

NARAYANA BALAKRISHNA NAIR

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Prof. K. S. Murty



NARAYANA BALAKRISHNA NAIR

(1927-2010)

Elected Fellow 1975

EARLY EDUCATION AND FAMILY BACKGROUND

NBALAKRISHNA NAIR was born on the 6th July 1927 at Perambavur, Kerala. His father was Amballur P Narayana Pillai and mother K Lakshmi Kutty Amma. He had three brothers and one sister and was the third child of his parents. His father was a Member of the Travancore Legislative Council for a number of years, a great Sanskrit scholar, an active Member of the Nair Service Society founded by Late Mannath Padmanabhan and one of the pioneers to start rubber plantation in the state of Kerala. Since he was born in an affluent family, the joint family system of Nair Tharavad had a great influence on his childhood. Literary discussions in the presence of Sanskrit scholars and participation in fine arts and folk dances instilled in him appreciation of the beauties of Nature.

Nair married Srimati Madhavi Govindamma on 3rd September 1950. He had two children, the first a son, Chandra Mohan, a doctor and the second, a daughter, Aparna.

Nair did his Intermediate from Union Christian College, Alwaye (1946) and BSc (Hons) from Madras Christian College, Chennai (1949, First Class First). He subsequently got his PhD (1955) and DSc (1965), both from Madras University. He specialized in Marine Biology and Oceanography from the University of Bergen, Norway. Nair's wide range of investigations include: participation in scientific cruises in the North Atlantic Region of Norway, detailed ecological survey of the marine fouling and wood boring organisms of Western Norway, eco-physiological studies of littoral molluscs in Millport, Isle of Cambay (1967); and studies in Kames Bay, Scotland, Bryozoans and molluscs in Helgoland, Germany, and in Caribbean sea (1973-75).

POSITIONS HELD

Dr Nair started his career as Lecturer in Zoology, AC College, Karaikudi (1949-53). Then, he worked as Research Fellow, University of Madras (1953-55); Professor of Zoology, AC College, Karaikudi (1955-57); and Norwegian Government Scholar (1957-59). Thereafter, he worked as Postgraduate Professor, Thyagaraja College, Madurai for one year. He was Reader in Madras University Madurai Centre for two years. For five years, he was Reader in Oceanography in the Kerala University, took



over as Professor of Marine Biology and Fisheries and worked from 1968 till his retirement. He was Visiting Professor of Ecology in the University De Orient on invitation by the Organisation of American States (1973-75) and CSIR Emeritus Scientist (1991-93).

MAJOR ACHIEVEMENTS

Extensive investigations were carried out in the Department of Aquatic Biology and Fisheries, Kerala University in the field of systematic ecology, functional morphology, environmental biology, biological studies of fishes, physiological studies on mollusks, diseases of various fishes, pollution, aquaculture and control of aquatic weeds under the dynamic leadership of Professor Nair. The University Grants Commission (UGC), New Delhi, chose the Department as the Centre of Excellence in Aquatic Sciences during his tenure. It will be no exaggeration if the credit for the Department to have been chosen as the Centre of Advanced Study (CAS) goes to Nair's nurturing CAS since its inception.

Professor Nair also specialized in conservation and management of living aquatic resources and pollution of aquatic biotopes. He was a world authority in marine boring organism and devoted most time of his active career in India, Norway, Great Britain, West Germany and South America. He was an authority of these organisms along the East and West Coasts of India. He collected, identified and described nearly 25 species of these organisms. His monograph 'marine fouling and wood boring organisms', is a piece of original work. Marine biologists have shown a lot of interest in his studies on succession of marine fouling communities in the Gulf of Cariaco, Carribbean Sea and the ship worms of South America (1973-75).

RESEARCH CONTRIBUTIONS

Professor Nair's main contributions mainly covered the broad area of conservation and management of aquatic living resources, divisible into three major categories: (i) bio-deterioration in the aquatic environment; (ii) fishery biology; (iii) and ecology of wetlands.

Bio-deterioration in Aquatic Environment

Among the questions of keen scientific interest that are encompassed in the broad field of marine biology, none has greater economic significance than the problem of marine biological deterioration. Both basic and applied researches have addressed the problem since time immemorial. While much has been accomplished, the problem still persists. With advancing technology, the problem has intensified. Protection and replacement are very expensive since the costs are spiraling.

Nair produced a great volume of key findings on several aspects of the taxonomy, functional morphology, development, growth rates, digestive physiology



ecology and the distribution of cellulose destroying organisms. He brought to light the existence of as many as 40 species of shipworms, and nature of their incidence and distribution along the coasts of India. The marine cellulose destroying organisms of Scandinavia and South America were also collected, identified and described. A comprehensive study of the nature of distribution and ecology of these pests along 17 estuaries of the South West Coast of India and the Lakshadweep archipelago was undertaken and the nature of damage estimated.

Nair's classical contributions to functional morphology of the boring molluscs are widely recognized and quoted. Thus, the structure and physiology of the teredinids such as *Bankia carinata*, *Nausitora hedleyi*, *Teredo furcifera*, *Teredora princesae* and the pholads, namely *Martesia striata*, *Zirphaea cirspata* and *Xylophaga dorsalis* are especially noteworthy. In the words of Professor RD Purchon, "...will serve as a standard work of reference for many years".

The most comprehensive and detailed embryology of a shipworm published in scientific literature is by Nair, who reported the phenomenon of sex reversal in tropical ship worms, delineated their breeding period along the East and West Coasts of India, in the Gulf of Cariaco and in the fjords of Norway, and assessed their growth rates in different substrata in the boreal and tropical regions. The sex characters of sphaeromatids were described, their blood size and brood composition ascertained and the nature of their vertical distribution in the water column delineated to check the damage of timber.

Professor Nair's contribution on the digestive physiology of shipworms, more especially the path of enzymic hydrolysis of cellulose, the respective roles of the crystalline style, the digestive diverticula and the probable involvement of the bacteria contained in the glands of Deshayes have been most outstanding. He was the first to demonstrate that the cellulose is directed to the oesophagus, that ingested food is sorted in the stomach, further digested in the caecum and then passed on to the specialized digestive diverticula for intracellular digestion. Recent studies have confirmed these results.

The nature and action of the different digestive enzymes were elucidated step by step and a clear and complete picture of the physiology of digestion in these wood-boring mollusks emerged. The biochemical composition in relation to the breeding cycle of *Nausitora hedleyi* and the effects of salinity on the development, growth rates and activity of tropical shipworms were elucidated.

Nair explained in great detail the mechanics of the process and characteristics of penetration of substrates by bivalves. Working in collaboration with Maurice Yonge and Allen Ansell of UK, Nair developed a new approach and used it with great success. Activity records were maintained with the aid of 16 mm cine photography using multi-channel pen recorders, isometric and isotonic myographs and pressure



transducers; boring and other activities of the animal, both outside and within the burrow, were recorded and interpreted. These led to a better understanding of the characteristics and dynamics of burrowing and boring in a number of bivalves.

Further, the ecology of bio fouling was examined in great detail from the boreal waters of Scandinavia to the tropical waters of Venezuela in the Atlantic, in the Tuticorin bay on the East Coast and in the Neendakara and Cochin Harbour along the South West Coast of India. The nature and extent of bio fouling by the bryozoans, the marine macroalgae, the mussel *Masculista arcuatula*, the barnacle *Balanus Amphitrite communis* and the oyster *Crassostrea madrasensis* were subjects of in-depth studies and valuable information was recorded. Distribution and seasonal variations of the benthic communities of the inshore waters and the major backwaters along the South West Coast of India were also studied.

The effects of physical, chemical and biological waters of the incidence, and relative abundance and the various interrelationships of the different species within the bio fouling community were the subjects of careful scrutiny. Thus, the eco-physiology of the marine bio fouling elements and the different types of organisms causing bio deterioration were examined in detail in several locations in the tropics, temperate and boreal waters. Their incidence and activities during the cycle of the seasons were ascertained in the estuarine, coastal and insular situations. The results were of great biological interest and economical importance from the point of view of destruction of valuable timber and bio fouling and corrosion.

Fishery Biology

Fisheries were a fascination for Professor Nair. The functional morphology, digestive physiology, reproductive biology and ecology of several species of fresh water, estuarine and littoral fishes were studied. The results are of great interest from the point of view of conservation and management of aquatic resources of our country. Thus, the detailed biology of several species of clupeids, cynoglosids, cichlids, cyprinids, loaches, larvivorous fishes, perches, perchlets, arid cat fishes, and mullets were examined in great detail and valuable results published.

Fish pathology, especially the nature of incidence, histopathology, structural and functional aspects of copepod and isopad parasites, and effects of infestation on the haematology of fishes were also elucidated.

Aquaculture: The genus *Perna* was correctly identified from the Indian waters and the confusion regarding the correct identity of this mutilid was settled on the basis of morphological characteristics. Nair and Kuriacose showed that the so-called genus *Mytilus*, hitherto identified and described from the Indian seas was not *Mytilus* but *Perna*. This has indeed been an important revelation.



An undescribed species, *Perna indica*, was brought to light. The classical work on the structure and biology of *Perna* was the foundation on which the entire concept of mussel farming in our country is based and which has developed into a very lucrative practice.

Several studies related to cultural aspects were initiated and transferred from laboratory to land by Nair and his group. Accordingly, baits and aqua feeds in cultural operations, food and feeding habits of culturable fish, ecology of predaceous aquatic weeds, eradication of pests and predators, and protection of aqua cultural implements were some of the several investigations undertaken by Nair and his students.

Ecology of Wetlands

Nair's extensive investigations of tropical estuaries, backwaters and lagoons produced results of great biological interest from the point of view of conservation and management of wetlands in the country. Most of the estuaries in the tropics are under the severe threat of pollution, reclamation and siltation owing to anthropogenic disturbances and severe human pressure. Detailed studies were carried out on the ecology with special reference to physical, chemical and biological features, distribution of nutrients, organic productivity, nature, composition, incidence and relative abundance of phytoplankton and zooplankton, benthos, and fisheries during a cycle of the season in several backwaters along the South West Coast of India.

The nature of distribution of heavy metals and the intensity of pollution from sources such as sewage, industrial effluents, retting of coconut husks for coir industry and agricultural residues such as pesticides and fertilizers were described.

Of particular interest was the discovery and elucidation of the nature of tropical estuarine sulphide system developed in these biotopes, consequent on extensive retting operations for coir industry. During retting oxidation of organic matter and liberation of hydrogen sulphide, among others, an ecosystem of micro aerobic and anaerobic properties is created seriously affecting the entire biota, more especially the fisheries converting vast stretches of these beautiful backwaters into virtual cess-pools of foul smelling stagnant water. Nair and his group initiated detailed ecological studies on this system and explained the nature of the pectinolytic activity of the microorganisms, the path of degradation of the organic matter leading to the liberation of hydrogen sulphide and the qualitative and quantitative changes undergone by the different constituents and their effect on the organic productivity, plankton nekton, benthos, meiofauna and the fisheries.

Other significant contributions made by Professor Nair and associates pertain to the nature and effects of the effluents from the Travancore Titanium Products on the flora and fauna of the area, toxicity of the more common insecticides used



agricultural operations on the fishes, toxicity of the mosquito larvicides on larvivorous fishes and the effect of insecticides on odonate nymphs.

Nair's contributions also relate to the ecology of the mesopsammon of the South West coast of India, the ecology of the aquatic oligochaetes, the biocoenosis of the African fern *Salvinia molesta* and ecophysiology of predaceous aquatic insects, the biology of the predaceous isopod *Alitropus typus* and the functional morphology and biology of the *Mytilidmasculisata arcuatula*.

Realising the great economic potential of marine algae as a source of food, fodder and pharmaceutical compounds, Nair took extensive surveys and identified as many as 165 species of littoral algae from the South West Coast of India. The occurrence, relative abundance and seasonal variations in the distribution of these algae, the physicochemical factors that influence their incidence and the biochemical composition of certain species were examined. Similarly, the sea grasses, mangroves and aquatic weeds occurring along the South West Coast of India were subjected to detailed ecological studies and mapping. Of special interest are the results of a series of investigations on the exotic fern *Salvinia molesta*, which is threatening the fresh water bodies of Kerala.

Sir CM Yonge has summarized Professor Nair's achievements as:

"I do not think that there is any one at present in the field of marine boring organisms who has done better work than Professor Nair. Allied to this, he is a man of high personal distinction".

AWARDS AND HONOURS

Professor Nair received the Caithness Gold Medal of the University of Madras for Distinction in Zoology (1945). He was awarded the UNESCO Fellowship for Advanced Study in Norway (1957) and the Royal Society and Nuffield Foundation Bursary (1967). He was awarded the SS Bhatnagar Prize (1971) by CSIR. He was elected Fellow of Zoological Society London (1961), the Indian National Science Academy (1975) and the Indian Academy of Sciences (1977). In 1978, he was selected as National Fellow by UGC in recognition of his outstanding contributions towards teaching and research in the country. He was awarded the Jawaharlal Fellowship by the Nehru Memorial Trust (1982). He was awarded the prestigious 'Padma Sri' in the year 1984. He was also chosen for Chandrakala Hora Memorial Medal by INSA in 1987.

LAST DAYS

Nair played an instrumental role in developing substantial manpower in the fields of aquatic environmental biology and fisheries in the country. He passed away on the



21st of April 2010. His demise is an irreparable loss to the scientific community and the void created in the field of aquatic biology is difficult to fill.

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