

# Community Fishery Management: Implications for Food Security and Livelihoods

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**Abstract:** A partnership project of the Bangladesh Department of Fisheries, five NGOs and ICLARM has introduced community management of inland fisheries in Bangladesh. Management arrangements and outcomes are compared in four waterbodies with different property rights. In the closed lake fishers jointly stock, guard and harvest fish, non-members are excluded. Production and incomes have fluctuated since the power of past fisher leaders has been challenged by more transparent decision making. After government made rivers open access, fishers no-longer had any recognized right to limit fishing there and have failed to develop institutions to limit fishing, effort has increased and increasingly small fish are caught using smaller nets. In two open beels, similar fishery outcomes have emerged from different contexts. One is managed by many diverse fisher groups who have agreed to protect fish and have seen catches and consumption increase. A similar pattern has emerged in a seasonal floodplain on private land managed by a multi-stakeholder committee led by women. Here the existing seasonal common fishing rights for very homogenous villages are maintained and overwintering fish have been protected by consensus. Local decisions and rules that conserve fish in the dry season and early monsoon are feasible for communities but require external facilitation and recognition of longer-term fisher or community use rights if they are to be sustainable.

**Keywords:** community-based management, co-management, access, equity, food security.

## 1. INTRODUCTION

The four million hectares of openwaters in Bangladesh are among the world's richest and most complex fisheries. The rivers, beels (lakes), baors (oxbow lakes), haors (large deeply flooded depressions), and floodplains support some 260 fish species (Rahman 1989). About 80% of rural households catch fish for food or to sell, and about 60% of animal protein consumption comes from fish (BBS 1997). However, the "miscellaneous" small fish caught from the floodplains by poor people have been neglected in official statistics and policies. Small fishes are the accessible and preferred food of poor people and are good sources of micro-nutrients (Thilsted et al. 1997).

Fish habitat destruction by roads, embankments, drainage, flood control, and natural siltation, along with overfishing, are commonly cited as causes of the deterioration of the country's fishery resources (Hughes et al. 1994; Ali 1997). The National Water Policy has recently emphasized reserving wetlands for fish in a reversal of past trends, but past fishery policies have discouraged development of local institutions for fisheries protection and management.

### 1.1 Fisheries Access in Bangladesh

The fisheries of Bangladesh became state property under the jurisdiction of the Ministry of Land (MOL) after the abolition of the *zamindari* system through the East Bengal State Acquisition and Tenancy Act in 1950. The MOL has effectively continued colonial policy the MOL by administering these state fisheries to raise revenue by

leasing out fishing rights in waterbodies to the highest bidder, usually for 1-3 years.

The floodplains have been divided up for fishery administration and government taxation into some 12,000 *jalmohals* or water estates. Arrangements that co-exist at present include leasing (individuals or cooperatives acquire exclusive fishing rights for designated waterbodies for 1 or 3 years), licensing of individual fishing units, group management, and open access. These administrative and regulatory changes are summarized by Farooque (1997).

Most fisheries have been leased to the highest bidder with a preference for fisher cooperatives. Often, either directly or by bidding through a cooperative, control came into the hands of rich and influential lessees. It has been widely regarded that fishers were suffering not only from declining catches but also from exploitation under this leasing system. Lessees usually sub-lease to agents on condition of receiving a profit (a share of the resource rent) or allow fishing by as many fishers as are willing to pay user fees set to ensure a profit (Naqi 1989, McGregor 1995). However, Toufique (1999) has argued that fishers have failed to gain fishing rights under the leasing system mainly because they are less able to enforce those property rights than are socially powerful lessees who can prevent unauthorized fishing by threat and by social pressure.

In 1986 in response to these problems and lobbying by the national fishers association, the government introduced a New Fisheries Management Policy (NFMP) and responsibility for nearly 300 waterbodies was transferred by

MOL to the Department of Fisheries (DOF). Under this arrangement DOF was to license individual “genuine fishers” (those whose livelihood depended on catching and selling fish). The aim was to save fishers from exploitation by influential middlemen, and for DOF to limit the number of fishers to ensure maximum sustainable catches (Ahmed et al. 1997).

In practice fishers were unable to exclude outsiders including past lessees and middlemen and often continued to depend on them to help fund license payments. DOF also found it easier to collect revenue through a few fisher leaders, rather than from the many individual fishers. Government also found it difficult to limit the number of license holders. Unlike the lessees who could hire an army of enforcers if needed, DOF staff have difficulty mobilizing magistrates to catch unauthorized fishers. Moreover, yearly licenses with the possibility, but no guarantee, of indefinite renewal did not give poor fishers secure use rights. Revenue orientation of fishery management continued because under NFMP total revenue had to increase by 10% per year from the earlier level of revenue.

Fishery administration has become more complex since 1995. The government ended revenue collection from flowing rivers with the intention of helping reduce the tax burden on fishers, but this in effect means that they are open access resources. NFMP was ended by the decision of MOL and then restored in a few waterbodies. In addition administration of closed waterbodies of up to 20 acres (8 ha) was handed to the Local Government Division from 1996 and then transferred to the Ministry of Youth and Sports in October 1997 for use by registered youth groups.

Lastly, the Protection and Conservation of Fish Act, 1950, restricts certain gear and fishing for juvenile fish and arose from government concern to protect long-term collective interest. But enforcement has been weak and compliance equally poor in the absence of any incentives for cooperation by either leaseholders or fishers.

## **1.2 Community Based Fisheries Management**

From the early 1990s there have been several projects in Bangladesh that introduced aspects of community or group management of fisheries, mostly based on group stocking of carp in closed beels and baors, on stocking by government in open waters, and on local initiatives to restore fish habitats. The results of these projects are summarized in Middendorp et al (1999).

The Community Based Fisheries Management (CBFM) Project is part of this trend and this paper presents part of its findings. It is a partnership project of the Bangladesh Department of Fisheries, five NGOs and ICLARM, and from late 1995 has worked to establish community

management of inland fisheries at 19 locations in Bangladesh. The project was designed as an action research project to test and assess alternative models of government-NGO-fisher collaboration and thereby develop a framework for community-based fishery management that might achieve greater efficiency, equity and sustainability.

## **2. METHODS**

Out of 19 waterbodies under CBFM project, four waterbodies and their communities were selected for detailed monitoring of fishing and fish consumption from 1997 onwards. They represent the four access arrangements and types of fishery under the project:

1. Hamil Beel is a small closed lake with exclusive access for fishers organized by an NGO - Caritas,
2. Ashurar Beel is a large open lake with management by groups organized by an NGO - Caritas,
3. Goakhola-Hatiara Beel is a seasonal floodplain comprising of private land managed by a multi-stakeholder committee where women organized by an NGO – Banchte Sheka – have taken a lead, and
4. Kali Nadi is an open access river where an NGO – Proshika - supports groups of traditional fishers.

The process of developing CBFM was documented through regular reviews with the partners and communities. Sample surveys of households were undertaken in 1996, 1997 and 1998. Fish catches and fish markets were monitored. Lastly, fish consumption and fishing by a sample of 30 NGO-participant and 30 other households were monitored daily for a week each month.

This paper assesses changes in fishery resources, fisher livelihoods, and institutions in the light of local context, CBFM interventions, and the wider policy changes already reviewed (ICLARM 1996).

## **3. CONTEXT**

The four waterbodies and communities studied are very different (Table 1). Hamil Beel is a small semi-enclosed shallow but perennial lake. The beel has a small catchment of adjacent fields and beyond these is partly surrounded by homesteads and villages. It is connected in the monsoon season to a river by a small canal. There are several other beels nearby. The five villages around Hamil Beel are inhabited by a mixture of occupational groups including farmers, sharecroppers, service holders, small traders, wage laborers and people who derive income from fishing in Hamil Beel. Most of the participants are muslim and 25% fish for income. In the past Hamil Beel was leased and then licensed under NFMP to the same fisher cooperative which

**Table 1. Characteristics of the waterbodies and communities.**

	Hamil Beel	Ashurar Beel	Goakhola Hatiara	Kali Nadi
<b>Waterbodies</b>				
Location	Tangail	Dinajpur	Narail	Kishoreganj
Max. area (ha)	16	400	250	1200
Wetland type	Permanent lake, one outlet	Dry season area 150 ha, monsoon through-flow with many outlets and inlets	Seasonal floodplain, all cultivated in winter	Side branch of a river, connects to wide floodplain in monsoon
Leasing arrangements	Leased to fishers (previously NFMP)	Previously under Third Fisheries Project, DOF retained, no lease	Only a canal inside the area is leased, rest is private property	Open access, no licensing or leasing (previously NFMP)
<b>Communities</b>				
Villages	5	17	5	14
Fisher groups	6	25	7	20
Households	1375	971	517	2378
NGO group hh	136	509	208	335
% hh muslim	96%	80%	0%	37%
% hh fish for income	27%	51%	20%	67%

*hh: household*

has retained power for 25 years, its members still pay revenue now through the CBFM mechanism and are organized by an NGO. The beel is stocked every year by the NGO groups.

Ashurar Beel is seasonally flooded but during the dry season water is left in only seven deep depressions. The beel originates from a river and water flows through the beel from the river in the monsoon season. This open floodplain beel is surrounded by fourteen villages inhabited by 971 households. Most of the households are Muslim and half of them fish for income. Historically fishing rights in this capture fishery were leased out but there was free access for small scale fishing in the monsoon in the floodplain. Two different tribal groups claim to be the original fishers. The 17 *katas* (brush piles, a type of fish aggregating device FAD) in the beel often resulted in conflicts among resource users. This beel was stocked with carp in 1995-1996 by the DOF under "Third Fisheries Project" but without active involvement of the fishing communities who were unwilling to pay for fish that escaped.

Goakhola Hatiara Beel is a seasonal beel which holds up to 1.8 m of water for 5-6 months of the monsoon each year. The beel is protected by flood control embankments and the water level is controlled by a sluice gate. Farmers cultivate two paddy crops each year. The beel is surrounded by five villages inhabited by 517 households. All are Hindu and they mostly fish in the waterbody for food. A *khal* or channel connecting the beel and river was leased out for fishing but access to fish for food in the flooded fields has always been common for the villagers, both man and women. Owners of land in the beel have dug over 80 *kuas* (ditches) as traps where fish congregate in the dry season.

Kali Nadi is a branch of a river which retains water throughout the year. Eleven villages surround the river where 2,378 households live. About 75% of people fishing are Hindu and more than half of them fish for income. In the past all the fishers got licenses to fish in the river under NFMP, but since a government decision in 1995 access to fish there has been open to anyone.

#### 4. CBFM

##### 4.1 Development support

The NGO partners have formed groups of fishers meeting their own poverty criteria; supported these groups with education, training and credit; raised awareness of fisheries management problems; and helped the fishers develop fishery management institutions and techniques. Direct impacts of NGO activities should include access to credit at lower interest rates than informal sources and improved livelihoods. Each NGO has its own approach. The direct services provided to these participants by the NGOs are summarized in Table 2. Caritas and Proshika targeted men who fish for at least part of their income, but Banchte Shekha only works with women. In 1996 women in 25% of NGO fisher households in the river site were also members of the same NGO.

Additionally the NGOs have helped the fishers to develop organizations for fishery management. Links and agreements with influentials in the local communities have been facilitated by the NGOs and by DOF staff through open meetings and local workshops. DOF has received revenue payments that define fishing rights, and has helped with access to local government when outsiders have attempted to access the fisheries.

**Table 2. NGO support to fishers (1995-1998) .**

Water-body	NGO	Trainin g (no. of persons x courses	Credit (Tk/person /yr)	% credit from NGO	
				NGO	Non- NGO
Hamil	Caritas	736	752	36	24
Ashura	Caritas	1,896	668	34	20
Goakhola -Hatiara	BS	342	862	13	7
Kali Nadi a	Proshik	1,405	7,158	59	11

Over the project period the number of participants grew as did the proportion of credit received from NGOs (reaching 30-40% in 1997 and 1998). More than half of these funds were used for non-fishery related income generating activities linked with NGO training. The aim was to reduce fishers' dependence on moneylenders (for gear purchase, paying government revenue and stocking costs), to compensate for loss of income during any closed seasons established by the fishing communities and to enhance household incomes. Dependence on moneylenders has fallen to some extent for NGO participants in river sites but does not differ from non-participants. Earlier in some beels fishers could not afford to take credit for lease fees and stocking, credit has helped them control the fisheries but they have more debt.

#### **4.2 Property rights and fishery management institutions**

All jalmohals are owned by the state, and the recent changes in usual access arrangements were summarized in Section 1.1. Under the CBFM project in the closed and open beels (but not rivers or private land) NGO participants pay revenue to the government (10% increase each year) for fishing rights. In Hamil Beel where participants pay for exclusive fishing rights they also allow neighbors to fish for food after organized fishing. In the seasonal beel (private lands) there is no government role or fishing restriction anywhere in the waterbody except in private kuas. Fish aggregating devices are traditional means for landowners to gain control over part of fishery resources. A kua is a ditch/pond dug in the floodplain area to trap fishes when water level falls and katas are brush piles constructed with plant materials such as branches and bamboo and water hyacinth.

Management committees were formed in all the waterbodies comprising the leaders from all NGO groups. In the seasonal beel and river they were joined by additional

representatives from other stakeholder groups selected by the NGO and DOF. In the leased beels the executive members of the committee are elected by secret ballot by general members. When a decision comes from the committee each representative discusses it with the group members and they come to a consensus or disagreement. The message then goes back to the committee and a final decision takes place. In Goakhola-Hatiara women take the lead but there are also male members, the other committees are entirely male (fishing for income is almost exclusively a male activity).

The committees in the three beels have their own resource management rules (Table 3). They all have closed seasons and try to restrict use of gears that target fish during migration to breed. Fishers have generally adopted simple conservation-based measures under CBFM, except in the one closed beel where participants have bought and released carp fingerlings for many years. In the stocked beel the members follow a rotational system of sharing guard duty to prevent poaching of the stocked fish that they bought through joint credit, and also fish on rotation with jointly owned gear. In Ashurar Beel they have banned private katas, and in both open beels the committees and wider communities have protected fish sanctuaries for 3 years. These are relatively small deeper areas where fish can safely overwinter, but which do not exclude fishing from the rest of the area.

However, in Kali Nadi the River Management Committee is very weak since fishers have lost their rights to exclude others with the end of licensing, have weak links between separate teams and groups, and external support has been limited and split by an administrative boundary that divides the river. They are unable to negotiate with the influentials and administration. Nevertheless NGO group members have tried to stop using smaller mesh gears.

The fishers often face different types of interactions: fishers-fishers (over leadership in Hamil Beel), fishers-outsiders (poaching, water sharing, encroachment by farmers) fishers-administration (attempts to leasing out beels without recognition of the fisher community rights) and fisher-NGO-government authorities. For example, DOF allies with fisher leaders who have been its clients for many years against newly organized fishers and elected leaders who gained power through NGO support over issues such as lease value and duration.

**Table 3. Property Rights, Community Organizations and Institutions.**

Attributes	Hamil Beel	Ashurar Beel	Goakhola Hatiara	Kali Nadi
Property rights	Public jalmahal. NGO participant fishers pay revenue for exclusive fishing rights.	Public jalmahal. In NFMP and Third Fisheries Project fishers paid license fee for each gear for fishing rights. Now no revenue collected.	Private land. A seasonal common fishery in the monsoon for surrounding villagers.	Public jalmahal. Open access and no revenue collection since 1996.
<b>Management committee</b>				
Type	Beel Management Committee	Beel Management committee	Beel Management Committee	River Management Committee
Year formed	1996	1997	1997	1998
No. of members	18	25	27	30
Membership	NGO fishers	NGO fishers	Mix of stakeholders	Mixed but fishers only
Executive members	Elected by all NGO group members	Elected by all NGO group members	Selected by NGO, DoF and the community	Selected by DoF and NGO, but non-functional
Constitution	Secretary, President, Treasurer and 3 leaders from each of 5 groups except leaders elected to executive posts	Secretary, Chairman, Vice Chairman, Asstt. Secretary, Cashier. All group leaders from whom executive elected	Female group leaders, male fishers, landowners, NGO staff and local Union Parishad chairman and member	NGO group leaders, other fishers, local elites, FAD owners, DoF and local administration, NGO staff, local council member
Financial responsibility	Yes since 1996	Yes since 2000	None	None
<b>Institutions</b>				
Decision making process	Monthly BMC meetings. Validation/ acceptance of decisions from each group.	Monthly BMC meetings. Group leaders discuss with their members and ask for opinion. Decisions being made on the basis of consensus. Special emergency meeting if necessary	BMC members take decision and implement through NGO participants.	Initial RMC meetings proposed conservation measures. No follow up and decisions not implemented
Resource management rules	All NGO members share costs and benefits equally. Exclude others. Stock carp, closed season, rotational harvest, group guarding	Closed season, gear restrictions, permanent fish sanctuary, no FADs ( <i>katas</i> ), subsistence fishing by non-members permitted	No fishing in winter in sanctuary ditches ( <i>kuas</i> ), closed season	Rotational and limited use of fine mesh seine net in "good fishing ground" decided through consensus between fishing groups
Compliance	Financial: high Closed season: partial	Sanctuary: high Closed season: partial	Sanctuaries: 100% Closed season: high	Na/low
% participants know of fishing rule violation	87%	97%	72%	Na

### 4.3 Interactions

The complexity of inland fisheries access, the strong control over these resources held by individuals in the past, and the potential benefits (income and resource rent) create strong conflicts (Table 4). Management committees were formed in order to mediate these conflicts and to help fishers improve cooperation and resolve conflicts among themselves and to develop links with other stakeholders and with government.

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In the rivers conflicts over productive fishing grounds, engaging non-traditional fishers for fishing, excessive *katas* and grabbing weaker fishers' *katas* are common. Sometimes influentials build barriers to catch all the fish migrating from the river into connecting khals. In the privately owned floodplain conflict arose from the wider community. Comparatively well off leaders wanted to control the management committee without contributing to management. The poor participants did not want to displease these influentials as they have to go to them for

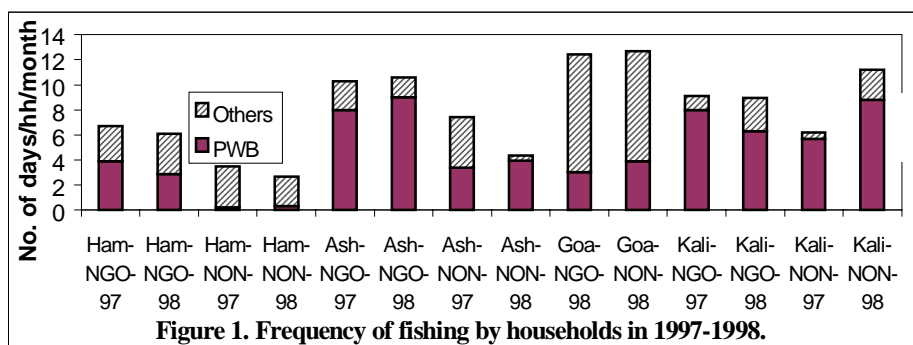
**Table 4. Cooperation and Conflict in Fisheries Management.**

	Hamil Beel	Ashur Beel	Goakhola Hatiara	Kali Nodi
<b>Fisheries management arrangements</b>	Stocked every year and managed by fishers, group harvest after the closed season, bigger katas by BMC	8ha fish sanctuary from 1997 to protect bio-diversity and breeding stocks, closed season, gear restriction, restriction in gear placement,	Some kuas reserved to protect overwintering fish breeding stock, compromise over water flows	Open access, no management, no fishing limit, some NGO groups practice “good fishing” individual katas harvested every year
<b>Cooperation</b>				
Fisher-fisher	Stocking and harvesting every year, closed season after stocking, guarding against outsiders	Sanctuary for three years, strict follow-up of closed season and gear restriction. Sanctuary partly fished by team effort in 2000.	All stakeholders fish during monsoon, put barricade to prevent fish escaping, maintain kuas	Group fishing, sharing gears in teams.
Fisher-other user	Permit poor to fish for food after main harvest upto next stocking	Permit poor to fish for food, allow farmers to use water for irrigation during dry season	All villagers can fish in the beel except in kuas. Sluice gate committee and BMC compromise between rice and fish.	Bigger kata owners employ local fishers to fish in their katas
Fishers-administration	Fisher leaders have good relations with Department of Fisheries	Adjacent khal excavated by the Union Parisad, UP chairman informally helps BMC: donated building and a pond for fry stocking	DoF and NGO support for forming BMC	None
NGO-Government-fisher	Against Municipal Council attempt to take control of the beel	Established NGO members de facto fishing rights in the beel	Against influentials exploiting poorer households	NGO motivate and organize fishers not to pay any fees to government.
<b>Conflict</b>				
Fisher-fisher	Old cooperative leaders vs new BMC leaders over stocking and BMC control and funds	Old cooperative leaders vs new BMC leaders over catching and selling fish fry collected from beel	None	??
Fishers-other	Landowners encroach beel in 1997 and fished in the beel in 1998	Increased irrigated paddy cultivation started conflict over water use	Tension over sluice operation: close to save crops or open to let in fish.	Increasing number of katas owned by non-fishers exclude traditional fishers from some areas.
Administration-fisher	Local Municipal Council attempted to lease out the beel to others	None	Local leaders vs NGO participants over leadership in BMC	Tolls collected from owners of illegal katas.
NGO-Government-fisher	Ex-fisher leaders + DoF vs new BMC leaders + NGO	DOF vs new BMC leaders	?	Land owners + kata owners vs NGO and its members

work and social support and so have to include them. Despite these tensions and conflicts, in the three beels through a mixture of defined property rights and common interest there has generally been growing cooperation, particularly within the community.

#### 4. LIVELIHOOD OUTCOMES

##### 4.3 Fish resources and catches



**Figure 1. Frequency of fishing by households in 1997-1998.**

Household survey data on fishing effort in the four waterbodies shows considerable differences between waterbodies but little difference between years (Figure 1). In Hamil Beel NGO participants fish in the waterbody half of their fishing time. They only fish in teams in the peak fishing period, at other times they fish individually for food. They successfully managed to exclude

other households from the same villages (non-NGO sample) from fishing in the waterbody.

In Ashurar Beel participants mostly fished in the waterbody, but non-participants are not excluded from the beel (there is no formal lease payment). The BMC has continued to allow non-participants to fish outside the sanctuary for food using smaller gears.

Fishing effort in Goakhola-Hatiara is the same for both the participants and non-participants: it is private land and all the people around the beel have rights to fish. As it has water for only 5-6 months a year everyone fishes in other places nearby for much of the time.

In Kali Nadi open access and large traditional fishing communities represented in both NGO and non-NGO samples mean that effort is similar for both groups. In 1997 non-participants fished less than the NGO professional fishers. High floods in 1998 increased availability of fish in the floodplains and the fishing effort by non-participant part-time fishers increased.

Annual stocking in Hamil Beel has shown variable output due to disputes between factions and escape of stocked fish during the 1998 flood. As a result catch and returns fell from an initial high associated with high compliance with past leaders' rules in 1996 (Table 5).

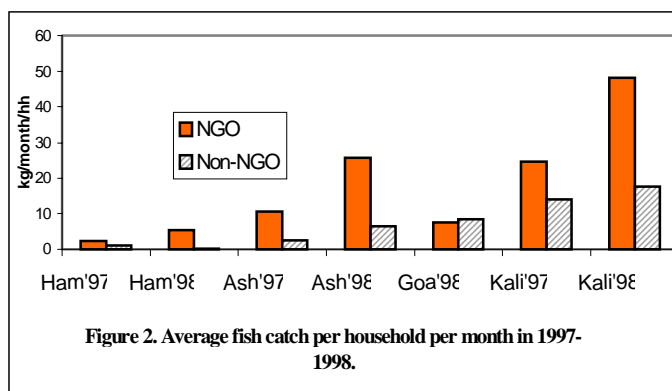
**Table 5. Culture-based fishery management in Hamil Beel 1996-1999.**

	1996	1998	1999
Fingerlings stocked (no)	62,080	47,400	89,400
Catch stocked fish (kg)	17,790	5,606	8,100
Catch wild fish (kg)	2,310	3,761	3,150
Yield (kg/ha)	1,256	585	703
% stocked fish	89%	60%	72%
Cost of fingerlings (Tk)	44,700	46,500	36,300
Gross value of fish (Tk)	745,400	313,560	412,580
Net return (Tk/hh)	5,150	1,960	2,770

1997 data incomplete.

There was little change in fish catch per household per month for the Hamil Beel participants, but in Ashurar Beel catch has almost doubled between 1997 and 1998 (Figure 2). Compliance with the closed season and sanctuary has probably increased catch there. Kali Nadi catch has been highest in 1998 possibly due to flooding. In Goakhola no difference in fishing effort was expected as all the households has equal probability of fishing in the monsoon season.

Table 6 shows that the fishing effort and total catch have increased since 1997 in the other three waterbodies. Open catch increases in 1998 were linked with flooding, but also are due to conservation through sanctuaries and observance of closed seasons by the participants and the community in



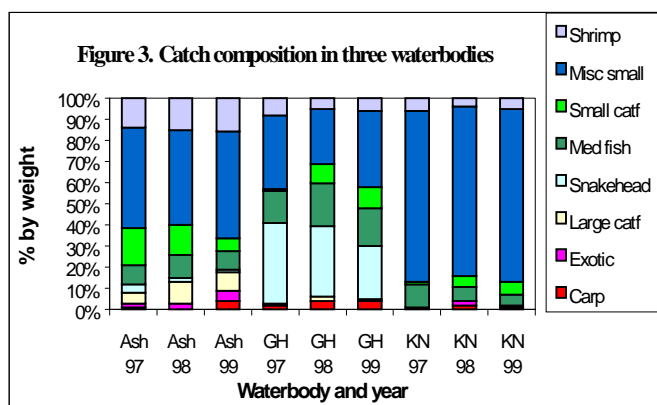
**Figure 2. Average fish catch per household per month in 1997-1998.**

the two beels. In Goakhola Beel, although it is privately owned, farmers as well as fishers jointly try to balance water needs for fish and paddy.

**Table 6. Changes in Fish catch.**

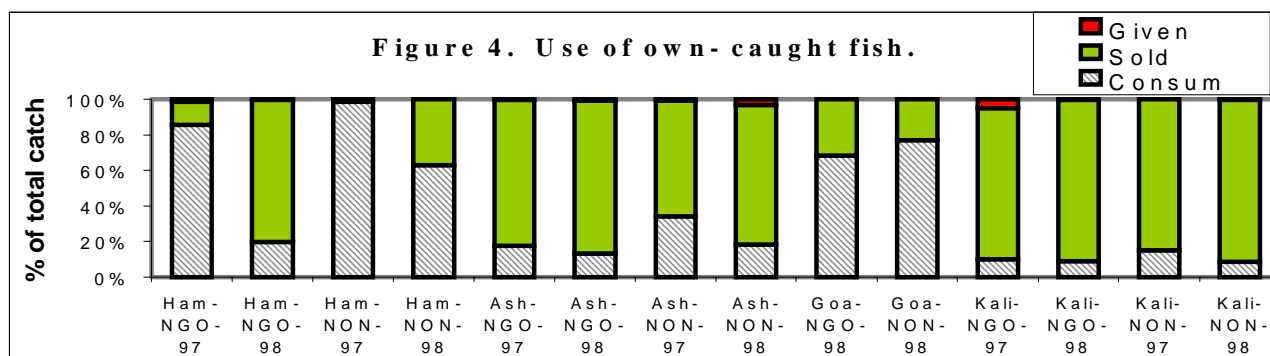
Indicator	Year	Ashurar Beel	Goakhola -Hatiara	Kali Nodi
Gear days (open fishing)	1997	7,927	2,699	11,211
	1998	10,634	2,852	10,679
	1999	13,940	3,743	12,074
Fish Agg. Device (no.)	1997	8	76	82
	1998	0	69	86
	1999	0	Na	na
Open catch (t)	1997	30.6	6.4	139.6
	1998	49.9	11.1	142.8
	1999	58.1	9.1	166.4
FAD catch (t)	1997	1.8	4.4	8.8
	1998	0	3.5	9.2
	1999	0	Na	Na
Total catch (t)	1997	32.5	10.8	148.4
	1998	49.9	14.6	152.0
	1999	58.1	Na	Na
Species caught (no.)	1997	36	30	52
	1998	36	25	60
	1999	28	29	62
	All	45	40	73
Catch (kg/gear day)	1997	3.9	2.4	12.5
	1998	4.7	3.9	13.0
	1999	4.2	2.4	13.8

The farmers benefit as 30-40% of catch is in their kuas (FADs). Any changes in Kali Nodi are linked with increasing competition and effort rather than conservation although FADs have not increased since the early 1990s, this is also the richest fishery with both a high catch and high species diversity due to its location and size. In the open waters species diversity in annual catches has not changed, but there have been some changes in catch composition (Figure 3). Small fish have increased as a proportion of catch. Larger catfish benefited from the sanctuary in Ashurar Beel (in early 2000 the participants collectively caught 2.7 t of boal *Wallago attu* a large high-valued catfish from 50% of the sanctuary). The seasonal floodplain differs in having a high annual catch of snakeheads *Channa* spp.



Beel use of very fine meshed push nets for subsistence fishing has increased considerably, confirming that non-participants are not excluded, while the gill nets used to fish for an income have become larger and larger meshed indicating an effort to conserve juvenile fish (Table 7).

Only smaller gears are used in Goakhola-Hatiara Beel, cast nets are mainly used in open water – there was more in the 1998 floods and little due to paddy cultivation in 1999. Seine nets used by professional fishers dominate Kali Nadi, but there has been a rapid change: total effort increased with open access, the proportion of big ber jals operated by traditional fishing teams fell but their nets grew in size and



**Table 7. Changes in fishing gears in capture fisheries.**

Attribute/gear		1997	1998	1999
<b>Ashurar Beel</b>				
% effort by	Cast net	34	35	17
	Gill net	32	22	28
	Push net	11	35	31
Gill net	Length (m)	140	220	247
	Mesh (cm)	2.6	3.1	5.5
Push net	Mesh (cm)	1.3	0.7	0.6
<b>Goakhola-Hatiara Beel</b>				
% effort by	Trap	41	30	45
	Gill net	28	18	27
	Cast net	18	23	3
	Hook	6	22	21
Gill net	Length (m)	8	12	11
	Mesh (cm)	3.2	2.0	2.3
<b>Kali Nodi</b>				
% effort by	Seine net	79	71	80
Ber jal (12 persons)	% effort	40	40	32
	Length (m)	395	410	457
	Mesh (cm)	0.6	1.2	1.1
Bara ber jal (3 persons)	% effort	29	16	18
	Length (m)	54	78	84
	Mesh (cm)	0.5	0.8	0.8
Besha gulli jal (2 persons)	% effort	31	44	50
	Length (m)	43	24	16
	Mesh (cm)	0.7	0.7	0.8

Changes in fishing gear have been complex but quite rapid within a three year period in the open fisheries. In Ashurar

they have increased mesh size. But smaller seine nets have increased as a proportion of effort and become smaller. Teams with large seine nets are not allowed to fish in some good fishing grounds which are under the control of rich influentials.

In Hamil beel NGO participants ate more than 80% of their catch in 1997 while in 1998 they sold the same percentage of their catch (Figure 4). Others showed a similar trend. In Ashura Beel both NGO participants and non-participants sold most of their catches in both years. Similarly both participants and non-participants consumed most of the catches in Goakhola-Hatiara Beel (mainly a subsistence fishery) but sold most in Kali Nadi (where many households are professional fishers).

## 5.2 Fish consumption

There was a common trend for increased fish consumption in all the waterbodies. However, in 1998 in Ashurar Beel and Kali Nadi consumption was very high (Figure 5).

In Ashurar Beel fish catch increased and so households generally increased consumption by more than 3-times, a combination of high water levels and the sanctuary and fishing restrictions may explain this. In Hamil Beel the increase in fish consumption was less. The non-NGO households generally consumed more fish than the NGO participants, since the former are mostly better-off than the



NGO participants. The NGOs target households that are

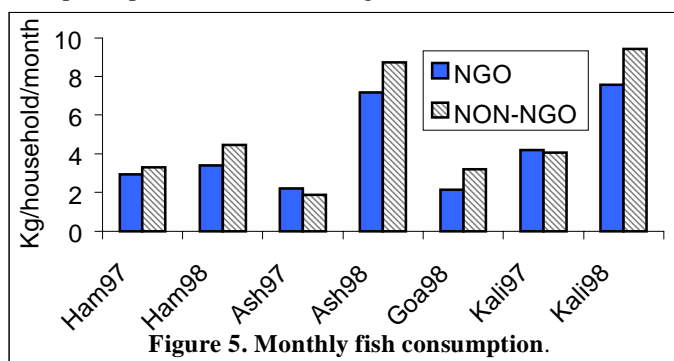


Figure 5. Monthly fish consumption.

landless or have small land holdings.

The number of species consumed by the participants and non-participants increased in the river where catches also increased, but fell in 1998 in the closed beel despite it being flooded and wild fish entering the area (Figure 6). The number of carp species consumed increased in 1998 because they escaped from ponds and other waterbodies and entered the project waterbodies, this was apparent in the river - Kali Nadi. During the 1998 flood these carps were sold at very low prices as road communications were broken and the pond and beel owners were afraid of losing the fish from their waterbodies.

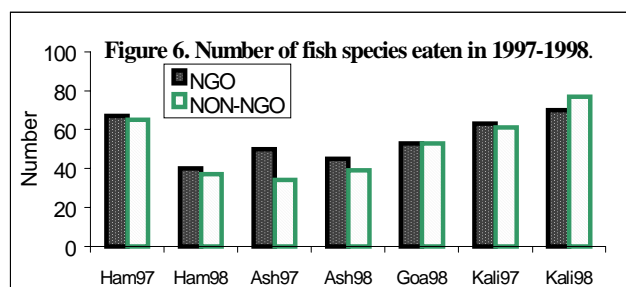


Figure 6. Number of fish species eaten in 1997-1998.

With community access to fishing for food, all households in the floodplain beel (Goakhola) mainly ate fish they caught, yet people fishing for an income in the other three waterbodies bought a substantial part of the fish they ate (Figure 7). Non-participants from Hamil Beel tended to buy

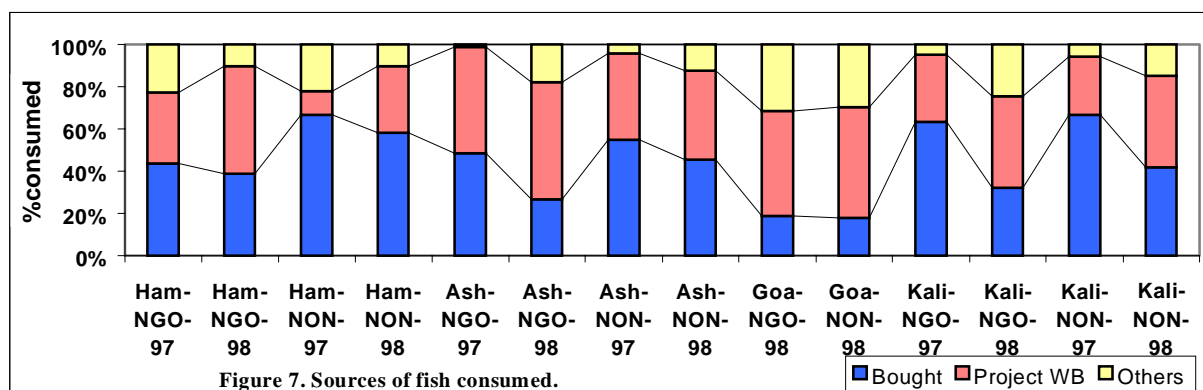


Figure 7. Sources of fish consumed.

most fish as they are excluded from the beel. In all cases the proportion of fish bought fell in 1998 since catches were higher than in 1997.

### 5.3 Assets, credit and incomes

The NGO participants in all four areas were poorer than their community average in terms of land. But the differences were least in the open beels where the non-NGO members are often both fishers and farmers. Asset ownership and access to credit are indicators of changed economic condition since the inception of the project (Table 8). Usually in Bangladesh people improve the roof of their house when they get money in hand. Even with loans they buy corrugated tin for the roof. A tin-roofed house is much safer in flood and for security than a thatched house. The percentage of tin-roofed houses increased among NGO participant households more than among the non-participants (who originally had tin roofs). The NGO participants have taken more credit from the NGO than have the non-participants who may also be in Non-CBFM NGO groups. This indicates that the participants have been successful in reducing loan from the moneylenders. As shown earlier household income from fishing in the closed beel dropped due to internal disputes

Table 8. Change in household assets and NGO credit.

Waterbody, status, year	Land (ha/hh)	% tin roof	% of credit from NGO
Ham-NGO-96	0.04	35	19
Ham-NGO-98		58	36
Ham-Non-96	0.38	80	17
Ham-Non-98		88	23
Ash-NGO-96	0.24	28	22
Ash-NGO-98		38	36
Ash-NGO-96	0.23	28	10
Ash-NGO-98		46	25
Goa-NGO-96	0.65	62	7
Goa-NGO-98		78	21
Goa-Non-96	0.93	70	0
Goa-Non-98		78	10
Kali-NGO-96	0.07	92	36
Kali-NGO-98		97	70
Kali-NGO-96	0.29	93	3
Kali-NGO-98		90	15

and escape of fish, and has risen in the river with increasing effort and has remained the same in the open beels excluding the 1998 flood.

## 6. INSTITUTIONAL ASSESSMENT AND CONCLUSIONS

The attempts to develop new fisher organizations and institutions assessed in this paper have been in the context of very different access and property rights regimes in the four waterbodies, different fishing dependence, community differences, and different NGO approaches and capabilities. To assess the early stages of the process, NGO members and others in the same communities made self assessments of their participation and influence.

Table 9 indicates that there were general improvements in participation in community affairs that appear not to be linked with NGO membership except in the river. Participation, influence over and efficiency of fishery decision making increased significantly for NGO members

**Table 9. Respondent self assessments of changes in participation indicators (comparison of mean scores 1995 vs late 1997).**

Waterbody	General partic.		Fishery partic.		Fishery influence		Fishery decision ease	
	NGO	Oth.	NGO	Oth.	NGO	Oth.	NGO	Oth.
Hamil Beel	S	S	S**	NS	S**	NS	S**	NS
Ashurar Beel	NS	S	S	S	S	S	S	S
Goakhola-Hatiara	S	S	S**	S	S	S	S*	S
Kali Nodi	S**	NS	S**	S	S**	S	S**	NS

Notes: indicators were scored by the respondents on a scale of 1-10 with 1 and 10 defined respectively as the worst and best conditions that the household could imagine for that indicator.

NS = not significant, S = significant ( $p < 0.05$ ), t-test comparing mean scores for 1995 and 1997.

in all four waterbodies, reflecting the emphasis of the project. In Hamil Beel non-members are excluded and so had no involvement in decisions, but in the other waterbodies non-participants also reported significant improvements probably as a result of mixed committees, general meetings, consultations and workshops. Even so the gains were greater for NGO members in all but Ashurar Beel where others in the community readily agreed on conservation measures and were consulted.

So far the management committees have been heavily dependent on support from NGOs and to some extent from DOF, for example in organizing elections and in technical advice on fishery management. However, many of ideas have been developed locally or through exchange visits between sites. Differences in organizational development reflect the level of NGO support. For example, in the river

site the NGO had no staff member to work only with the fishing communities but ran its normal credit and training program, this reduced dependence on moneylenders but failed to facilitate a strong committee representing groups of fishers.

The combination of open access, lack of well defined community use rights, conflict and low NGO support means that fishers in the river had little incentive to make new fishery rules and comply with them. At the other extreme there already existed a well-defined system in the closed beel based on exclusive use rights and sharing investments and returns. But power rested with a few leaders and the contribution of CBFM has been to make fisher management there more transparent and improve equality, internal factions developed which have limited short-term returns but may in the longer term broaden the basis of fisher management. The greatest institutional changes occurred in the two open beels, under different organizational arrangements. Whether decisions are taken by representatives of fisher groups or a wider committee may not be critical provided there is wider consultation and support from local leaders and farmers and provided traditional rights to fish for food are respected. Setting aside small but critical areas as fish sanctuaries and closing fishing when catches are low and fish are breeding have been common-sense improvements that have met with wide acceptance and high levels of compliance.

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