

Kole fish culture: an alternate option for climate change adaptation to support livelihood of fishers in the drought prone northwest Bangladesh

M I Golder¹ and M A Ehshan^{1*}

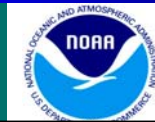
¹Department of Fisheries (DoF), Bangladesh

*Presenting author: amisan72@yahoo.com



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What is a river kole ?

- **'Kole'** is a depressions or water pockets appeared seasonally in the Padma river bed in dry season.
- The koles resemble small lake or large pond which remain un-inundated for 5 to 6 months till to next rainy season offering trapped water potential for aquaculture.

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Figure 1(a). A kole appeared in dry season in the Padma river bed in northern Bangladesh

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Figure 1(b). Koles appeared in dry season in the Padma river bed in northern Bangladesh

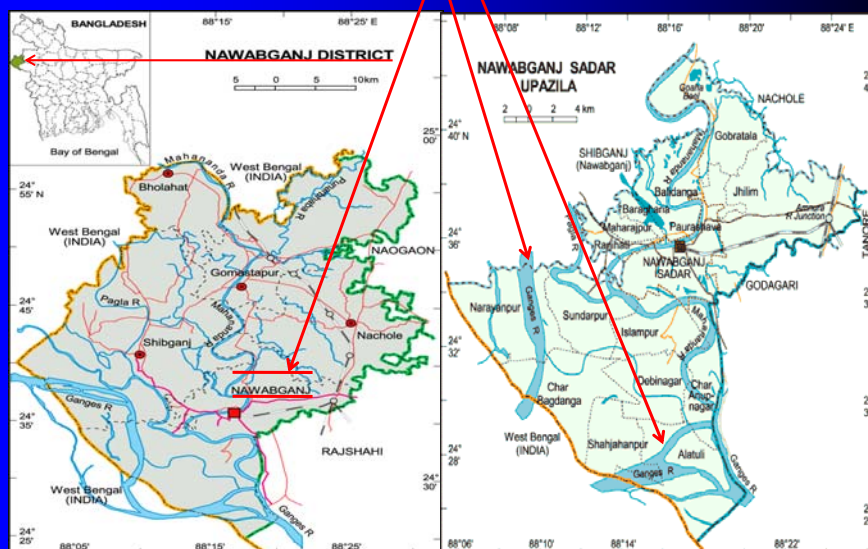
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Methods

- Study period: Jan-Jun, 2012 and Jan-Jun, 2015
- Each year a total of three koles were selected
- Surveyed with pretested structured questionnaire
- Personal interview and focused group discussions (FGD) in each kole was done
- No specific suggestion was given to kole fish farmers during & before study period

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Study area



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Observations: General

- Koles begin to appear in the month of November to December taking it's area and depth larger and deeper at the beginning those gradually become smaller and shallower respectively later
- Biggest kole: Initial area 15.0ha that gradually reduced to 7.4ha
- Smallest kole: Initial area 2.13 ha that finally became 1.6 ha
- No remarkable aquatic weed except some rooted plant and filamentous green algae
- The river bed was mostly sandy but clay bottom soil was also found.

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Observations: Culture practice

- Repeated netting with fine mesh net to eradicate wild fish
- No liming at pre-stocking but in some cases liming was done in post stocking period
- Both native and exotic carp fingerlings were stocked
- Fingerlings transportation mortality varied 10-15%
- Stocking used to begin in early January that continue until February to complete
- Both organic and inorganic fertilizers were used and fish was fed with supplementary feed at irregular interval

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Observations: Wild fish species

Nos. of wild fish species found belonging various family

Belonidae = 1	Notopteridae=2	Gobiidae = 1	Heteropneustide=1
Clupeidae= 1	Ambassidae=2	Osphronemidae=2	Schilbeidae = 4
Cobitidae = 2	Anabantidae=1	Nandidae = 1	Siluridae = 2
Cyprinidae=13	Channidae= 3	Bagridae = 6	Mastacembelidae= 3
Mugilidae = 1	Badidae = 1	Clariidae = 1	Tetraodontidae = 1
Family = 20; Species = 51 (+Prawn species = 2)			

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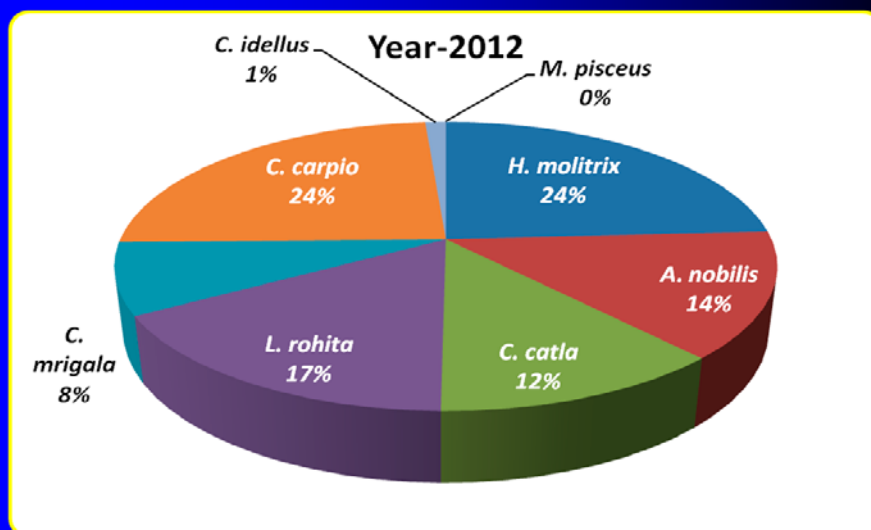


Figure 2. Stocking percentage of various fish species in 2012

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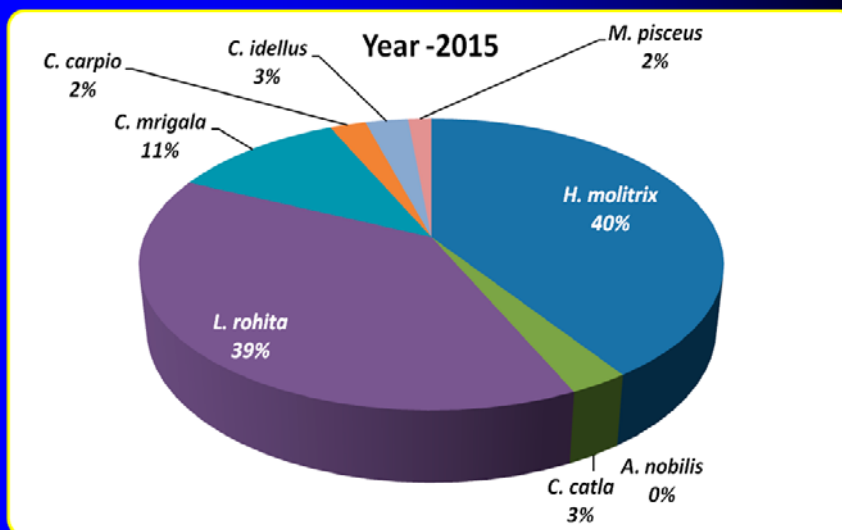


Figure 3. Stocking percentage of various fish species in 2015

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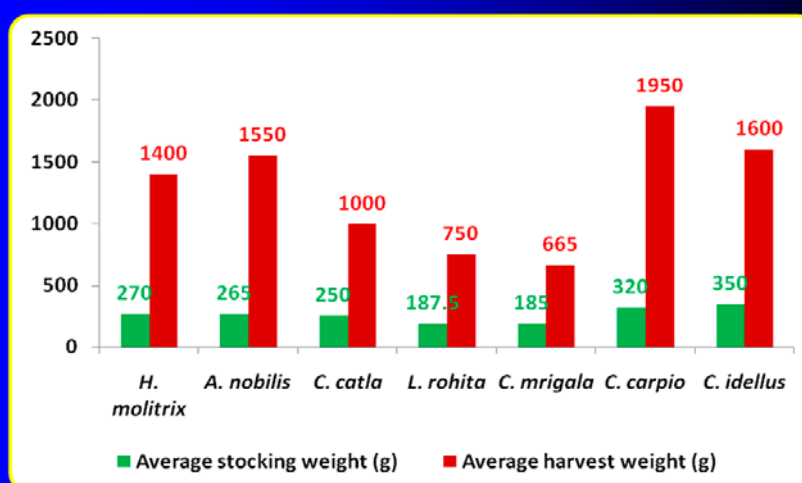


Figure 4. Average stocking weight (g) and average harvest weight (g) of various stocked fish species in 2012.

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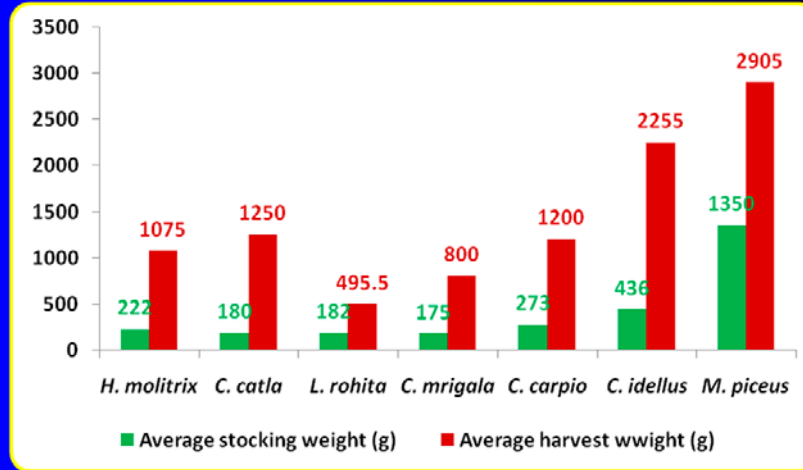


Figure. 5. Average stocking weight (g) and average harvest weight (g) of various stocked fish species in 2015.

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Fish harvest

- Harvesting begin in June that takes couple of weeks or even a month to complete
- Harvested average 767kg (including 42kg wild) fish per hectare of kole in 2012
- Harvested average 2235kg (including 82kg wild) fish per hectare of kole in 2015
- In general surface and bottom feeder carps grew better. Growth performance of grass carp and black carp was also found good in grass and snails rich kole

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Improvement:

- Stocking surface and column feeder fish species should be given priority for better fish harvest.
- Early partial harvesting specially surface feeder is advised apprehending early inundation of kole
- In case of large kole, pen (made of bamboo and nylon net) can be used for early rearing of large size fingerlings to minimize the invest cost
- Overwintered large size carp fingerlings (200-500g each) can be procured and preserved earlier for stocking

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Environmental & socio-economic aspects

- Chapainawabganj is a drought prone area where nearly 50% ponds become seasonal and about 10% ponds become dry and rivers also become shrink due to climate change impact, limiting livelihood options for the poor fishers'
- Around 10-12% of total pond area in this region is being used for nursery purpose. Kole can be used for raising carp fingerling in early season reducing pressure on existing nursery facility can enhance aquaculture production
- Large sized kole can also be used for nursing fry and fingerlings in pens and cages thus reducing pressure on grow out ponds

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Environmental & socio-economic aspects

- About 100 to 125 nos. of koles (~2000 ha) appear each year in the Padma river basin potential both for rearing fish and raising fry-fingerlings of carps.
- Existing culture practice: Koles can produce 1500-1800 MT of additional fish per annum
- Appropriate culture technology: can increase up to 6000-8000 MT, valued about BDT1200.0-2000.0 million (US\$15.0-25.0 million).
- About 2000-2500 people (75-90% fishers) whose livelihood become vulnerable during dry period can be engaged in kole fish culture as one of the AIGA options.

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Use of kole

- An alternate livelihood option for fishers and unemployed youth of this draught prone region
- CBO approach comprising at least 90% members from local fishers community for kole fish culture should be followed for successful management of common pool water resources.
- The following points should be considered for kole culture:
 - no attempt to disrupt normal river water flow and build no permanent structure
 - no unauthorized chemicals for kole preparation and fish harvesting and no activity that pose threat to environment

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Conclusion

- A new non-traditional aquaculture option derived from climate changes and as a way of adaptation that generates part-time employment for poor fishers in lean period
- Present production level as well as net profit from kole fish culture can be increased at least 2 to 3 times if they are trained properly
- Therefore initiatives are expected to explore these potential water-bodies to support livelihoods of local fishers as a tool of climate change adaptation options

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Figure 6. After six months culture period fishermen are harvesting fish in a kole (Sadar upazila of Chapainawabganj district, Bangladesh).

