Natural History of *Phoenix andamanensis* from the Andaman Islands

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Phoenix andamanensis **is an insular endemic described by Sasha C. Barrow in 1998 based on the specimens collected in 1990 by Jamueal Leopold Ellis from the Saddle Peak. This species is known only from a few herbarium collections, mostly collected during the earlier part of 20th century. The ecology, populations, natural regeneration and conservation status of this species are poorly known. During recent fieldwork in the Andaman-Nicobar Archipelago, two populations of** ***Phoenix andamanensis*** **were located in dense evergreen forests near Kalpong Hydroelectric Project catchment area and Saddle Peak. The natural history of** ***Phoenix andamanensis*** **is detailed and illustrated here.**

Phoenix L., is an Old World genus having a wide distribution from the northwestern Coast of Africa (Canary Islands and Cape Verde Islands) to subtropical and tropical Africa, and from the Arabian Peninsula through the Mediterranean to the Indian Subcontinent, Indochina to Hong Kong and Malesia. Barrow (1998), in her revisionary studies, distinguished 13 species and two varieties in the genus. In the Andaman-Nicobar Islands, the genus is represented by three species viz. *Phoenix andamanensis* S. Barrow, *P. paludosa* Roxb. and *P. sylvestris* (L.) Roxb. A fourth species, *P. rupicola* T. Anderson, was included in a checklist of the Andaman flora by Pande and Diwakar (2008), but it is likely that the authors confused the taxon with *Phoenix andamanensis,* with which it is very closely allied morphologically. *Phoenix andamanensis* (Fig. 1) is a little-known species described by

Barrow in 1998 from specimens collected by Jamueal Leopold Ellis in 1990 from the Saddle Peak, the highest point in the Bay of Bengal.

According to Barrow (1998), "…The biogeographical basis of the close relationship between these two species of limited distribution, *P. rupicola* from Bhutan and Northeastern India, and *P. andamanensis* from the Andaman Islands, has not been thoroughly investigated and needs further study…. *Phoenix andamanensis* has been recorded from one locality each in both North Andaman and Little Andaman, and from Cinque and Rutland Islands (Brandis 1906, Parkinson 1923). The modern distribution of the species is unknown." Barrow had only secondary information on this taxon, collected from herbarium sheets and literature by Brandis (1906) and Parkinson (1923). Parkinson (1923) referred to the frequent occurrence of a lesser known *Phoenix* species from the Cinque Island and Mount Ford (Rutland Island) of the South Andaman group in his *Forest Flora of the Andaman Islands*. It seems that Parkinson relied upon the account of Brandis (1906) for the entry of *P. andamanensis* in his flora. Parkinson did not refer to his own sighting of the taxon.

Charles Edward Parkinson (1890–1945) was an Extra Assistant Conservator of the Andaman Forest Department and worked as Forest Botanist in Burma during the British regime. He undertook the major task of compiling a tree flora of the Andaman Islands for the first time in the floristic history of Andaman Islands. Parkinson undertook several intensive and extensive explorations, especially amongst the South and Middle Andaman group of islands during his tenure in Andamans and made remarkable herbarium collections. His specimens were deposited primarily at the Forest Research Institute, Dehra Dun (DD) and otherwise at the Botanical Survey of India of Howrah (CAL) and Port Blair (PBL). Dietrich Brandis also mentioned *P. andamanensis* in his *Indian Trees* (1906) based on information from Rogers. Charles Gilbert Rogers, who was an Assistant Conservator of Forests in Andaman Islands, also carried out extensive studies on Andaman forest types in relation with soil types and formation. According to Rogers, a single stemmed palm with dark brown-colored petiole bases and orange-colored fruits and inflorescences occurred in Cinque Island and Northeast corner of the Rutland Island (Fig. 2) (Brandis 1906). He considered that it may be the same *Phoenix* species mentioned by Kurz (1870) in his *Report on the Andaman Islands*. Interestingly, Kurz did not cite this taxon in his monumental work, *Forest Flora of British Burma*

1. A population of *Phoenix andamanensis* at Kalpong, North Andamans.

2. Rutland Island, another habitat of *Phoenix andamanensis*. Rogers located the taxon and collected specimens in 1904 from Rutland Is. (*Rogers 132* & *285*, K).

(1877), although he had included other insular taxa from the Andaman-Nicobar Islands, making this lesser known species more curious.

In this context, it is relevant to mention the compendium titled *A Preliminary List of Plants of the Andaman Islands* by J.S. Gamble (1903). Gamble prepared this checklist of Andaman plants mostly through compilation of taxa listed in the separate floras of Hooker and Kurz and also from data gathered by Rogers and Heinig. Robert Lawrence Heinig was the Conservator of Forests contemporary with Rogers in the Andaman Forest Department. Interestingly, Gamble (1903) did not include *P. andamanensis* in his compendium.

According to available data at the Royal Botanic Gardens, Kew (K) and the Botanical Survey of India (CAL & PBL), the earlier herbarium collections of this species from the Little Andaman Island and South Andaman group of Islands were mostly collected by Rogers. Rogers made extensive plant explorations during his tenure in Andaman Islands, and his specimens were deposited at CAL, K and PBL. Rogers collected this species for the first time from Little Andaman Island in January 1903 (*Rogers s.n.*, K). Rogers recorded the species again from Rutland Island (South Andaman) near Port Blair in 1904 (*Rogers 132*, K). During 1905, the species was recorded from Saddle Peak (North Andaman) at an altitude of 459 m by Osmaston (CAL). Later in 1911, Rogers again collected specimens from Cinque Island (*Rogers s.n.*, CAL) and Rutland Island (*Rogers s.n.*, K). Thereafter, for a remarkable period of about 65 years, this taxon was not recorded or collected until 1976 by Balakrishnan and Nair from the Saddle Peak at an altitude of 500 m (*Balakrishnan & Nair 4771*, CAL & PBL). Later, in 1990, Ellis collected this species again from Saddle Peak at an altitude of 700 m (*Ellis 14189*, K & PBL). The Ellis specimen is the type for the species.

The Andaman-Nicobar Islands

The Andaman and Nicobar Islands, with their enchanting seascapes bordering lush green rain forests, are located in the Bay of Bengal over 650 nautical miles away from the Coromandel Coast of Peninsular India. This archipelago lying in north-south direction consists of 306 islands and 206 rocks and rock outcrops (islets) in the tropical belt from latitudes 6°45′ to 13°41′N and longitudes 92°12′ to 93°57′E. The flora of Andaman-Nicobar Archipelago is significantly rich, with a diverse and pristine composition of tropical plant species. According to an official estimate carried out by the author in 2014, there are 2463 Angiosperm

3. *Phoenix andamanensis*. Individual ca. 15 m tall projecting out the crown over the canopy at Kalpong forest, North Andamans.

species comprising up to 182 families and 1018 genera, within this small, fragmented geographical region of 8249 km^2, thus indicating a high degree of plant diversity and fragile ecological equilibrium. Geologically, the Andaman-Nicobar Islands are regarded as the exposed peaks of a submerged mountain range in continuation with the Arakan–Yoma Mountains of the Myanmar towards Moluccas Island of the Indonesia (Renvoize 1979); hence the insular flora of Andaman-Nicobar Islands is obviously "continental" in origin and evolved to the present status from a totally balanced continental bio-system through evolution over millions of years. Therefore, the present insular bio-system may be referred to as a "sub continental bio-system" coupled with multi-dimensional phytogeographical affinities towards nearer and distant regions such as Northeast India, Southeast Asia, Sri Lanka and Peninsular India (Western Ghats). The geographical isolation of this floristic zone from the major land masses of South and Southeast Asia over millions of years has resulted in variation of its insular taxa from their ancestrally-allied taxa found in continently South and South East Asia. The flora of the Andaman-Nicobar Islands is rather unusual in phytogeography, characterizing transit zone vegetation between the Indian Subcontinent and the Malesian region.

Phoenix andamanensis in Andaman Islands

The Andaman-Nicobar Archipelago present difficult conditions for fieldwork. Many of the islands are inaccessible and remain uninhabited. Barrow (1998) referred to the occurrence of *Phoenix andamanensis* in

4 (top). Saddle Peak, viewed from Kalipur beach. Saddle Peak is the type locality of *Phoenix andamanensis*.
5 (bottom). Kalpong River at North Andamans.

undisturbed "scrub jungle" along the eastern side of Rutland Island and northern end of Cinque Island from a personal communication by Balachandran, one of the Conservators of Andaman Forest Department during the period of her studies. During the year 1992, the author conducted a survey of palms of Andaman and Nicobar Islands among selected islands significantly rich in palm species (Mathew & Abraham 1994). The fieldwork on Rutland Island at this time was hampered by a cyclonic storm and heavy rain, making it

6. A seedling of *Phoenix andamanensis* from JNTBGRI Field Gene Bank nursery.

difficult to explore all regions of Mount Ford (on Rutland Island), thus perhaps explaining the absence of *P. andamanensis* from the survey.

Recently, the author recorded two populations of this taxon as evergreen forest components at two localities in North Andaman, viz. Saddle Peak and Kalpong (Fig. 3). Saddle Peak (732 m) is the highest point in the Andaman-Nicobar Archipelago, recognized as a National Park in 1979, covering an area of 3254 hectares. The locality at Saddle Peak (Fig. 4), where this taxon occurred at an altitude of about 710 m, may be the same place that Ellis had made his type collection. The Andaman Islands are almost devoid of fresh water sources, with the exception of the Kalpong River in North Andamans (Fig. 5). The Kalpong River originates from the Saddle Peak and flows across the island in a northward direction about 35 km before joining the Aerial Bay Creek of the eastern coast at Diligpur. The first hydroelectric project of the Andaman-Nicobar Administration was constructed on this river. The author located only a few individuals of this taxon at Saddle Peak. One population, comprising around 50 individuals, was located about 500 m above the Kalpong river bank, occurring on rather undulating terrain. The author did not locate the taxon during exploration, over a five-day period in 2012, of the evergreen forests of Little Andaman Island at Krishna Nalla, Rabidranagar and Vishu Nalla Dam. Rogers located this taxon at Bumila creek in the southwest region of the island, but the present status of the taxon there is unknown.

Phoenix andamanensis is a tall palm growing up to 15 m in natural habitats, its crown projecting over the top of the canopy at Saddle Peak and Kalpong forests. The fruits are orange in color and up to 24 × 12 mm in size. The rest of the details are more or less same as the taxonomic description in the revisionary work (Barrow 1998). Barrow (pers. comm.) noted that the distinguishing character between *P. andamanensis* and its allied taxon, *P. rupicola*, is the nature of the endosperm. *Phoenix andamanensis* has a ruminate endosperm, and *P. rupicola* has a homogenous endosperm. The author found fruiting specimens of *P. andamanensis* at the Kalpong River location; however, the nature of the endosperm of the seeds is still to be clarified.

Conservation

Plant diversity management for successful conservation, especially in the insular habitats of Andaman-Nicobar Islands, requires a strategic framework of action in order to

overcome diverse pressures, such as catastrophic events, inaccessibility of several uninhabited islands, disjunct geographical distribution of endemic taxa, and anthropogenic interventions among inhabited islands. Therefore, conservation of insular germplasm outside the island is highly recommended for safeguarding insular plant species. Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNTBGRI), located at the foothills of the southern Western Ghats, has a concern for insular germplasm conservation of the Andaman-Nicobar plant species. It is one of the mandates of the field gene bank, established in 1994 in JNTBGRI, to be a center of conservation of Andaman plant species outside the islands. The climatological features and the latitudes of the Andaman Islands and the southern Western Ghats are broadly similar, the latter lending themselves well for successful growth of Andaman species on the slopes of the Western Ghats. To date, 125 species from Andaman-Nicobar Islands have been established at the field gene bank of JNTBGRI. It is considered to be the largest collection of Andaman- Nicobar plant species outside the islands.

Phoenix andamanensis is evidently rare in the Andaman Islands. The present population located at Kalpong is within the protected forests region, and the other population at Saddle Peak is in the National Park area. It would appear that the species has a small gene pool comprising a very few populations in isolated pockets of three or four islands, and thus the possibility for out-breeding is limited. The conservation status is very likely to be fragile and possibly endangered. The regeneration of the species in natural habitats would appear very limited; however, seed germination was successfully carried out by the North Andaman Forest Division of the Andaman-Nicobar Administration. The growth rate of the seedlings is rather slow when compared with other insular palm species. As regards to the conservation of the species outside the islands, JNTBGRI has taken the initiative, and a few seedlings have been introduced at the field conservatory for Andaman-Nicobar plants established in JNTBGRI (Fig. 6).

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