

Insect Biodiversity:

Functional Dynamics and Ecological Perspectives



Prof. T.N. Ananthakrishnan

Insect Biodiversity:

Functional dynamics and Ecological Perspectives

Prof. T.N. ANANTHAKRISHNAN

(Former Director, Zoological Survey of India, Calcutta, W.B.
& Ex-Founder Director, Entomology Research Institute, Chennai, T.N.)



Published by:

Tanay Sharma

Scientific Publishers (India)

5-A, New Pali Road, P.O. Box 91,

Jodhpur – 342 001 (India)

E-mail: info@scientificpub.com

www.scientificpub.com

© Ananthakrishnan, T.N., 2010

All rights reserved. No part of this publication or the information contained herein may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, by photocopying, recording or otherwise, without written prior permission from the editor and the publishers.

ISBN: 978-81-7233-641-7

eISBN: 978-93-8786-971-4

Lasertype set : Rajesh Ojha

Binding at: Rajasthan Law Book Binding Works, Jodhpur

Printed in India

"A greening of the human mind must precede the greening of the earth. A green mind is one that cares, saves and shares. These are qualities essential for conserving Biodiversity, now and for ever."

— M.S. Swaminathan, FRS

Preface

A knowledge of the ecological basis of biodiversity is an important element of paramount importance for the preservation of genetic diversity and sustainable utilisation. Preserving habitats as a means to protect threatened species, with such activities tending to lead to the acceleration of biodiversity becomes a useful criterion. All species deserve adequate recognition regardless of their utilitarian value, in view of their being components of our life support system. Species richness or the number of species at a site or habitat, be it an agroecosystem or a forest habitat is an essential criterion. It is in this connection that the present edited volume seeks to identify species diversity in a host of ecosystems with a view to assess the wealth of species, notably in agroecosystems, natural forest ecosystem, forest floor, beverage and spice crops, desert ecosystem and of vector insects. Needless to emphasize that the ecological resources and services are generated by the consistent interaction between organisms, population, community and their physical and chemical environment. Species diversity increases initially and then becomes stabilized or declines in later stages of ecosystem development. In recent years emphasis is laid on role of ecological scenario in the meaningful management of bioresources. An important area wherein biodiversity studies have been consistent, is the concern over the loss of forest ecosystems and resultant implication on biodiversity. The ecological and economic implication of these changes appear very relevant, notably forest loss and resultant effect on species composition and extinction. The chapters on social forestry and natural forestry add to our knowledge of biodiversity, besides the beverage and spice crops. The impact of temperature on biodiversity in such ecosystems as the hot desert and cold desert ecosystems further add to our existing knowledge of the ecological dimensions of biodiversity. Last but not least, the impact of closed ecosystems as occurring in plants galls provides an added dimension of ecosystems and the impact of gall diversity in insect biodiversity.

The diversity involved in environmental degradation with increasing conversions and alterations of habitats is of commonplace occurrence, although the establishment of plantations and secondary forests have compensated for the overall loss of biodiversity. Stability

in the structure and composition involving populations, communities and landscape needs to be assured. The decline of populations and directional change in composition is often used as a criterion in their conservation. "Loss of species and continued depletion of population with habitat simplification may eventually lead to the breakdown of ecological function, thereby causing ecosystem collapse". Therefore, the major challenge to biodiversity conservation is to sustain ecosystem functioning and maintain resilience of ecosystem to change".

The need for top quality taxonomic revision has never been greater than it is today, involving new ways to apply systematic knowledge to conservation problems. One cannot overlook the need for the application of systematics in the conservation of biodiversity. Survival of biodiversity is a prerequisite for the survival of the ecological and loss of living components in an ecosystem will lead to changes in the local environment. Needless to emphasize that development programmes should be planned and executed, taking into consideration their impact on biodiversity and to achieve their continued monitoring conservation of biodiversity is vital.

My sincere thanks are due to everyone of the authors of the different chapters whose expertise over the years has contributed to the realisation of the need for a better understanding of biodiversity and become aware of the complexities involved in the study of biodiversity.

Chennai
1-8-2009

T.N. Ananthakrishnan

Contents

Preface

v

1. Perspectives of Changing Biodiversity : Ecological and Economic Implications
— *T.N. Ananthakrishnan* 1
2. Biodiversity of ground surface dwelling arthropods in the moist forests of the Western Ghats
— *Sabu K. Thomas and Shiju T. Raj* 13
3. Biodiversity of Insects in Spice Crop Ecosystems
— *S. Devasahayam and T.K. Jacob* 31
4. Insect biodiversity in Beverage crops Ecosystems
— *N. Muraleedharan* 47
5. Biodiversity of Insect Biocontrol Agents
— *R.J. Rabindra, C.R. Ballal, S.K. Jalali and T. Venkatesan* 69
6. Ecological Impact and Biodiversity of Insect Pests of Teak
— *John Prasanth Jacob* 89
7. Ecological Interactions and Impact of Biodiversity of Insects in Social Forests
— *S. Murugesan and N. Senthilkumar* 107
8. Insect Biodiversity in Scrub Jungle Environment
— *R.W. Alexander Jesudasan* 127
9. Patterns of Adaptive Radiation and Diversification in Cecidogenous Insects
— *A. Raman* 153
10. Biodiversity and ecosystem level consequences in relation to Thrips-host interactions
— *T.N. Ananthakrishnan* 179

11.	Ecological Diversity and Insect Biodiversity in Cold Deserts in India	
	— <i>G. Thirumalai, Kailash Chandra and Avtar Kaur Sidhu</i>	199
12.	Insect functional dynamics in the unique xeric ecosystem of The Thar Desert, northwestern Rajasthan (India): Before and after the advent of Indira Gandhi Nahar Pariyojana	
	— <i>Dr. B.K. Tyagi</i>	211
13.	Epilogue	227