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Distribution, status and conservation of Sangai deer (*Rucervus eldii eldii*) in Manipur, India

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Abstract

The only wild population of *Rucervus eldii eldii* or the Sangai deer is found in the North Eastern premise of India's unique floating national park, the Keibul Lamjao National Park (KNLP), Manipur. The national park is located at the southern end of Loktak Lake, the largest fresh water lake in Eastern India and one of the seven Ramsar sites of international importance. Once reported to be extinct in 1951, the species was rediscovered in a small pocket during a survey conducted by IUCN in 1953. Since then the Government has been working hard to defend and stabilize the existence of species and yielded satisfying results, with population of Sangai escalated from 14 in 1975 to 260 in 2016. But the road to recovery is difficult due to number of menacing threats looming over the species. The construction of Ithai barrage being the main cause to affect the hydrological regime of KNLP. Other threats can be recapitulated as biomass demand and competition with human, depleting habitat condition, poaching and a few more, the newest amidst the peril being the wild boars. Conservation measures are being carried out both in In-situ by habitat manipulation, rescue centre setups, anti-poaching camps and engrossing local community in conservation efforts whilst in ex-situ a captive breeding centre has been constructed in the Langol Reserve forest hosting 15 deer in number at present. Only the authorities of Manipur Zoological Garden are responsible for the care and perpetration of measures to forfend the deer. The above data was collected by field analysis and questionnaire. And hence it can be concluded that the conservational activities have stepped up and the government is also taking substantial measures to bring the species to sturdiness.

Keywords: *Rucervus eldii eldii*, conservation, distribution, habitat, Sangai deer, population, KNLP (Keibul Lamjao National Park)

Introduction

Keibul Lamjao (or the vast land where tiger resides) National Park is situated on the south eastern corner of largest fresh water Lake of North-East India, Loktak Lake- a Ramsar site (Montreux declaration- 1990). Located between 24°27'N and 24°31'N latitude and 93°5'E and 93°55'E longitudes of the Bishnupur district, Manipur, the park covers an area of 40 km².

The national park is characterized by many floating decomposed plant materials known as 'phumdi'. This unique floating park is the natural refuge of the endangered Manipur Eld's deer or brow-antlered deer (*Cervus eldi eldi*), or Sangai also called the dancing deer. Listed as an endangered species by IUCN, the park was initially declared to be a sanctuary in 1966, was subsequently declared to be a national park in 1977 through a gazette notification (Forest Department, Government of Manipur, 2017) [15].

The Keibul Lamjao National Park is the only natural habitat of the endemic and endangered Sangai deer which is the state animal of Manipur. *Rucervus eldii eldii* or the Sangai is a beautiful medium sized deer belonging to family cervidae, with uniquely distinctive antlers with extremely long brow tine, which form the main beam. The forward protruding beam appears to come out from the eyebrow. This signifies its name, brow-antlered deer. The sexes are moderately dimorphic in body size and weight. The tail is short and rump patch is not pronounced. It has a dark reddish brown winter coat, which turns paler in summer. The females fawn all year round. The deer walks on the hind surface of its pasterns with mincing hops over floating foliage, and is hence also called the Dancing Deer.

The deer species, fending for itself in its last safe refuge in the wild at Keibul Lamjao, is caught in the phenomenal conflict between development and the natural environment. Humans, supposed to be the guardian angel of the Sangai, have been the very reason for the threat on the existence of this highly spoken of deer species (Government of Manipur 2017) [15].

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Materials and Methods

The survey was planned to study the habitat, population, threats and aspects of conservation by the Forest department of Manipur. The research work and survey was carried out both in KLNP (in-situ) and Manipur Zoological Garden (ex-situ) in order to *get all* the required aspects and data required. The study method consists of questionnaire survey and collection of data from primary and secondary resources. Population trend from 1975 till 2016 was identified by aerial, ground and point transect method with analysis done by Distance software in different years by the Government of Manipur.

Results and Discussion

In-situ habitat ecology- The Keibul Lamjao National Park

The Sangai or the dancing deer is found naturally only on the floating biomass of the Keibul Lamjao National Park. The park covers an area of 40 km² and the home range of the deer in the park is confined to 15–20 km².

Phumdi or floating meadow is the most important and unique part of the habitat of Sangai. It is the floating mass of entangled vegetation which has formed as a result of accumulation of organic debris and biomass with soil particles concentrated in solid form. It covers approximately 2/3rd to 3/4th area of the park. Its thickness varies from few centimetres to about two meters. The humus is black in colour and very spongy with large number of pores. It floats with 1/5th part above and 4/5th part below water.

The high proportion of vegetative materials contributes to floating of phumdi's with gradual accumulation of more aquatic plants, colonizing grasses, soil particles etc. Phumdi became thicker and got converted into thick mass, which can support human beings and wild animals (Singh, 1992) [9].

Earlier, the utilization of the plant resources found in the park

had no significant impact on the ecology of phumdi. But the present utilization trend coupled with the changed water regime presents a dismal scenario. The water from Imphal River and Khuga River entering in the park due to back flow washes the roots of floating meadows and in the process the soil particles, which provides nutrition and binding strength to floating meadows are washed away (Tuboi *et al.*, 2013) [14]. Therefore, the floating meadows got thinned and weakened over a period of time.

Apart from this the construction of Itai barrage in 1983 has triggered yet another problem. The usual essential cycle of flooding and drying of lake has come to a complete halt. The lake water hoisted two important cycles which played a distinct role in development and survival of Phumdi. During dry season i.e., usually from around October to March and up till April- May, the water level recedes with Phumdi going down to touch the bottom of the lake thereby enabling the roots to take up nutrients from soil. With the arrival of rain, the water level starts to raise allowing Phumdi to get detached from the ground, go up and remain afloat. This natural cycle contributed in maintaining the luxuriant growth of vegetation on Phumdi and helping simultaneously through the process of growth and decay (fig-1).

After construction of barrage the water retained at constant level of 768.5 m above m.s.l. throughout the year to ensure power supply. But, this led to change in ecology of the national park. The year 1983 was hence marked as a worst turning point for Sangai and its natural habitat. The Phumdi lost its rotation cycle resulting in disturbance of the vegetation community (fig-2). The species which adjusted with the change of the environment came out as dominant group while the once flourishing tall grasses with time has now become dull and unhealthy.

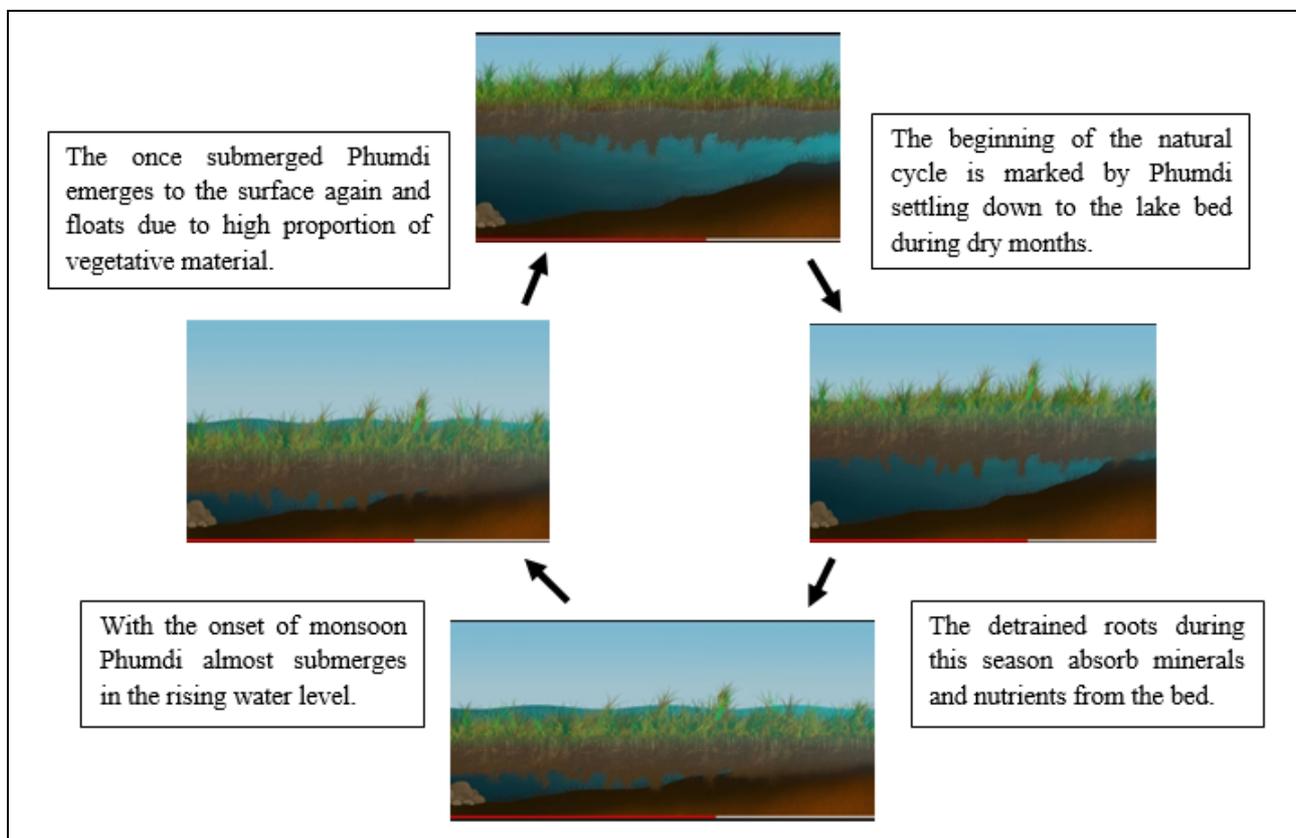


Fig 1: The cycle of phumdi before construction of the Loktak hydroelectric project

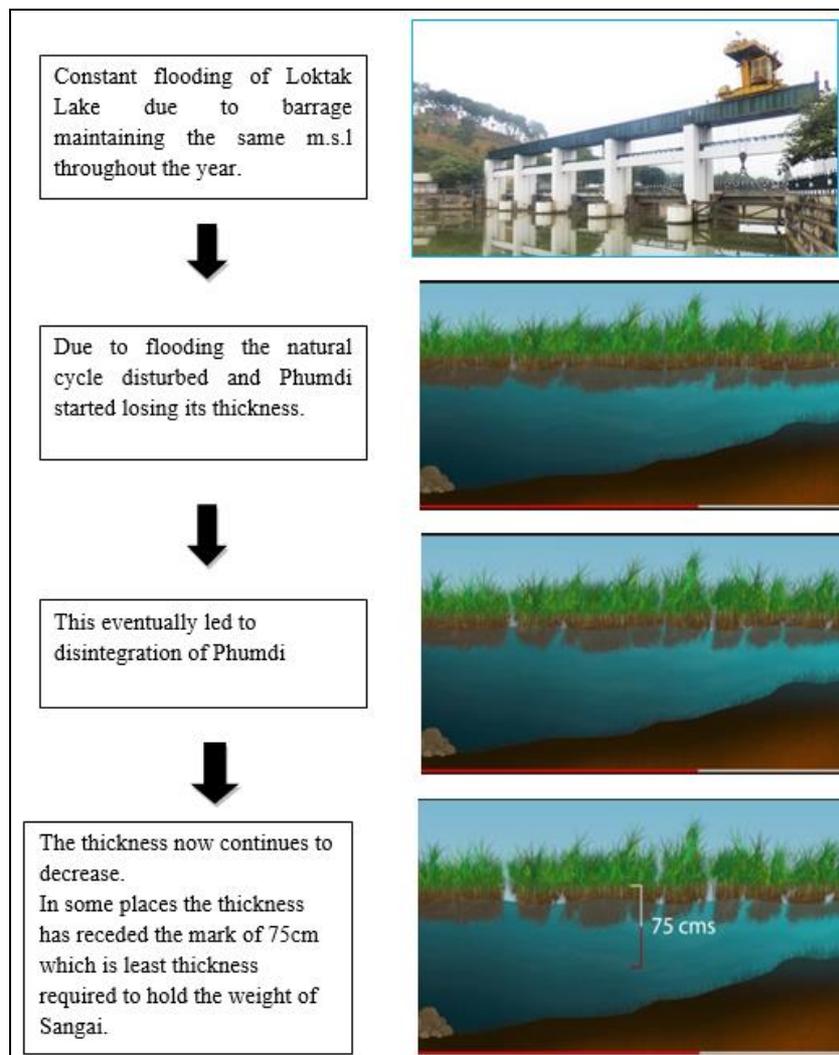


Fig 2: The scenario after construction of the Ithai Barrage – the hydroelectric project

Ex-situ habitat ecology- The Manipur Zoological Garden

The Manipur zoological garden located in Roisemba, Imphal is actively engaged in maintaining the captive breeding centre for Sangai.

The captive breeding centre or the second home of Sangai is established within the premise of Langol Reserve forest occupying an area of 7 hectares and is not opened for visitors, hence cutting down the disturbance the shy animal faces. The centre consists of three interconnected enclosures which are used to isolate a wounded or injured deer.

Population trend

Wild population trend

Wild animal census in parks and sanctuaries is not simple. It is more difficult in floating habitats like that of Keibul Lamjao National Park. The method of direct count from fixed points referred to as machans adopted for KLNP gives only the chance figure and is not conclusive. However, it may be taken as a general indicator of the effectiveness of all the protection measures for the preservation of the animal, taken up by the government to a certain extent.

Sangai was once reported extinct in 1951, but was re-discovered and counted six heads in 1953 by Eldi Percy Gee, the then honorary secretary, Indian Board for Wildlife, eastern region, in a survey conducted under the auspices of the IUCN.

He counted 14 heads via aerial census. After rediscovering the species, the conservation process made a remarkable contribution and the Sangai population soon saw an upward trend with slight fluctuations in a few years. The trend of Sangai population has been depicted in tabular (Table-1) and graphical form (Figure-3) below-

Table 1: Overall Sangai population census and its types from year 1975 till 2016

Year	Census type	Total
1975	Aerial	14
1977	Aerial	18
1978	Aerial	23
1979	Aerial	30
1984	Ground	57
1986	Ground	95
1991	Ground	104
1995	Ground	152
1996	Ground	143
1999	Ground	149
2000	Ground	162
2003	Ground	180
2013	Ground	204
2016	Ground	260

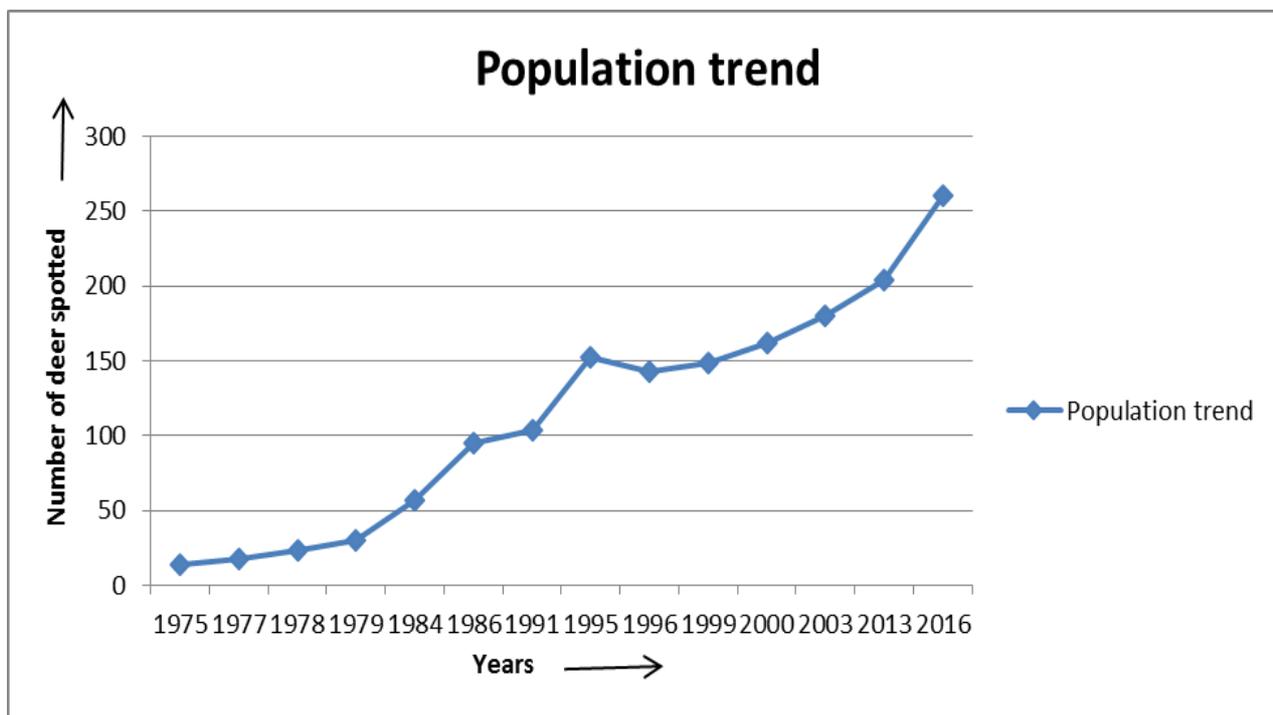


Fig 3: Population trend of Sangai from 1975 till 2016

Captive breeding population status

At present (January 2018) there are 15 Sangai constituting 7 male, 7 female and a fawn which was born on December 23rd 2017.

The total captive population of Sangai in India is assessed with an eye to distributing animals in such a way as to promote maximum growth of the population. There are fifteen zoos in India which are presently holding Sangai, i.e. Delhi, Calcutta, Kanpur, Hyderabad, Ahmedabad, Madras, Assam, Mysore, Manipur, Bhilai, Chhatbir, Lucknow, Jaipur, Nandankanan, Trivandrum.

All the animals that are now in the collections of various zoos have come from only two (2) wild caught pairs which were given to Calcutta Zoo (1:1) in 1956 and Delhi Zoo (1:1) in 1962. There is also a male Sangai (1:0) in Manipur which is said to be the offspring of a female of wild origin and a male of Delhi origin. The offspring of the Delhi pair have gone to eight different zoos in the country, viz. Ahmedabad, Hyderabad, Lucknow, Kanpur, Imphal, Jaipur, Chhatbir, Mysore. Similarly, the offspring from the Calcutta pair have gone to five other zoos, viz. Mysore, Assam, Trivandrum, Nandankanan, Bhilai.

Cervids generally are flexible in adjustment to any habitat. By nature, if protected and adequate food resources provided, cervids expand their population and double within 3-4 years (Population and Habitat Viability Assessment, PHVA report 1992) [10] irrespective of agro-climatic conditions persisting. But the species in captivity cannot tagged with representation of true wild gene pool due to genetic depression taking place among the group because of offspring produced probably by dominant male only of the group. It is feared that animals with the two lineages might have lost 50% of their original diversity.

Conservation plans and actions

The road to recovery though not easy is never impossible. And this is well proved by the dedicated officials and staffs of Manipur who are working day and night despite of any

condition or environment and have been so far successful in bringing the species back from the brink of extinction.

The conservation and prevention measures being carried out in the KLNP (in situ conservation practice) are listed below-

- Strengthening the existing population in KLNP by monitoring the population trend every alternate year and ensuring vaccination against common diseases of livestock in and around the national park.
- Establishment of second population in order to minimize the pressure will be a major step towards protection of the species which is under consideration. – Improving habitat conditions by controlled grazing of livestock in the surrounding village and regulated extraction of biomass from the park.
- Engaging local people as daily wage worker or animal watcher which helps improve the socio economic condition of the local people.
- Construction of ring bund for boundary demarcation has also been done by the government of Manipur.
- Habitat manipulation by bringing together Phumdi patches and joining and attaching them with help of bamboo thatches.
- Protection against fire with well-established fire lines of length more than 200 meters and width of 10 meters.
- Intensified Patrolling by the appointed forest guards of the forest department and also with help of local people around the village.
- The Sangai Rescue Centre construction inside the park is completed. This centre occupies an area of 7 ha land mass adjoining to the park for with fencing all around. A veterinary doctor also stays close to premises of the national park.

On the other hand the Manipur zoological garden is actively maintaining the second home of Sangai and even consists of a well setup Animal Health care centre which is headed by a veterinary officer assisted by animal attendants. Facilities for drugs, medicines, feed supplements and sanitation are available for animals.

Activities processed under the Captive breeding centre are as follows-

- Precaution and preventive measure against outbreak of disease is maintained by regular spraying of Kohrsolin solution and lime-bleach around all animal enclosures throughout the year.
- Daily supply of supplements such as mineral mixture, calcium, B-complex etc. are given to the zoo inmates and De-worming of animals every 3 month.
- The Veterinary officer and its team regularly keep a check of injured and ill zoo inmates.
- Vaccination programme for cattle around the zoo area is done on regular basis against Foot and Mouth disease.
- Facility of referring sick animals to the State Veterinary hospital which is 8 kms away from the Zoo is done as and when required.

Reason of Population decline

The Sangai population has many threats pondering over it. After a detailed research by questionnaire the main threats were listed and has been briefed below-

- Deteriorating habitat condition- the construction of Ithai barrage has contributed to change in water regime which has left Phumdi in a continuous floating state resulting in its thinning and hence is depleting and deteriorating the habitat.
- Biomass demand- the plant species of the park provide food, fodder, fuel, medicinal and thatching material for hut construction. The dominant grass species which contributes maximum to the forage diet of wild ungulates of the park are also consumed by the local people.
- Degradation of water quality- the water quality is deteriorating due to excess nutrient and pollutant from rivers Nambul, Nambol, Moirang, Potsangbam and Naransenia that drains into the lake which are amongst the highly polluted in terms of water quality and nutrient status of soil and sediments. Not only this, the anthropogenic activities such as deforestation and jhumming in the catchment areas bring in sediments with pollutants leading to siltation in the lake.
- Poaching and incidental mortalities- till early 1900's hunting of sangai was permitted by the Manipur State Durbar. It was only after 1934 that hunting was banned. Even after banning the act threats still ponder due to the location of park at the border of insurgent prone India and Myanmar.
- Wild boar- the newest threat to the species is by its co-inhabitants, the Wild boar. During a survey conducted in August 2011 at Keibul Lamjao National Park, a young Sangai was found killed by wild boars. It was noticed that the lower abdomen and thigh part of the fawn were eaten by wild boars. This was the first report of Sangai being killed by wild boar and it is a serious concern for the conservation of this endangered mammal.

Apart from the above mentioned major problems there exist some more issues such as change in plant community structure of the park, increased probability of diseases and mortalities during catastrophes, lack of connectivity for recolonization, inadequate number of permanent staffs, encroachment along the boundary of National Park, inadequate fund flow, inadequate research on habitat management - long term study was conducted only by WII, poor socio-economic conditions of the people living around the park.

Whereas on the other hand review of reports since the time of introduction of Sangai in Manipur Zoological garden indicated that the major cause of mortality was traumatic injury (41.5%). Injuries generally were related to inter-male aggression (28.5%) although many injuries also presumably were associated with self-destructive behaviour (12.9%). Other causes of mortality included infant mortality (10.4%), infectious diseases and deaths from unknown causes (20.2%). After considering all the aspects of discussion, the conclusion drawn can be directed as, "even after all the approaches and conservation measures, Sangai continue to be listed as endangered species. Though the population has increased subsequently, the threats have also increased comparatively. There still exists a persistent need to work for the protection of this endemic deer." These species of flora and fauna are the heritage of a country which once lost will affect things adversely.

Future conservation approaches and recommendations

*(Source- Population & Habitat Viability Assessment 11 -13 October, Mysore Report August 1994 Coimbatore, India)

Population Recommendations

- Alternative populations should be established, ideally within the traditional biogeographic range of the subspecies.
- The captive population should be enhanced and improved as rapidly possible as breeding stock to insure against catastrophe and for possibly for reintroduction programmes, although the latter was not supported by all in the workshop.
- The content, consistency and reliability of annual census date, both in situ and ex situ, should be enhanced including population size, demography and reproductive index.

Recommendations for Captive Population

- An enhanced captive population should serve as security against catastrophe and possibly reintroduction programmes. For this, the captive population should be increased as rapidly as possible by improved management assisted by recent advances in reproductive physiology,
- The captive management of the species must include marking of individual animals, scrupulous maintenance of birth, transfer, and death records, including infant mortalities. Demographic and genetic information should be utilized in strategic management and collection planning for the species.
- The present captive population should be managed for maximum genetic variance through a system of exchange of individuals among zoos.

Human Impact / Education / Public Awareness

- Biotic pressure on Keibul Lamjao National Park is one of the major threats to Sangai both directly and indirectly, and should be reduced with suitable precautions to care for the needs of the people living in the area.
- A full time coordinator for eco-restoration activities should be identified for integrating of various projects and agencies in this type of work.
- Education and awareness programmes should focus first on people living in and around the National Park, integrating attempts to foster local pride with social welfare and eco-development programmes to address

problems and reduce destruction of habitat.

- Meetings and seminars for various levels of officials, administrators, scientists, business people and policy makers should be organized to create awareness and a sense of participation in solving the problems of the National Park and Sangai.

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