‘Harvest reserves’ in floodplain river fisheries - Protecting fish to increase catches

Key messages for selection and management

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Background

This presentation is one of a series of five presenting key outputs from FMSP floodplain projects, carried out in the Asian region between 1992 and 2005. The five papers focus on:

- General management guidelines for floodplain river fisheries (as published in FAO Fisheries Technical Paper 384/1)
- Selection and management of harvest reserves (key messages)
- Materials for a training course on harvest reserves
- Management of sluice gates and water levels in flood control, drainage and irrigation (FCDI) schemes for integrated benefits of agriculture and fisheries (key messages)
- FMSP approaches to modelling floodplain fisheries

This presentation was prepared by FMSP Project R8486 – 'Promotion of FMSP guidelines for floodplain fisheries management and sluice gate control'

Selection Criteria and
Co-management Guidelines for
River Fishery Harvest Reserves

DFID Renewable Natural Resources Research Strategy
Fisheries Management Science Programme

April 2000

DFID Department for International Development
MRAG
Dinas Perikanan
CRIFI

This presentation based largely on this FMSP document

Hoggarth (2000)

Content:
1. Guiding principles
2. General guidelines for co-management of river fisheries
3. Specific management guidelines for harvest reserves
4. Summary of key steps for co-management of river fisheries

25 pages with examples in text boxes

Download: www.FMSP.org.uk
(R7043 project page)

Five 'key messages' on selecting and managing harvest reserves for floodplain river fisheries

1. Adopt a collaborative approach both in selecting and managing reserves
2. Manage 'whitefish' at a catchment level and 'blackfish' at a local level
3. Select locations carefully, considering who will benefit and how
4. Develop reserve management rules that are appropriate to local conditions and that will deliver the best overall benefits to stakeholders
5. Manage adaptively – monitor the results, compare with other places, and adapt rules as needed

Details on these are given below

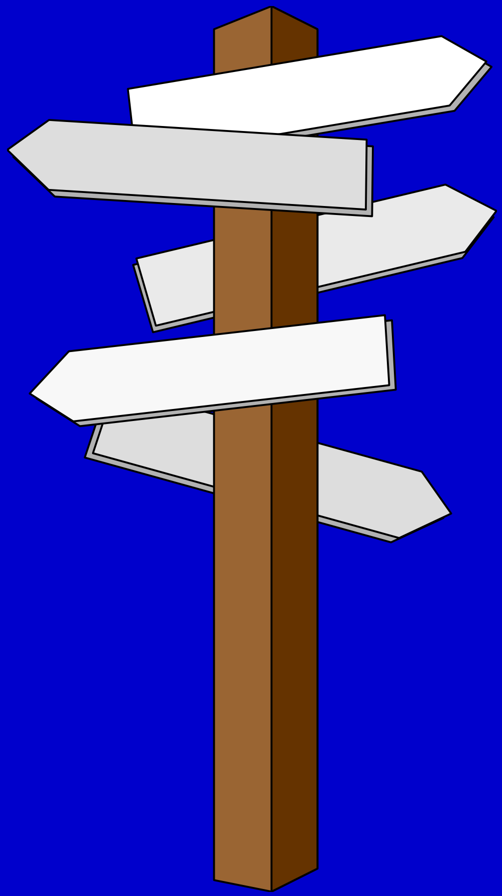
Presentation content

What is a ‘harvest reserve’

Why use harvest reserves?

Key messages 1-5

Credits and references



See also ‘training presentation’ for illustrations of selecting suitable areas for harvest reserves and for developing co-management

What is a ‘harvest reserve’

A harvest reserve is:

- a spatially defined area of water, …
- managed with a specified (but flexible) set of technical regulations, …
- intended to sustain or increase the potential fish yield, …
- available from existing, natural fish stocks, …
- for the benefit of fishers.

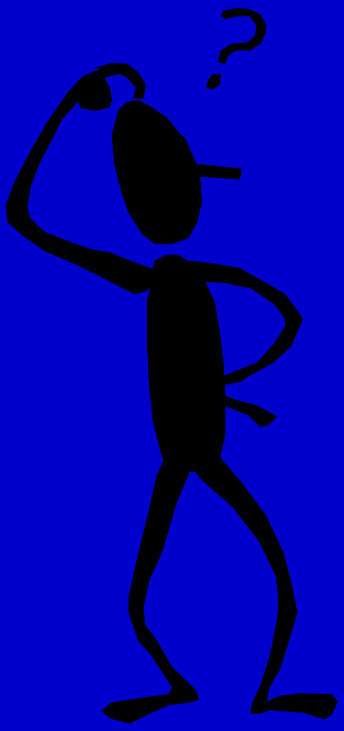
The term ‘harvest reserve’ emphasizes the need to design such protected areas for the benefit of fisheries livelihoods. The term ‘fish sanctuary’, commonly used in Bangladesh, is interpreted by some people to mean an area fully closed to all fishing at all times. A harvest reserve allows more flexibility in the management rules to ensure that both fish and fishers will benefit. Permanent closure of reserves may be appropriate in some locations, but probably not in all.

Two key questions to consider for a *harvest* reserve

- Will the reserve protect fish stocks? (If so, how?)
- Will the reserve increase fish catches? (If so, how, where, and for whom?)

Why use harvest reserves?

- They conserve fish stocks and can increase catches in floodplain river fisheries (when well designed)
- Their high visibility makes illegal fishing easier to detect (it is easier to see a poacher fishing in a reserve than to see who is using illegally small mesh sizes, or using too many units of gear)
- They are traditional and locally acceptable management tools in many places
- They are conceptually simple, with easily understandable effects



FMSP Modelling studies of floodplain fisheries

In Bangladesh, fishing is so intense that less than 2% of floodplain resident fish survive each year (Hoggarth et al, 1999b).

Many water bodies are pumped dry to dig the last fish out from the mud.

Modelling work by FMSP project R5953 (see e.g. Halls et al, 2001) has shown that fish survival (and hence the production of new recruits in the following year) could be much increased by restricting such fishing during the dry season. Harvest reserves provide a way of protecting the breeding stock in some locations, while maintaining fishing opportunities in others.

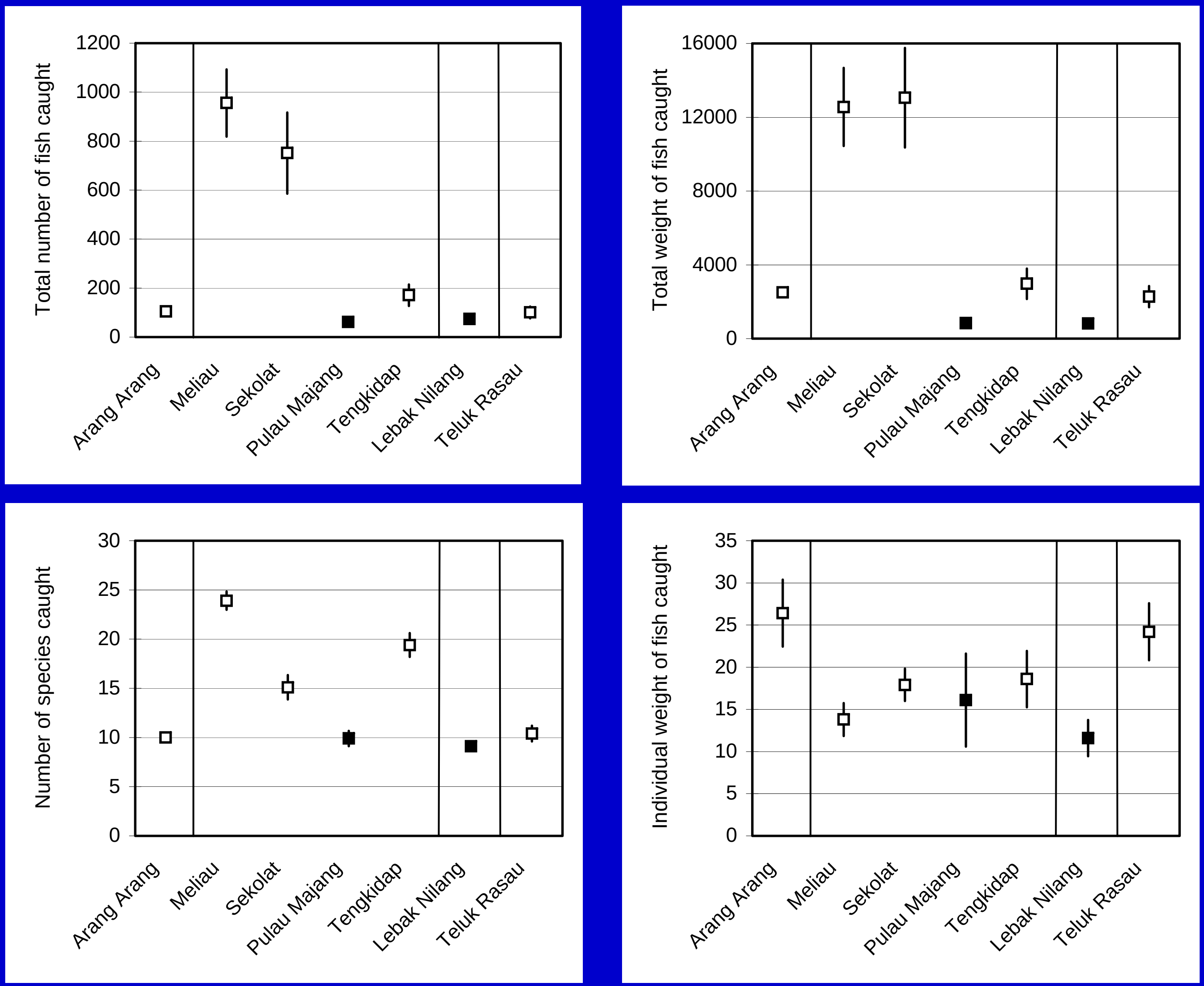
FMSP Studies of reserve impacts in Indonesia

The effects of reserves on fish stocks and catches were also studied by FMSP project R7043, at 9 case study sites in Indonesia, some with and some without reserves (see Hoggarth et al, 2004).

In two community-managed reserve sites where poaching levels were low, fish stocks were 5-21 times more abundant, comprised up to 31 more species and were 5-6 times larger by weight, than at a nearby comparison site that was fished with poison in the dry season (see next slide).

In these reserves, community rules only restricted fishing for certain gears or for certain seasons, but compliance with these rules was good. In contrast, some government-managed reserves that were permanently closed were also poorly enforced or poorly located, and fish stocks were little different from those in nearby exploited water-bodies.

Example biological impacts of reserves (from Hoggarth et al, 2004)



Open symbols: reserves

Filled symbols: fished comparison sites

Vertical lines separate catchment groups (most valid for comparisons)

See FMSP web site to download paper

Key Messages
on selecting and managing harvest reserves for floodplain river fisheries

Key message 1. Adopt a collaborative approach both in selecting and managing reserves

A participatory, co-management approach draws on the knowledge, skills and capacities of resource users, government officers, local development NGOs and other stakeholders, as appropriate in each location.

Co-management will be easier to develop in some locations than others, where particular conditions are met that encourage community action and enforcement (see next slide; Sections 2.1 and 4.1 of Hoggarth, 2000; and Chapter 3 of Hoggarth et al, 1999).

Where good conditions exist, local people should take the lead in the selection of reserves, using their local experience to identify the most suitable water-bodies. Resource users are more likely to know the hydrology of their local area, locations of critical (spawning and dry season survival) habitat and migration routes, and to support reserves if they consider that the best water-body has been selected.

Where should co-management be used?

Co-management may be easiest to develop where:

- its **legality** is recognised both by government and by local people
- the **ownership rights** of villages over the water-bodies (wetlands) in their territory are recognised by local people
- physical resource boundaries are clear and within the administrative boundary of a **single village**
- local people agree that there are **problems** with their fishery (wetland) resources
- local people express a **strong interest** in being involved in management
- the community or user group is highly **dependent** on their fishery resources
- the community has strong **organisations** (e.g. the village committee), skilful and respected **leaders**, or effective **mechanisms** for discussing issues and finding solutions to local problems, and for enforcing their own management rules and resolving conflicts
- villages are **small**
- local stakeholders share the same **culture**, **ideals**, and/or **religions**

Co-management may also be developed in water-bodies that are shared between several villages, but greater efforts will be required for their management and simpler management strategies and tools should therefore be used

Partners' roles in co-management

Effective co-management requires clear definition of the roles of the different partners. While flexibility is required in different locations, the following key roles are recommended (see Chapter 4 in Hoggarth 2000 and Chapter 5 in Hoggarth et al 1999).

Key activities in villages (or other local management units)	Key activities at catchment / regional level
• identifying the stakeholders, their perceived problems, and their objectives for the fishery; • assessing the local fishery; • designing a management plan; • implementing the plan; and • monitoring outcomes and adapting the plan.	• co-ordinating the village units and promoting new units; • representing the fishery in its interaction with other sectors; and • facilitating the adaptive learning process.

Key message 2. Manage ‘whitefish’ at a catchment level and ‘blackfish’ at a local level

The distribution of people who benefit from a reserve depends on the dispersal pattern of the extra fish produced.

Reserves inhabited by relatively non-migratory, local ‘blackfish’ species will mainly increase fish catches within a small local area.

Reserves designed to protect the breeding populations of more migratory, riverine ‘whitefish’ species may give benefits to the whole river catchment due to their much wider dispersal patterns.

Floodplain River Fish

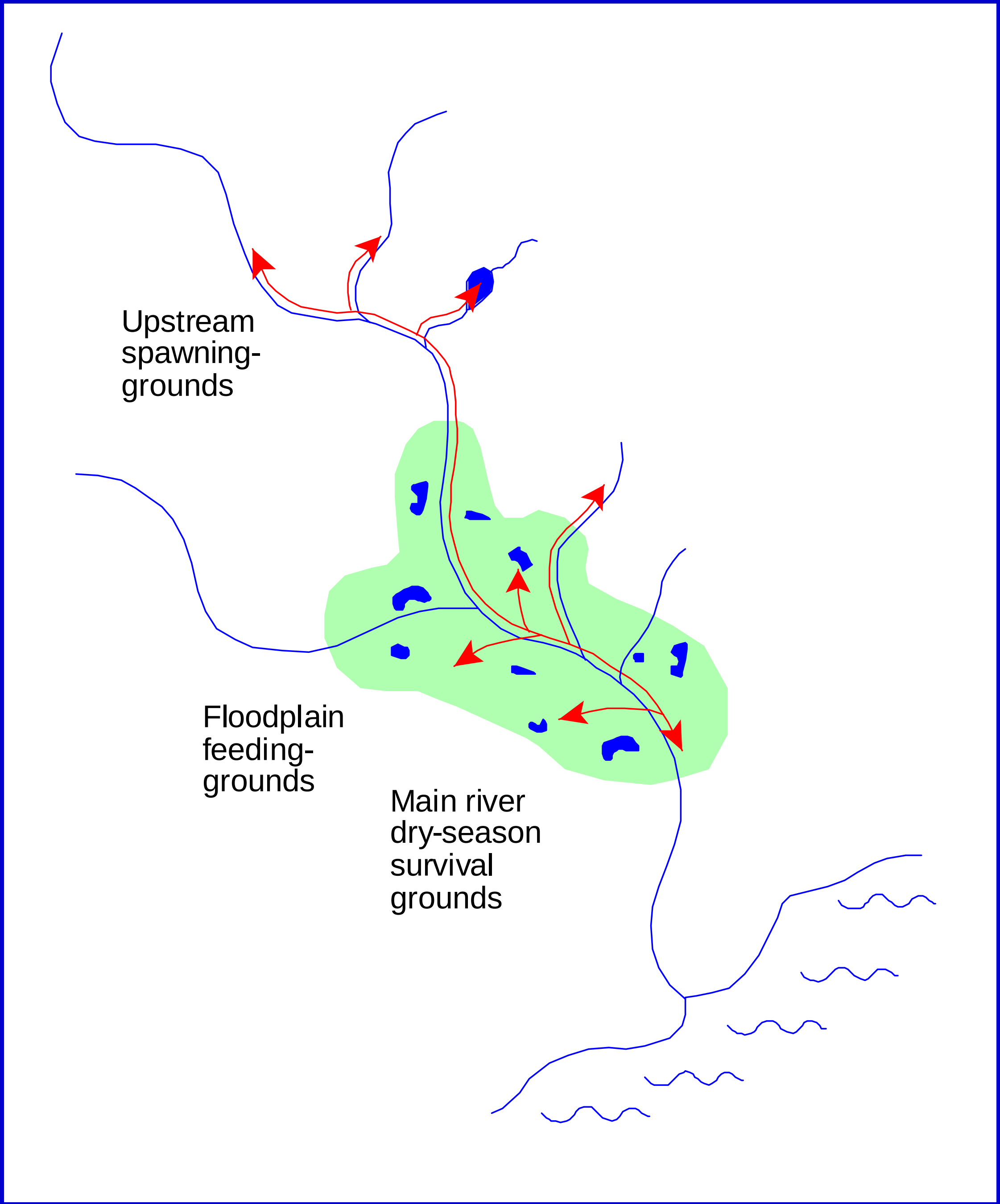
Whitefish

- ‘Flowing water fish’, can not tolerate low oxygen conditions, migrate long distances e.g. to feed and breed on the floodplain.
- Survive dry season in main river channels, often downstream.

Blackfish

- ‘Still-water fish’, can survive low oxygen conditions, tend to migrate short distances.
- Survive dry season in floodplain pools and creeks (even in mud).

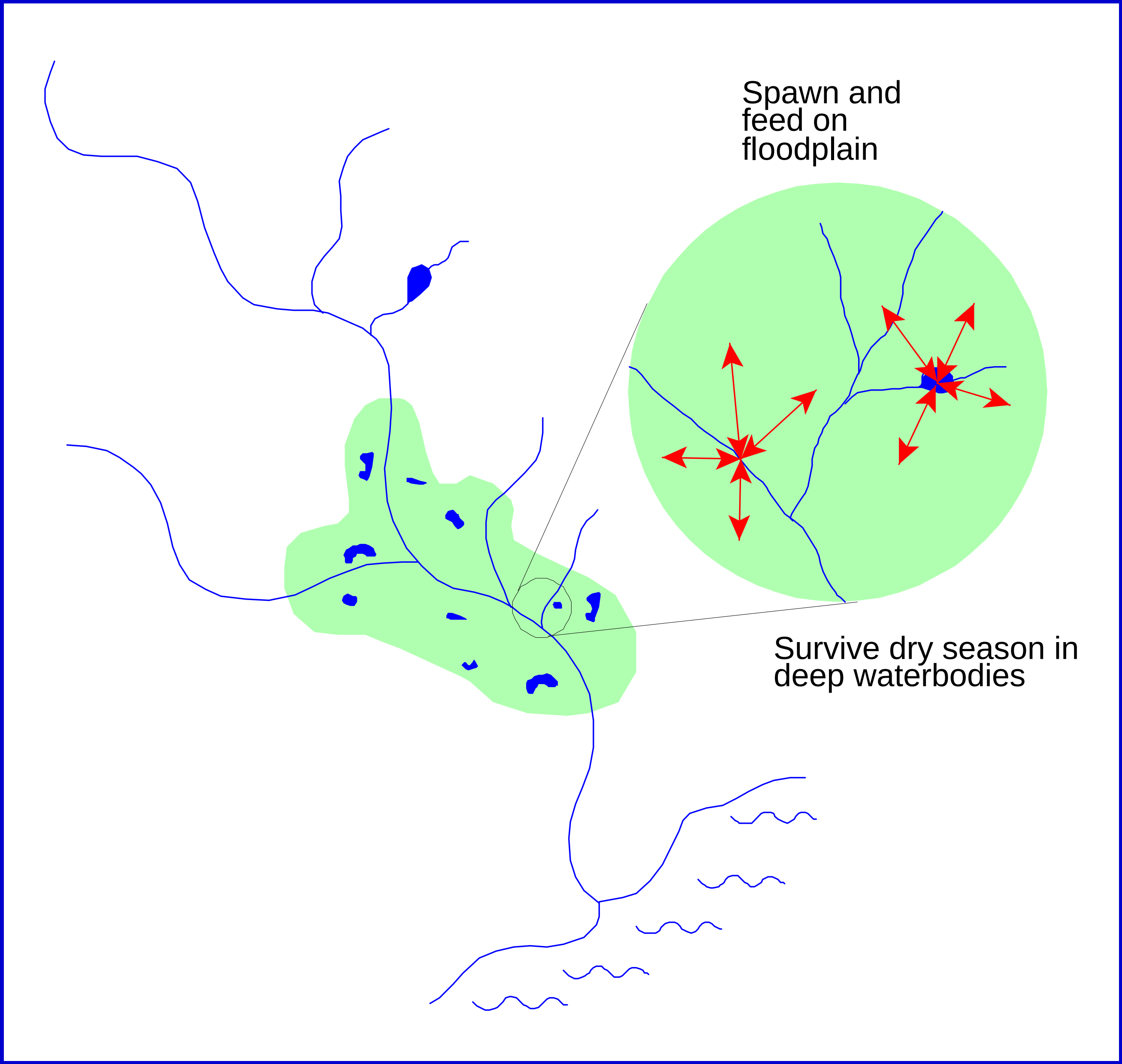
Also have greyfish, in between blackfish and whitefish!



Whitefish

migrate at a catchment (regional) scale

…. and need to be managed at a catchment or sub-catchment scale



Blackfish

migrate at a *local* scale (from each floodplain lake or river)

… and can best be managed at a local level e.g. by each village

Selection and management of reserves for blackfish and whitefish

Reserves for blackfish should be located in deep, permanent dry season water-bodies in floodplain areas.

Reserves for whitefish should be located in their spawning grounds, usually in upstream parts of the catchment.

Whitefish may need additional management measures (e.g. controls on barrier traps) to ensure that some fish can migrate freely to their spawning grounds each year.

Blackfish reserves are more likely to be supported by local communities, since the extra fish produced by their management efforts will stay mainly within their own waters.

Whitefish reserves may need to be promoted more actively by government for the wider benefit of stakeholders thoughout the catchment.

Note: FMSP studies on fish migrations

Migrations of floodplain blackfish and whitefish were studied by tagging in project R5953 (see Hoggarth et al, 1999, Part 2).

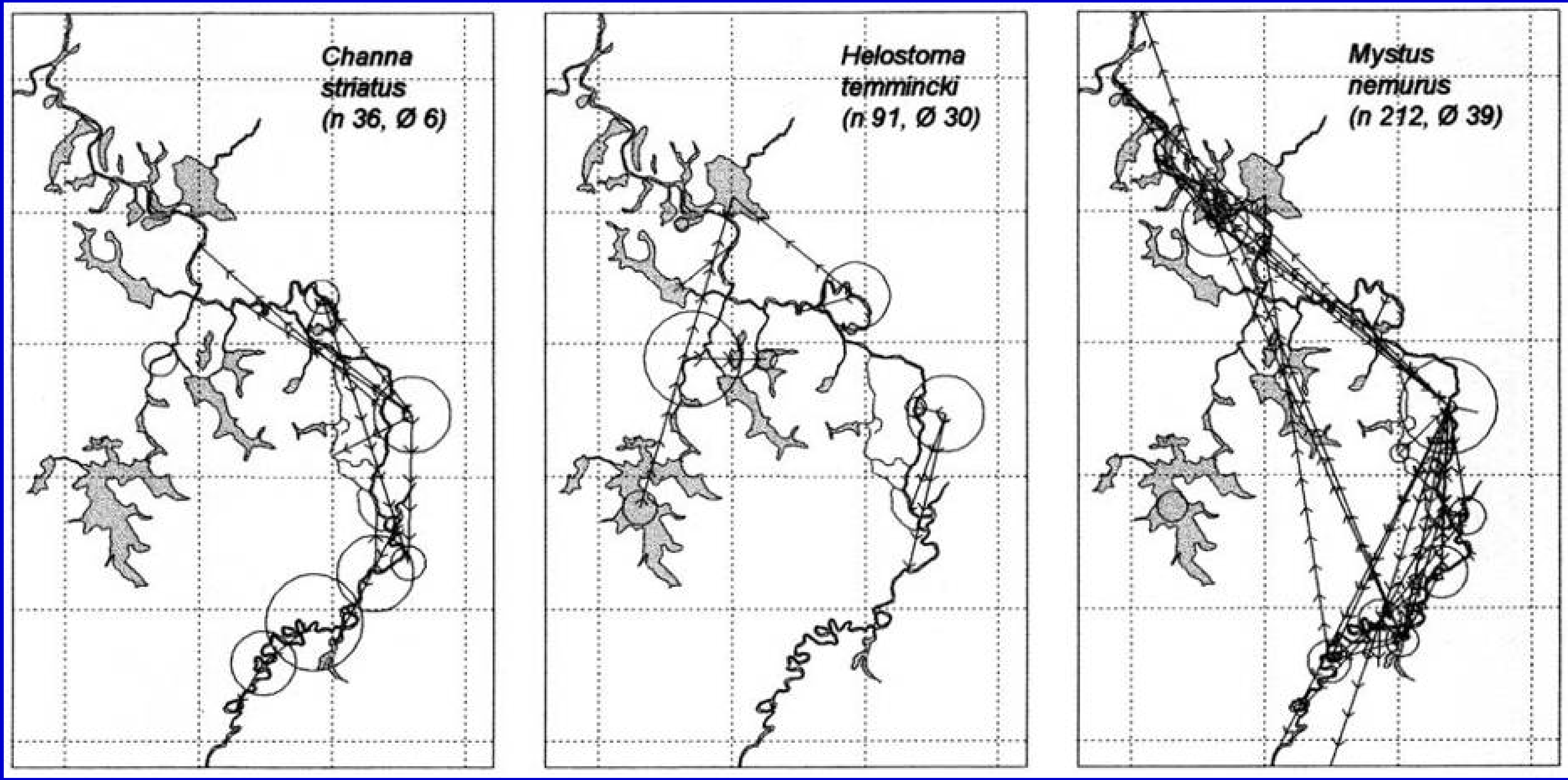
Six species of fish were tagged and released in both Bangladesh and Indonesia (n~5000 in each country)

Tagged with T-bar or streamer tags

Rewards: T-shirt or $2

Migrations of tagged fish in Indonesia

Fish migration distances varied between species, but all species moved between villages to some extent. (n = total number of tags recaptured; Ø = number of recaptures represented by largest circle)



Key message 3. Select locations carefully, considering *who* will benefit and *how*

Beyond the general blackfish-whitefish points made above, reserve locations should be selected that will give the best possible benefits for *local* people.

Selection must consider the flows of water in and out of the reserve, the migration routes of the fish, and the locations where the extra fish produced by the reserve will be caught.

Both social and technical criteria should be used to select suitable water bodies (see Chapter 3 of Hoggarth 2000, and reserves training presentation).

Example guidelines for reserve selection

- Several small reserves should be selected rather than one large one.
- Reserves should include several different habitat types to protect different fish species and their various life stages.
- For both blackfish and whitefish reserves, water-bodies should be selected that have good connections to surrounding fished areas (e.g. through water channels or across flooded land), ensuring that the extra fish produced in the reserve may be caught.
- Where possible, reserves should be located well away from potential sources of pollution.
- Where reserves are fully closed, enough alternative fishing grounds should be left to maintain fishing opportunities for local people.
- Where possible, a new reserve should be close to the village(s) involved in its management, so as to reduce the chance of illegal fishing.

See illustrations in reserve training presentation

Note also that the choice of water-body depends on the objective of the reserve, e.g.:

- to ensure that some blackfish survive the dry season to spawn next year’s stock (blackfish are especially vulnerable to capture in the dry season);
- to reduce any disturbance of fish during spawning seasons (usually the early flood);
- to restrict the capture of young fish during the rising and high water seasons; or
- to restrict the capture of migrating whitefish during rising and falling water seasons (whitefish are especially vulnerable to capture during their migrations).

Key message 4. Develop reserve management rules that are appropriate to local conditions and that will deliver the best overall benefits to stakeholders

Harvest reserves may either be closed year-round, or just for certain seasons, or just for certain gears. The best option will depend on local conditions (see next slide).

Remember that reserves are not the only useful management measures. Also consider other measures, both to protect the environment and manage the fishery, e.g.

- to restore degraded habitats,
- to protect fish migration routes (manage sluice gates, and restrict use of barrier traps), and
- to control fishing effort (licensing waterbodies or gears etc)

Should harvest reserves be fully closed?

Full closure better ...

- in particularly vulnerable habitats
- where fully closed 'taboo' areas are traditional practices
- to give the clearest message on their status

Partial closure better ...

- if the reserve water body is the only fishing place
- where some limited fishing will not harm stocks (e.g. with only certain gear types or only in the flood season)

Example guidelines for reserve management

- In blackfish reserves, the most dangerous dry-season gears (poison, electric fishing, de-watering and fish drives) should always be restricted to protect the spawning stock over the dry season. Most floodplain fish spawn at the start of the flood.
- The location of the reserve should be made as clear as possible, by defining boundaries at recognisable local features, such as bridges, well-known buildings (mosques, schools etc) and river confluences.
- Channels connecting reserves with fished areas may need to be maintained by the removal of silt or vegetation. If reserves are silting up or drying out in the dry season, they may be excavated to maintain a sufficient depth of water.
- Additional measures may be used to enhance the value of the reserve as perceived by local stakeholders, e.g. by re-stocking a depleted fish species into the reserve, or restoring nursery or spawning habitats.

Key message 5. Manage adaptively – monitor the results, compare with other places, and adapt as needed

The optimum management rules for each location can not be predicted in advance. Reserves will be more effective in some places than others, and the number of reserves needed or the relative area that should be set aside will also vary between locations.

Floodplain river systems change continuously, both with the normal flood cycle and due to longer-term trends in the catchment.

Human uses of the floodplain environment also change gradually over time and sometimes shift dramatically, e.g. with the introduction of a new irrigation scheme or an effective new fishing gear.

For these reasons, we recommend a long-term, 'adaptive' management approach in which local managers and partners monitor their fishery to see if their goals are being met, and meet regularly to consider what to do if they are not.

See River Fishery Management Guidelines presentation for further details

Project details, credits and references

FMSP Project R5953 – 'Fisheries dynamics of modified floodplains in southern Asia '

Start Date: 03/1994

End Date: 03/1997

Project Collaborators:

- MRAG (Dan Hoggarth, Ashley Halls);
- CRIFI, Indonesia (Fuad Cholik, Agus Utomo, Ondara);
- BAU Mymensingh (M.A. Wahab, Kanailal Debnath, Ranjan Kumar Dam)

Key References: MRAG (1997); Halls et al (1998); Hoggarth et al (1999); Hoggarth et al (1999b).

Project web page: http://www.fmsp.org.uk/FTRs/r5953/.htm

FMSP Project R7043 – 'Selection criteria and co-management guidelines for harvest reserves in tropical river fisheries'

Start Date: 11/1997

End Date: 05/2000

Project Collaborators:

- MRAG (Dan Hoggarth, Mark Aeron-Thomas, Caroline Garaway, Ashley Halls, Phil Townsley);
- CRIFI Indonesia (Sonny Koeshendrajana, Zahri Nasution, Achmad Sarnita, Samuel);
- Provincial Indonesian Fisheries Services (Dinas Perikanan) in Jambi, South Sumatra and West Kalimantan

Key References: Hoggarth (compiler) (2000); Hoggarth et al (2004)

Project web page: http://www.fmsp.org.uk/FTRs/r7043.htm

References

Garaway, C.J. & Arthur, R.I. 2002. Adaptive learning - Lessons from Southern Lao PDR. FMSP Project R7335: Adaptive Learning Approaches to Fisheries Enhancement. RDC, Lao PDR and MRAG Ltd. 31 pp. http://www.fmsp.org.uk/

Halls, A.S., Hoggarth, D.D. & Debnath, D. (1999). Impacts of hydraulic engineering on the dynamics and production potential of floodplain fish populations in Bangladesh. *Fisheries Management and Ecology* **6**: 261-285. http://www.blackwell-synergy.com/loi/fme?open=1999

Halls, A.S., Kirkwood, G.P. and Payne, A.I. (2001). A dynamic pool model for floodplain-river fisheries. *Ecohydrology and Hydrobiology*, 1 (3): 323-339. http://www.ecohydro.pl/index.php

Hoggarth, D.D. (compiler) (2000) Selection Criteria and Co-Management Guidelines for Harvest Reserves in Tropical River Fisheries. Central Research Institute for Fisheries (CRIFI), Jakarta, Indonesia. http://www.fmsp.org.uk/FTRs/r7043/r70439.pdf

Hoggarth, D.D., Cowan, V.J., Halls, A.S., Aeron-Thomas, M., McGregor, A.J., Garaway, C.A., Payne, A.I. & Welcomme, R.L. (1999). Management Guidelines for Asian Floodplain River Fisheries. Part 1. A Spatial, Hierarchical and Integrated Strategy for Adaptive Co Management. Part 2. Summary of DFID Research. *FAO Fisheries Technical Paper*, 384/1&2 FAO, Rome 63pp & 117pp. http://www.fao.org/DOCREP/006/X1357E/X1357E00.htm

Hoggarth, D.D., Halls, A.S., Dam, R. K. & Debnath, K. (1999b) Recruitment Sources for fish stocks inside a floodplain river impoundment in Bangladesh. *Fisheries Management and Ecology* 6: 287-310. http://www.blackwell-synergy.com/loi/fme?open=1999

Hoggarth, D.D., Koeshendrajana, S., Aeron-Thomas, M., Garaway, C., Halls, A.S., Nasution, Z., Samuel, & Sarnita, A.. (2004) An integrated assessment of Indonesian river fishery reserves; Part 1 – Introduction and study design; Part 2 – Institutional analyses; Part 3 – Biological studies; Part 4 – Socio-economic studies and the distribution of fisheries costs and benefits. Indonesian Fisheries Research Journal. Vol. 9, No.1: 1-26. http://www.fmsp.org.uk/FTRs/r7043/.htm

Disclaimer

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