From exclusion to collective ownership:
A case study of user-group representatives in fisheries management in Bangladesh

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Introduction:
Rajdhala beel is a semi-closed fishery located in Purbadhala thana in Netrakona district of Bangladesh ($24^0$95' -$25^0$00' N lat and 90^o60' E long)The *beel* covers 53 ha and has two openings. It connects to a river about 0.3 km away to the north (*Dhalai River)* in the monsoon for a few months through a channel (Fig. 1). The *beel* retains water all year and mostly has a depth of 4.6 - 7.7m (15 feet - 25 feet).

Around 300 years ago a branch of Kangsha river named Dhalai river flowed by what is now the Purbadhala thana head quarter. Another branch of the river Brahmaputra named Diar river joined the Dhalai river at Purbadhala. The confluence of both rivers made a big ditch. Later the main river channels changed their routes. In daytime the water of that big ditch looks white due to reflection of sunlight. Water in the *beel* was so clean that local people called it 'Dhala' which means white in Bangla, they never found any water hyacinth in the *beel*. In 1730 AD a Hindu king Raja Sree Purna Chandra Shing came from the Borendra area in Rajshahi (Northwest Bangladesh) and settled here. This waterbody came under the control of the 'Raja' and it became known as *Rajdhala beel*.

It is also said that the *beel* has been formed naturally by an earthquake. People also say there was a grazing land and one-day a Hindu priest asked a cowboy for drinking water. Finding no source of drinking water in the location of the *beel*, the priest made a small hole in the earth with his iron stick and formed this waterbody.

There are 4 villages around the beel with 640 households of which 93 households are traditional fishers.

Previous access arrangement
Table-1 summarises key events of the fishery management in Rajdhala since 1960. Before the liberation war in 1971, fisheries (jalmahals) were managed by landlords 'zamindars' and later by the Department of Fisheries during the Pakistan Period. There was less fishing pressure in the waterbody then, and fishers sometimes gave big carp and other wild fish to the zamindar living around the waterbody. It reported that in some years in the 1960s the Department of Fisheries released carp in the *beel.* Fisher leaders were responsible for guarding and all other fishing activities. They did not catch small sized stocked fish and they would only get 25% of income from catching good size of carp and gave 75% of income to DoF. Fisher representatives also occasionally distributed big fish to influential, officials etc. In the normal fishing time fishers use ber jal (seine net) and gave 50% share of catch to the DoF. Around 100 fishers were engaged in fishing during the peak season. They also owned agricultural land.

Many of the fisher families left Bangladesh during communal riots in 1965 or during the liberation war in 1971, and settled in India. After the independence of Bangladesh a Fisher

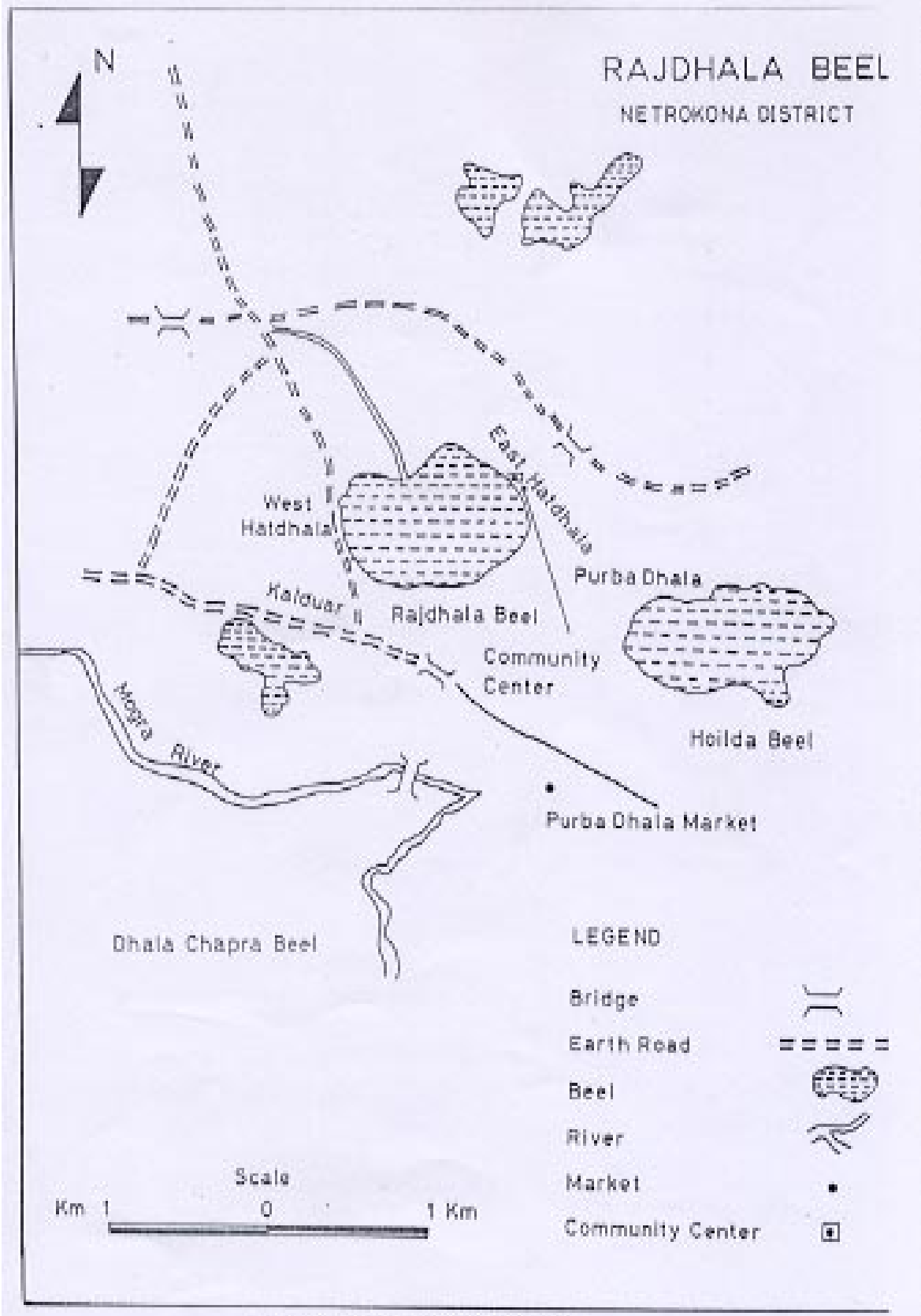


Fig. 1. Rajdhala Beel and adjacent areas.

Cooperative Society took the lease to this *beel* for three years. The cooperative society members, totaling 72 fishers, introduced fishing by five teams following a rotational system. They took 50% share of income and they gave rest 50% share to the cooperative leaders. Also they invested in four kathas (brush pile) from which the leader of the cooperative took 50% of catch. The fishers also gave a share of the catch of wild fishes to the cooperative leader. Seine net, moijal and cast net were used during this period.

Table -1. History of fishery access in Rajdhala Beel

Year	Policy	Fishing access	Fishery management
1960-71	Managed by DoF	Fishers gave 50% share to DoF for natural fish but 75% share for stocked fish during peak time.	More than 100 fishers introduced fishing by team. Individual fishing was also allowed.
1972-80	Leased by fisher cooperative society	Fishers gave 50% share to leaseholder (society leader)	5 fishing teams engaged in fishing. Fishers invested in katha, used berjal, moi jal, cast net
1981	Leased by individual through open auction	Fishers give 50% share to leaseholder	-
1982-83	DoF control	Only 22 fishers got access to fish for income.	Fishers got 40% share and used cast net, seine net.
1984-86	Leased by individual	-	-
1987-89	Leased by cooperative society	50 fishers got 40% share	Four seine nets used by 22 fishers.
1990-91	NFMP (licensing system)	Cooperative society, 22 licensed fishers got access and got 60% share.	Share distribution followed strictly during peak fishing time (Agrahayan-Poush)
1992-94	Leased by individual	Leaseholder hired around 30 fishers from outside. They gave 60% share to the leaseholder.	Six seine net teams fished by rotation during peak harvesting time.
1995-96	Already leased to outsider individual (stocked) before CBFM started	Leased in at higher lease value. Leaseholder was businessman from outside who got a contract from DoF to stock carp fingerlings. Hired outside fishers. Fihsers got only 30% share of their catch.	Leaseholder employed 5 local people and 5 people from Comilla, who controlled access and fishing. Caritas organized fishers to non-cooperate.
1997	Caritas organized four groups composed of 93 fishers. *Beel* transferred to CBFM project after leaseholder gave up.	Conflict between leaseholder and organized fishers. One employee of previous leaseholder tried to pay lease value but Caritas paid lease for CBFM fishers.	7 Ber jal, pata jal and cast net were operated. Stocked in September.
1998	CBFM	11 member Beel Management Committee formed. Fishers keep 40% of income, giving 40% to Caritas to repay loan, lease and stocking and keeping 20% as their savings.	Rotation in fishing started. Fishers used 4 seine net and few gill net only. No other gears are allowed to operate in the *beel.*

In 1981 an individual lessee Mr. Sunil Kumar took lease through open auction from the District Administration. Then in 1982 another non-fisher took this waterbody for two years for around five times the previous value (Table-2). In this period only two teams with 22 listed fishers fished during the peak harvesting time. In the other months all the fishers used seine net and cast net and gave 60% of the value of their catch to the leaseholder.

Table-2. Revenue collection from Rajdhala beel .

Year	Bangla year	Annual Lease value (actual Tk.)	
1974-80	1381-1387	1,200	
1981	1388	2,100	
1982	1389	10,250	
1983	1390	10,250	
1984	1391	3,500	
1985	1392	3,500	
1986	1393	3,500	
1987	1394	43,750	(25% increase)
1988	1395	48,125	(10% increase)
1989	1396	52,937	(10% increase, not collected)
1990	1397	20,000	
1991	1398	20,000	
1992	1399	70,000	(open auction)
1993	1400	87,500	
1994	1401	109,375	
1995	1402	160,000	
1996	1403	160,000	
1997	1404	206,000	CBFM (25% increase)
1998	1405	226,600	(10% increase)
1999	1406	242,000	

The lease value increased several times during 1982 to 1989 with changing hands between different leaseholders. In 1984 the fishers cooperative society's local leader managed the lease from the district administration but at a high lease value. Fishing continued to be done by two seine nets used by 22 fishers during peak harvesting time, which gave 60% of catch to the leaders. Fishers were allowed to fish in the rest of the months, and seine net users gave a lump sum share to the cooperative leader. The cooperative society's leader cum leaseholder got 60% share of income from catch.

In 1987 the fishers cooperative society took the lease again for 3 years with a 25% increase over the previous lease value in the first year. In both the second and third years the lease money increased by 10%. The fishing arrangement was the same during this period, except there were 50 fishers who had access for fishing and give 60% share of catch to the representative of the cooperative society.

In 1990 the *beel* was transferred under the New Fisheries Management Policy (NFMP). The local fisheries cooperative leader, Mr. Adhar, is a member of the Central Matshyajebee Samabay Samittee (National Fishermen's Association) and had good links with the District Administration, he managed to fix the total revenue through license at Tk. 20,000 per year (previous lease value Tk. 52,937). Only 22 fishers got license and used four seine nets. They got 40% of the catch in

the peak harvesting time (three months). Fishers gave 60% of the income from catch to the cooperative leader, Mr. Adhar, but a lower share of catch was given to him during the rest of the months. The lease value was paid from income earned through harvesting two kathas (brush piles) established by fishers in Rajdhala beel. The income from katha was shared as above. As the revenue was lower than before, local influentials wanted to get this *beel* through open auction from the district authority. The Deputy Commissioner did not keep this waterbody under NFMP and instead auction the rights of the *beel.* Although other waterbodies under NFMP were still under licensing, Rajdhala was auctioned in 1992 to local influentials. Around 30 fishers operated four seine nets while all other fishers operated cast nets. The leaseholder also hired some fishers from other areas. In the next year another influential businessman from Netrakona district took the lease through open auction at a very high lease value. Reports from the local fishers say that this leaseholder could not make a profit from the *beel* because there was not enough rain when wild fish should have come from the floodplain into the *beel.* Indiscriminate fishing was also reported during this year.

In 1995, Mr. Siddique Mia from Comilla district took lease to the waterbody for 3 years. The Department of Fisheries stocked five tons of fingerlings in the *beel,* which were supplied by the lessee from his own hatchery. Siddique Mia hired five local people and five person from Comilla for guarding, caretaking and overall management of the waterbody. The manager of that team, Mr. Awal, is a local influential whose social power meant that he could perform this function. There were five local team engaged in fishing by using ber jal, besides, three fishing teams were hired from outside for fishing. The fishers gave 70% of the catch to the leaseholder, but subsistence fishing was not allowed.

Lease value was fixed at Tk. 160,000 for the first year and the same amount was in the second year (1996, Table-2). Due to absence of lessee, the local manager Mr. Awal started to cheat him by giving him a lump sum rather than a share of catch, and he did not show any account to the leaseholder. Awal and other caretakers faced regular quarrels with local fishers over rights for the poor to catch fish for subsistence.

The restrictions imposed by the leaseholder had resulted in conflicts in the community, and in mid 1996 there had been a quarrel between the fishers linked with the leaseholder and some fishers organized by Caritas. The thana administration had to intervene to diffuse the situation.

Community Based Fisheries Management (CBFM) and Caritas intervention:
A major effort to promote more sustainable management in the *beel* was taken in 1996 through the CBFM project. Caritas, a national Non Government Organization working for the betterment of poor people, has worked on a process of empowering fishers to carry out their own development and to manage their renewable resources.

Since January 1996, Caritas organized 4 male and 2 female groups with a total in 93 of male and 36 of females respectively. Activities have concentrated on motivation, trainings and income generating projects for the group members. Upto December 1999, these groups accumulated Tk. 69,666 as savings of their groups. These groups hold meetings on a monthly basis. Caritas organized 23 training courses for its participants with 595 trainees from across all courses. The trainings covered awareness build up, leadership, accounts, fisheries management, nursery

development and other income generating activities. 5 adult literacy courses with 100 participants were organized for illiterate group members. Fishers were also provided with 36 pit latrines, 2 tube wells and 410 saplings to maintain environment friendly living conditions. Around Tk. 900,000 has been disbursed to the fishers as both individual and group loans to pay government revenue (no service charge) for access rights over the *beel,* for managing the *beel* through stocking and for buying boats and nets.

Fisheries Management System

Beel Management Committee

A Beel Management Committee (BMC) was formed in October 1997 incorporating representatives (President, Secretary and Cashier) from 4 male groups. The BMC is composed of 11 members and its past President, Secretary and Cashier were elected by 11 member's vote. BMC members meet regularly on monthly basis. In November 1998 an election by secret ballot of all participants was held for these three posts; participation was high and new Secretary and Cashier were elected, the President retained his post by one vote.

Fishers voluntarily made a bund at the offtakes of the canal leading from Rajdhala Beel during flooding in June-July 1998 to keep fish inside the *beel.*

The progress and activities of the BMC are summarized in the following Table.

Table-3. Activities of BMC in Rajdhala Beel

Arrangements	Yes/No	Arrangements	Yes/No
BMC formed	✓	Formation through election	✓
Selection	x	Involvement of fishers only	✓
With other community people	x	BMC/RMC meeting held	✓
Have meeting minutes	✓	Have Bank account	✓
Have written rules	x	Have future plans	✓
Establish access to fishing :			
Closed season for fishing		Prevented fishing by outsiders	✓
Informal acceptance of fishing for food	✓	Rotational fishing access	✓
Guarding rules accepted and followed	✓	Coordination with GO and NGO	✓
	✓	Fishing related conflicts resolved	✓

A Fisher Community Centre was constructed in June 1998 at the beel side with a cost of Tk. 77,977 in which the fisher contribution is Tk. 35,977 and Caritas provided the remainder as a grant.

In 1998 the BMC has donated Tk. 700 for 2 students for education, paid medical bills for 3 patients Tk. 1,400, provided fish for marriage and other ceremony in the community and subscription paid Tk. 800 for religious functions.

Access right over the fishery

The *beel* was under the control of an outside leasing holder when the project has started its activities. Mr. Awal who is a Freedom fighter and local manager of the leaseholder made publicity by miking that nobody could fish in the *beel.* Some of the fishers contacted the Thana Nirabi Officer (TNO) and complained about this. But TNO arrested two persons on the spot and announced that the fishers should not make any further contact himself, the TFO or Caritas.

Awal and his group members attacked a few fishers in Hatdhala village at night when they were fishing. The fishers became afraid and they did not come out from their home. The Deputy Commissioner (DC) wrote a letter to the MoL that lease value of 1404 year was not yet paid. Therefore, DFO and Caritas tried to get the water body handed over to DOF for the CBFM project.

Due to strong non-cooperative movement by the organized fishers, along with problems with the local manager of the lessee, the leaseholder was forced to surrender his lease back to the district administration one-year prior to completion of his tenure. The DC as usual invited tender for further leasing out of the beel. The local influentials tried to get the lease in their favour. In the meantime DOF (CBFM project) was able to hold-up the tendering process and the MOL asked for an evaluation report from the DC. Eventually in August 1997, after direct contact with the Ministry of Land (MOL) providing supporting document regarding project activities, lobbing and explanations from DoF, Caritas and ICLARM, and finally intervention on behalf of Caritas by the ex-Secretary of the Ministry of Land, the MOL decided to hand over Rajdhala beel to Ministry of Fisheries and Livestock for the organized fishers to manage.

Stocking the *beel*

Nursery ponds

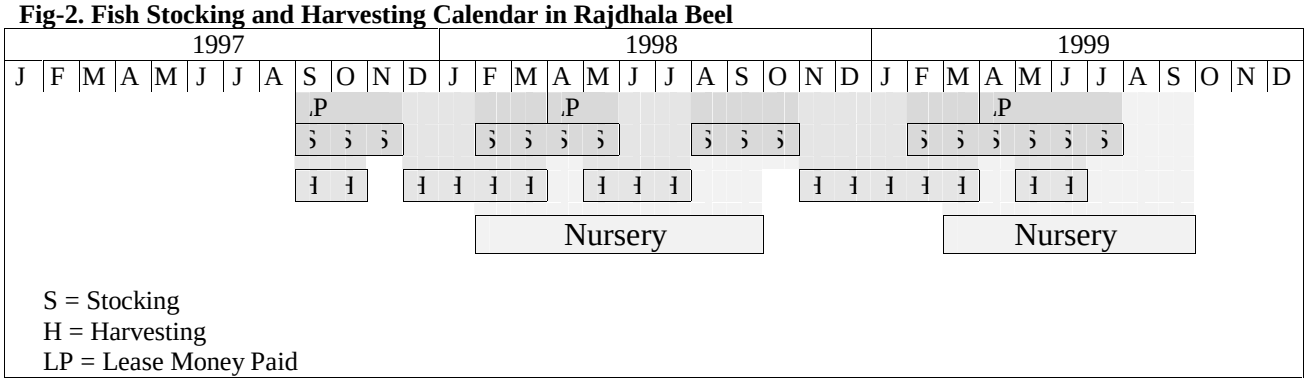
In 1997 the fishers leased two nursery ponds of 0.26 ha (25 decimal and 38 decimal respectively) on a yearly basis at a cost of Tk. 16,000. Around 2 kg spawns of common carp, mirror carp, katla and mrigel released in the nursery ponds and later stocked in the beel. In the next year 1998 they leased one more pond of 25 decimal (0.10 ha) with a cost of Tk. 5000. In 1998 they caught some brood fish of common carp from Rajdhala beel and produced spawn in the cages fixed in the beel. The quality of fry was good and it has been released in the beel. One fisher participant is paid to take care of these nursery ponds.

The fishers bought 10 decimal (0.04ha) of land for Tk. 6500 where they have built a community center along the edge of the beel.

They introduced nursery ponds in 1997 but due to lack of practical knowledge in nursing technology they did not get a good results from nursery. They bought maximum fingerlings from outside in 1997 but in 1998 they produced fingerlings in the nursery ponds. Maximum of the fingerlings they released in the beels was from their nursery.

Stocking and harvesting of fish

Fig-2. Fish Stocking and Harvesting Calendar in Rajdhala Beel



The participants started stocking since September 1997 and they stocked 2.7 metric tons of carp fingerlings up to March 1998 (Table-4)

Table-4 : Stocking of fingerlings in Rajdhala Beel from September 1997 to March 1998

Species	No	Size (cm)	Weight (kg)
Silver Carp	37,696	10-13	997
Katla	58,446	10-13	733
Rohu	30,462	8-13	403.25
Mrigel	20,040	10-13	309
Grass Carp	12,500	10-13	161
CommonCarp	1,765	10-15	50.25
Thai Sarputi/Rajputi	20	10-13	0.75
Total	160,929		2,654.25

After stocking the fishers have guarded fish from poaching. All fishers have participated in this activity that was supervised by the Beel Management Committee (BMC). Initially they bought most of the fingerlings from outside. They did not get a full year for stocking and in the second year (April 1998-March 1999) they stocked and 6.7 metric tons of fingerlings most of which were from their own nursery (Table-5).

Table-5 : Stocking of fingerlings in Rajdhala Beel from April 1998 to March 1999

Species	No	Size (cm)	Weight (kg)
Silver Carp	7,287	15-20	217.00
Katla	66,456	10-18	34,95.90
Rohu	29,446	10-15	908.20
Mrigel	17,226	10-13	668.00
Grass Carp	39,050	8-13	764.50
CommonCarp	10,733	8-16	413.20
Thai Sarputi/Rajputi	2,417	10-13	122.85
Mirror Carp	3,900	8-10	76.00
Other Carp	5,400	10-13	54.00
All	181,915	-	6,719.65

Prolonged flooding in 1998 inundated the beel and some stocked fish were escaped from the beel. After flooding they applied lime to prevent fish disease. Stocking of fingerlings was late due to flood and there were aquatic weeds grown naturally on the edge of the beel after receding the floodwater. The Thana Fisheries Officer and BMC members decided to stock grass carp fingerlings that might eat those weeds to have better fish habitat in the beel.

They have harvested 14.5 metric tons of fish (wild and stocked) up to March1998 with a value of Tk. 402,926. Out of total fish harvested 93% species were wild (Chapila contributed 91% of total catch) (Table-6).

Table-6 : Harvesting of stocked and wild fish from Rajdhala Beel (September 1997 - March 1998)

Stocked fish	No	Kg	Value (Tk)	Wild fish	Kg	Value (Tk)
Rui	27	45.5	3,383	Chapila	13,333.30	333,742
Grass Carp	328	830.15	43,242	Chital	50.55	4,355
Catla	2	2.2	145	Gazar	4.00	150
Other carp (Mixed)	83	75.1	2,764	Boal	46.51	6,000
Comon Carp	100	140.25	9,145			
All	540	1,093.20	58,679		13,434.36	344,247

In 1998-99 they harvested around 25.8 metric tons of fish with the value of Tk. 1,035,591 of which 68% of stocked fish. Chapila contributed significantly lower amount of total catch in this year compared to the last year due to stocking of more silver carp in 1997-98 (Table-7)

Table-7 : Harvesting of stocked and wild fish from Rajdhala Beel (September 1998 - March 1999)

Stocked fish	No	Kg	Value (Tk)	Wild fish	Kg	Value (Tk)
Rohu	1,759	1,554.15	78,605	Chapila	6,869.3	207,540
Catla	13,434	7,938.05	332,467	Cital	471.7	44,370
Mrigel	6,636	2,347.40	94,887	Chanda	361.2	11,097
Silver Carp	8,322	2,862.75	75,829	Boal	291.5	17,849
Grass Carp	889	1,471.40	84,518	Punti	141.0	2,720
Common Carp	709	871.40	53,403	Mola	66.0	2,015
Other Carps	933	408.48	22,940	Goinna	47.0	1,981
				Kalibaos	45.6	1,942
				Tengra	40.6	1,085
				Guzi/Pangas	25.95	1,353
				Kakila/Foli	13.0	457
				Shol/Gazar	12.1	533
All	32,682	17,453.63	742,649		8,384.95	292,942

The participants got the fishing rights in September 1997 and stocked fingerlings in the beel. They also inverted for nursery ponds and gears during the time. The results of stocking and harvesting shows that fishers did not get a full year of harvesting in 1997 and their net income per person was negative but in the next year they could earn a considerable amount through stocking. They received interest free group loans from Caritas and paid lease money, bought fingerlings and others. Lease money is very high in Rajdhala beel and fishers could not repay their loans in time, they have still few amounts of outstanding loans. They introduced nursery, which saved costs for fingerlings in 1998.

Table-8. Organized fishing in Rajdhala Beel (stocking and group fishing) under CBFM project.

Action	1997-98	1998-99
Stocked fish (kg)	2,654	6,720
Stocked fish (Tk)	170,911	134,133*
Fish stocked (kg/ha)	50.1	127
Harvest of stocked fish (kg)	1,093	17,454
Harvest of other fish (kg)	13,434	8,385
Value of fish caught (Tk)	402,900	1,035,591
Yield of stocked fish (kg/ha)	20.6	329.3
Yield of other fish (kg/ha)	253.5	158.2
Gross income (Tk/ha)	7,600	19,540
Stocking cost (Tk/ha)	3,972	2,909
Lease (Tk/ha)	3,887	4,275
Other cost (Tk/ha)	755	1,377
Total costs (Tk/person)	4,909	4,879
Net fisher income (Tk/person)**	-577	6,257
Outstanding loan (Tk/person)***	1,219	1,259

Notes:
* included nursery pond rent, fry and feed etc. costs.
** net amount received by fishers excluding value of fish consumed and income from angling fees.
*** at the end of the year.
Source: BMC records.

Result of Intervention

Equity and empowerment

The fishers are now able to protect their resources form outsiders. The Beel Management Committee has link with Thana Fisheries Officer and also Caritas worker helps them to follow-up their management rules. Fishers follow a regular fishing system and a closed season for fishing. They have taken steps to limit angling by non-participants with the help of Thana Nirbahi Officer.

Up to December 1999 the fisher took a loan of around Tk. 9,00,000 from Caritas to pay the lease for two years and for buying nets, boats and fingerlings. The lease fee faced by the fishers at Tk. 206,000 in 1997-98 and Tk. 226,600 in 1997-98 is Tk. 4,400 per ha or a tax of Tk. 2,380 per fishing household and is much higher than in any other CBFM project waterbodies. Fishers are overburdened with credit at Tk. 6,500 per fisher for 93 fishers. Caritas with BMC members agreed that all participants would share 40% of income from harvest, 40% would be used to repay Caritas loan and the remaining 20% would be kept by the BMC as savings. However, with this sharing arrangement the fishers are not encouraged very much to participate in fishing. About 10-15% of the fishers did not participate in fishing, rather they worked as agricultural laborers and could earn around Tk. 75 per day. Whereas, participants who fish in a team, got Tk. 40 to 50 per day (40% share of catch distributed all 93 participants). So there is an equity problem because fishing effort has not been shared equally among members, while income and costs have been shared equally.

The BMC members at present have a weak understanding of how to plan and their activities. Caritas has already provided some training to 50 participants but they still need more training on leadership and management. At present the participants, while belonging to one Hindu fishing community, lack the experience and cohesion to make clear operational rules and in the face of influentials linked with post fishery management have difficulty enforcing closed season.

Although the lease money and other group loans for net, boats received from Caritas was free of service charge which is not in the case of other NGOs, repayment of their principal loan through savings is really difficult at initial stage when they are to pay comparatively higher amount of lease money to the government.

Resource sustainability

The traditional fisher households living around the beel are involved in fishing activities. However, some of their family members are engaged in other income generating activities. There are 93 fisher households organized by Caritas and they fish in team by rotation. Some of their household members are involved in fishing in other waterbodies in the area. As fish catch declines over time, fishers have increased their fishing effort.

Fishers said that they mainly used cast net up to 1990 and their catch per unit effort has declined, their catch was about 3 kg. per day from open beels/floodplains. Their catch has been lower for the last five years, which was around 2 kg. per day undertaking same level of fishing effort.

After handing over this beel to the community under CBFM they stocked in the beel and have introduced management rules for effective fishery management.

The fishers can eat fish on average on four days in a week. During the dry season when some of them fish in other open waterbodies they eat fish on only two days in a week and sometimes they buy dried fish from local markets. The fishers set a restriction on fishing for two months (April - May) after stocking in 1997 as this was the breeding time for chapila. Due to scarce job opportunities during these months they had to suffer from food insufficiency.

Biodiversity

According to fisheries biologist, the quality of water in the beel is suitable for fish culture. Although the beel is under culture, wild fish contributed a considerable amount of income from catch.

The species reportedly extinct were Ektuti(*Dermogenys pussilus),* Gilar chaki (*Chaca chaca),* Veda (*Nundus nundus),* Golsha *(Mystus bleekeri) and* Pabda *(Ompok pabda).* The reason for extinction of these species is due to overfishing, siltation in the connecting channels and natural events e.g. flood and drought. The other wild species being endangered were: Kholisha (*Colisha fasciatius,* Mola (*Amblypharyngodon mola),* Ayir (*Mystus aor),* Chital(*Notopterus chitala)* etc.

Table-9. Main species caught in Rajdhala Beel during October 1996-December 1997

Local name	Latin name	% of catch
Rui, catla, mrigel	*Labeo rohita, Catla catla, Cirrhinus mrigala*	38.05
Silver carp, grass carp, mirror carp common carp, bighead carp thai sarputi	*Hypophthalmichthys molitrix, Ctenopharyngodon idellus,* *Cyprinus carpio (communis), Cyprinus carpio (specularis), Aristichthys nobilis, Puntius gonionotus*	32.49
Chapila	*Gudusius chapra*	23.34
Jatputi, kanchan puti, mola, chela, gol chanda, dankina, kechki, batashi, tepa	*Puntius sophore, Puntius conchonius, Amblypharyngodon mola, Salmostoma bacaila, Leiognathus equulus, Esomus danricus, Corica soborna, Pseudeutropius atherinoides, Tetraodon cutcutia*	2.23
Baila	*Glossogobius giuris*	1.93
Gura icha	*Nematopalaemon tenuipes*	1.10
Boal, baghaura, chital	*Wallago attu, Notopterus chitala*	0.43
Taki, shoal, gajar	*Channa punctatus, Channa striatus, Channa marulius*	0.16
Guchi baim	*Mastcembelus puncalus*	0.15
Nilotica	*Oreochromis niloticus*	0.07
Kaikla	*Xenentodon cancila*	0.03
Tengra, shing, magur	*Mystus tengara, Heteropneustes fossilis, Clarias batrachus*	0.02

It is notable that a natural species Chapila (*Gudusia chapra*) that was most abundant in the beel in the past has been declining for the last few years. Shortage of available food for chapila due to

stocking of exotic carp may be a reason for this since chapila is a surface feeder and large quantities of Silver Carp have been stocked.

The dwellers surrounding the beel use water for multiple purposes including for irrigation. They also cultivate paddy crop in the dry season, which contributes soil to the beel accelerating siltation.

Other results of development

Household characteristics

A household baseline survey was undertaken in 1996 where random samples 50 NGO and 60 non-NGO households were taken. The survey results reveal that the NGO participant households are mostly (82%) headed by men who fish for an income, although many only fish part time, whereas for most of the non-NGO sample fishing is a subsistence activity (for home consumption).

Both male and female education levels are lower in the NGO participant households, which correlates with their lower average incomes and wealth. There may also be cultural differences since all of the NGO participant households are Hindu, while a majority of the non-NGO households are Muslim. Caritas has targeted poorer households as well as fishers in forming its groups, although its participant households are not completely landless. NGO participant households are on average smaller and have a smaller area of housing per person (51ft sq compared with 61ft sq) and of lower quality housing. Impact monitoring in 1997 and 1998 indicated that housing condition has improved for NGO participants. About 32% of NGO households invested in their houses for tin roofs compared with 9% of other households. The mean landholding of non-NGO households is significantly higher (almost three times higher at 1.58 acres per household), and these households also have homesteads which average twice as large as those of NGO participants.

Baseline survey in 1996 indicated that the NGO households had problems obtaining enough to eat than did non-NGO households. Impact survey in 1998 indicated that a considerable number of participants obtained enough to eat (40% of NGO households did not face any food deficit) however, the increased number of non-NGO households (24%) were in food surplus. The pattern reported for fish consumption is not clear, all NGO participant households eat fish, but for 50% fish is only eaten seasonally, compared with 18% of non-NGO households which reportedly never eat fish.

Household income and credit

On average household which fish for an income have members who have fished for longer than other households and those in NGO groups have mostly inherited their occupation (this is a traditional Hindu fishing community), whereas only 28% of non-NGO households who fish for an income inherited the trade.

The NGO participant households shared incomes, which were significantly lower than non-NGO traditional fishers (who fish for food and are NGO participants) have the lowest incomes-much less than those who just fish for food. However, even these traditional fishing households only derive 47% of their income from fishing (farming, labour and handicrafts being their main other

occupation). The non-NGO households mainly gain income from service and farming and hence are likely to fall outside the criteria for inclusion in NGO groups and have relatively stable income.

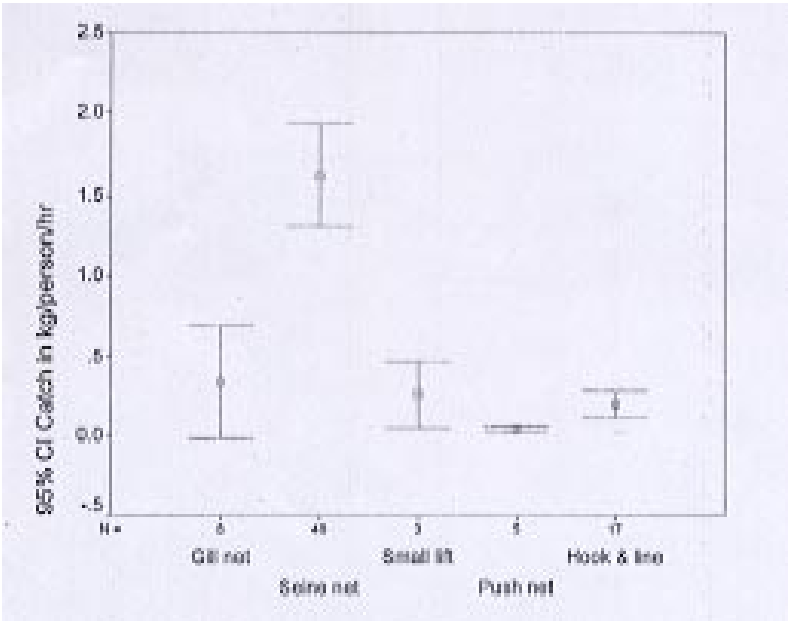
Impact survey shows that the non-NGO households took more credit on average over the two years compared with the NGO participants. Also the non-NGO households sold out their most durable assets (land) and mortgaged out more land and received three times higher amount than the NGO households. The average amount received from both selling of assets and received credit from different sources were about twice for non-NGO households than did NGO households. However, a considerable amount of fund used for daily needs and other production purposes e.g. livestock rearing was reported by NGO households and non-NGO households used for multiple production purposes (livestock, fishing gear and small trade).

Fishing effort and gear use

Households fishing for an income tend to use boats and seine net since most of the fishing is done by organized fishing team but cast nets were the most widely used fishing gear among the NGO and non-NGO households for subsistence. Hook and line are relatively important for non-NGO household, which fish for food.

Generally catch (non-stocked natural fish) per person per hour of effort was good in 1997 compare to the next year 1998. Catch per unit effort for seine net was around 1.5 kg but the amount was lower than 0.5 kg for other gears gill net, small lift, push net and hook and line. Catch per unit effort was comparatively lower for all types of gear unit in 1998 compare to 1997 is possibly due to fishing effort was mainly concentrated in team and monitoring of catch effort covered natural species that were allowed to catch for subsistence fishing.

Fig-3. Catch per person per hour in Rajdhala Beel in 1997



Seasonality in fishing was summarized by gear use and by location. The peak season for people who fish for an income is the post-monsoon through winter to summer and a much higher percentage of NGO participant households were active than (88% compared with about 40% of

non-NGO professional fishers who are clearly mainly part-time fishers). By comparison the monsoon is the peak season for fishing for consumption, when 30-40% of these households were fishing.

Apart from organized fishing in the Beel, the traditional fishers could earn a reasonable income by fishing in other open beels and floodplains and their average income was around Tk. 70 per day.

Role of women in the fishery

Caritas organized groups of fisher for managing the fishery, but they also organized women who are involved in other income generating activities. Baseline survey on women in the sample households indicated that majority of women in NGO households are involved in fishing related activities. However, both NGO and non-NGO households are involved with similar extent in non-fishing income earning activities (livestock rearing).

The women participants attended in local community meeting held on quarterly basis report that they received training for poultry rearing but they did not get any appliances for vaccination and other inputs from Caritas. They also received training on handicrafts making (bamboo cane). They expressed necessity of training on tailoring service and also machine to work at home.

Women's attitudes are being gradually widened by participation in different NGO activities. There was no difference in use of women's income between NGO households and other households.

Conclusion

The concept of community management in semi closed beel is now widely accepted. It proved easier to develop community management in the bounded beel because of its limited size well-defined community, clear benefits from stocking and most importantly the existing rights of the participants over the fishery.

The poor fishers in Rajdhala beel have shown that given tactical and government support favorable to the poor, they can bring about tangible improvements both in their own lives and in the management of the common property resources. With NGO support backed by government, fisheries rights can be established resulting in more sustainable and productive fishery management.

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