

**BIODIVERSITY OF  
RANTHAMBHORE TIGER RESERVE, RAJASTHAN**



# **BIODIVERSITY OF RANTHAMBHORE TIGER RESERVE, RAJASTHAN**

**V. SINGH  
A. K. SHRIVASTAVA**



**SCIENTIFIC PUBLISHERS (INDIA)**

**P. O. BOX 91**

**JODHPUR (INDIA)**

*Published by :*  
Pawan Kumar,  
Scientific Publishers (India),  
5-A, New Pali Road,  
P.O. Box No. 91,  
Jodhpur – 342 001  
E-mail: info@scientificpub.com  
www.scientificpub.com

© Authors, 2007

Date of Publication : June, 2007

All rights reserved. No Part of this work may be reproduced or utilized in any form or by any means, electronic or mechanical, or by information storage and retrieval system without prior written permission from the authors.

ISBN : 81-7233-492-3

eISBN : 978-93-87307-89-6

**Journal of Economic & Taxonomic Botany**  
**Additional series No. 29 (2007)**

Lasertype set: Rajesh Ojha  
Printed in India

## FOREWORD

Biodiversity refers to total variability within organisms and ecological complexes within which it exists. It is dynamic at genetic, species and ecosystem levels and constitutes resources upon which the present and future generations depend. It makes substantial contributions to the development of agriculture, medicine, industry etc. After Convention on Biological Diversity (CBD) at Rio de Janeiro in June, 1992, which was ratified by India on February 18<sup>th</sup>, 1994, each participating country of the convention has the responsibility to conserve, restore and sustainably use the biological resources within its jurisdiction to fulfill human needs.

For conservation and wise management of biological wealth, particularly protected areas, there has been a necessity to have correct and reliable knowledge about the flora, fauna and abiotic components of the ecosystem through inventurisation, documentation and monitoring. India has a network of protected areas through 86 National Parks, 488 Wildlife Sanctuaries, 13 Biosphere reserves, 7 World Heritage sites, 6 Ramsar sites and 29 Tiger Reserves, covering about 4.4 per cent of total landmass of the country. The State of Rajasthan harbours two National Parks (two under notification) and 25 Wildlife Sanctuaries. Ranthambhore National Park is one which was the former hunting ground of the Maharajas of Jaipur. In 1955, the area was declared as Sawai Mansingh Wildlife Sanctuary and subsequently in 1973 as a potential area under "Project Tiger". Again in 1980, the area was notified as National Park to sustain healthy Tiger population and other wildlife. In order to properly implement the conservation strategies and utilize the treasure of bioresources, there is a great necessity to understand the relationship of flora and fauna with each other and with the ecosystem. In the absence of such information, the management of protected areas can not produce desired results.

The present book on Biodiversity of Ranthambhore Tiger Reserve has filled the vital gap as it contains entire biodiversity information, viz. physical and chemical nature of soil and water, climatic conditions, geology and topography, socio-economic aspects of inhabitants, besides flora and fauna. The floral diversity, which is an initial point for flow of energy, has been described in details, providing keys for identification, correct nomenclature, local names, diagnostic descriptions, ecology, phytogeographical aspects to understand the migration of plant species and biological spectrum for phytoclimate. The authors have also assessed the bioperspective value to the Reserve. Under faunal diversity, the authors have made an attempt to document the existing vertebrates of the Reserve, interaction between flora and fauna and their interdependency. The study has resulted in sketching out a food web and flow of energy in the Reserve. Besides identification of threatened flora and fauna, causes of threats and conservation aspects have found special attention in the book. The authors have also made an attempt to illustrate the diurnal and seasonal migration of wildlife within the Reserve. To supplement the findings, several figures, photographs, tables, graphs, pie charts, maps etc have been appended in this book. I have great pleasure in writing the

foreword of such a comprehensive, profusely illustrated compendium which will be of immense value for Reserve managers, foresters, environmentalists, policy makers, planners and researchers.

I congratulate Dr. V. Singh and Dr. A.K. Shrivastava who have provided valuable information through this monumental work on internationally popular Tiger Reserve of India. It is hoped that the data presented in this volume will help in understanding the concept of biodiversity and its present and future sustainable use.



Date : 3<sup>rd</sup> January, 2007

R.N. Mehrotra

Principal Chief Conservator of Forests  
& Chief Wildlife Warden,  
Govt. of Rajasthan, Jaipur

## PREFACE

The biological resources offer diversified options for sustainable economic activity. The loss of biodiversity has serious economic and social impact on human race. It is well realized that due to some natural and unnatural factors, the biological resources of the earth are under varying degrees of threat. The Tiger populations have been most seriously threatened throughout the globe, inspite of having National Parks and Biosphere Reserves. In India also, the tiger is under severe crisis. The reasons for it are many, but poaching is most serious factor. There has been a large demand of skin and bone, particularly in Tibet for skin and China for bone which is used in medicines. However, in recent past China has shut all such activities. The professional wildlife traders place purchase order to professional hunters who kill the giant cat as many as possible. It has become evident in several seizure operations that killing of wild cat has become an international trade. During August, 2003, a person was arrested at Delhi with 400 kg tiger bones, 8 tiger skin and 38 leopard skins and so many other skins. Earlier in 1999, seizures of tiger skin and leopard skin was made in Ghaziabad (Khaga) and Haldwani. There have been several other instances to prove illegal killing of wildlife for trade, including in Rajasthan. The neglect and poaching had skewed the pitch against tigers, as a result, the entire Tiger population in Sariska Tiger Reserve has disappeared mainly due to poaching and to some extent due to imbalance in sex ratio, delayed rains and scarcity of prey because of migration of herbivores. It had not been the story of Sariska alone, in 1992 there had been a poaching wave in Ranthambhore National Park too, which is still going on resulting in reduction of tiger individual to 26 in 2005. Interestingly, this number of Tigers has been recorded in core zone, but non from buffer zone. The buffer zone of the Park has been facing great pressure for grazing and it is an open secret that Ranthambhore Tiger Reserve becomes a grazing ground in monsoon season for all local cattle.

Tigers need prey, water, some concealment and can tolerate some human proximity if they are not interfered or disturbed. Tigers are highly visible and identifiable at Ranthambhore than elsewhere, inspite that their number has been decreasing every year. The tiger can not be preserved in isolation, since it is an apex of large and complex biotype. Its habitat, shelter, availability of sufficient food and water, behaviour, association and threats need to be studied in the light of requirements of producers at different trophic levels and human and cattle populations residing within and surroundings of the Reserve. The Wildlife Protection Acts, Forests Acts and proposed National Wildlife Crime Bureau (decision of National Board of Wildlife, 17<sup>th</sup> March, 2005) can be effectively enforced only when protection of nature and wildlife are an article of faith to everybody.

Ranthambhore is one of the first Project Tiger areas in India declared in 1973 to ensure maintenance of viable population of tiger and to preserve, for all time, areas of biological importance as a national heritage for the benefit, education and enjoyment of the people. It is an unique ecosystem in its being a natural heritage of characteristic geomorphological, floral and faunal features, and at the same time

being a cultural heritage of significant archeological importance (Fort and other historical monuments). It is a classical example where the monuments are intermixed with wildlife; tiger and other wild fauna take shelter, mate, breed and die in these old monuments. In 1980, the area was notified as a National Park to sustain healthy Tiger population and populations of other permanent residents viz. Panther, Marsh Crocodiles, Hyenas, Jungle Cats, Sloth Bears, Sambar etc and avian fauna and other wildlife, besides rich plant diversity. Infact, it is a gene-pool for posterity and an ecological island of Indo-malayan realm. The biodiversity of such a globally known Tiger Reserve has not been studied so far in details. As such, the authorities involved in conservation of Reserve and tiger in particular fail to formulate strategies in scientific way due to lack of data. Keeping above in view, the present study was undertaken.

In the present work, the floral and faunal diversity (Vertebrates) have been documented. The flora of the Reserve comprises 539 species of higher plants belonging to 329 genera under 98 families. For easy determination of taxa, keys have been provided from family to infra-specific level. The nomenclature has been updated along with important synonyms relevant to the flora of India and Rajasthan in particular. Short diagnostic description, based on personal observations, has been provided along with phenological and ecological data for each species and infra-specific taxon. Local names have been given to make the work usable up to grass-root level.

Besides taxonomic information, the traditional knowledge of the inhabitants in and around the Reserve regarding various uses of plants, including medicinal, has also been documented to determine the economic potential of the Reserve. The phytogeographical assessment of the flora has been evaluated to understand the ratio of various phytogeographical elements and also their routes of migration. Biological spectrum of the flora has been analyzed to determine the phytoclimate of the area. Factors posing threat to biodiversity have been discussed and threatened taxa have been identified and classified as per IUCN criteria. The wild relatives of crop plants have been identified to determine the genetic potentiality of the Reserve for the improvement of crop/cultivated species. Some recent invasions of plants have been highlighted, besides endemics. Further, some conservation and management strategies have been offered for *in-situ* conservation in Tiger Reserve, based on personal experiences.

The faunal wealth of the Reserve has been documented with the help of Zoological Survey of India, Jodhpur, published literature and Forest authorities and officials of the Reserve. About 361 species belonging to 261 genera under 94 families (Vertebrates) have been enumerated. The fauna has been classified up to infra-specific level. Valid zoological names have been adopted and their local and/or English names have been provided. To understand the relationship and dependency of fauna on flora, observations on the behaviour of animals were taken, particularly for food and shelter. As a result of which it could be possible to classify the fauna on feeding habits, viz. carnivorous, insectivorous, scavenger, herbivorous etc. About 82 species of plants were recorded which are commonly relished by the wild fauna in the Reserve. Attempts have also been made to classify fauna of the Reserve based on their shelter needs. A food web has been draw to determine the flow of energy in the Reserve. Besides identification of threatened fauna and their categorization as per IUCN criteria, the factors responsible for the threat have also been identified and discussed.

To achieve the targets of present study, the abiotic components, besides geographical location and short history of the Reserve, the topography, geology and



soils, water resources and climatic data like rainfall, temperature, relative humidity, wind etc, which determine the biological composition and functioning of an ecosystem, have also been discussed. Up-to-date relevant literature has been reviewed. A number of photographs, illustrations, maps and diagrams have been appended to supplement the output of the study.

It is hoped that the work will be useful to environmentalists, botanists, researchers, policy makers, wildlife managers and wildlife watchers.

To complete the present study, we received ceaseless encouragement and suggestions from several people, for which we are grateful to them. To name a few, we express our gratitude to Shri P.J. Parmar, Dr. P.M. Padhye, Dr. R.P. Pandey and Dr. S.L. Meena of Botanical Survey of India, Jodhpur whose invaluable suggestions enabled us to accomplish our task successfully. The help of Dr. N.S. Rathore and his colleagues of Zoological Survey of India, Jodhpur deserves equal appreciation without which it would have not been possible for us to record the faunal diversity of the Reserve, we are thankful to them.

Our sincere appreciation is also extended to Dr. S.P. Bohra and Dr. N.S. Shekhawat, Department of Botany, Jai Narain Vyas University, Jodhpur for their help and suggestions. Shri S.K. Mishra, Ground Water Department, Jodhpur and Dr. G. Singh, Arid Forest Research Institute, Jodhpur deserve special thanks for analyzing soil and water chemistry.

It gives us a great pleasure to express our gratitude to the authorities of WWF-India, especially Mr. P.K. Sen, Director, Tiger & Wildlife Programme and Mr. Sudipto Chatterjee, Co-ordinator, Forest & Biodiversity Division for providing literature which proved to be a great boon in completion of the present work. Thanks are also extended to Shri F.S. Rathod, Ex-Field Director, RTR & Dr. S.P. Goyal and Somanta Bagchi, WII, Dehra Dun for identical co-operation.

The authorities and officials of the Reserve, especially Shri G.V. Reddy, Shri G. Bharadwaj, Shri K. Sudarson, Shri Satish Jain, Shri Mahaveer Sharma and Shri Satpal Jat, deserve special thanks for providing help in the field. The junior author expresses his sincere thanks to the authorities of MoEF, New Delhi for providing financial assistance.

We thank the staff of Botanical Survey of India, Jodhpur, especially Shri Khiv Ram and Shri R.S. Purohit, for help in field and preparation of illustrations respectively, Mrs. Monika Singh and Miss. Anita Bana for help in preparation of manuscript and Miss. Rinku Sharma for providing it in digital form.

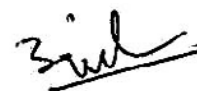
Lastly we thank Shri Dharmendra Khandel, Tiger Watch, Sawaimadhopur for sharing his observations and experiences on the wildlife behaviour in RTR and for some beautiful photographs.

Dated : 1.1.2007

Place : Jodhpur



V. Singh



A. K. Shrivastava



# CONTENTS

<i>Foreword</i>	V
<i>Preface</i>	VII
INTRODUCTION	1
JUSTIFICATION AND OBJECTIVES	2
GEOGRAPHICAL POSITION AND TOPOGRAPHY	4
GEOLOGY AND SOILS	6
WATER RESOURCES	9
CLIMATE	11
METHODOLOGY	13
FLORAL DIVERSITY	15
PRESENT STATUS OF KNOWLEDGE	25
VEGETATION TYPES	26
KEY TO THE FAMILIES	39
ENUMERATION OF SPECIES	45
FLORISTIC ANALYSIS AND IMPORTANT FINDINGS	269
PHYTOGEOGRAPHICAL ASPECTS	272
BIOLOGICAL SPECTRUM	273
THREATS TO BIODIVERSITY	279
CONSERVATION AND MANAGEMENT STRATEGIES	280
BIOPERSPECTIVE POTENTIAL	289
FAUNAL DIVERSITY	302
REVIEW OF LITERATURE	313
ENUMERATION OF SPECIES	315
VERTEBRATA	315
PISCES	315
AMPHIBIA	316
REPTILIA	317
AVES	320
MAMMALIA	327
STATISTICAL ANALYSIS OF FAUNA	333
PLANT-ANIMAL RELATIONSHIP	335
CONSERVATION AND MANAGEMENT	342
REFERENCES	346
INDEX TO THE ENGLISH AND LOCAL NAMES-FLORA	362
INDEX TO THE BOTANICAL NAMES	366
INDEX TO THE ENGLISH AND LOCAL NAMES-FAUNA	402
INDEX TO THE ZOOLOGICAL NAMES	407
INDEX TO THE PHOTOGRAPHS	413
INDEX TO THE ILLUSTRATIONS	415

