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CENTRE FOR ECOLOGICAL SCIENCES INDIAN INSTITUTE OF SCIENCE BANGALORE

*Priya Susan Mathew**

The Centre for Ecological Sciences was established at the Indian Institute of Science in 1982. The Centre has since established several active research programmes in Basic and Applied Ecology. This Centre has excellent facilities for theoretical as well as experimental research in plant, animal and human ecology as well as social behaviour of insects. Its major strength, however, is the field research facilities in Sirsi, Uttara Kannada District and in the Mudumalai and Mukurti Sanctuaries of Nilgiri Biosphere Reserve where a variety of ecological studies can be taken up. This is the first Centre of Excellence supported by the Ministry of Environment and Forests, Government of India. Comprising of life scientists, chemists, mathematicians and engineers, the emphasis is on field oriented research. The Centre concerns itself with research in the following major areas:

a. ***Biological diversity***: This research field is mainly concentrated in areas of study such as organization of biological (particularly insects, plants and large mammal) communities, factors that determine number and identity of species occurring in any community, impact of various forms of land use on levels of biological diversity, best ways to preserve our heritage of biological diversity.

b. ***Social behaviour***: Factors favouring the evolution of sociality in certain groups of animals, role played by the social animals ranging from wasps to elephants in biological communities.

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c. ***Human ecology***: Role played by the dominant social animal -man in biological communities, How do his activities, both traditional and modern affect the productivity and diversity of biological communities?

d. ***Ecodevelopment:*** How can man improve his management of biological communities? In particular,in Western Ghats ,how to improve the efficiency of use of fuel, fodder, construction material etc., to reduce his demands for these materials.

e. ***Climate Change and Tropical Forests*** :Impact of climate change on forests in India, tracking of carbon flow in Indian forests, the potential of forestry as a climate mitigation option, economic and institutional aspects of forestry mitigation options and adaptation to climate change.

f. ***Plant-animal interactions***: Evolutionary ecology of species interactions in pollination, seed dispersal and herbivory systems, the behavioural and chemical bases for such interactions, what favours the evolution of mutualisms such as those between ants and ant-plants?

g. ***Animal communication***: Song pattern recognition in Orthopteran insects (cricket and grasshoppers); communication signals during courtship displays and their role in male mating success.

Current Research Activities of the Centre Major R&D Projects:

1. **Title:** "Ecological Sciences Research and Training Centre at the Indian Institute of Science, Bangalore". Sponsor: Ministry of Environment and Forests, Government of India.

2. **Title:** "Forest Management". Sponsor: Ford Foundation.

3. **Title:** "Developing an action programme for conserving the biodiversity of the Western Ghats through a network of undergraduate colleges". Sponsor: World Wide Fund for Nature-India (WWF) & Pew Scholars Programme in Conservation and Environment School of Nature Resources and Environment.

4. **Title:** "Unit on Social Insect Biology". Sponsor: Department of Science and Technology, Government of India.

5. **Title:** "Behavioural Ecology of some Indian Ants (Comparative study of reproduction regulation in the queenless genus *Diacamma*)". Sponsor: Indo-French Centre for the Promotion of Advanced Research. (Department of Science and Technology, Government of India)

6. Title: Energy Planning using GIS. Sponsor: Ministry of Science and Technology, Government of India

Courses Offered at CES

Population Theory:

Elementary population growth, exponential, logistic; Continuous and discrete time models; Steady state, oscillations, chaos, Age structured populations; Leslie Matrices; Effects of variable environment; interactive populations, predator-prey models, competition, host-parasite interactions, symbiosis; Natural selection; Fisher's theorem; Malthusian parameter, survivorship, fertility rates; Reproductive value, game theoretic modelling of interactive populations; Evolutionarily stable strategies, hostile co-evolution.

Co-ordinators - N.V.JOSHI AND SULOCHANA GADGIL

Field course in Ecology

Censusing natural populations; Estimation of biomass productivity of cropland, grassland, and plantations; Estimation of species diversity Survey and mapping of landuse and vegetation; Laboratory analysis of soils; plant and animal diversity studies; Methods in quantitative ethology.

Co-ordinator - R. SUKUMAR

Animal Behaviour (Proximate Mechanisms and Neurobiology)

History and development of the study of animal behaviour; Sensory systems; Neural mechanisms; Learning; Communication; Complex behaviour; Neuroethology.

Co-ordinator - ROHINI BALAKRISHNAN

Plant-animal interactions (Ecology, Behaviour and Evolution)

The Term "Plant-animal interactions" encompasses a wide array of associations. This course will explore a subset of these relationships and will focus largely on plants and their pollinators, seed dispersers and herbivores. These interactions will be examined from the perspective of all associating partners and will be investigated from the view points of ecology, behaviour and evolution. Some key

concepts include co-evolution, mutualism, sexual display, mate choice in plants and resource allocation. This course will depend heavily on the reading of classical and contemporary research papers. Students will also be required to present a seminar on a topic of their choice by reviewing the literature. Laboratory/field exercises will be conducted as required.

Co-ordinator - RENEE M BORGES

Conservation Biology

Biological diversity, genetic diversity, species diversity, ecosystem diversity; Genetic variation and evolution; Patterns of species diversity in communities, tropical versus temperate region diversity, maintenance of diversity; Ecosystems of the world, Island biogeography, extinction, Conservation of biological diversity; Genetics and conservation; single species conservation; minimum viable populations, habitat requirements, problems in conservation of rare, specialist and keystone species, captive breeding and conservation; Ecosystem conservation, design of nature reserves, climate change and conservation, social context of conservations.

Co-ordinator - R. SUKUMAR AND N.V. JOSHI

Behaviour and Sociobiology

Introduction to Animal societies; Principles of evolution by Natural Selection; Behaviour Genetics; The paradox of altruism; The theory of inclusive fitness; Mechanisms of Kin recognition; The evolution of Social behaviour.

Co-ordinator -RAGHAVENDRA GADAGKAR

CES Departmental Library

At CES, there is a well stocked library that holds books on various disciplines including the Computer Science, Psychology, Social Sciences, Anthropology, Environment Energy, Natural Resources, Conservation, Landuse Pollution Science, Mathematics, StatisticsEarth Science, Hydrology, Limnology, Climate, Human Genetics Biology and Biostatistics Ecology, Marine, Biogeography Evolution, Genetics, Microbiology Plant Science Zoology and Animal Behaviour Invertebrates (Molluscs, Earthworms, Spiders) Insects, Vertebrates, Fishes, Birds Mammals Epidemology & Technology Agriculture, Soils, Pests Forests and Wildlife.

Faculty:

Chairman
Prof. R. Sukumar

Professors
Raghavendra Gadagkar Ph.D (IISc), FASc, FNA, FNASc
R Sukumar Ph.D (IISc)

Associate Professors
N V Joshi Ph.D (IISc), FASc
Renee M. Borges Ph.D (Florida)

Assistant Professors
Rohini Balakrishnan Ph.D (TIFR/Bombay University)
K. Praveen Karanth Ph.D (SUNY-Albany)
Kartik Shanker Ph.D (IISc)
Kavita Isvaran Ph.D.

Senior Scientific Officer
D M Bhat, Ph.D. (Karnataka)

Scientific Officer
T V Ramachandra Ph.D (IISc), FIE, FIEE (UK)

Technical Officer
Janardanan Pillai M.Sc.(Kerala)

Associate Faculty

Prof. Vidyanand Nanjundiah Ph.D. (Chicago), FASc (Also in DMRDG)
Prof. N H Ravindranath Ph.D. (IIT/B) (Also in ASTRA)