Perception on Fishermen's Fish Diversity and Its Conservation in Rudrasagar Lake, Tripura

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ABSTRACT

Rudrasagar lake is a low land deep and extensive lake/wetland in the Tripura. Rudrasagar Lake is declared as National Lake No. 13 and also it is declared as an International Lake numbered 1572 as a Ramsar site. However, the lake at present is under threat from a variety of human induced changes to their hydrology. The lake is abundant in commercially important freshwater fish species. The families of around two thousand fishers around the lake have been facing a threat in livelihood as the lake is dying. Keeping in view the background the study was conducted to know the perception of the fishers about fish bio diversity and its conservation in the lake. Thus, altogether 140 fishers and twenty local fish traders in the vicinity of the lake were interviewed. A total of 70 fish species were reported by the fishers during the study. It was found that majority of the respondents (92.59% of active fishers, 83.72% of seasonal fishers and 90% of local fish traders) felt that the availability of the fishes in the lake have decreased drastically during last 15-20 years. Most of the respondents expressed that lack of water of the lake due to siltation and reduction in the flow of water through the major three streams and the lack of regulation to control the pollution over lake coupled with lack of sustainable fishery enhancement measures by the government departments are the major reasons for decline of fishery resources in the lake. In conclusion it can be stated that the fisheries manager need to be very creative and innovative to manage the resources. The community of fishers and the government, through a co-management arrangement will need to work together to save the glory of the lake as well as to secure the livelihood of the fishers' depending on the lake for their livelihood.

Key words- *Fishers; Livelihood; Fish bio diversity; Conservation; Wet land;*

Wetlands play vital role in ensuring fish production and livelihood security of the fishers depends on the lake. In Tripura, fishing is one of the important economic activities in rural areas and supports the livelihood of 73,264 fishermen population (*Anonymous, 2002*). The state is blessed by Lake i.e. 'Rudrasagar' covering 365.61 ha water area with annual fish production of 41,683kg (2006-07) (*Upadhyay and Singh, 2010*). According to the Annual Report (2005-2006) of Ministry of Environment and Forest Govt. of India, Rudrasagar Lake is listed in the list of wetlands identified under national wetland conservation programme and was mentioned in the list of wetlands of international importance under Ramsar Convention. The lake is abundant in commercially important freshwater fishes like *Botia* spp, *Notopterus chitala*, *Mystus* spp., *Ompok pabda*, *Labeo bata*, *Mystus aor*, *Wallago attu*, *Heterophneutes fossilis* and freshwater scampi, with annual production of 26 metric-tons, and an ideal habitat for IUCN Red listed three-striped Roof Turtle Kachuga dhongka. Apart from these species other important fish species are: *Puntius sophore*, *Esomus danrica*, *Chanda ranga*, *Nandus nandus*, *Anabus testudeneus*, *Colisa fasciatus*, *Notopterus notopterus*, *Cirrhinus reba*, *Mastacembelus pancalus*, *Channa punctata*,, *Macrognathus siamensis*, *Gudusia chapra*, *Cylonia* spp, *Labeo rohita*, *Mystus gulio*, *Ompak pabda*, *Channa marulius* etc. (*Ramsar Convention of Wetland, 2005*). Fishing and other activities in this Lake are solely monitored by Rudrasagar Fishermen Cooperative Society which earns around Rs. 13 Lakh annually from it. Altogether, 1996 fishermen families belonging to 15 fishermen villages are earning their livelihood through fishing in this lake (*Upadhyay and Singh, 2010*). But presently, the condition of the lake is very disappointing

and pathetic with the observation of turbid water, excessive growth of algal blooms and water hyacinth, dumped garbage, construction material in the bank of the lake and so on. It happened due to the increased growth of population, en-masse settlement in the catchmemt area accelerated the pace of degradation and decimation leading to soil erosion and consequent effects on siltation. The discharge of domestic and industrial sewage, runoff from livestock feedlots and pastures, agricultural run-offs as fertilizers, insecticides and habitat construction which slowly fills in the water body with sediments and organic matter and finally makes the ecosystem unhealthy to live for diversity of flora and fauna of the lake (*Deka, 2011*). Aquatic weeds are composed of rare marginal-floating-emergent-submerged weeds. Lands are owned by the state with perennial water areas leased out to the subsistent fishermens' cooperative, and surrounding seasonal waterbodies are cultivated for paddy. Main threats are increasing silt loads due to deforestation, expansion of agricultural land and intensive farming and land conversion for population pressure.(*Ramsar Convention of Wetland, 2005*). The Rudrasagar Lake has now shrunk to around 100.46 hectares due to encroachments and is turning into a paddy field. With pollution levels rising and threatening the ecological balance of the region, the families of around two thousand fishers around the lake have been facing a threat in livelihood as the lake is dying.

During the past few decades there has been a global shift in approach to fisheries management to one that recognizes the importance of fishers' participation and shared decision-making in the management of fisheries. Local communities will need to take more responsibility for solving local problems. In order to do this, however, communities must be empowered and resources provided to make decisions locally and to take actions that meet local opportunities and problems. Keeping this background in mind, the study was conducted to investigate fishers' perception on fish bio diversity and its conservation in Rudrasagar lake.

METHODOLOGY

The *ex post facto* research design is resorted in the study under cross sectional approach. From 15 fisher's villages, which are mainly dependent on fishing in Rudrasagar Lake, 7 villages were randomly selected by using simple random sampling method. Then twenty fishers were selected randomly from each village. Thus, altogether 140 fishes were included for the study. Along with this, 20 local fish traders were identified with the help of simple random sampling method. Keeping in view the objectives of the study and the variables to be measured, an interview schedule was developed. Apart from information on the socio-personal characteristics of the respondents, proper open and closed ended questions were formed to study the perception of the fishers on fish bio diversity and its conservation. The final data was collected from the individual fishers through observation and personal interview with the help of structured interview schedule, keeping in view the objective and variables. Before finally administering, the entire schedule was pre-tested in the field on a separate sample of fishers household. On the basis of pre-test, necessary additions, deletions and alterations were made in the schedule.

RESULTS AND DISCUSSION

Profile of the fishers: The results presented in Table 1 revealed that most of the respondents (47%) were aged between 35-50 years. around 53.57 per cent fishers were found to have an experience more than 20 years in fishing. Another 30 per cent fishers reported an experience between 10-20 years. Most of the fishers (41.43%) of the selected area did schooling upto primary level. Around 11.43 per cent of the fishers were illiterate. Only small portion of them can sign only (10%). Some are educated till secondary level (12.86%). Data in Table 1 also represents that around 60 per cent of the fishers had medium income level between Rs. 8,000 to Rs. 57, 000/- from fish sale per annum. Around 19 per cent of the fishers had low income up to Rs. 7,100/- annually from fish sale. Although non-fishing activities (e.g. agriculture, livestock rearing, non farm and off farm) often supplement their fishing income.

Category of fishers: A large number of fishers are engaged in fish catching in Rudrasagar lake throughout the year. They are depended on fishing as a source of income and nutrition with different abilities and motivations. The distributions of fishers by category over the seasons observed in the study area are shown in Table 2. Professional fishers/Active fishers, who depend on fishing almost year-round for their livelihood comprised 38.57 per cent whereas, seasonal fishers who

Table 1. Demographic characteristics of the respondents

Respondents characteristics		No.	%
Age	Late adolescence (18-35 years)	22	15.71
	Early adulthood (35-50 years)	65	46.43
	Late adulthood (>50 years)	53	37.86
Experience in fishing			
	Least (upto 10 years)	23	16.43
	Medium (10-20 years)	42	30
	High (more than 10 years)	75	53.57
Annual income from fishing			
	Low (1000-7100)	27	19.28
	Medium (8000-57000)	84	60.00
	High (more than 57500)	29	20.72
Education			
	Illiterate	16	11.43
	Capable to sign only	15	10.71
	Primary	58	41.43
	Secondary	18	12.86
	High School	8	05.71
	Graduate and above	5	03.57

Table 2. Distribution of Fishers as per their Nature of Fishing

Nature of fishers	No.	%
Active fishers	54	38.57
Seasonal fishers	86	61.43

only fishing during a part of the year as income earning comprises 61.43 per cent of the total sample studied. *Perception of fish diversity and its conservation:* Perception of fishers and local fish traders was sought about the status of fish germplasm resources over last 15 years in the lake. Reasons perceived by the respondents for declining of fish biodiversity in these water bodies were also documented along with the measures suggested by the people for conservation of fish germplasm resources in the concerned water bodies and presented in the Table 3.

A total of 70 fish species were identified as perceived by the fishers during the study. An overwhelming majority of the respondents felt that the availability of the fishes in the lake have decreased drastically during last 15-20 years (Table 3). They also reported that diversity of fishes caught and their average sizes have also decreased. Some of the important commercial fish species like *Glossgobious giures, Clarius batrachus, Wallago Attu, Mystus Aor, Chitala chitala, Tetrodon cutcutia, Eutropiichthys vacha, Ailia coila, Puntius sarana, Chanda nama,*

Table 3. Fisher's and Fish Traders Perception about Status of Fish Germplasm Resources

Perception	Active Fishers (54)	Seasonal fishers (86)	Local fish traders (20)
About availability			
Increased	0(0)	00 (0)	00 (0)
Decreased	50 (92.59)	72 (83.72)	18 (90.00)
No Change	03 (5.56)	10 (11.63)	02 (10.00)
Can's say	01 (1.85)	04 (4.65)	00 (0)
About diversity			
Increased	00 (0)	00 (0)	00 (0)
Decreased	42 (77.78)	80 (93.03)	19 (95.00)
No Change	00 (0)	01 (01.16)	00 (0.00)
Can's say	12 (22.22)	05 (05.81)	01 (0.50)
About size of the fishes			
Increased	00 (0)	00 (0)	00 (0)
Decreased	54 (100)	82 (95.35)	20 (100)
No Change	00 (0)	00 (0)	00 (0.00)
Can's say	00 (0)	04 (04.65)	00 (0.00)

Barilius barna, Amphinous cuchia are rarely caught now as compared to 10-20 years back. The fish species like *Botia daris and Chaka chaka, Xenentodon cancila, Badis badis, Osteobram cotoio, Tor tor, Silonia silondia and Barilius barila* were not found at all during last couple of years as reported by fishers and fish traders. The fishers opined that they were facing difficulties in earning and sustaining a livelihood from fishing in the lake. Several families from traditional fishing community have left fishing in search of an adequate livelihood in other sectors like daily wage labourer, trading and migration to cities for employment. Fishers were aware of not only the decline of fishery resources, but also its causes, as well as, a few of the remedies. However, they are too occupied with earning a bare minimum livelihood amidst the declining fish catches, to undertake any resource enhancement or conservation measures. There was some realisation that the fish resource is a fragile and limited resource, can be deducted from the concern for the future of fishing activities, especially amongst the seasonal fishers. The attitude on and the practice of consulting the government fisheries officials and applying government regulations is rather negative and calls for concern.

Reasons for decline in fishery resources: Major causes of this decline in fishery resources perceived by the people are presented in Table 4. An overwhelming

majority of the respondents expressed that lack of water of the lake due to siltation and reduction in the flow of water through the major three streams and the lack of regulation to control the pollution over lake coupled with lack of sustainable fishery enhancement measures by the government departments are the major reasons for decline of fishery resources in the lake. The respondent also reported use of small mesh sized nets by poachers and use of insecticides by the people practicesing agriculture in the bank of the lake. Pollution of river water caused by several manmade causes was also perceived as a reason for decline in fish diversity by half of the respondents.

Table 4. Perceived Reasons for Declining of Fishery Resources in the Rudrasagar lake

Reasons	RBQ	Rank
Lack of water in the lake due to siltation	74.86	I
Use of small mesh size nets and irresponsible fisheries	45.54	IV
Pollution from agricultural run-off, heavy metals and sweage	51.89	III
Heavy metals deposition due to immersion of idols and brick kiln industries	24.70	VII
Pollution due to tourism at Nirmahal	16.30	VIII
Reduction in the flow of water through the major three streams	64.81	II
Application of poison (illegal way of fishing) by the local people in the streams which are carrying the water in the lakes.	34.50	VI
Over fishing and lack of regulations	42.20	V

Table 5. Measures Suggested by the Fishers for Conservation of Fishery Resources in the Lake (N=140)

Reasons	Perceived by fishers
Fishery enhancement measures by the Govt. Depts.	95 (67.86%)
Control measures by the concerned org. to stop water pollution of the lake.	87 (62.14%)
Creation of awareness among the fishermen towards conservation measures.	63 (45%)
More transference and efficient activities of the cooperatives.	59 (42.14%)

Measures suggested by the people for fish conservation: The people suggested a few measures, which in their view, could be taken for conservation of fishery resources in the lake (Table 5). An overwhelming majority of the respondent opined that the government department should undertake fishery enhancement measures in the lake. People, particularly the fishers, were of the view that poor fishers who are finding it hard to earn livelihood by fishing can not do much on our own for conservation of fishery resources. The fishers emphasized that more transference and efficient activities of the cooperatives are required to conserve the fisheries resource based. This would enhance their income and they will be able to care more for the sustainable utilization of the fishery resources. The people also wanted control measures to be undertaken by the government department to stop water pollution in the lake. People also felt the need to create awareness among the fishermen for sustainable utilization and conservation of fishery resources.

CONCLUSION

The lake is rich in its fisheries biodiversity but due to environmental degradation and human disturbance some common species become eroded from the wetland, which indicate gradual decline of fisheries biodiversity. Fish sanctuary may be developed to conserve the species. Fish sanctuary means to establish and maintain a particular demarcated protected area in the water body as a permanent shelter for the protection of fish for natural propagation, where targeted fish will not be disturbed or captured. Establishing of aquatic sanctuary is one of the effective tools for conserving fish stock, preserving biodiversity and increasing fish production. In some cases restoration as well as conservation of habitat may be possible by establishing aquatic sanctuary. Fisheries congregate in the sanctuaries for shelter, lead peaceful life without any disturbance and can move independently towards the feeding and breeding grounds. Therefore, impact of fish sanctuaries might be positive in almost all cases of fish production, biodiversity and socio-economic condition of the fishing community.

Pollution alters the natural habitat. Water pollution especially injurious to the biotic components of aquatic ecosystem. Agricultural runoff, oil spillage from mechanized boat, human waste, domestic garbage is the main causes of water pollution of the Lake. Toxic waste entering the water bodies, disturb the food chain and so the aquatic ecosystem. Insecticides, pesticides, sulfur and nitrogen oxide affects adversely the aquatic biodiversity. Pollution of river water coming through three

perennial streams: the Noacherra, Durlavanarayacherra and Kemtalicherra in the lake is the threat to the ecosystem of the Rudrasagar Lake and it is one of the main causes of losing fisheries biodiversity. Public awareness especially fishers and streamside people should be developed on pollution control and fisheries biodiversity enhancement.

Fishing gears is an important topic in case of fishing because fishing intensity and catch composition depends on fishing gears. In studied area, 07 different types of fishing gears were found to operate in the lake. Improper fishing caused reduction of fish species from the water body, barrier to proper growth and development of the fishes. Awareness programme on the proper and sustainable use of different type of fishing gears is utmost important.

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