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DATE: 10/7/88

MEMORANDUM

TO: AID/PPC/CDIE/DI, room 209 SA-18

FROM: AID/SCI, Victoria Ose

SUBJECT: Transmittal of AID/SCI Progress Report(s)

Attached for permanent retention/proper disposition is the following:

AID/SCI Progress Report No. 3. E. 30
Proj act. w/ interim reports
Dev Report (Interim)
Tech R - Jan 1 - 6/30/87
" R - 6/30 - 12/31/85

Attachment
Dist. R - 7/1 - 12/30/87

+ other

GENERAL REPORT

PROPAGATION OF MAHSEERS IN HIMALAYAN WATER OF NEPAL

INNOVATIVE SCIENTIFIC PROGRAM (ISRP)
PROJECT NO (3E - 30)

Interim Report

By
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In Collaboration With:

Tribhuvan University
Kathmandu, Nepal and
University of Arkansas and
US Fish and Wildlife Service

Endorsement by

Department of Wildlife Conservation
Principal Private Secretariat
Royal Palace Kathmandu (NEPAL)

Funded by US Agency for International Development,
Washington, D.C.

PROPAGATION OF MAHSEERS IN HIMALAYAN WATER OF NEPAL – GENERAL REPORT

INTRODUCTION

In the past two decades, great attention was paid to the study of the biology of mahseers. Now the study of ecology of behaviour of mahseer is considered very crucial for the management of species in wild and captivity. In order to achieve this coveted goal, the Trisuli river, Tadi river and impoundments (Gadkhar fish farm, Trisuli reservoir and Balaju recreational fish ponds) were selected for routine studies. Such an innovative study in nature and captivity will be helpful to develop methodology and technology for the management of mahseer brood stocks, artificial spawning rearing of fry and fingerling and propagation in natural waters. With this aim in view, this "Mahseer's Ecology Project" was started with the financial support from U.S. Agency for International Development Cooperation, Washington D.C., and in Collaboration with the University of Arkansas and U.S. Fish and Wildlife Service.

CAMP FACILITIES

In the upper stretches of the Trisuli river, camp facilities are located near Batrawati, Trisuli Bazar (town), Trisuli fish farm, Gadkhar fish farm and Kharani Tar Anaap Raha village. There are guest houses, Panchayat buildings, cooperative housing facilities available for researchers at different sections of Trisuli and Tadi river. In lower stretches of the Trisuli river lodging facilities are available near Malekhu, Benighat and Mugling area.

FIELD ACTIVITIES

There are well-trained professional fishermen who have been capturing mahseers and other game fishes from Trisuli river. Besides these there are fishermen and boatmen who are helpful in capturing brood stocks of mahseer from the river. for trapping upstreaming juvenile mahseers a barrier traps were set across the Tadi river. Trapped juvenile mahseers measining 10 to 15 cm were stocked in adjacent Royal Gadhar ponds. Mahseers measuring above 25 cm were fin clipped and tagged and relased back to the Tadi river. Visits of Mr. B.B. Shah, Deputy Secretary of Department of Wildlife Conservation, Royal Palace, and Mr. R.B. Thapa, Additional Secretary, Ministry of Agriculture were organised to demonstrate field activities. field sites of Trisuli river was also visited by Mr. Mahesh Kumar Upadhaya, Vice-chancellor, Tribhuvan University. also Miss. Anjali Sherchan, Project Officer USAID, Kathmandu also made visit to Royal Gadkar Farm.

PROBLEM ENCOUNTERED

Field work was actually started from June 1985. Initial phase of the field work from April to July, become troublesome due to late budget arrival, Principal investigator had to spend his personal money to support field work and transportation of equipments and travel expenses etc. In the year 1986 the budget condition ws better improved.

ASSISTANTSHIPS

I initiated field work with co-investigator Mr. Kanti Bhadur Karki, Senior fisheries officer HMG. Fish section. Three personnels Messer S. Khampa, Binod Maheseth and Mahendra Nakarmi with advanced Training in biology were chosen for the field programme and they have demonstrated that this aspect of project has been a great success both for themselves and to the advancement of the research objectives. Two more assistantships has been created in 1987 in order to assist in carrying out study of environmental parameter of the mahseer habitat, spawning ground, life history stages and artifical breeding. After field training of about one month, conducted in February, 1986, the research associates began actual fin clipping, tagging and fish transporting work Mahseer brood stock caught from Trisuli river were transferred to Kathmandu fish ponds using MS 222 as an anesthetic.

REFERENCE MATERIAL & EQUIPMENT

Essential reference materials such as nets, fish enclosures, aquaria were purchased during the period. Reprints or photocopies of important papers published in India, Pakistan and Bangladesh U.S. and U.K. made through Indian Documentation Centre, New Delhi.

Principal investigator visited U.S. under PSTC grants of USAID, in April - 1986 which helped him greatly to be fully faimilar with cold water fishery management and hatchery system in U.S. This opportunity helped him to establish effective contacts with many U.S. fishery scientists in Washington, Arkansas, Missouri, Montana, Seattle. While in United States, the principal investigator gave seminar on "Conservation and Management of the Himalayan Mahweer (Tor putitora) - A mountain river game fish, in the University of Arkansas, Montans State University at Bozeman, University of Montana at Missoula. Lively discussions after seminars and face to face contacts with fish experts gave the investigator better insign about the improvement of his current research and new idea about future research. I made coumputer search of recent literature with my Advisor Professer Douglas A. James and Robert Jenkins, and became fully armed with knowledge about cold water fishery management in United States. This visit has stimulating to the investigatór professionally, and has been a year of major accomplishment as may be seen in the attached recent bibliography.

Also, I had opportunity to be familiar with field techniques used in migratory fishery research in the University Montana state University. Portable field equipments supplies and field tags shipped from U.S. to Nepal helped greatly for the advancement of mahaseer research. Recently, the principal in investigator received assurance from US Agency of International Development Washington for second visit to U.S. The second visit of the principal investigator to U.S. is connected with original PSTC grant as well as his future research program on "Ranching mahseer in the Himalayan Waters of Nepal". The investigator is grateful

to USAID for this kind consideration given to him for the furtherance of his research program.

RESEARCH RESULT TRANSMISSION IN INTERNATIONAL MEETING

For rapid transmission of research result and interaction from scientists effort being made to present research results in the international gathering. One of the paper entitled Spawning Ecology and Behaviour of the Himalayan Mahseer was presented in the First Asian Forum 1986, held in Manila Philippines. Thanks to USAID, Nepal for permission to publish the paper. A monograph on "Artificial Himalayan Mahseer Spawning" was also published in 1986. Next paper on Induced spawning of Himalayan Mahseer, has been appeared in the Bulletion of Zoological Society of Nepal in 1987. Recently, a paper entitled "Artificial habitat technology for the Mitigation of Reproductive Needs of the Mahseer" has been forwarded to an International Conference on Artificial Fish Habitat Management to be held in Florida in Nov. 1987.

SPAWNING ECOLOGY OF THE HIMALAYAN MAHSEER - A TECHNICAL REPORT

INTRODUCTION

Propagation of the declining Mahseer, the superior game fish of Nepal is a demanding task. It is a task that requires a foundation of sound quantitative data regarding its habitat needs, breeding success, and critical stages of life history, migration and spawning. Data and information on these aspects do not exist in sufficient precision in Nepal. The goal of the present interim report is to provide information about mahseer breeding needs and life history and artificial spawning.

LITERATURE REVIEW

Mahseer as a premier game fish has intrigued naturalists and anglers from centuries. Macdonald (1948) gave a vivid account of its game value. Khan (1939) studied its sex organs. Hora (1940) studied taxonomy of mahseer of India. Ahamad (1948) studied spawning habits of copper mahseer of India. Desai (1972) studied problem of Mahseer conservation in India. Shrestha (1981) highlighted the need and opportunity of the mahseer research for its propagation in Nepal. He described the declining trend of mahseer fishery in Himalayan waters of Nepal.

BACKGROUND OF INFORMATION

Hill people of Nepal named mahseer 'Sahar', the leaper, when they first saw it displaying great sport. anglers call it the 'king' of mountain gamefish, an accolade described of ancient art and literature of Nepal. Those who have fished them for food, trade and profit - from prehistoric times to the present - have always respected the pride of the place they command in Nepalese courts. It is not surprising that for the descendants of the native inhabitants on this side of the river Ganga, Mahseer continues to possess a cultural significance which, in the light of present circumstances, may not be far removed from what may once again reappear in modern form.

It is thanks to their resilience that the mahseer or Himalayan salmon has continued its symbiotic relationship with man as well as they have. It has been competitively overexploited; its natural habitat savaged, and much of it has been lost, and they are now identified as an ideal candidate for domestication, to be caged and cultured to provide premium food for the table. But in conjunction with the growing mountain population and undiminished angler interest, mere maintenance and survival on the current cutting edge of these kind of use and challenge is not enough. This is particularly so in the light of the choices to be made regarding the fundamental changes now shaping the future of the Himalayan salmon.

MAJOR FINDINGS

The field work focused upon a determination of the environmental and biological requirements for mahseer reproduction was completed. It was expected that once these requirements were known they could be developed in Nepal's cold water impoundments in order to establish a fishery. This appears feasible, but it is not as simple and straightforward as I had originally hoped.

I have discovered that mahseer have demanding spawning requirements. Spawning triggers include maturity, water temperature, and even moon phase. It might be possible to substitute some of these triggers with hormones, but these fish also have very specific spawning site requirements. these include water temperature, oxygen content, velocity, gravel size, and depth. for example, water velocity must be fast enough to remove silt, and in eddy (not laminar) flow. Gravel size appears to stimulate a visual trigger. Gravel must be uniform in size, just large enough to "craddle" the eggs, provide a good flow of oxygenated water, but still allow the egg to remain nestled in the gravel. Unfortunately these characteristics are never found in existing impoundments of Royal Gadkhar farm. Next year, I plan to make more intensive study of spawning triggers and cues on.systematic effect of hormone on mahseer.

Mahseer will grow to maturity reaching large sizes in impoundments. I have raised them at one of my experiment stations in Trisuli to 15 kg. Even though these fish develop eggs and milt they will not release it in the ponds. Even fish spawning in the adjacent river will not continue to release spawn in the pond. I have carried out a successful induced breeding experiments which demonstrates clearly possibility of agumenting the depleted population of mahseer by using carp pituitary as inducer.

I have also discovered that mahseer are migratory and that they move from Narayani rivers to spawning sites in small feeder streams located at Trisuli and Tadi river. However, nothing else is known of their migratory behavior. I have studied ecological aspect of life history mahseer and determined precisely ecological requirement of the species in wild. I did experiments in Tadi river. I detected successful return of 25 tagged fish among 50 tagged ones.

Siltation of river bed make less congenial to advanced stages of hatchlings a fries in river bed. Hatchery bred fries were transported to the impoundments of the Kathmandu (Balaju, Gokarna and Kulaekhani). For transportation oxygen packed plastic bags half filled with water were successfully used. Adult fish were tranquilized with MS222 for transports.

REPRODUCTIVE SCHEME FOR LARGE IMPOUNDMENTS

Dams both block mahseer migration and destroy their natural spawning channels. Although I have been aware that dam construction severely affects fish populations, it was not until my visit to the U.S. that

I became aware of the enormous research and results that have been accomplished in the U.S. to mitigate the effect of dams. Upon my return to Nepal, I began to study the feasibility of developing artificial mahseer spawning channels, and now believe this is not only feasible, but the only way in which mahseer fisheries can be established behind impoundments. I have proposed this concept to officials in Nepal and received support from them. But I must obtain additional information from U.S. experts concerning the scheme against which to test and modify my ideas. I also want to obtain enough information from my second visit to be sufficiently conversant with engineers that the incorporation of fish ladders and alternative channels can be considered for the Marsyandi dam project now under construction, and the Chisipani dam planned for construction in 1992.

FUTURE HIGHLIGHTS

More information is also needed about the migratory behavior of mahseer. Migratory signals, homing cues, habitat preference at different life stages, migration routes, are all topics that must be examined in order to develop a sound management plan, including fish ladder construction. These aspects are not included in the original Mahseer Proposal. I plan to study them in future if my new proposal "Ranching Mahseer" be funded by USAID.