

Studies on certain aspects
of ECOLOGY and DEVELOPMENT
of *Rana limnocharis* Wiegmann

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Ph. D. Thesis

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MEGHALAYA - INDIA

1979

North-Eastern



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August 29, 1979

C E R T I F I C A T E

I, the undersigned, certify that this Thesis entitled "STUDIES ON CERTAIN ASPECTS OF ECOLOGY AND DEVELOPMENT OF RANA LIMNOCHARIS WIEGMANN" submitted by Mrs. Debjani Roy for the degree of Doctor of Philosophy of the North-Eastern Hill University, Shillong embodies the record of original investigation carried out by her under my supervision during the period 1975-79. She has been duly registered and the thesis presented is worthy of being considered for the award of Ph.D. degree. This work has not been submitted for any degree to any other University.

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ACKNOWLEDGEMENTS

It is a pleasure for me to express my thanks to all those who have helped me during the course of my research work.

Dr. Mahendra K. Khare, I take this opportunity to express my gratitude to you for guiding me for all these years to conduct my experiments, supervising my works and helping me in completing my thesis. It was your encouragement which helped me to overcome the difficulties during the course of this work.

Professor R. George Michael, I am deeply indebted to you for providing the laboratory facilities and giving me valuable critical suggestions during my scientific training and preparation of the thesis.

Faculty members of the Zoology Department, I gratefully acknowledge your cordial help and suggestions at various occasions.

Mr. S.K. Chanda (Zoological Survey of India, Eastern Regional Station, Shillong), I acknowledge your help for getting me acquainted with the technique of identification of the frogs of the North-Eastern Hill Regions and particularly Rana limnocharis Wiegmann.

Mr. P.K. Prabhakaran, my thanks are due to you for the varied help I received from you during my research work.

Mr. Anup Kumar Sahu, I express my grateful thanks to you for preparing the photostat copies and rendering other varied help to me from time to time.

Mr. Bijoy Das, I acknowledge your help in photography and Mr. Salil Roy Choudhury, I thank you for extending help in the drawings.

Mr. Khambor Tariang, I thank you very much for typing the thesis. Without your labour I could never have completed this work in time.

I express my indebtedness to the Council of Scientific and Industrial Research, New Delhi for awarding me Junior Research Fellowship which enabled me to undertake and complete the present thesis.

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Dated 27.8.79

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General Introduction

The group Amphibia comprising of toads, frogs and their congeners, is one of the largest living orders among the vertebrates. There are as many as 2,600 species belonging to 250 genera (Heusser, 1974) and these extend through all temperate and tropical lands except perpetually snow-capped mountains, waterless deserts and some islands of the Pacific. True frogs of the genus Rana Linnaeus are found all over North America, Central America, Northern part of South America, Europe, Asia, Africa except its frozen and desert areas and Northern Australia.

For reasons that hardly need enumeration here, frogs have constituted as one of the most favourable animal types for a wide range of biological studies for centuries; and indeed in the current age of standardization in every field, numerous biomedical research projects are being conducted with amphibians that are not standardized for any of the basic characters, such as age, source, nutrition, species, physiology, health or genetics (Nace, 1968) - evidently because of the facility with which these animals are subjected to experimentation.

Many astounding concepts of Developmental Biology to-day have come up as a result of studies on anurans and urodels. Frogs and toads have been used for demonstrating many fundamental concepts in animal physiology, tissue transplantation,

regeneration mechanisms in limb development and in medical studies by gynaecologists for pregnancy tests. And now with an increasing awareness of the value of frogs as food, they are considered as animals of considerable economic importance.

Frogs legs are now served as gourmet dishes in many parts of the world. To ensure the desired supply of frogs for this purpose, however, dependence on nature has to be supplemented with, if not replaced by, frog culture which has thus resumed great significance in recent times.

Priddy and Culley (1971) have reviewed the work on frog culture among recent endeavours. In 1968, at Louisiana State University in the United States of America, a research programme was initiated with N.I.H. which supports to the culture of Rana catesbiana, Shaw, Rana grylio Stejneger and Rana pipiens Schreber. Concurrently at the University of Michigan an amphibian facility was started to culture Rana pipiens and 22 other selected species of amphibians (Nace, 1968). Arizona State University have developed a management system for Ambystoma maxicanum Shaw and some other aquatic amphibians. At the Institute for the study of mind, drugs and behaviour at the Loyola University, Illinois, successful maintenance techniques for adult ranids, hylids and bufonids have been developed. In Japan, at the University of Hiroshima, ranids, hylids and discoglossids have been

successfully maintained. Attempts on frog culture have also been made in Italy, Austria and England.

Indian frog-legs have attained a good international market. In the past few years MPEDA (Marine Products Export Development Authority) have been exporting tons of frozen frog-legs. In 1978, they exported 3570 tons worth Rs. Rs. 8,42,51,000.00. Most of this export is dependent upon frogs collected from the natural resources. Besides severely disturbing the ecosystem, this practice would lead to rapid depletion of our frog resources in the country. Therefore, the need of developing efficient frog culture practices cannot be over emphasised. Although successful rearing of ranids, like Rana tigrina Daudin, Rana crassa Jerdon, Rana hexadactyla Lesson and Rana catesbiana Shaw, in frog/fish combination ponds has been reported by Central Inland Fisheries Research Institute, Barrackpore (Mondal, 1975); and work on the care and maintenance of certain Indian frog species has been undertaken at Utkal University (Mohanty-Hejmadi, 1974); we are still far from having evolved reliable methods of frog culture. It needs hardly be stated that for any such attempt in respect of any species, a knowledge of its biology and ecology must be known in detail.

In a preliminary investigation on survey of frogs in 1975-76 (Sahu, unpublished) Rana limnocharis Wiegmann, the

streaked frog, was found to be the commonest species available at Shillong and the neighbouring hills. It is used as a food item among certain tribal communities in the North-Eastern Hill States of India. It has also been reported to be used as food item in Korea (Heusser, 1974). It is with this view in background that investigations were undertaken to evolve suitable breeding and culture techniques of this frog. Thus, the following aspects of the development and ecology of Rana limnocharis relevant in this context, have been investigated in the present work : (1) Morphological characters and annual cycle. (2) Normal Table of development. (3) A 12-month analysis of the food and feeding habits. (4) Pituitary - gonadal cycle comprising the study of cytological changes in the pituitary gland and gonads through an annual cycle. (5) Induced Breeding and (6) Certain ecological aspects such as spawn size, fertility ratio, survival and mortality and influence of limiting temperature on embryonic and post-embryonic development. It is hoped that studies on these aspects on Rana limnocharis Wiegmann will ultimately help in formulating a technology for the maintenance and mass culture of this species.

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