

# Fish Harvesting Systems in Indian Reservoirs

A.A.Khan, K.N.Kartha, Percy Dawson and V.C.George\*  
*Research Centre of Central Institute of Fisheries Technology, Burla*

The present communication is an effort to enumerate the various fishing gear systems deployed in Indian reservoirs for the judicious exploitation of commercial varieties of fish. The authors have attempted to describe the indigenous gear used as well as improvements effected in them. Mention is also made on newer gear developed and introduced.

Indian reservoirs with 3 million ha of water spread offer tremendous scope for augmenting fish production. The reservoir fishery is important not only from the point of view of fish production but also from the sociological aspect of providing employment to about 2 million people. The indigenous or native gear operated in riverine conditions are not effective in the changed lacustrine conditions. Continuous efforts to develop modern fishing gear and methods have resulted in improved catches and better economic returns. The present communication is an effort to enumerate the various craft and gear systems deployed for the judicious exploitation of fishery resources.

## 1. Fishing craft

The vessels used are small, wooden, non-mechanised and can be transported easily to remote areas. In Karnataka and Tamilnadu, most of the fishermen use coracle type of boats of size 1.50-2.00 m which are cheaper and last for about 2-3 years. In Maharashtra, they use "Dungies" and "Jappas" like the country crafts of Kerala coast. In Kadore reservoir, the boat used is of size 3.90x1.60x0.45 m and in Pong Dam it is 3.60x1.20x0.60 m. The size of boat used in Rihand is 4.50x1.00x0.60 m of 1-3 tons capacity. Two types of fishing craft are operated in Gandhisagar reservoir. The common one is plank built flat bottom of size 2.00-3.00x0.75x0.30 m. The displaced fishermen of erstwhile East Pakistan are

using Bengal type "Dungies" of 3.00 to 7.00 m length. Fishing boats employed in Hirakud reservoir are locally known as "Dungies" of 5.50 to 9.50 m length, 0.43 to 1.20 m breadth and 7.5 cm to 15.0 cm draught. In reservoirs like Jaisamund, Pong dam, Govindsagar, Gandhisagar and Hirakud, motor boats of 6.00 to 9.20 m. OAL fitted with 24 to 37.5 HP inboard diesel engine have been introduced by the State Fisheries Corporation/Fishermen Cooperatives Societies for fishing activities and quick transport of fish to the landing centre.

## 2. Fishing gear material

The introduction of synthetic fibres like nylon in place of natural fibre enhanced the catch efficiency of gill nets used in reservoirs to nine times. The nylon monofilament having equivalent thickness to nylon multifilament yielded two times increase in the catch. High density polyethylene monofilament yarn, twine and fibrillated tape are added later as new, cheap and effective substitute to nylon multifilament. Recent studies conducted with twines of polypropylene multifilament, nylon multifilament; nylon monofilament, PE yarn and twine confirmed that polypropylene is more efficient and cheaper.

## 3. Fishing gear

The low energy fishing gear developed for the reservoirs include gill nets, long lines and drag nets.

\* Central Institute of Fisheries Technology, Cochin-682 029

### 3. 1. Gill nets

Traditional simple gill nets of "Rangoon type" was first introduced in Mettur reservoir and this basic design (Kuriyan, 1973; Chaudhari, 1977 and Sreenivasan *et al.*, 1985) was adopted as the principal gear for operation at the surface and column layers in Mettur, Gandhisagar, Bhavanisagar and other reservoirs with local modifications depending upon the fishery.

Gill nets used in almost all reservoirs require improvements in respect of design, rigging and other parameters like mesh size and twine size in order to increase its efficiency. First attempt to increase the efficiency of lacustrine gill nets was made by Gulbadamov (1962). The modified gill net is hung both from head rope and foot rope and had floats and sinkers respectively at regular intervals.

von Brandt (1964) recorded that for relatively large fishes, the mechanism of capture is more by entangling rather than gilling. In Hirakud reservoir, a study has shown that 77% of fish are captured by entangling while the rest were caught by gilling (Sulochanan *et al.* 1968). Entangling capacity of net could be increased through vertical lines or framing.

In a vertical line net, the slackness is increased by providing vertical line to the net from head rope to foot rope and by making the vertical coefficient to 0.70. In framed nets, the maximum slackness is obtained by making square compartments of required dimensions by passing twine horizontally and vertically, keeping the vertical coefficient 0.50. Comparative fishing experiments with three type of nets in Hirakud reservoir have shown the apparent superiority of frame nets by yielding 1.4 times to 4.76 times (Sulochanan *et al.* 1968). The size of frame was subsequently standardised to 1.75 m. George *et al.* (1973) confirmed that frame nets are more efficient

than simple gill nets for judicial exploitation of *Catla catla* from Hirakud reservoir. Khan *et al.* (1985) further reported that frame nets with a hanging coefficient of 0.40 is effective for better catch. It is also established that this gear is efficient where the fish population is sparse and comprising of large size groups.

Trammelling technique was also tried in Hirakud reservoir. The mesh size of the two outer webbings (armouring) is 3 to 5 times bigger than that of the middle (Lint) small meshed webbing. The output of trammel nets are 2.54 times greater than simple gill net (Naidu & George, 1972) but less efficient than frame net (Naidu *et al.*, 1976).

#### 3.1.1 Mesh size

Determination of optimum mesh size and twine size and fishing height for different species and size groups in various reservoirs were stressed by Kuriyan (1973), Natarajan (1976) and Anon (1976). Baranov (1960) considers the mesh size to be the function of the length of fish. Following Baranov's method Sulochanan *et al.* (1968) fixed 75 mm mesh bar suitable for Hirakud reservoir. Nair *et al.* (1969) found that net of 53 mm, mesh bar were suitable for the capture of *Labeo calbasu* in Gandhisagar reservoir. Kartha & Rao (1991) recommended 148 mm, 89 mm and 60 mm for *Catla*, *Mrigal* and *rohu* respectively. 55 mm bar net was found ideal for harvesting *L.diplostoma*, *L.bata* (George *et al.* 1975).

Natarajan (1976) determined the mesh bar 91, 41, 52 mm respectively for *C.catla*, *C.mrigala* and *L.calbasu*. In Hirakud reservoir, the mesh size for *Catla* was fixed at 90 mm bar (George *et al.*, 1979). A mesh bar between 100-150 mm for *Catla* in Govindasagar reservoir is recommended (Anon, 1980).

#### 3.1.2 Twine size

In Govindasagar, Hirakud and Gandhisagar, nylon twine 210x2x3 was

found suitable for major carps and nylon 210x1x3 for other fishes like *G.chapra*, *R.cotio* and *E.vacha* (George *et al.*, 1984). Selection of twine of proper diameter for fabrication of gill nets is important and hence twine of smaller diameter having sufficient strength is preferred.

### 3.1.3 Fishing height

A fishing height of 5.25 m for catla gill net and 3.0 m for other fishes like *L.calbasu*, *L.bata*, *L.diplostoma* was fixed in Hirakud reservoir (George *et al.*, 1984) while Nair *et al.* (1969) and Kartha & Rao (1991) recommended a fishing height of 3 m for *L.calbasu* and catla gill nets in Gandhisagar reservoir.

### 4. Lines

The advantage of this gear is that it can be operated in areas where other fishing gear are difficult to be employed due to submerged obstructions. Manoharadoss *et al.* (1981) reported that Kirby bent hooks of size 17-20 are the most suitable for the capture of predators like *S.silondia*, *M.aor*, and *M.seenghala* for Hirakud reservoir. Among the different baits used, earthworms and prawns gave good results.

### 5. Drag nets

Varghese *et al.* (1980) reported that no single gear can be employed exclusively for the total or near total eradication of predators and uneconomical species of fish. By simultaneous operation of several techniques of less selective fishing gear and methods, it is possible to eradicate the predators and unwanted species of fishes. In Hirakud reservoir it has been established that stick held drag net (George *et al.*, 1980) can be used for the capture of minor fishery resources.

Mruthyunjaya (1982) reported that "Alvi" nets of mesh size 8.0 mm to 12.0 mm are destructive as its operation will remove all varieties of fish irrespective of size. It

is established that such techniques are feasible with the introduction of shore seine in Hirakud reservoir (George *et al.*, 1983). During certain season, it is likely to catch the juveniles of carps and to avoid this, mesh regulation was imposed and period of operation of the gear had to be restricted. Varghese *et al.*, (1983) have worked out proportionate coefficient for calculating the appropriate mesh size for shore seines.

### Conclusion

Exploitation methods have a great influence on the development of fishing in reservoirs. To harvest the multi-species fishery, different fishing gear and techniques are to be employed to realise optimum harvest. There is a need to try improved fishing gear and methods and modification effected to suit the prevailing conditions and the fishery.

The authors are grateful to Shri M.R.Nair, Director, CIFT, Cochin for kind permission to present the paper.

### References

- Anon (1976) *Report on the National Commission on Agriculture Part 8 (Fisheries)* Govt. of India, Ministry of Agriculture and Irrigation, Department of Agriculture, New Delhi p.270.
- Anon(1980) Proc.6th Workshop All India Cord. Proj. Ecol. and Fish Freshwat. Reserv. Simla
- Baranov, F.I. (1960) *Industrial Fishing Technique, Pischepromizdat, Moscow*
- Choudhari, D.K.(1977) *CIFE, Newsletter*, 31
- George, N.A., Khan, A.A. & Pandey, O.P.(1975) *Fish.Technol* 12, 60
- George, V.C., Khan, A.A. & Varghese, M.D.(1979)*Fish.Technol* 16,87
- George, V.C., Khan, A.A. & Varghese, M.D.(1982)*Fish.Technol*. 19, 121

- George, V.C., Khan, A.A. & Varghese, M.D. (1983) *Fish. Technol.* 20, 5
- George, V.C., Varghese, M.D. & Khan, A.A. (1984) *Paper presented to the Seminar on freshwater fisheries and rural developments Orissa State Fisheries Department, Rourkela*, p.4
- Gulbadamov, S.B. (1962) *Supplementary report to Govt. of India on the improvement of fishing technique in inland reservoirs of India* FAO/EATP, 1499, p.39
- Kartha, K.N. & Rao, K.S. (1991) *Fish. Technol.* 28, 5
- Khan, A.A., George, V.C. & Varghese, M.D. (1980) *Fish. Technol.* 17, 15
- Kuriyan, G.K. (1973) *Fish. Technol.* 10, 1
- Manohardoss, R.S., Percy Dawson & George, V.C. (1981) *Paper presented to the Seminar on Inland Fisheries at Ukai-Department of Fisheries, Govt. of Gujarat*
- Mruthyunjaya, K.S. (1982) *Fish. Chimes*, 2, 25
- Naidu, R.M. & George, V.C. (1979) *Fish. Technol.* 9, 31
- Naidu, R.M., Khan, A.A. & Narayanappa, G. (1976) *Fish. Technol.* 13, 50
- Nair, S.G., Shahul Hameed, M. & Varghese, M.D. (1969) *Proc. Seminar Ecol. and Freshwat. Reservoirs*, CIFRI, Barrackpore
- Natarajan, A.V. (1976) *Proc. Indo-Pacific Fish-Con.* 17(3), 1
- Sreenivasan, R., Chandrasekharan, F & Arokiswamy, J. (1985) in *Harvest and Post-harvest Technology of Fish.* p.97 Society of Fisheries Technologists (India), Cochin
- Sulochanan, P., George, V.C. & Naidu, R.M. (1968) *Fish. Technol.* 5, 81
- Varghese, M.D., Manohardoss, R.S., Khan, A.A. & George, V.C. (1980) *Workshop on Reservoir Fisheries for rural development* CIFE, Bombay (unpublished)
- Varghese, M.D., George, V.C., Khan, A.A. & Iyer, H.K. (1983) *Fish. Technol.* 20, 97
- Von Brandt, A. (1964) *Fish Catching Methods of the World*. Fishing News (Books) Ltd., London