

CONCLUSION–9

The present dissertation reflects the current diversity status and phylogeography of indigenous palms and canes in various wild habitats of West Bengal. The entire state of West Bengal consists of a diversified topography from sub-alpine Himalayas of Northern part to the mangroves of south Bengal and houses series of large and small *in-situ* and *ex-situ* conservatories that are suitable for wide range of palms and canes. Members of Arecaceae are early divergent and quite interesting monocotyledons with diversified habits and during the process of this dissertation, a total of 49 species representing 17 genera of indigenous palms and canes mostly distributed in the forests and open scrubs throughout the state, mostly concentrated in Northern Bengal were recorded. Out of 49 indigenous species, 26 species are palms and 23 species of rattans have been recognized. The rattans are found most dominating and *Calamus* is the largest genus that represents a total of 17 species, *Plectocomia* with three species and *Daemonorops* with two species. *Calamus* and *Daemonorops* of rattans are widely growing in various sub-tropical, tropical forests of terai and duars and lower hills of Northern Bengal whereas *Plectocomia* found in the forests of tropical and temperate forests of high altitude Himalaya of Darjeeling and Kalimpong districts. Among the palms, *Phoenix* is the largest genus with five species followed by *Wallichia*, *Caryota* and *Trachycarpus* with three species, *Areca* with two species and *Borassus*, *Cocos*, *Nypa* and *Arenga* represent only one species each. Apart from the indigenous species, more over 47 species representing 26 genera of introduced palms are also recorded from different *ex-situ* conservatories, Botanical Gardens, Horticultural gardens, parks, Institutions and road side landscapes. *Arenga* is a largest exotic genus that represents a total of 4 species followed by *Ptychosperma*, *Roystonea*, *Phoenix* and *Livistona* with three species, *Hyphaene*, *Raphis*, *Thrinax*, *Washingtonia*, *Prichardia*, *Hyphorbe*, *Areca*, *Dypsis*, *Archontophoenix* with two species and *Chamedorea*, *Elaeis*, *Bactris*, *Veitchia*, *Heterospatha*, *Dictyosperma*, *Carpentaria*, *Licuala*, *Sabal*, *Lodoicea*, *Latania* with only one species each recorded from various parks, roadside landscapes and commercial areas.

Detailed floristic work on the family Arecaceae of West Bengal was studied to understand the present status of palm and cane diversity and it was found quite significant in forests and open areas of West Bengal. Two new taxa *Calamus*

pseudoerectus S. Mondal, S. K. Basu & M. Chowdhury and *Daemonorops teraiensis* S. Mondal and M. Chowdhury of Arecaceae were discovered from the wild areas of Himalaya and sub-Himalayan West Bengal. In addition, five new taxa *i.e.*, *Areca triandra* Roxb. *ex* Buch.-Ham., *Calamus nambariensis* Becc., *C. longisetus* Griff., *Plectocomia bractealis* Becc. and *Salacca secunda* are recorded for the first time from various wild habitats from the boundary of West Bengal. *Nypa fruticans* and *Phoenix peludosa* are the only important halophytic palms that growing in the tidal creeks of Sundarbans mangrove and a good population sizes for both the species were recorded.

The most of the species of this family are endemic and threatened. A total 34 species of palm and canes of recorded 49 indigenous species are recorded as endemic to Indian sub-continent and South and South East Asia. The species like *Calamus pseudoerectus* Sujit Mondal, S. K. Basu & M. Chowdhury, *Calamus khasianus* Becc., *Calamus kingianus* Becc., *Daemonorops teraiensis* Sujit Mondal & M. Chowdhury, *Plectocomia assamica* Griff., *Plectocomia bractealis* Becc., *Plectocomia himalayana* Griff., *Pinanga griffithii* Becc., *Wallichia caryotoides* Roxb. are endemic to India. *Corypha taliera* Roxb., *Corypha umbraculifera* L., *Calamus floribundus* Griff., *Calamus gracilis* Roxb., *Calamus guruba* (Buch.-Ham.) *ex* Mart., *Calamus leptospadix* Griff., *Calamus inermis* T. Anders., *Pinanga gracilis* Bl., *Arenga micrantha* C. F. Wei, *Calamus acanthospathus* Griff., *Calamus flagellum* Griff. *ex* Mart., *Wallichia oblongifolia* Griff., *Wallichia disticha* T. Anders. are recorded as endemic to Indian sub-continent and China whereas, species like *Trachycarpus fortunei* (Hook.) H. Wendl., *Trachycarpus martianus* (Wall. *ex* Mart.) H. Wendl., *Phoenix acaulis* Buch.-Ham. *ex* Roxb., *Phoenix paludosa* Roxb., *Phoenix rupicola* T. Anders., *Calamus erectus* Roxb., *Calamus longisetus* Griff., *Calamus tenuis* Roxb., *Calamus viminalis* Willd., *Calamus latifolius* Roxb., *Calamus nambariensis* Becc., *Salacca secunda* Griff. are endemic due to their nativeness and restricted distribution in South–East Asia. *Calamus pseudoerectus* and *Daemonorops teraiensis* are considered as endemic to West Bengal due to their restricted distribution in sub-Himalayan and Himalayan Darjeeling and Kalimpong district.

44 species out of 49 recorded taxa are under threatened category. *Calamus numbariensis* is critically endangered species and is reported from Kalimpong and Darjeeling district only. Four species namely *Areca triandra*, *Phoenix acaulis*, *Phoenix paludosa* and *Phoenix rupicola* are categorized under near threatened category and

species like *Nypa fruticans*, *Areca catechu*, *Corypha utan* and *Calamus tenuis* are categorized under least concerned category.

On account of multifarious flowering behavior, study the phenology of palms in wild is difficult and a total 89 species from both indigenous and exotic were selected for this study. The emergence of inflorescence in pleoanthic palms is either seasonal or perennial round the year. In hapaxanthic palms like *Arenga*, *Caryota* and *Wallichia* there were flowering starts once in lifetime and after attaining maturity plant dies. Among the pleoanthic palms, in the genus *Phoenix*, flowering season commences from December and continues up to February. Life forms, habit groups and pollination type were carefully studied and a significant result was found. Based on phonological study flowering calendars for 89 species were prepared for future study.

Selected 23 species of Arecaceae were studied for Palynological investigation and result shows great variation in exine of ornamentation that range from psilate (primitive) to verrucate (advance) and pollen grains are mostly isopolar, heteropolar, para-isopolar and apolar in *Areca catechu* and *Chamaedorea elegans*.

Palms and canes plays a very important role in livelihood of various ethnic communities and local people since long back and plant parts have been widely used as medicine, food, fodder, house building material, hunting, fishing and war equipments etc. Among the 49 indigenous species, tender shoots of 8 species, fruits of 14 species, starchy sap of 5 species are recorded as edible. Young twigs, tender shoot, leaves of 12 palms and canes are recorded to be used most significantly for the fodder of domestic and wild animals. 8 species are recorded as medicine, 11 palms used in making houses and thatching, 4 species for various religious purposes.

Palms and canes of this region in wild facing huge anthropological and natural threats that drastically affects on palm and canes populations. The palm and canes diversity in various wildernesses of West Bengal is quite interesting and rich especially in *in-situ* conservatories of North Bengal. Conservation and sustainable utilization of these natural resources assume great importance in the context when forest wealth of the country as a whole has been on the decline. In the absence of concrete efforts towards their replenishment, some of these wild palms are likely to face severe threats of extinction. Authority should initiate various national and international projects and develop proper conservation strategies along with the remote sensing technology for

mapping with view to conserve the palms and rattan biodiversity. The data extracted out from this work will be used as primary data for the proper conservation program of West Bengal palms for the policy makers. Therefore, sincere attention and proper scientific conservation measures should be taken immediately by the authority, otherwise most of the species of rattans and palms of this area will extinct from the wild in the near future.