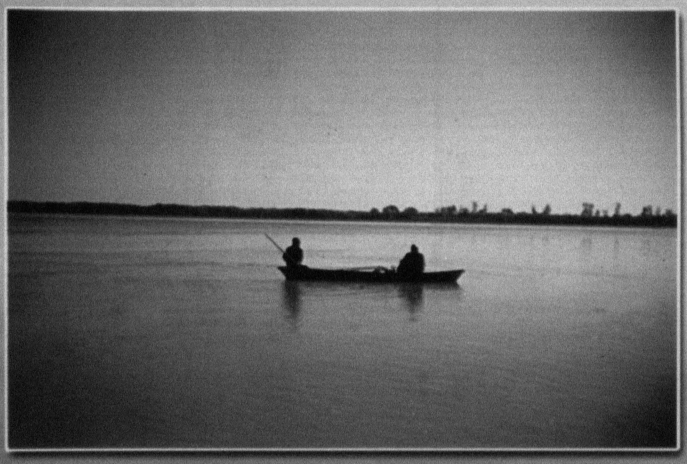
ROPAR WETLAND



Central Inland Fisheries Research Institute
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Foreword

In Punjab there are mainly three artificial lakes on river Sutlej i.e. Nangal, Ropar and Harike. These lakes are created due to erection of barrage for diverting the river water into irrigation canals of these. Of these the lakes at Ropar and Harike form a part of respective Wetland system.

Ropar Wetland spread over an area of 1365 hectare is an important ecological resource mainly of fishery, but the problem of siltation and industrial pollution are becoming responsible for its degradation. So in order to manage this Wetland properly especially the fishery, it was felt imperative to know its ecological and fishery status. A survey work on the "Evaluation of ecological and fish community structure of river Sutlej" was undertaken by the Scientists of Karnal Centre of CIFRI. Ropar Wetland formed the part of the project work. This document summarises the ecological, biological and fishery status of Wetland carried over 3 years from 1999-2002.

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The Scientists also acknowledge the help rendered by Irrigation department, Ropar in providing the water-availability data at Ropar Head Works. Co-operation and facilities extended by Director, Punjab Fisheries and his staff specially Mr. G.S. Dogra, C.E.O., Ropar are highly appreciated. Thanks are due to Mr. Paras Bhatia, for printing the document.

1. INTRODUCTION

Ropar wet land situated in Roopnagar district of Punjab is a man made water body which came into existence in 1952 due to construction of barrage on river Sutlej for utilization of river resources for irrigation purpose. Existence of barrage caused accumulation of Sutlej water in the shape of lake covering an area of 800 hectares. A few shallow water features along both sides of river also got encompassed resulting in wetland area of 1365 ha. Ropar Head Works region at the foot hills of Shiwalik Himalayas was notified as a wetland by the Punjab Government in 1991. It is one of the 3 wetlands of National importance within the state.

Ropar wetland is spread over as approximate area of 1365 ha located at 30-58'N latitude and 75-32' E longitude, has a depth range of 0.5 to 6 meters. The wetland includes a small forest area of 30 hectare, which comprise 18 tree species, undergrowth comprising 14 species of bushes and grasses. The forest and lake attract and are home to many wild birds which have been check listed numbering 154 species' Mammals such as Wild boar, Jackal, Ware, Mongoose and jungle cat also frequent the wetland area (Govt. of Punjab). The water quality index (WOI) has been assessed between 80-99 designated as mildly polluted by Bath *et al.* (1998).

2. ANTHROPOGENIC ACTIVITY AROUND THE WETLAND

The Wetland is surrounded by agricultural fields on all sides, one bank has sparse population, but other bank has i) Super thermal plant ii) Ambuja cement factory and large township. Fertilizer and pesticide run off from the fields, municipal effluents of township and wash off from cement plant have direct assess to this wetland, but water discharge and settled Ash ponds of thermal plant do not have direct assess, instead water is discharged into a seasonal tributary-Sirsa and ash ponds are also situated along its banks. The tributary joins main wetland 2-3 km down of thermal plant

In addition the wetland receives discharge from 3 big factories i) National Fertilizer Ltd. (NFL) ii) Punjab National Fertilizer iii) Punjab Alkalies and chemicals (PACL) situated at Nangal some 40 km above. The unlined fly ash ponds at Nangal lie very close to river resulting in leeching of trace elements.

3. WETLAND ECOSYSTEM

Wetland ecosystem was monitored by measuring i) Soil and water quality. ii) Biotic communities, presence and composition at such a location which is subjected to cumulative effect of all above mentioned effluents and also assimilation impact of river system due to continuous water flow. Location taken up was beside Kateli fish farm (Fig. 1).

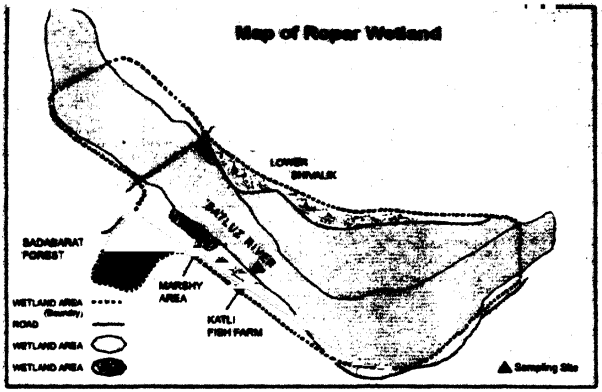
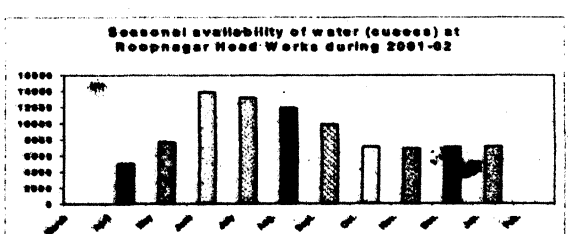


FIG. 1

Observations were taken for a period of 3 years from 1999-2002 on seasonal basis (Pre, post-monsoon and winter)

3.1 Availability of water at Ropar Head Works

Ropar Wetland till now has substantial flow of water (Fig. 2) except in summer. The richness of aqua resources diminishes the impact of heavy industrial pollutants.



Source – Irrigation Department, Ropar Head Works, Punjab

3.2 Soil quality

Table 1. Seasonal fluctuations in soil characteristics of Ropar Wetland (1999-2002)

Parameters	Seasons		
	Pre-monsoon	Post-monsoon	Winter
SOIL TEXTURE			
Sand (%)	49.10	57.60	54.70
Silt (%)	30.2	28.3	30.6
Clay (%)	20.7	14.1	15.1
CHARACTERISTICS			
pH	7.80	7.80	7.70
Organic carbon (%)	0.42	0.43	0.58
Free calcium carbonate (%)	5.20	5.58	5.50
Available nitrogen (mg/100g)	21.56	18.11	18.48
Available phosphorus (mg/100g)	1.21	1.23	0.87
Specific conductance (µmhos/cm)	432.7	176.7	259.3

Texture

Soil texture of wetland (Table 1) is sandy loam having sand range of 49.10 to 57.60%, silt range of 28.3-30.6% and clay range of 14.1 to 20.7%. High presence of silt may be due to leeching of ash from Ash ponds.

Characteristics

Wetland bed is alkaline having little variation in pH (7.7-7.8). Presence of moderate organic carbon (0.42-0.58%) available nitrogen (18.11-21.56 mg/100g) and phosphate (0.87-1.21 mg/100g) denote it medium productive.

Specific conductance range of 176.7-432.7 µmhos/cm denote site having good amount of dissolved salts especially during pre-monsoon when water quantity as well as flow is minimum. Minimum electric conductance, 176.7 µmhos/cm during post-monsoon denote the assimilation capacity of riverbed due to monsoon flow.

3.3 Water Quality

Physical features

The average water temperature of wet land (Table 2) was 20.63°C ranging between 16.7 to 23.2°C, thereby showing that hot water discharge of thermal plant does not have untoward effect on wetland.

Water was alkaline throughout, pH ranged between 7.4 to 8.2.

Transparency was high during winter, 62 cm due to less turbidity, low transparency of 35.5 cm during pre-monsoon was due to pre-monsoon showers in uplands.

Table 2. Seasonal fluctuations in water characteristics of Ropar W (1999-2002)

Parameters	Seasons		
	Pre-monsoon	Post-monsoon	Winter
Temperature (°C)	23.2	22.0	16.7
Transparency (cm)	35.5	54.7	62.0
pH	7.67	8.20	7.46
Dissolved oxygen (mg/l)	8.4	9.0	8.7
Free carbon dioxide (mg/l)	10.0	10.0	6.5
T. alkalinity (mg/l)	72.0	78.7	80.0
Total hardness (mg/l)	92.7	104.0	113.3
T. dissolved solids (mg/l)	89.0	101.0	96.0
Dissolved organic matter (mg/l)	1.80	2.30	1.58
Specific conductance (µmhos/cm)	180.0	203.7	193.0
Inorganic phosphate (mg/l)	NA	36.0	16.0

Chemical characteristics

Sufficient dissolved oxygen (8.4-9.0 mg/l), conducive alkalinity, 72-80 mg/l denote Ropar Head Works region good for productivity.

Hardness range of 92.7 –113.3 mg/l and Total dissolved solids of 89.0-101.0 mg/l also do not warrant much deterioting condition of water at the site.
The specific conductance of 180-203.7 µmhos/cm show that conductivity was low in water phase compared to soil.

Perusal of data (Table 2 and 3) also showed electric conductance between soil and water had indirect relation, thereby showing that mineral content within water brought from uplands in monsoons which settle subsequently enriching the soil during winter to summer.

3.4 Biotic communities

3.4.1 Plankton

Standing crop of plankton ranged between 200-250 u^{-1} (Table 3). It being low in relation to wetland system, but this may be due to continuous flow at the site.

Plankton composition reveals dominance of bacillariophyceae in the range of 85% (pre-monsoon) to 52.2% (winter). Presence of chlorophyceae (15-21.6%) and myxophyceae, nil to 26.1%.

Table 3. Seasonal fluctuations in Biotic communities of Ropar Wetland (1999-2002)

	Seasons		
	Pre-monsoon	Post-monsoon	Winter
Total density			
Plankton (u/l)	250	250	200
Periphyton (u/cm^2)	300	267	217
Macrobenthos (u/m^2)	265	233	475
Macrophytes dry wt. (kg/m^2)	-	0.120	0.032
Macrophyte associated fauna (u/kg/m^2)	-	I	II

3.4.2 Periphyton

Standing crop of periphyton like plankton was low. It being 217 ucm^{-2} in winter, 267 ucm^{-2} in post monsoon and 300 ucm^{-2} in pre-monsoon.

Periphyton like plankton showed dominance of bacillariophyceae, 77.4% (pre-monsoon) to 55% (winter) chlorophyceae in the range of 11.4-25% and myxophyceae in the range of 11.4-23.33%, contributed towards total population.

Dominance of bacillariophyceae along with presence of myxophyceae shows the system comparatively clean but under the impact of unwanted effluents.

The microphytic vegetation at the site did not show much diversity and was mainly dominated by *Navicula, Nitzschia, Diatoma, Cymbella, Frustulia* and *Synedra* among diatoms

Spirogyra and *Protococcus* sp. among green algae.

Microcystis among blue green.

3.4.3 Macrobenthos : Macrobenthic density exhibited seasonal fluctuation under the impact of monsoons (Table 3). It being low 233 um^{-2} during post-monsoon and high 475 um^{-2} during winter. The change in density may be due to change in sub soil at the site

Benthic population exhibited seasonal fluctuation. It showed maximum diversity during pre-monsoon having Gastropods, 67.74%, Hemiptera, 7.0%, Odonate nymphs 7.0% and Ephemeroptera nymphs , 17.69%. During post-monsoon, population was mainly formed of molluscs (63.74%) and tubificids (36.26%). Winter population comprised of molluscs 56.13%, tubificids, 19.2% and chironomids, 20.75%. Observations show that only molluscs were regular feature.

Presence of tubificids and chironomids during post-monsoon to winter only show that organic enrichment needed for these groups is being brought in from uplands during monsoon.

The population mainly comprised of following species.

Melania, Straitella, Faunus ater, Gyraulus sp. and *Corbicula sp.* among mollusca. *Dytiscus sp.*, Progomphus nymphs, Baetis nymphs among insecta.

T. tubifex, Limnodrillus sp. among oligochaetes.

3.4.4 Macrophyte : Macrophytes were present mainly between post-monsoon to winter at the site (Table 3). The density ranged between0.120 to 0.032 kgm^{-2}.

Population comprised of *Potomogeton crispus* (post-monsoon) and *Eichhornia cressipes* (winter).

3.4.5 Macrophytes associated fauna : Meiofauna exhibited large seasonal variation in density and composition. The density was 1 in post-monsoon and 11 u/kg/m^2 in winter.

Post-monsoon has presence of Hemiptera only while in winter population comprised of molluscs, 27.27%; coleoptera, 27.27%, Odonate nymphus 27.27% and dipteran larvae 18.18%.

The main forms present were

Lymnae columella, Gyraulus sp.	(Mollusca)
Regimbartia and Dytiscus nymphs	(Coleoptera)
Gomphus nymphs	(Odonate)
Tipula larvae	(Diptera)
Laccotrehes sp.	(Hemiptera)

4. FISH AND FISHERY

4.1 Fish population

Fish species encountered in wetland exclusively has not been categorized so far by the department, but the wet land is fed by river Sutlej exclusively hence whatever species encountered in landing centre at Roopnagar are presumed to be present within wetland also as the catchment area of Roopnagar landing centre is from Kiratpur (20 km above) to Ballachour covering as approximate 60 km stretch which includes wetland area in between. Total of 31 fish species were encountered at Roopnagar and are given in Annexure-I

Govt. of Punjab has enlisted 35 fish species in wetland, but during 3 years observations (99-02) following fishes were not encountered at all in any season.

1. Grass carp
2. Silver carp
3. *Mystus tengra*
4. *Mystus cavasius*

5. *Trichogastzic faciatus*
6. *Schizothorax esocinus*
7. *Catla catla*

Absence of *C. catla* at upper Sutlej is a cause of concern. Perhaps this fish can not negotiate the middle polluted stretch of river even during monsoons, otherwise the species was observed to be present in down stretch of Sutlej from Sultanpur to Ferozpur. (Annual Report , RI/B/2 , 99-2002)

S. richardsonii , 1-2 kg were encountered occasionally during winter. This species may be descending to Ropar during severe winter from Nangal dam where these are present in abundance.

4.2 Fishery Resources

Ropar wetland is open to fishing. Fishing takes place round the year barring closed season July-August. The wetland is auctioned along with river.

Fish biomass

Fish biomass of Ropar catchment (Table 4) area wherein wetland forms maximum contribution varied between 2 27 to 5 01 t/month on an average for the last 3 years The increase during 2001-02 was mainly due to adverse environs at upstream Nangal where due to heavy effluent influx from factories during November 01 and breach of Ash dyke of Super Thermal Plant during Dec 01, caused instant mortality as well as displacement of fishes downwards In concurrence to displacement, more fishing effort was made on part of contractors to catch maximum fish hence increase in fish biomass.

Table 4. Fish catch and composition at Roopnagar landing centre

Year	Av. landing t/month	Percentage composition (%)				
		IMC	Minor carps	Common carps	Large size catfishes	Misc.
1999-2k	2.27	5.52	77.97	2.20	6.18	8 81
2k-2001	2 51	7.17	74.90	-	5.18	5.18
2001-02	5.01	25.94	51 10	11.38	5.98	4.40

Seasonal fluctuation in total catch and composition (Table 5) exhibit that maximum, 8 tons forming 39.92% of Annual catch was during monsoon, that too only in the month of June (July-August closed season). The catch

comprised mainly of IMC, forming 83.25% of total population contributed exclusively by *Labeo rohita*, 44.44% and *C. mrigala*, 38.79% clearly indicating the ascending breeding run to Roopnagar wet land of these two species. Absence of *C. catla* even in monsoon clearly indicate that this fish does not ascend to upper Sutlej.

Presence of 1.50% of *T. putitora* during winter compared to lesser representation in other seasons show that the species descend foot hills of Shiwalik upto Ropar during low temperature.

Presence of 51.54-70.81% of minor carps mainly *L. dero* and *L. dyocheilus* round the year barring monsoons show that this group is better suited to Kandi areas (Mountain foot hills).

Presence of 8.68-30.92% of common carp show its establishment within the system.

Table 5. Seasonal fluctuation in total catch and composition at Roopnagar during 2001-02

Seasons	T. catch (tons)	Fish groups (tons)					
		IMC	Minor carps	*C. carpio*	Large catfishes	*T. putitora*	Misc.
Monsoon (June only)	8.00	6.65 (83.25%)	1.08 (13.5%)	-	0.15 (1.87%)	-	0.11 (1.37%)
Post-monsoon (Sept-Nov.)	6.10	0.40 (6.55%)	4.32 (70.81%)	0.53 (8.68%)	0.40 (6.55%)	0.05 (0.81%)	0.40 (6.55)
Winter (Dec.-Feb.)	1.94	0.06 (3.09%)	1.00 (51.54%)	0.60 (30.92%)	0.20 (10.30%)	0.03 (1.54%)	0.05 (2.57%)
Summer (March-May)	4.00	0.88 (22%)	2.31 (57.75%)	0.50 (12.5%)	0.22 (5.5%)	0.03 (0.75%)	0.06 (1.5%)

5. CONCLUSION

Ropar wetland although receiving industrial, municipal and agricultural run off especially from Nangal still sustains good water qualities especially for fishery purposes.

6. RECOMMENDATIONS

Since the wetland is in good condition, every effort should be made to maintain its ecosystem for which following things need to be taken care of.

1. Dumping of coal ash along Sutlej at Nangal should be stopped.

2. Earthen dykes to segregate ash dykes of Super thermal plant should be such to minimize leeching effect.
3. Human and agricultural actjvities around the lake needs a check.
4. Extension drive needs to be taken up to educate farmers of negative effect of excessive use of pesticide and fertilizers-instead farmers be educated regarding use of bio-fertilizers and bio-pesticides.
5. Sewage treatment plants needs to be formed around the wetland, so that only treated sewage of cities is discharged into Sutlej.
6. To utilize wetland aqua resources judiciously the lake may be ranched with catla seed.

7. REFERENCES

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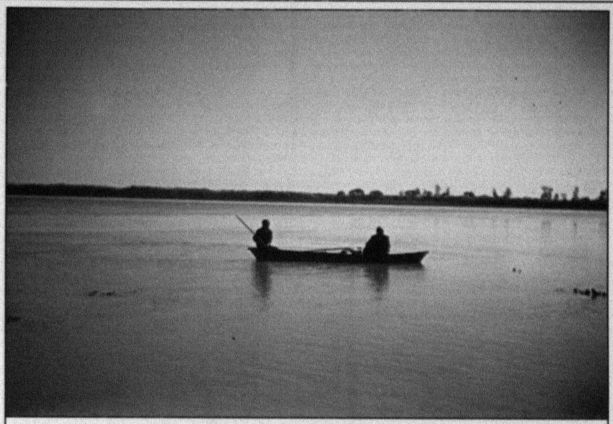
CHECKLIST OF FISH FAUNA FOUND IN ROPAR WETLAND

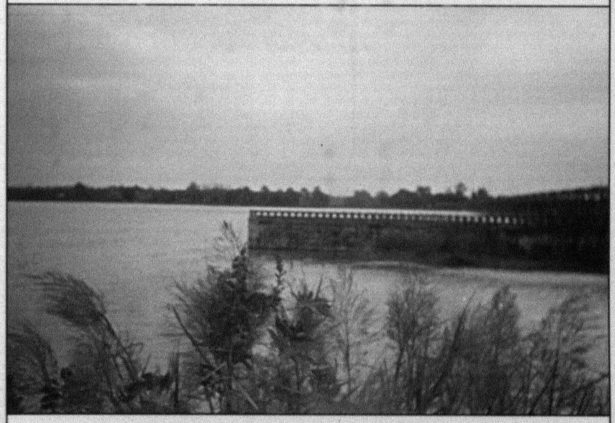
1. *Labeo rohita*
2. *L. gonius*
3. *L. calbasu*
4. *L. dero*
5. *L. dyocheilus*
6. *L. bata*
7. *Cirrhinus mrigala*
8. *C. reba*
9. *Cyprinus carpio*
10. *Wallago attu*
11. *Ompak bimaculatus*
12. *Notopterus notopterus*
13. *N. chitala*
14. *Tor putitora*
15. *Mastacembelus armatus*
16. *Puntius sophore*
17. *Puntius ticto*
18. *P. cirrhosus*
19. *P. stigma*
20. *Channa marulius*
21. *C. punctatus*
22. *C. striatus*
23. *Rita rita*
24. *Heteropneustes fossilis*
25. *Clarias batracus*
26. *Bagarius bagarius*
27. *Xenentodon cancila*
28. *Ambassis nama*
29. *A. ranga*
30. *Eutropiichthys vacha*
31. *S. richardsonii*

Guru Gobind Singh Super Thermal Plant along one side of Wetland

Hume pipes carrying ash from thermal plant to ash tanks within Wetland

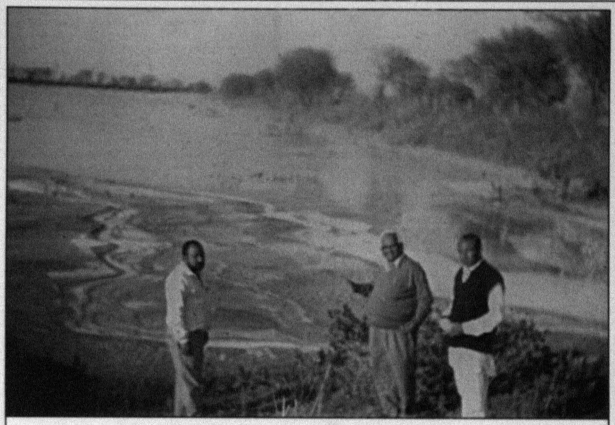


Fishing activity with Ropar Wetland (Above barrage)



Ropar Wetland during monsoons (Ropar Head Works)

Fish catch at Ropar centre (minor carps mainly)



Ash tanks on the banks of tributary

Ambooja cement factory on the banks of Wetland