

# Integrated Floodplain Management

## Fishing Effort Control

### What is fishing effort control?

Reduction of destructive fishing gears and methods as well as reduction of fishing pressure to a sustainable rate along with conservation measures can be denoted as fishing effort control.

### Why fishing effort control?

Fishing pressure, harmful fishing gears and destructive fishing methods are among the major reasons for reduction of fisheries resources from the open waters of the country. All the mentioned factors are making the once rich open water fisheries resources empty. So imposing methods for fishing effort control is urgent at this moment. This will hopefully ensure that sufficient mother fish remain in the water bodies to spawn and propagate in the next breeding season, and thus sustainable fish population will be maintained.

Studies revealed that the fishing pressure in Bangladesh floodplains is so high that less than 2% of produced fish survives until the end of each year.

### What are the methods of fishing effort control?

- **Conserved area or Sanctuary:** Whole or a part of a water body is demarcated, announced and maintained as no fishing zone. Where fish and other aquatic animals are not harvested or disturbed through out the year.
- **Closed season:** Ban on fishing during critical part of its life cycle. As a result, fish can breed and propagate successfully, allowing produce to grow bigger.
- **Restriction on harmful fishing gears:** Restriction on current jal, moshari jal etc. and restriction on mesh size of net is proved to be very useful tool for maintaining a healthy fishery.
- **Ban on destructive fishing practice:** Complete dewatering and cross dams along with fishing at a sluice gate opening is considered destructive for fish. Bans should be imposed on these methods.
- **Ban on harvesting immature fish:** Harvesting of immature fish should also be stopped to allow fish to breed at least once in their lifetime. Bans should also be imposed on the carrying and marketing of immature fish.

### What is the result of effort control?

Experience in many projects working for fisheries management projects (MACH, CBFM 2, Fourth Fisheries Projects) shows that fish friendly management and harvesting can result in remarkable increase in production. Again proper enforcement of all these management measures will have a positive impact on other aquatic resources that will bring benefit for the poor resource users too.

Study results shows:

- The best result could be attained from 30-40% closed area as sanctuary, however 10% dry season area is sufficient to sustain fisheries production.
- Two months closure in late dry-season (April-June) increases catch by 120%.

### Is it possible to enforce effort control?

At present in many localities under different development projects fishers or other resources users are successfully imposing effort control measures, monitoring by themselves and enjoying benefits.



This fact sheet is prepared based on research findings of various projects aiming at improved floodplain resources management.

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## Fish Sanctuary

### What is fish sanctuary?

The whole or part of a water body where fish and other aquatic life can take shelter and continue some of their biological activities with out interruption or disturbance can be denoted as a fish sanctuary. Harvesting of fish and other aquatic resources from a sanctuary is strictly prohibited. As a result, fish taking shelter in a sanctuary can breed and propagate in the following breeding season, playing an important role in increasing fisheries production and maintaining biodiversity.

### Why sanctuary?

Many research results show that each year after indiscriminate fishing only 2% fish can survive in the floodplains of Bangladesh. This 2% of fish is not sufficient to replenish the vast floodplains. That is why, to maintain an optimum fish stock for sustainable productivity and fish species diversity, fish sanctuaries have proved to be successful.

### How big should a sanctuary be?

Research findings in the Pabna Irrigation Project suggest that maintaining 10 to 15% of dry season water area of a water body, as sanctuary will result in 50% increase in fisheries production. In case of a river or a Haor a part of it, in case of a beel complex a beel can be conserved as sanctuary.

### Where to establish a sanctuary?

Any place of a water body where sufficient water remains through out the year for fish is suitable to establish a sanctuary, like:

- Deep scour holes in rivers;
- Deeper areas or ditches in beels or floodplains;
- River or part of water body used by fish as breeding ground;
- Fish migration routes etc.

If the selected place for sanctuary is not deep enough to hold sufficient water in dry season, it can be excavated, for further protection of fish tree branches, bamboo, water hyacinth or other aquatic plants can be used.

### What should be the duration of a sanctuary?

Sanctuaries can be long term or seasonal. Sanctuaries in deep beels or river scour holes can be maintained year round and longer period. On the other hand seasonal sanctuaries in floodplains, shallow beels or in canals are also important. These sanctuaries are mainly to allow safe migration of fish.

### What should be the management of a sanctuary?

To ensure a proper and sustainable management of sanctuary it is suggested to involve local fishermen and other communities from the beginning through local CBO. They should also be given the responsibility of guarding and maintenance.

- Create awareness among the community;
- Stop fishing or any other harmful activities in the sanctuary;
- Establish 50-200 m buffer zone around the sanctuary;
- Responsibility to look after, repairing etc. should be given to local organization.

So far, established sanctuaries in different water bodies in different parts of Bangladesh have proved to be successful. A joint effort of establishing sanctuaries and maintenance would be an effective step towards enhancing open water fisheries.



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## Periodic Ban on Fishing

### What is a periodic ban?

Generally, people fish round the year in the rivers, beels, and haors using different types of gears. The ever-increasing number of fishermen and gears creates a pressure on this self-sustaining resource that causes a decline in production. That is why periodic ban on fishing has proved to be a successful method for fisheries management. People impose ban on fishing during critical periods of fish's life cycle.

### Why is periodic ban important?

One of the major causes of declining floodplain fisheries production and biodiversity is over fishing. Over fishing reduces and finishes the stock as a result production and diversity gradually reduces. To overcome this problem and maintain a sustainable stock, periodic bans on fishing are proved to be a successful method.

### How long should be the ban period?

Length of periodic ban should be determined based on situation and need. Fishing bans can be 1 to 3 months period, maybe less or more. In this regard, the number of fishermen and their rate of dependence should be taken into consideration.

### Which period is suitable for fishing ban?

As because ban is imposed for a short period, it should be determined which period will be more effective to maximize production. Experiences in Pabna Irrigation Project on 6773 ha floodplain shows:

- **One month ban** in January resulted in 102% increase in production, which is higher than any other month. If a 1-month ban imposed in April will increase production by 95%.
- **Two months ban** in January-February will result in 125% increase in production. Based on local situation ban during April-May period will result in 20% increase in production.
- **Three months ban** during January-March can result in 139% increase in fish production, which is more effective than any other period of the year. Three months ban during July-September would increase production up to 124%, during October-December it is only 68%.

### With respect to the situation in Bangladesh, how long should a ban period be?

Considering the population pressure and dependence on fishing, especially by the poor fishers, a short period of ban, 1-2 months, would be feasible. The CBO in management of a waterbody can decide upon the duration and period of fishing ban.



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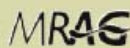
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## Fish Migration

### What is fish migration?

All floodplain fish move from one habitat to another to complete their lifecycle (reproduction, nursing, grow-out etc.) and fulfill needs (shelter, feeding) at certain times. This type of movement of fish for biological reasons from one habitat to another is called migration. General floodplain fish shows two types of migration:

- Lateral migration: When fish migrate to rivers from adjacent beels/haors through canals and vice versa, it is called lateral migration. Again, small distance migration of fish within a beel, maybe from deeper part to shallow flooded areas, is also considered as lateral migration.
- Longitudinal migration: When fish migrates from up-stream of a river to down-stream or vice versa to fulfill its biological needs is called longitudinal migration.

### Is migration necessary?

All kinds of fish need to migrate at certain time to complete their lifecycle, otherwise natural production will be stopped and the vast resource will become extinct. Therefore, migration and the scope for natural fish in the floodplains is necessary for a sustainable fishery.

### What are the objectives of fish migration?

Fish migrate for three main biological needs:

- **Spawning migration:** Generally with the onset of monsoon fish starts to migrate to their suitable places for spawning during April-June. When heavy rain starts with thunder and lightning this along with the change in temperature provokes fish to migrate and schools of fish starts movement (Fig. 1). Some fish migrates for spawning during July-August too. Temperature, thunder shower, water current and increase in water on sets spawning behavior in fish that induces spawning migration.
- **Feeding migration:** This migration also starts with the onset of monsoon and continues up to the beginning of water recession from the floodplains. Floodplains are extremely highly productive ecosystems with nutrient rich surface runoff, shallow regions (ATTZ) with abundant sunlight. During this period, fish comes out from their critical winter habitats to the wide floodplains besides breeding they start increased feeding, produced spawns moves to nursery grounds, feed on their specific food, and grow bigger.

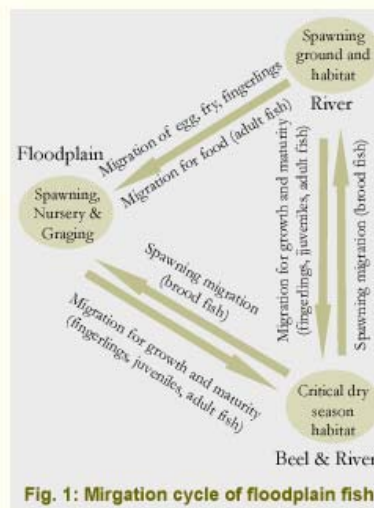


Fig. 1: Migration cycle of floodplain fish

- **Migration to critical dry season habitats:** Dry season (December to March) is critical period for the fish. Vast wet season aquatic habitat is reduced to smaller pools (size reduction may be one third to one fourth of original size) and people starts catching fish very intensively. That is why fishing and natural mortality of fish becomes highest during this period. At this time fishes starts to migrate to deeper beels or rivers.

Fishes will remain in their dry season habitats up to the onset of the next monsoon (April-May) and again they will migrate for spawning and feeding to the floodplains. This migration cycle of inland open water fishes which is vital for the self-replenishing fisheries resource of the country. If this migration cycle is disrupted or disturbed at any stage, it will hamper the existence of fish.



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## Obstacles to Fish Migration

### What is the significance of obstacles to fish migration?

One of the main reasons of the loss of floodplain fisheries production and biodiversity is the loss of migration facilities to complete fish's biological cycle. As a result spawning and growth of fish is hampered, production decreased, biodiversity threatened.

### What are the major obstacles?

Studies identified followings as the major obstacles to fish migration:

Flood control and irrigation projects: At present there are 653 such projects in the country that are negatively impacting 5.5 million ha wetland. Fish migration to and from these wetlands is either completely or largely stopped. Generally three types of structures are built in these sorts of projects:

- Earthen embankments along the river to protect spill over from the river to adjacent crop fields, floodplains and beels.
- Mouth of Canal blocked to stop river water entering the beels or floodplains through canals.
- Regulators at the mouth of canal/distributaries to regulate entry of water to adjacent beel or floodplains.

All these three types of flood control structures hamper fish migration. Among them, regulators are less harmful if operated in a fish friendly manner, allowing limited fish movement, which is possible without hampering rice production.

Catching migratory fish: With the onset of monsoon, when fish start to migrate, many people begin catching fish in, and at the mouth of canals / small links that are used as their migratory routs. Studies revealed that 50% of the migratory fish are caught before reaching the regulators.

Silted up of the canals: Due to afforestation and unplanned land use land slide and erosion has increased in the hills and uplands and as a result canals and small rivers are being silted up. As a result, water flow through them either completely stopped or reduced significantly, which is hampering fish migration. Silted up of the canal between Juginee Beel and Laohajang River at Tangail District is a good example, where the fish production in the beel reduced suddenly as the connection was disrupted and no fish could enter into the beel from the river.

Fishing at the regulator or sluice gate points: There are 4190 regulators or sluice gates in 653 FCD/Is. When fish tries to enter into the floodplains through them people sets net and other gears there and catches up the fish those were able to escape from catching in the canals.

### How to remove these obstacles to fish migration?

- Re-excavation of silted canals:** so that early season flooding water carrying fish spawn and hatchlings can enter into the floodplains through them.
- Stop catching migratory fishes:** while they are going one habitat to another for breeding or growing.
- Stop fishing at the regulator points:** by using nets, spears or other means especially during spawning migration.
- Keep the gate open during fish migration period:** especially during spawning period to allow brood fish and spawn/hatchling movement. The sluice gate committee can do this with out hampering rice.
- Declare as seasonal sanctuary:** can also protect fish from catching in canals or at the mouth of the sluice gate or regulator.



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## Fish Friendly Sluice Gate Operation

### Why fish friendly sluice gate operation?

To protect rice crop in the floodplains there are about 13000 km embankment and 4190 sluice gates constructed under 653 flood control and irrigation projects in Bangladesh. As a result 5.5 million ha of floodplain are directly impacted. These sluices and embankments have severely impacted and reduced fisheries production and species diversity of the areas. This is why operating the sluice gates in a fish-friendly manner is very important. Research reveals that fish and crop friendly operation can benefit both, and increase fish production significantly and conserve species diversity.

### What is fish friendly operation of sluice gates?

Sluice gates are operated mainly targeting crops, they are opened or closed to benefit crops alone. Natural fish movement never considered in this regard. But sluice gate management should be in such a manner that allows fish movement from one habitat to other in need and in time, which is urgent for fishes in the nature to propagate and survive, this way of sluice gate operation can be denoted as fish friendly sluice gate operation. It will enhance fisheries production and conserve species diversity as well.

### How important is fish friendly operation of sluice gates?

In different parts of Bangladesh there are four very expansive fish passes are constructed to allow fish movement to and from river and enclosed floodplains. However, all the four fish pass are ineffective due to technical and management faults. Considering the situation local people and the scientists suggests that instead of constructing more costly fish passes it would be wise to establish a fish friendly operation of the existing sluice gates, where the gate will be closed or opened coordinately to allow fish movement through them whilst at the same time protecting crops. Fishermen and farmers representative will jointly discuss and decide. Piloting results proves that it is possible to increase fish production considerably with out hampering crops in this way.

### How to operate a sluice gate in a fish friendly manner?

Sluice gate should be kept open with the onset of monsoon when fish starts moving from floodplains to river and river to floodplains so that fish and fish spawn and hatchlings can move one habitat to another as per their need. At the same time it should be regularly monitored whether floodwater is damaging the crops or not. Again, at the end of the monsoon gate should be kept closed as long as possible to maintain sufficient water inside the embankment to allow fish to grow for a longer period too, this will also increase fisheries production.

### What are the principles of fish friendly sluice operation?

To enhance fisheries production within flood control projects 6 principles should be followed:

- Gate should be open frequently at the onset of monsoon to allow fish to enter into the floodplains, but water scours should be avoided at the mouth.
- At the end of monsoon when water starts to recede, the water should be released slowly.
- At the end of monsoon some more water should be preserved inside the embankment as long as possible, this will allow fishes a longer growing period.
- The connectivity's from river to gate and from gate to beel should be well protected; fishing should be controlled to allow fish, spawn and hatchlings to enter.
- Framers should be motivated so that they will grow early harvestable low water demanding crops instead of boro rice so that it will be possible to keep the gate open for longer period and well in advance.
- All this activities should be done with the participation of local community and all stakeholders including farmers and fishers.



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## Result of Keeping More Water Inside Embankments

### Why it is important to keep more water during dry season?

At the end of wet season, the tendency to drain out water as fast as possible is common to all the flood control projects through sluice gates. As a result, dry season water in the beel and canals in side embankment is scarcer which impacts fisheries production. Research results show that even a little more water in the beels and canals during dry season could significantly increase fisheries production.

### What will be the impact of increased water on crop and fish?

Research conducted in Pabna irrigation project with 6773 ha land shows quite significant results:

- If the water height is increased 0.25 m at the sluice gate point, it will produce 85 tons of more fish and only 8 ha additional land will be under water thus boro rice cultivation will not be possible costs 30 tons of rice on an average.
- If the water height can be maintained 0.50 m more, additional fish production will be 175 tons, and 16 ha of land will be unavailable for boro rice.

### How significant is the benefit?

If the loss in rice production is compared to gain in fish production, it will be clear that ultimate gain is much higher (table 1). A comparative account of the situation for the Pabna Irrigation Project is given below:

- due to 0.25 m of increased water height it is possible to gain 85 tons of additional fish production, at the cost of boro rice from 8 ha land of Tk. 109,906 results in a net benefit of about Tk. 3,600,000 from the additional fish.
- again, if the water height is maintained 0.50 m, additional fish production will be 175 tons at the cost of boro rice from 16 ha land, Tk. 219,872. Net benefit in this case will be Tk. 7,300,000 from the additional fish.

**Table 1: Benefits of increased water coverage (results of data analysis from 6,773 ha area)**

Description	0.25 m increase	0.50 m increase
Additional fish production (in ton)	85.60	175.70
Loss of Boro rice (ha)	8.00	16.00
Price of additional fish produced (Tk.)	3,680,800	7,555,100
Loss of Boro rice price (Tk.)	109,936	219,872
Net additional income	3,570,864	7,335,224
Ratio of additional fish price and loss of Boro rice	33.4	34.3

### Is it possible to increase water height during dry season?

It will be a challenging job to hold increased water inside the irrigation projects, because it depends on various factors. That is why if the local people need to be motivated, especially the farmers, fishers and local leaders. They can sit together, compare the ultimate benefit, and decide. In this case, initially a target of 0.25 m increase in water height can be achieved.



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