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FORM AND BIOLOGICAL SPECTRUM OF ANDAMAN AND NICOBAR ISLANDS*

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ABSTRACT

In the present paper, the vascular plants of Andaman and Nicobar Islands, belonging to 204 families, 1045 genera and 2315 species have been put to their exact life forms and percentage belonging to each life form class. The same has been compared with Raunkiaer's normal and other spectra determined in different parts of the country. Phanerophytes, Chamaephytes, Hemicryptophytes, Geophytes or Cryptophytes, Therophytes, Lianas and Epiphytes represent 49.40, 12.14, 7.48, 3.37, 12.31, 9.49 and 5.81 percentage respectively and it has been found that the phyto-climate of these islands is typical phanerophytic which is characteristic of the humid tropics and subtropics.

The Andaman and Nicobar Islands situated in the Bay of Bengal towards the east of Peninsular India lie between 6°40′ and 13°40′ N latitudes and 92°10′ and 94°10′ E longitudes (Fig. 1). These islands were largely unexplored and botanically little known, until recently in 1972, when the Botanical Survey of India established a new Regional Circle office at Port Blair. A decade of intensive botanical survey of these islands, since then, has increased our knowledge on the flora, though not up to the level of regions in mainland India. There has been absolutely no studies on the ecology and phytogeography of the islands so far, except some vegetational accounts by Kurz (1870, 1976), Thothathri (1960a, 1960b, 1962) and Thothathri *et al.* (1973). The flora has never been subjected to analysis for life form and biological spectrum. Therefore, the present authors made a pioneering attempt in this direction and the results are found to be significant.

The Andaman group consists of about 291 islands stretching out more or less in north-south direction with an area of about 6340 sq. km. The major groups of islands are North Andamans (including Landfall Isl., Nercondum Isl., Sound Isl., Interview Isl., etc.), Middle Andamans, South Andamans (including Baratang Isl., Ritchie's Archipelago, Neill Isl., Barren Isl., Rutland Isl., etc.) and Little Andaman. The Nicobar group consists of about 28 islands, lying in north to southeast direction, covering an area of 1953 sq. km. The 'Ten Degree Channel' (10°N latitude) with a width of 155 km from Little Andaman to Car Nicobar Island separates the two groups of islands. The Nicobars are divisible into two groups—the southern and northern. The former comprises Great and Little Nicobars with the adjacent numerous islands. The northern group includes Nancowry, Kamorta, Katchal, Teressa, Car Nicobar, Trinkut, Tillangchong and many other small islands. The chain of islands from Landfall in N. Andamans to Great

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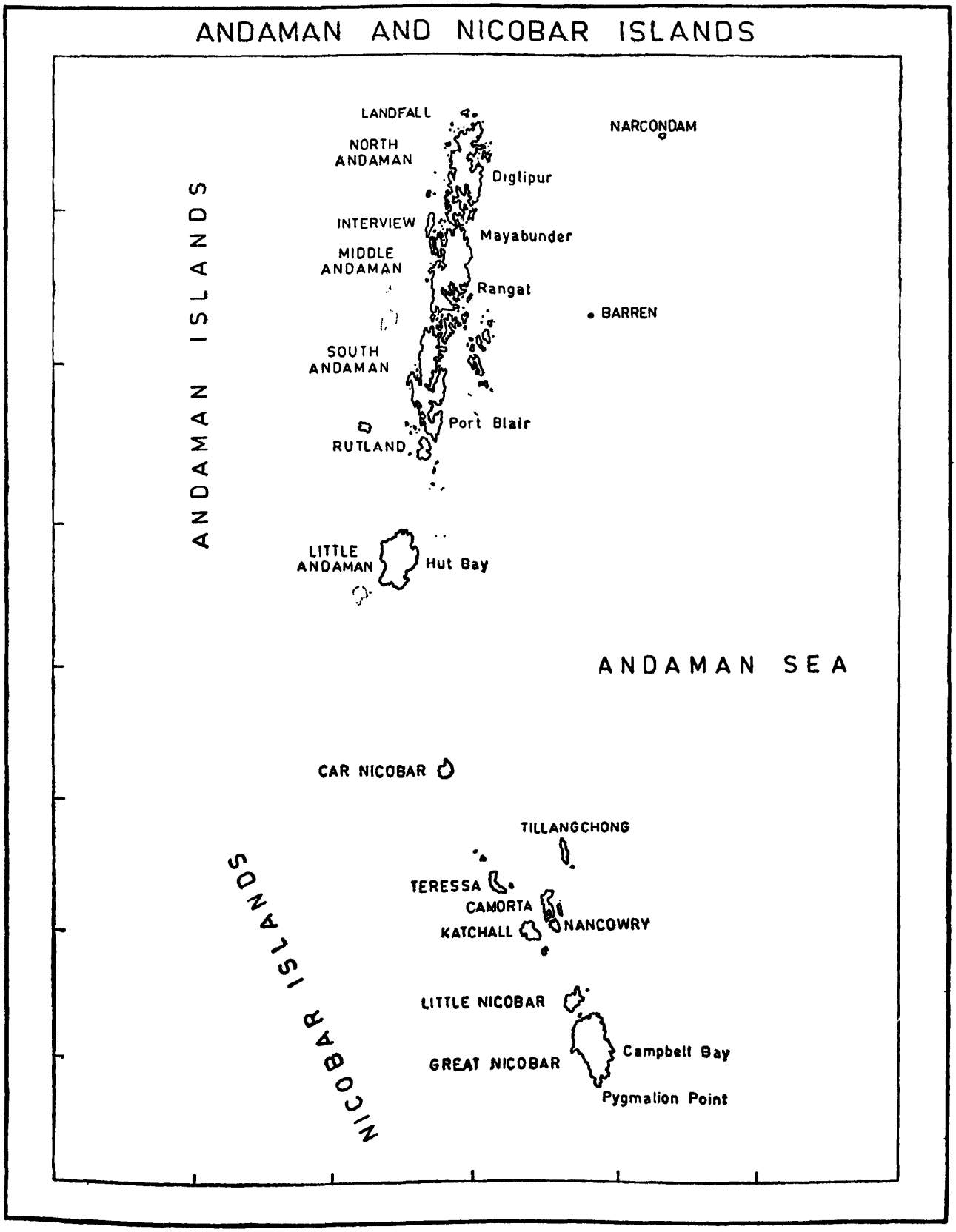

Fig. 1 : Map of Andaman and Nicobar Islands

Nicobar Island form a submarine ridge which extends from Burma to Moluccas. The soil is usually immature, poor in drainage, low in moisture retaining capacity, soft and deep sandy loam, varying from fine texture of alluvial flats to the gravel soil of the low hills. The higher hills consist of hard clayey soil with micaceous sand-stone formation and conglomerates below. Saline low lying land is usually of alluvial formation lying along the sea coast. The Nicobar islands have a predominance of calcareous sandstones, Alluvial deposits and plutonic rocks are conspicuous and polycistine clay covers the greater part of the islands.

These islands show a uniform tropical warm humid climate with the temperature ranging from 22°C to 32°C and the mean relative humidity of about 82%. Average annual rainfall ranges from about 300 cm in the north to about 380 cm in the south. However, in Port Blair the rainfall is less at about 282 cm average for the last 6 years (Fig. 2). The main precipitation occurs during the south-west and north-east monsoons from April to December. These islands are subjected to cyclonic winds and gales, usually common with change of monsoons and sudden depressions in the seas around. The months January to March show fairly dry weather.

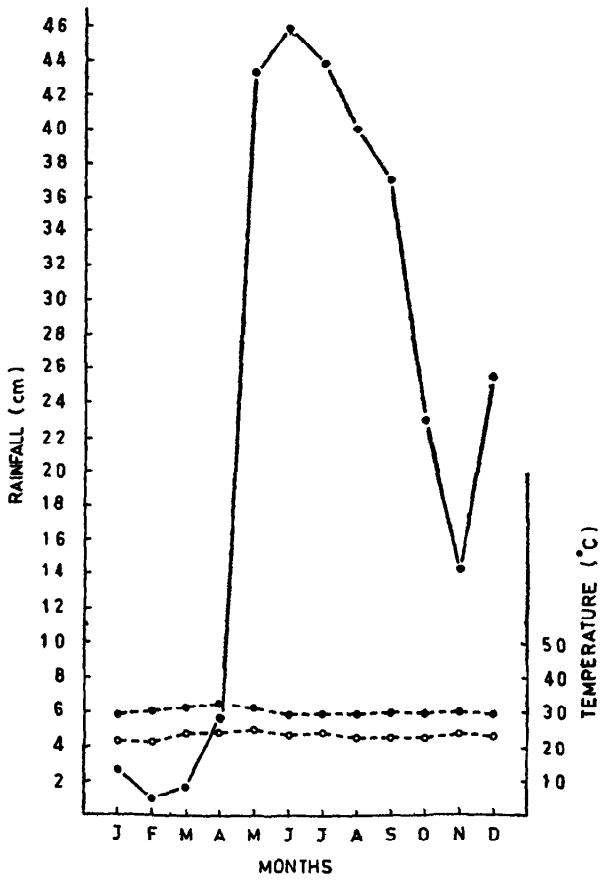

Fig. 2 : Temperature and rainfall at Port Blair—average for 6 years

LIFE FORM AND BIOLOGICAL SPECTRUM

The tropical humid climate facilitates rich luxuriant vegetation in all the islands and about 70% of the total geographical area is under rich tropical evergreen and semi-evergreen forests. Beach forests, moist deciduous and moist evergreen forests, mangrove forests, grasslands, open scrub forests and marine vegetation are the main types of vegetation in these islands.

Raunkiaer (1934) defined life forms as the sum of the adaptation of the plant to the climate. The phyto-climate is characterised by the statistics of life form, that is to say that, the life forms best adapted to a certain climate will form a higher percentage of the flora than the others. The biological spectrum shows the percentage relation between the life forms and all the phanerogams. Further, it throws light on how a plant passes through unfavourable seasons of growth.

The present knowledge on the flora of Andaman and Nicobar Islands is based on reports, vegetation accounts and floristic lists of various authors such as Balakrishnan (1976, 1977, 1980 and 1982) Balakrishnan and Chakrabarty (1978), Balakrishnan and Nair (1976, 1977 and 1982), Bhargava (1958), Chakrabarty (1979a & b), Kurz (1870, 1975 & 1976), Parkinson (1923), Sahni (1953 & 1958), Srinivasan (1960), Thothathri 1960a & b, 1962, 1975 & 1977) and Thothathri *et al.* (1973) as given in the references at the end of this paper.

In the present investigation vascular plants reported in the above mentioned contributions, herbarium specimens preserved in the herbarium of Botanical Survey of India at Port Blair (PBL) and field observations of the authors have been carefully utilised for a listing of all species so far known from these islands. This list has been put to their exact life forms and percentage belonging to each life form class as slightly modified by Ellenberg & Muller-Dombois (1967) and Muller-Dombois & Ellenberg (1974).

Kurz (1870), Parkinson (1923) and Thothathri (1962) classified 1411 species into 572 trees, 294 shrubs, 259 climbers and 286 herbs. However, in this work the biological spectrum of 2315 vascular species represented by 1045 genera and 204 families has been prepared for different groups of islands (Table 1 and 2). The same has been compared with the spectra available for different parts of the country and normal world spectrum (Table 3).

Table 1 : Distribution of species into various groups

Groups	Family	Genera	Species
Pteridophytes	31	59	142
Gymnosperms	3	3	6
Dicotyledons	142	764	1669
Monocotyledons	28	219	498
Total	204	1045	2315

The general appearance of a plant community is caused by the life form of the dominant plant than by any other characteristic feature of the vegetation (Hanson & Churchill, 1961). It also throws light on how a plant passes through the unfavourable seasons of growth. Therophytes are well represented only in climate with a fairly long dry season or when the anthropogenic factors are more pronounced. However, in these islands as compared to

Table 2 : Distribution of life form spectrum in different islands

Life forms	Andaman Islands			Nicobar Islands		
	North	Middle	South	Little	North	South
Ph Phanerophytes	53.53	60.47	47.21	46.97	45.10	54.47
Ch Chamaephytes*	7.94	6.80	11.71	12.93	12.90	15.48
H Hemicryptophytes	3.82	7.16	6.47	4.94	9:26	6.40
G Geophytes or CR Cryptophytes	2.06	1.28	2.83	1.52	2.21	2.10
Th Therophytes	13.82	11.23	15.29	17.49	14.11	10.71
L Lianas/large climbers	14.12	11.04	10.30	13.31	10.36	11.06
E Epiphytes**	4.71	1.84	4.85	5.32	5.18	8.97
HH Hydrophytes	0.07	0.18	1.34	1.52	0.88	0.81

* Includes some low succulents also
** Includes some parasites also

several places in mainland India, the Therophytes are just normal, similar to other tropical humid areas.

Hemicryptophytes and Chamaephytes are indicators of cold zones. Phanerophytes make up 57 percent or more only in wet tropical forests with the percentage dropping to 49 percent or below in even closely related monsoon forests (Daubenmire, 1968). This is quite evident from the spectra of subtropical evergreen forests of Matheran, Mahabaleshwar and Andaman & Nicobar Islands (Table 3). Meher-Homji (1964) while comparing the biological spectra of various regions of the country has shown that these spectra for different regions are related to their bioclimates. Flora of these islands is phanerophytic and typical of humid regions. Secondly, the biotic factors (including human deforestation) in South and Little Andamans are reducing the Phanerophytes and are gradually increasing the Therophytes as compared to other islands (Table 2). Geographic evidence also supports the interpretation that there is a significant degree of uniformity in the life forms of plants within a given climatic type, wherever it reappears over the face of the globe, and the prevailing structural types are related to the climate. In addition, the abundance of lianas and vascular epiphytes always increases with approach toward the west frost-free climates (Hosokawa, 1950 ; Omura 1950) which is obvious in these islands.

Thus it can be concluded that the phytoclimate of these islands is phanerophytic with a good amount of Phanerophytes, Chamaephytes, lianas or climbers and epiphytes which is characteristic of the humid tropics and subtropics but by the increase of the anthropogenic factors the trend may shift from phanerophytic to therophytic.

Table 3 : Life form spectra comparison of Andaman and Nicobar Islands and some other climatic types in India and normal world spectrum

Region	Percentage distribution of life forms						
	Ph	Ch	H	G* (Cr)	Th	L	E
1. Average normal world spectrum (Raunkiaer, 1934)	46	9	26	6	13	—	—
2. Subtropical evergreen, India (Barucha & Ferriera, 1941a)	63	17	2	5	10	—	—
3. Matheran (Barucha & Ferriera, 1941b)	65.3	17.2	2.2	4.8	10.5	—	—
4. Mahabaleshwar (Barucha & Ferriera, 1941b)	60	19.6	3.4	3.8	13.2	—	—
5. Allahabad (Srivastava, 1944)	38	9.2	3.4	7.8	41.6	—	—
6. Karamnara watershed (Rao, 1968)	40	6	1	10	43	—	—
7. North Kanara (Arora, 1960)	48.3	14.8	4	10.9	22	—	—
8. Bhopal (Oommachan, 1977)	40	13	2	9	36	—	—
9. Bhaderwah (Kaul & Sarin, 1976)	30	25	18	15.6	11.4	—	—
10. Andaman & Nicobar Islands (present authors)	49.40	12.14	7.48	3.37	12.3	9.49	5.81

*includes Hydrophytes also

REFERENCES

ARORA, R. K. The botany of Coorg forests. *Proc. nat. Acad. Sci.* 308 : 289-305. 1960.

BALAKRISHNAN, N. P. Our Orchids. In the Andaman and Nicobar Information, Port Blair pp. 153-165. 1976.

—— Recent botanical studies in Andaman and Nicobar Islands. *Bull. bot. Surv. India* 19 : 132-138. 1977.

—— Notes on some little known ferns of Andaman and Nicobar Islands. *Ibid.* 22 : 136-140. 1980.

—— New or little known plants from Great Nicobar Island. *Ibid.* 24 : 55-66. 1982.

—— AND P. CHAKRABARTY. Descriptive notes on some new or little known orchids of Nicobar Islands. *Ibid.* 20 : 80-90. 1978.

—— AND N. G. NAIR. New records of Orchids from Andaman Islands. *Ibid.* 18 : 149-154. 1976.

—— AND —— New records of plants from Andaman and Nicobar Islands—I. *Indian Forester* 103 : 638-640. 1977.

—— AND —— New taxa and record from Saddle Peak, Andaman Islands. *Bull. bot. Surv. India* 24 : 28-36. 1982.

GHARGAVA, O. P. Tropical evergreen virgin forests of Andaman Islands. *Indian Forester* 84 : 20-29. 1958.

BHARUCHA, F. R. AND D. B. FERREIRA. The biological spectrum of the flora. *Journ. Univ. Bombay n.s. Biol. Sci.* 9 : 93-100. 1941a.

—— AND —— The biological spectrum of the Matheran and Mahabaleshwar flora. *Journ. Indian bot. Soc.* 20 : 195-211. 1941b.

CHAKRABARTY, P. Contribution to the flora of Katchal Island in Andaman & Nicobars. *Bull. bot. Surv. India* 21 : 1-17. 1979a.

—— New records of plants from Andaman and Nicobar Islands. *Journ. Bombay nat. Hist. Soc.* 76 : 212-215. 1979b.

DAUBENMIRE, R. Plant Communities. Herper & Row Publ., New York. 1968.

ELLENBERG, H. AND D. MUELLER-DOMBOIS. A key to Raunkiaer plant life forms with revised sub-divisions. *Bergeobot. Inst. ETH. Stiftg. Rubel, Zurich* 37 : 56-73. 1967.

HANSON, H. C. AND E. D. CHURCHILL. The Plant Community. Reinhold Publ. Co., New York. 1961.

HOSOKAWA, T. Epiphytic quotient. *Bot. Mag. (Tokyo)* 63 : 18-20. 1950.

KAUL, V. AND Y. K. SARIN. Life form classification and the biological spectrum of the flora of Bhadrawah. *Trop. Ecol.* 17 : 132-138. 1976.

KURZ, S. *Report on the vegetation of the Andaman Islands.* Calcutta. 1870.

—— Description of new plants from Nicobar Islands. *Journ. Bot. Lond., n.s.* 13 : 321-323. 1875.

—— A sketch of the vegetation of the Nicobar Islands. *Journ. Asiat. Soc. Beng.* 45(3) : 105-164. 1876.

MEHER-HOMJI, V. H. Life forms and biological spectra as emphamonic criteria of aridity and humidity in the tropics. *Journ. Indian bot. Soc.* 43 : 424-430. 1964.

MULLER, D.-DOMBOIS AND H. ELLENBERG. Aims and methods of vegetation ecology. John Wiley & Son, New York. 1974.

OMURA, M. Life forms of epiphytic lichens. *Bot. Mag. (Tokyo)* 63 : 155-160. 1950.

OOMMACHAN, M. The Flora of Bhopal. J. K. Jain & Bros. 1977.

PARKINSON, C. E. A forest flora of the Andaman Islands. Simla. 1923.

RAO, S. S. Landforms of Deccan traps. *Proc. 22nd Internat. Geolog. Congress.* 1968.

RAUNKIAER, C. The life forms of plants and statistical plant geography (being the collected papers of C. Raunkiaer). Clarendon Press, Oxford. 1934.

SAHNI, K. C. Botanical exploration in Great Nicobar Island. *Indian Forester* 79 : 3-7. 1953.

—— Mangrove forests in Andaman and Nicobar Islands. *Ibid.* 84 : 554-562. 1958.

SRINIVASAN, K. S. On the foreshore vegetation of Malacca Coast of the Car Nicobar Island. *Bull. bot. Surv. India* 2 : 15-25. 1960.

SRIVASTAVA, G. D. The biological spectrum of the Allahabad flora. *Journ. Indian Bot. Soc.* 23 : 1-3. 1944.

THOTHATHRI, K. Botanical exploration of Car Nicobar and Nancowry Islands. *Bull. bot. Surv. India* 2: 341-346. 1960a.

—— Studies on the flora of Andaman Islands. *Ibid.* 2 : 357-373. 1960b.

—— New records of plants from the Andaman and Nicobar Islands. *Journ. Bombay nat. Hist. Soc.* 58 : 310-317. 1961.

—— Contributions to the flora of Andaman and Nicobar Islands. *Bull. bot. Surv. India* 4 : 281-296. 1962.

—— Botanical exploration in Baratang and Little Andaman Islands. *Indian Forester* 101 : 176-181. 1975.

—— A review on the floristic studies in the Andaman and Nicobar Islands, upto 1970. *Bull. bot. Surv. India* 19 : 127-131. 1977.

——, S. P. BANERJEE, P. K. MUKHERJEE, P. K. HAJRA AND G. D. PAL. Botanical results of the joint scientific expedition to the Great Nicobar Island. *Ibid.* 15 : 235-265. 1973.