shrike	<i>Lanius cristatus lucionensis</i> Linnaeus,1766	WM
	TURDIDAE		
102.	Nicobar Orange-headed Thrush ^{ENS}	<i>Geokichla citrina albogularis</i> (Blyth,1847)	R
103.	Eyebrowed Thrush	<i>Turdus obscures</i> Gmelin,1789	WM
	MUSCICAPIDAE		
104.	Common Stonechat	<i>Saxicola stejnegeri</i> (Parrot,1908)	WM
	CISTICOLIDAE		
105.	Zitting Cisticola	<i>Cisticola juncidis cursitans</i> (Franklin,1831)	R
	LOCUSTELLIDAE		
106.	Lanceolated Warbler	<i>Locustella lanceolata</i> (Temminck,1840)	WM
107.	Black-browed Reed-Warbler	<i>Acrocephalus bistrigiceps</i> Swinhoe,1860	WM
108.	Oriental Reed- Warbler	<i>Acrocephalus orientalis</i> (Temminck & Schlegel,1847)	WM
	PHYLLOSCOPIDAE		
109.	Dusky Warbler	<i>Phylloscopus fuscatus</i> (Blyth,1842)	WM
110.	Arctic Leaf- Warbler	<i>Phylloscopus borealis</i> (Blasius,1858)	V
	MUSCICAPIDAE		
111.	Nicobar Jungle Flycatcher ^E	<i>Cyornis nicobaricus</i> Richmond,1903	R
112.	Asian Brown Flycatcher	<i>Muscicapa latirostris</i> (Raffles,1822)	WM
113.	Nicobar Black-naped Monarch Flycatcher ^{ENS}	<i>Hypothymis azurea nicobarica</i> (Bianchi,1907)	R
	NECTARINIIDAE		
114.	Nicobar Olive-backed Sunbird ^{ENS}	<i>Cinnyris jugularis klossi</i> (Richmond,1902)	R
115.	Nicobar Crimson Sunbird ^{ENS}	<i>Aethopyga siparaja nicobarica</i> Hume,1873	R

	ZOSTEROPIDAE		
116.	Nicobar White-eye ^{ENS}	Zosterops palpebrosus nicobaricus Blyth,1845	R
	PASSERIDAE		
117.	House Sparrow ^{IN}	Passer domesticus(Linnaeus,1758)	R
	STURNIDAE		
118.	Andaman Glossy Starling ^{ENS}	Aplonis panayensis tyleri(Hume,1873)	R/LM
119.	Nicobar Glossy Starling ^{ENS}	Aplonis panayensis albiris Abdulali,1967	R/LM
120.	Nicobar White-headed Starling ^{ENS}	Sturnia erythropygia erythropygius (Blyth,1846)	R
121.	Common Starling	Sturnus vulgaris Linnaeus,1758	PM
122.	Common Myna ^{IN}	Acridotheres tristis(Linnaeus,1766)	R
123.	Great Nicobar Hill Myna ^{ENS}	Gracula javensis halibretha Oberholser 1926	R
	ORIOOLIDAE		
124.	Nicobar Black-naped Oriole ^{ENS}	Oriolus chinensis macrourus Blyth,1846	R
	DICRURIDAE		
125.	Black Drongo	Edolius macrocercus Vieillot,1817	WM
126.	Ashy Drongo	Edolius leucophaeus salangensis Reichenow,1890	WM
127.	Nicobar Racket tailed Drongo ^{ENS}	Dicrurus paradiseus nicobariensis (Baker,1918)	R

*Common & Scientific name followed by Rasmussen & Anderton (2005), Order & Family followed by BirdLife International, 2015; Praveen et al.(2016);Clement et al.(2016).

Residential Status; R- Resident; R/LM-Resident with local movements; R/WM- Resident with winter Migrant; WM- Winter Migrant; WM/PM- Winter Migrant as well as Passage Migrant; PM- Passage Migrant; PM/SM- Passage Migrant with summer Migrant; PM/WM- Passage Migrant with winter movements; SM- Summer Migrant; SM/R- Summer Migrant with Resident; S- Straggler and V-Vagrant. Residential status followed by Ali & Ripley (1983), Tikader (1984). Grimmett et al.(2008), Kazmierczak & Van Perlo (2000); kumar et al.(2005); (Rasmussen & Anderton (2012)

LIST OF REPTILES

Order/Family/Common Name	Species Name
Order: Crocodylia	
Family: CROCODILIDAE	
Salt Water Crocodile	<i>Crocodylus porosus</i> Schneider, 1801
Order: Testudines	
Family: DERMOCHELYIDAE	
Leatherback Sea Turtle	<i>Dermochelys coriacea</i> (Vandelli, 1761)
Family: CHELONIIDAE	
Green Sea Turtle	<i>Chelonia mydas</i> (Linnaeus, 1758)
Hawksbill Sea Turtle	<i>Eretmochelys imbricate</i> (Linnaeus, 1766)
Olive Ridley Sea Turtle	<i>Lepidochelys olivacea</i> (Eschscholtz, 1829)
Family: GEOEMYDIDAE	
Malayan Box Turtle	<i>Cuora amboinensis</i> (Riche in Daudin, 1801)
Order: Squamata	
Family: GEKKONIDAE	
Asian House Gecko	<i>Hemidactylus frenatus</i> (Dumeril and Bibron, 1836)
Brook's house Gecko	<i>Hemidactylus brookii</i> Gray 1845
Indo- Pacific Gecko	<i>Hemidactylus garnotii</i> (Dumeril and Bibron, 1836)
Oriental Worm Gecko	<i>Hemiphyllodactylus typus</i> Bleeker, 1860
Common Smooth- Scaled Gecko	<i>Lepidodactylus lugubris</i> (Dumeril and Bibron, 1836)
Andaman Day Gecko ^E	<i>Phelsuma andamanense</i> Blyth, 1860
Family: AGAMIDAE	
Green-crested Lizard	<i>Bronchocela cristatella</i> (Kuhl, 1820)
Daniel's Forest Lizard ^E	<i>Bronchocela danieli</i> (Tiwari and Biswass, 1973)
Family: SCINCIDAE	
Nicobar Tree Skink ^E	<i>Dasia nicobariensis</i> Biswas and Sanyal, 1977
Olive Tree Skink	<i>Dasia olivacea</i> Gray, 1839
Rough Mabuya or Brown Mabuya	<i>Eutropis rudis</i> (Boulenger, 1887)
Common Sun Skink	<i>Eutropis multifasciata</i> (Kuhl, 1820)

Rough- scaled Sun Skink	<i>Eutropis rugifera</i> (Stoliczka, 1870)
Spotted Forest Skink	<i>Sphenomorphus maculates</i> Blyth, 1853
Large - eared Ground Skink ^E	<i>Scincella macrotis</i> (Fitzinger, 1867)
Family: DIBAMIDAE	
Nicobarese Worm Lizard ^E	<i>Dibamus nicobaricus</i> (Fitzinger, 1867)
Family: VARANIDAE	
Water Monitor Lizard	<i>Varanus salvator andamanensis</i> Deraniyagala,1944
Family: TYPHLOPIDAE	
Brahminy Worm Snake	<i>Indotyphlops braminus</i> (Daudin, 1803)
Family XENOPELTIDAE	
Sunbeam Snake	<i>Xenopeltis unicolor</i> ReinwardtBoie, 1827
Family: PYTHONIDAE	
Reticulated Python	<i>Python reticulates</i> (Schneider, 1801)
Family: NATRICINAE	
Nicobar Keelback ^E	<i>Amphiesma nicobariense</i> (Sclater, 1981)
Triangle – spotted Keelback	<i>Xenochrophis trianguligerus</i> (Boie, 1827)
Family: COLUBRIDAE	
Nicobar Cat Snake ^E	<i>Boiga wallachi</i> Das, 1998
Nicobar Bronzeback Tree Snake ^E	<i>Dendrelaphis humayuni</i> Tiwari and Biswas, 1973
Yellow-Striped Kukri Snake ^E	<i>Oligodon woodmasoni</i> (Sclater, 1981)
Nicobar Stripe-necked Snake ^E	<i>Gongylosoma nicobarense</i> (Stoliczka, 1870)
Family: HOMALOPSIDAE	
Dog-faced Water Snake	<i>Cerberus rynchops</i> (Schneider, 1799)
Family: ELAPIDAE	
Yellow-lipped Sea Krait	<i>Laticauda colubrine</i> (Schneider, 1799)
Black and Yellow Sea Snake	<i>Pelamisplaturus</i> (Linnaeus, 1766)
Family: VIPERIDAE	
Nicobar Pit Viper ^E	<i>Trimeresurus labialis</i> (Fitzinger, 1867)
Nicobar Bamboo Pit Viper ^E	<i>Trimeresurus mutabilis</i> Stoliczka, 1870
Order: Anura	
Family: DICROGLOSSIDAE	

Nicobar Cricket Frog ^E	<i>Fejervarya nicobariensis</i> (Stoliczka, 1870)
Shompen Frog	<i>Limnonectes shompenorum</i> Das, 1998
Family: BUFONIDAE	
Asian Common Toad	<i>Bufo melanostictus</i> Schneider, 1799
Family: RANIDAE	
Red- eared Frog	<i>Hylarana erythraea</i> (Schlegel, 1837)
Nicobar Island Frog	<i>Hylarana nicobariensis</i> (Stoliczka, 1870)
Family: RHACOPHORIDAE	
Nicobarese Tree Frog ^E	<i>Polypedates insularis</i> Das, 1995

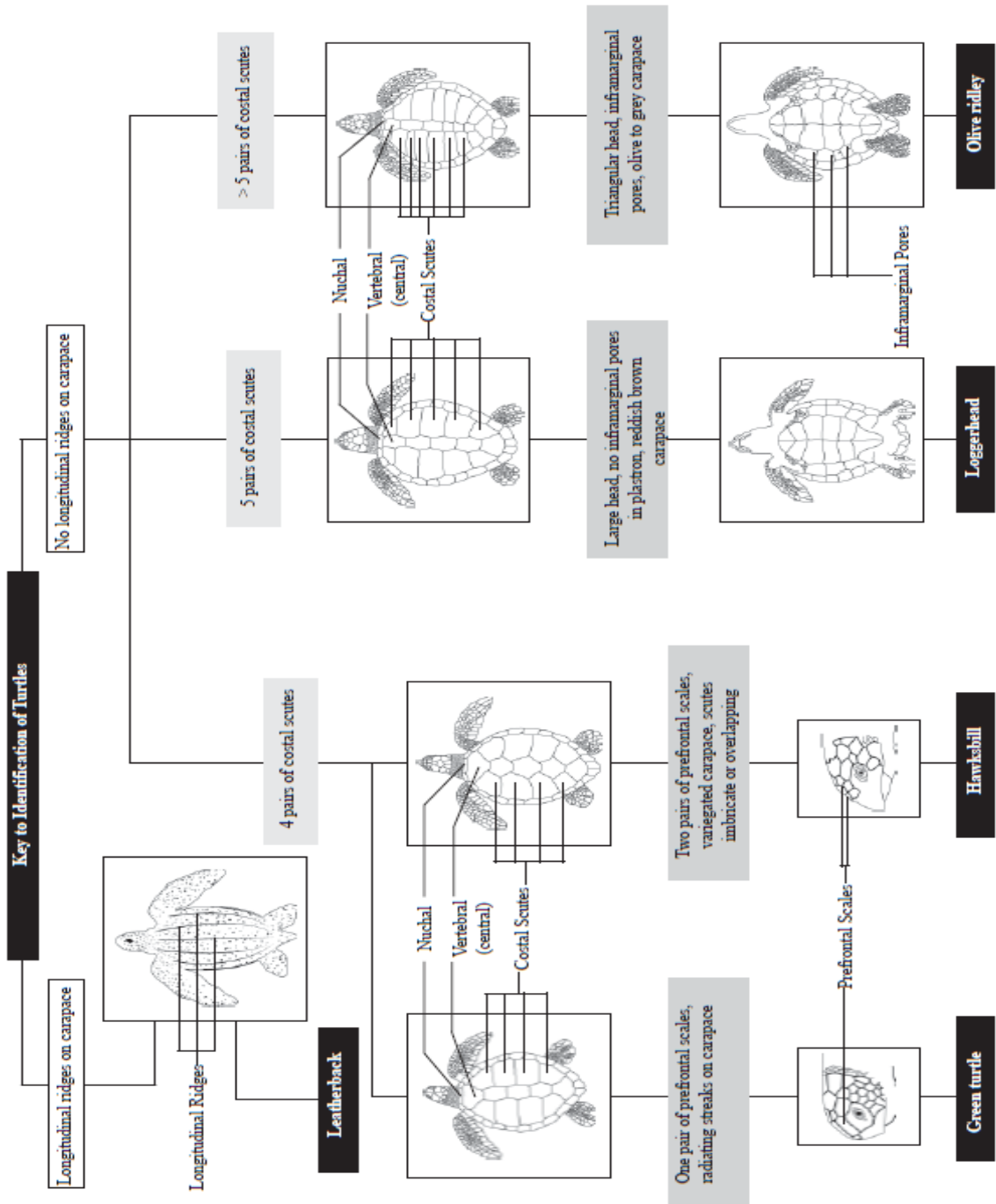
ANNEXURE-XIII

LIST OF FRESH WATER FISHES

Name of river	Fish species recorded
1.Alexandra	(i) <i>Periophthalmus koelreuteri</i> (Pallas), (ii) <i>Platycephalus indicus</i> (Linnaeus)
2.Dagmar	(i) <i>Syngnathus spiciferu</i> Rüppell, (ii) <i>Oryzias melastigma</i> (McClelland) (iii) <i>Mugil macrolepis</i> Smith, (iv) <i>Mugil melinoptera</i> Valenciennes (v) <i>Ambassis gymnocephalus</i> (Lacépède), (vi) <i>Gazza minuta</i> (Bloch) (vii) <i>Gerres oblongus</i> Cuvier , (viii) <i>Butis gymnopomus</i> (Bleeker), (ix) <i>Bunaka gyrinoides</i> (Bleeker), (x) <i>Eleotris andamanensis</i> Herre, (xi) <i>Eleotris fusca</i> (Schneider), (xii) <i>Ophiocara aporos</i> (Bleeker), <i>Kraemicus smithi</i> sp.n., (xiii) <i>Stigmatogobius römeri</i> (Weber) , (xiv) <i>Quisquilius eugenius</i> Jordan & Evermann
3.Galathea	(i) <i>Salarias fuscus</i> Rüppell, (ii) <i>Callogobius hasseltii</i> (Bleeker), (iii) <i>Tetraodon fluviatilis</i> Hamilton.
4.Jubilee	(i) <i>Mugil cunnesius</i> Valenciennes, (ii) <i>Ambassis commersoni</i> Cuvier, (iii) <i>Leiognathus equulus</i> (Forskål)

ANNEXURE-XIV

KEY TO IDENTIFICATION OF TURTLES



Data sheet for extensive nesting beach survey

Date of Survey _____ Time start _____ Time End _____

Beach Name _____ Beach Zone _____

Observer _____

Length of beach (distance covered in survey): _____

Average width of nesting beach: _____

Beach is backed by (eg. Dunes, trees, habitation): _____

Number of Villages: _____

Assessment of threats:

Direct

Incidental catch: _____

Meat consumption _____

Poaching of eggs _____

Feral animals _____

Indirect

Plantations: _____

Sand mining: _____

Beach armouring: _____

Other: _____

Lighting disturbance: _____

Intensity _____ Source _____

Species: _____

Nesting season: _____

Estimates of nesting density (for each species): _____

Comments:

ANNEXURE XVI

LIST OF ECONOMICALLY IMPORTANT PLANTS

Sl. No.	Species	Part used
	EDIBLE PLANTS:	
1	<i>Ardisia solanacea</i> Roxb.	Raw fruit
2	<i>Blechnum orientale</i> L.	Tender fronds boiled and eaten
3	<i>Calamus andamanicus</i> Kurz	Juice of stem as drinking water
4	<i>Calamus</i> spp.	Raw fruit
5	<i>Ceratopteris thalictroides</i> (L.)	Tender fronds boiled and eaten
6	<i>Citrus</i> sp.	Raw fruit
7	<i>Cocos nucifera</i> L.	Fruit
8	<i>Colocasia esculenta</i> (L.)Schott.	Rhizome boiled and eaten
9	<i>Dioscorea glabra</i> Roxb.	Tuber boiled and eaten
10	<i>Diospyros cauliflora</i> Blume	Raw fruit
11	<i>Flagellaria indica</i> L.	Stem & leaf boiled and eaten
12	<i>Ficus</i> spp.	Fruit boiled and eaten
13	<i>Helminthostachys zeylanica</i>	Tender fronds boiled & eaten
14	<i>Mangifera camptosperma</i> Pierre	Raw fruit
15	<i>Morinda citrifolia</i> L.	Leaf as vegetable
16	<i>Musa sapientum</i>	Fruit eaten raw or after boiling
17	<i>Pandanus dubius</i> Spreng.	Fruit forms the staple food; eaten after boiling and processing.
18	<i>Pangium edule</i> Reinw.	Seed roasted and eaten
19	<i>Pinanga manii</i> Becc.	Raw fruit
20	<i>Pisonia umbellifera</i> J.R.Forst. & G.Forst.) Seem.	Tender shoot as vegetable
21	<i>Rubus moluccanus</i> L. var. <i>Angulosus</i> Kolkanan	Raw fruit
22	<i>Selaginella</i> sp.	Root as vegetable
23	<i>Tacca leontopetaloides</i> (L.) Kuntza	Rhizome boiled and eaten
24	<i>Terminalia catappa</i> L.	Raw fruit
25	<i>Thespesia populnea</i> (L.) Soloer	Leaf as vegetable
	CONDIMENTS:	
1	<i>Capsicum frutescens</i> L.	Fruit
	NARCOTIC:	
1	<i>Nicotiana tabacum</i> L.	Leaf
	STIMULANTS:	
1	<i>Areca catechu</i> L.	Nut
2	<i>Piper betel</i> L	Leaf

	BEE REPELLENT:	
1	<i>Hornstedtia fenzlii</i> (Kurz) K.Sehum	Rhizome extract as bee repellent.
2	<i>Barringtonia asiatica</i> (L)Kurz	Fruit powder as fish poison
3	<i>Pangium edule</i> Reinw.	Bark powder as fish poison
	CONSTRUCTION OF HUT:	
1	<i>Actephila excelsa</i> (Dalzell)	Branches used for posts, beams,
2	<i>Antidesma tetrandrum</i> Blume	- do-
3	<i>Calophyllum inophyllum</i> L.	- do-
4	<i>Casearia grewiaefolia</i> Vent.	Branches used for posts, beams, thatching rods or sticks etc.
5	<i>Diospyros cauliflora</i> Blume	- do-
6	<i>Dryptes sumatrana</i> (Miq.)Pax &	- do-
7	<i>Dysoxylum binectariferum</i>	- do-
8	<i>Mallotus resinusus</i> (Blanco) Merr.	- do-
9	<i>Radermachera pinnata</i> (Blanco)	- do-
10	<i>Saurauia bracteosa</i> DC	- do-
11	<i>Semecarpus kurzii</i> Engl.	- do-
12	<i>Areca catechu</i> L.	Split stem used for making floor of hut
13	<i>Pinanga manii</i> Becc.	- do-
14	<i>Dinochloa scandens</i> (Blume ex	- do-
15	<i>Areca catechu</i> L.	Leaf used for thatching of roof
16	<i>Calamus</i> spp.	- do-
17	<i>Nypa fruticans</i> Wurmb.	- do-
18	<i>Pandanus dubius</i> Spreng	- do-
19	<i>P. odorifer</i> (Forssk.) Kuntze	- do-
	ROPE:	
1	<i>Actoplanes canniformis</i>	Twig
2	<i>Calamus</i> spp.	Twig
3	<i>Connarus semidecandrus</i> Jack	Twig
4	<i>Connarus paniculatus</i> Roxb.	Twig
	CLOTH:	
1	<i>Sterculia macrophylla</i> Vent.	Bark
2	<i>Ficus</i> spp.	Bark
	UTENSILS:	
1	<i>Aglaia edulis</i> (Roxb.) Wall.	Bark used for making large vessel for cooking Pandanus fruit.
2	<i>Aglaia sylvestris</i> (M.Roemer) Merr.	- do-
3	<i>Calophyllum inophyllum</i> L.	- do-
4	<i>Neolamarckia cadamba</i> (Roxb.)	- do-
5	<i>Terminalia</i> sp.	- do-

6	<i>Trema tomentosa</i> (Roxb.)H.Hara	- do-
7	<i>Areca catechu</i> L.	Spathe used for such purposes
8	<i>Cocos nucifera</i> L.	Shell used as mug
	PLATE/COVER:	
1	<i>Macaranga indica</i> Wight	Leaf
2	<i>Macaranga nicobarica</i> N.P.Balacr.	Leaf
3	<i>Macaranga peltata</i> Roxb. Mueller	Leaf
	BRUSH:	
1	<i>Nypa fruticans</i> Wurmmb.	Dried fruit with fibre used for cleaning the hands
2	<i>Pandanus dubius</i> Spreng	-do-
	DUG OUT CANOE:	
1	<i>Barringtonia asiatica</i> (L)Kurz	Trunk
2	<i>Calophyllum inophyllum</i> L.	Trunk
3	<i>Calophyllum soulattri</i> Burm.F.	Trunk
4	<i>Sterculia macrophylla</i> Vent.	Trunk
5	<i>Garcinia nervosa</i> Miq.	Branches used for making paddle of canoe
6	<i>Leea</i> sp.	Branches used for making balance of canoe
	FISHING HARPOON:	
1	<i>Atalantia monophylla</i> (Roxb.) A	Branch
2	<i>Dinochloa scandens</i> (Blume ex	Stem
	MAT/BASKET:	
1	<i>Calamus</i> spp.	Strip of the cane used for making crude mat and basket
2	<i>Leea</i> sp.	Leaves often used as bed sheet
3	<i>Pandanus odorifer</i> (Forssk.) Kuntze	Leaves used to make crude mat
	ORNAMENTS:	
1	<i>Coix lacryma- jobi</i> L.	Seeds used to make necklace
2	<i>Dinochloa scandens</i> (Blume ex	Slender piece of branch used as ear
	MEDICINAL PLANTS:	
1	<i>Actoplanes canniformis</i> (G.Forst.) K.Schum	Decoction of stem and root taken orally in fever
2	<i>Alstonia kurzii</i> Hook.F.	Bark, root or leaf boiled in water and vapour inhaled for curing fever.
3	<i>Alstonia macrophylla</i>	- do-
4	<i>Ardisia solanacea</i> Roxb	Root boiled in water and used for washing uterus after childbirth; decoction of root also taken orally to remove blood clot and cure internal hemorrhage.

5	<i>Croton argyratus</i> Blume	Seeds pounded and eaten in small quantity as laxative and in stomach disorders
6	<i>Dischidia bengalensis</i> Colebr.	Leaf pounded & applied externally for reducing pain on mumps & sores. Twigs pounded & applied externally for healing of fractured bone.
7	<i>Glochidion calocarpum</i> Kurz	Seeds or bark pounded & applied externally in skin diseases; decoction of leaf taken orally for curing fever
8	<i>Leea</i> sp.	Leaf eaten in fever
9	<i>Myristica</i> sp.	Seed or bark pounded & applied externally for skin diseases
10	<i>Ophiorrhiza nicobarica</i> N.P.Blakr.	Fresh leaves pasted in water and applied on wounds.
11	<i>Semecarpus kurzii</i> Engl.	Fruit used to cure injuries.

Medicinal Plants used by Shompens

Sl No	Family	Species
1.	Leeaceae	<i>Leea</i> sp.
2.	Anacardiaceae	<i>Semecarpus kurzii</i>
3.	Rubiaceae	<i>Ophiorrhiza nicobarica</i>
4.	Myrsinaceae	<i>Ardisia solanacea</i>
5.	Apocynaceae	<i>Alstonia kurzii</i>
6.	Apocynaceae	<i>Alstonia macrophylla</i>
7.	Asclepiadaceae	<i>Dischidia benghalensis</i>
8.	Myristicaceae	<i>Myristica elliptica</i>
9.	Euphorbiaceae	<i>Croton argyratus</i>
10.	Euphorbiaceae	<i>Glochidion calocarpum</i>
11.	Marantaceae	<i>Actoplanes canniformis</i>

ANNEXURE –XVII

Important Researches in Great Nicobar and Campbell Bay National Park

1. Abdulali, H. 1967. The birds of the Nicobar Islands, with notes on some Andaman Birds. *J. Bombay Nat. Hist. Soc.*, 64: 139-190.
2. Andrews H. V., S. Krishnan, & P. Biswas. 2002. Leatherback nesting in the Andaman and Nicobar Islands. *Kachhapa* No. 6: 13-16.
3. Andrews, H. V., S. Krishnan., and P. Biswas. 2001. The status and distribution of marine turtles around the Andaman Nicobar Archipelago. GOI-UNDP- Sea Turtle Project. Centre for Herpetology, Madras Crocodile Bank Trust, Mamallapuram, India.
4. Bhaskar, S. 1993. *The status and ecology of sea turtles in the Andaman and Nicobar Islands*. ST 1/93. Centre for Herpetology, Madras Crocodile Bank Trust, Post Bag 4, Mamallapuram, Tamil Nadu- 603104, India.
5. Das, I. 1994. A checklist of the amphibians and reptiles of the Andaman and Nicobar Islands. *J. Andaman Sci. Assoc.*, 10 (1&2): 44 – 49
6. Biswas S. and Sanyal D. P. 1977. Notes on the Reptilia collection from the Great Nicobar Island during Great Nicobar Expedition in 1966. *Records of the Zoological Survey of India*, 72, 107 – 124.
7. Blyth, E, 1846. Notes on the fauna of the Nicobar Islands; Reptilia. *J. Asiatic Soc. Bengal*, 15, 367 – 379
8. Chandra, K. 1996. New records of moths from the Andaman and Nicobar Islands, India. *J. Andaman Sci. Assoc.*, 12 (1&2): 31 –35.
9. Chandra, K. 2001. Fauna of Great Nicobar Biosphere Reserve. *ENVIS Newsletter*, Z.S.I.7 (12):5-8.
10. Chaturvedi, Y. 1980. Mammals of the Andaman and Nicobars: their zoogeography and faunal affinity. *Rec. Zool. Surv. India*, 77: 127 – 129.
11. Das, A.K. And Dev Roy, M.K. 1989. A general account of the mangrove fauna of Andaman and Nicobar Islands. *Fauna of Conservation Areas: Zoological survey of India*, Calcutta, No 4: 1-173.
12. Dekker, R.W.R.J., 1992. Status and breeding biology of the Nicobar Megapode *Megapodius nicobariensis abbotti* on Great Nicobar, India. Report, National Museum of Natural History, Leiden.

13. Kariathil, T. J., Raffi, S. M., Ajmal, S. and Kannan, L. 2002. Biodiversity, Species Composition, Distribution and Relative abundance of Crabs in Reef Ecosystems of Campbell Bay, Great Nicobar Island. *SDMRI Research Publication* No. 2: 125-131.
14. Khatri, T. C and Chandra K. 1995. Butterflies of Great Nicobar Island. *Indian J. Forestry*, 18(4): 267-273.
15. Menon, A. G. K and Talwar, P. K. 1972. Fishes of the Great Nicobar Expedition, 1966 with description of a new gobioid fish of the family Kraemeriidae. *Rec. Zool. Surv. India*, 66(1-4): 35-61.
16. Narasimmarajan, K. and Raghunathan, C. 2012. Status of Long Tailed Macaque (*Macaca fascicularis um-brosa*) and conservation of the recovery population in Great Nicobar Island, India. *Wildlife Biology Practice*, 8(2):1-8.
17. Rajeshkumar, S. et al. 2014. Daily Activity Budget of Nicobar Long-tailed Macaque (*Macaca fascicularis umbrosa*) in Great Nicobar Island, India. *Journal of Research in Biology* 4(4):1338-1347.
18. Sankaran, R. 1993. The avifauna of the Andaman and Nicobars. Review and the current scenario. Ornithological Society of India, Bangalore, India. .
19. Sankaran, R. 1995a. The Nicobar Megapode and other endemic avifauna of the Nicobar Islands. SACON Technical Report No. 2. SACON, Coimbatore.
20. Sankaran, R. 1995b. Impact assessment of nest collection on the Edible – nest Swiftlet in the Nicobar Islands. SACON Occassional Report 1. SACON.
21. Sivakumar, K. 2010. Impact of the tsunami (December, 2004) on the long tailed macaque of Nicobar Islands, India. *Hystrix It. J. Mamm. (n.s.)*, 21 (1): 35-42.
22. Sivakumar, K. 2007. The Nicobar Megapode: Status, distribution and conservation: aftermath tsunami. RR 07/002, Wildlife Institute of India, Dehradun.
23. Sivaperuman, C. and Venkataraman, K. 2012. Present status and distribution of Long-tailed macaque (*Macaca fascicularis umbrosa*) in Great Nicobar Biosphere Reserve, India. *Tiger Paper*, 39(3):26-29.
24. Sridhar, R., Thangaradjou, T., Kannan, L., Ramachandran, A. and Jayakumar, S. 2006. Rapid assessment on the impact of Tsunami on mangrove vegetation of the Great Nicobar Island. *J Indian Soc Remote Sen*, 34(1):89–93
25. Vijayakumar, S.P. and David, P. 2006. Taxonomy, natural history and distribution of the snakes of Nicobar Islands (India) based on new materials and with an emphasis on endemic species. *Russian Journal of Herpetology*, 13(1): 11-40.

26. Meera, A.U and Shanker, K. 2008. Ecology and behavior of an endemic tree shrew *Tupaia Nicobarica* Zelebor 1869 on Great Nicobar Island, India. *Journal of the Bombay Natural History Society*, 105(1), Jan-Apr 2008 55-63.
27. Sharma T.V.R.S., Jaisankar, I. Jay Kumar and Punnam Chander M. 2015. Gardening of *Elaeocarpus* (Rudraksha) for conservation and tourist interest in Andaman & Nicobar Islands, *Journal of the Andaman Science Association* Vol. 20(2):172-177.