

## Research Note

# A Comprehensive Account of Fishing Crafts and Gears of River Tapti, India

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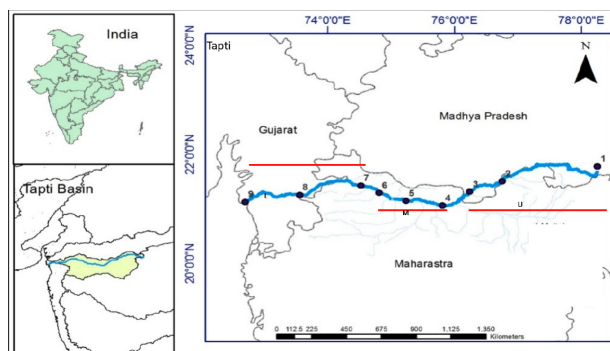
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In India, fishers in the inland sector usually follow traditional methods for catching fish and there is lack of comprehensive compilation of fishing crafts, gears, and other indigenous fishing methods which is important for scientific and judicious management of the capture fishery (Koleker, 2009). River Tapti is one of the most important west flowing rivers of peninsular India, originating from the Vindhya Mountain of the Satpura range and flowing through Madhya Pradesh, Maharashtra, Gujarat before entering the Arabian Sea in Gujarat state with a drainage area of about 48,000 sq km. Several studies have documented fishing crafts and gears operated along stretches of this river (Karamchandani & Pisolkar, 1967; Bhakta et al., 2016; Bose et al., 2019). The present study tried to document the fishing crafts and gears on the entire stretch of river Tapti in an attempt to add to the existing literature.

The study was conducted from July 2017 to January 2020 along the entire stretch of river Tapti. For sampling, the river was divided into three regions, namely upper (U), middle (M), and lower (L) stretches (Fig. 1). The selected sampling stations in the upper stretch were Multai, Betul, Dedhatalai, and Burhanpur; those in the middle stretch were Bhusawal, Savkheda, and Sarangkhedha. The stations in the lower stretch were Singalkhanch and Kamrej.



Sampling sites: 1. Multai 2. Betul 3. Dedhatalai 4. Burhanpur 5. Bhusawal 6. Savkheda 7. Sarangkhedha 8. Singalkhanch 9. Kamrej

Fig. 1. Map depicting the sampling sites in river Tapti

During the field survey, specification, material, description, and other data related to the fishing operation were collected for different crafts and gears using a structured questionnaire, field observations and interviews with fishers. For estimation of gear-wise dominant fish catch, data were collected separately from the catches, and fishes were identified up to species level using the standard taxonomic keys of Jhingran (1991), Talwar and Jhingran (1991) and Jayaram (1999). The gear-wise catch efficiency was estimated based on catch per unit effort (CPUE) (Sayeed et al., 2014) using the equation  $CPUE = \text{total catch} / \text{total fishing effort}$  in each period and expressed as a catch in Kg operation<sup>-1</sup>.

The fishing crafts operational in river Tapti were non-mechanized wooden crafts, dugout canoes and

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catamaran (teppa). Fishing gears comprised of fishing nets such as gillnet, cast net, *mahajal* (dragnet), push net (*pelni*) and long handle scoop net (*jhelki*); handlines/rod and line; traps such as crab and prawn trap. Gill net, cast net, *mahajal*, are the major gears found operated in all three stretches and observed to contribute more to fish landing. Usage of different fishing gears and crafts along river Tapti was found to be influenced by rainfall, land topography, water depth and water flow velocity.

Gill net was found to be the most common gear operated throughout the year at all the sampling stations surveyed in the river Tapti. The net is locally known as *phansi jal*, *disco jal*, *sahensa* in Madhya Pradesh; *disco*, *machhi jal* in Maharashtra; and *fanda Jal* in Gujarat. At the upper and middle stretch, gill net use was relatively low especially in the monsoon months. The operation of gill net exceeded 90% of all gear used and was also recorded to be the only gear in operation during one season or the other in about 50% of all the three stretches. Gill nets of different mesh sizes in the range of 20-160 mm were observed in operation. However, small mesh gill net operations were mostly observed from May to July i.e., before monsoon, while the nets above 60 mm were used during monsoon months starting from August and continued till April. The CPUE was found to vary widely and were in the range of 0.3 to 15 kg operation<sup>-1</sup>. The variations in CPUE were mostly due to the reduced volume of water in the river, particularly during the pre-monsoon season.

Cast net is known as *phak jal* in Madhya Pradesh and Maharashtra and *chhogia* in Gujarat. Next to the gill net, it was the most frequently used gear in all three stretches of the river. Use of cast net along the river was relatively more during pre-monsoon months and lowest during the monsoon period. At the upper stretch of the river, cast net usage was at the maximum with 42% during pre-monsoon months. At upper stretch, cast net was used consistently throughout the year. The gear with different mesh and pocket-size was found to operate particularly in shallow areas of the river either from the river shore or from the boat. The CPUE of the gear was calculated to be in the range of 0.25 to 4 kg operation<sup>-1</sup>. The CPUE was highest in post-monsoon months and lowest in pre-monsoon months.

Drag net is locally known as *mahajal*, operated mostly during pre-monsoon or summer season in the entire stretch of the river. The maximum

proportional operation of the gear (15%) was noticed at middle stretch during post-monsoon. The gear has small mesh size (2-10 mm), attached with head rope made of HDPE and footrope made of coir. *Mahajal* is operated from the shore and the gear is set in water in a semi-circular fashion using a boat or raft. CPUE of *mahajal* was found to vary with the season and was observed in the range of 2.5 to 75.5 kg operation<sup>-1</sup>.

A type of traditional push net known locally as *pelni* is mostly employed in prawn fishing. It is a conical-shaped fishing gear with a triangular bamboo frame and mosquito net as a netting material. The net is mostly operated in shallow and marginal areas of the river. *Pelni* is used in all the seasons at the upper and middle stretches while its predominance was during the pre-monsoon months. At the upper stretch (16-32%) and middle stretch (40-48%), the gear was predominantly used throughout the year. The net is operated by a single person and the CPUE was observed as 0.1 to 2.0 kg operation<sup>-1</sup> or 0.25 to 1.25 kg h<sup>-1</sup>.

A type of scoop net with a long handle locally known as *jhelki* is used by fishers of the lower stretch of river Tapti below the Ukai dam for catching small fishes. It is used mostly during pre-monsoon (21% of operated gears) and post-monsoon (9% of operated gears) months. This net has two parts; the lower part is an oval-shaped frame made of bamboo strip/sticks or iron rod with 60 to 90 cm length and 30-45 cm wide wherein mosquito net (zero mm mesh) is tied with nylon or jute rope. The upper part is made of a bamboo pole 200-250 cm long, tied with a rope. *Jhelki* is mainly operated in dyke periphery of the river during pre-monsoon and post-monsoon months. The local fisherwomen mostly use this single-person-operated gear. Handlines are another commonly used gear locally called *gal* and are in use along the entire stretch of river Tapti covering at all the three states viz. Madhya Pradesh, Maharashtra, and Gujarat. Handlines were mostly employed during monsoon and post-monsoon months at most of the stations while during pre-monsoon season it was found operated only at the upper stretch of the river. At the upper and middle stretch, *gal* was operated throughout the year and the maximum proportion of operation was 45% at upper stretch of the river during post-monsoon months. Two variants of handlines operation were observed, those are single hook and multiple hook systems. The single hook systems are tied with a bamboo

pole placed on the shore. The multiple hook operation resembles longline fishing in marine fisheries with a long line measuring 100-400 m in length, made up of nylon tied to bamboo poles installed at both shore and the line is kept in hanging position in water with the help of floats and sinkers. About 50-100 individual lines with hooks are attached at an interval of one meter along the main line, depending on the length of main line. The position of hook in the water column is adjusted with the help of thermocol floats. Baits such as earthworms, small prawns, small fishes and *atta* (wheat flour) were used to catch fishes like murels, eels, catfishes and carps. CPUE of hook and line was observed in the range of 0.5-20 kg operation<sup>-1</sup> and was found highest during monsoon months.

Rod and line were the other traditional fishing gear identified during the study. This is a modification of the gear hook and line. It is known *gal* in both Madhya Pradesh and Maharashtra. The gear is made up of a small wooden pole, monofilament thread and a hook. Thermocol pieces are used as a float to fix the position of the hook at the desired depth in the water. It was operated mostly during monsoon and post-monsoon months at upper and middle stretches of the river. At upper stretch, the gear was used throughout the year and up to 40% of the operated gears. CPUE of pole and line was observed in the range of 0.5 to 5.0 kg gear<sup>-1</sup> operation<sup>-1</sup> and was found highest in post-monsoon months.

Traps for catching crabs and prawns were observed in operation in the lower stretch of the river during monsoon and post-monsoon seasons. Fishing traps are made up of bamboo or iron, as was found at the lower stretch of the river. The bamboo made cylindrical traps with 21 cm diameter and 51 cm length were used as crab traps while the rectangular iron cages with dimensions of 90 cm × 90 cm × 45 cm (L × B × H) were utilized for capturing prawns. Crab traps were mostly operated during monsoon months while prawn traps were found operated during post-monsoon months. Both the traps are set in the riverbed in the night hours and the gears are operated for up to 12 h. The baits used in the traps to attract crabs and prawns were chicken viscera and small chopped fish. CPUE of both the traps ranged between 1.5 to 5.5 kg gear<sup>-1</sup> operation<sup>-1</sup>.

Boats are locally known as *donga* in MP, *nav* in Maharashtra, and *navdi* in Gujarat. Boats are made-up of different materials such as tin, wood and Fibre

Reinforced Plastic (FRP). Only non-mechanised boats were observed to be used for fishing in the river Tapti. Boats are mostly used for the operation of *mahajal* and gill nets.

Dugout canoe is commonly known as *donga* in Madhya Pradesh and observed only at the upper stretch of the river during pre-monsoon (25% of the operated crafts) and post-monsoon (41% of the operated crafts) months. The craft is made from teak wood. The inner part of the wood is removed to make the place for sitting and to use as the workspace, keeping fishing materials and catch. The length of canoe is around 8-12 feet. The fishers mostly used it for the operation of gill nets. The fast water flow in the upper stretch of the river during monsoon restricts its use.

Inflatable tube used in fishing is commonly known as *tarafa*. Four inflated tubes are fastened together to form a broad base which acts as a base with a wooden platform of around 8 feet × 4 feet. It is mostly used for the operation of gill net and *mahajal*. Use of the craft at upper stretch was uniform of 12% in all seasons; at middle stretch, its operation was observed during the post-monsoon season (19%) while at a lower stretch it was operated during pre-monsoon and post-monsoon seasons (5%).

Catamaran is known as *terapa* in the states of Maharashtra and Gujarat and was found in use in a limited number in the middle stretch only. It is constructed by tying wooden logs together. A total of 6-12 logs are tied together with nylon rope or coir and mainly operated by 1-2 fishers for gill net and hook and line fishing. A long bamboo or wooden pole is used for rowing the craft.

The Catch per unit effort (CPUE) of different fishing gears in river Tapti varied from 0.1 to 75.5 Kg operation<sup>-1</sup>. As per expectations, the maximum CPUE was recorded by fishing with the fishing gear *mahajal* during peak fishing season of pre-monsoon months. In handlines fishing, CPUE varied from 0.5-20 kg operation<sup>-1</sup> and the value was found maximum during peak season of monsoon months. In the case of trap fishing, the CPUE was in the range of 0.5 to 4 kg operation<sup>-1</sup> with the higher CPUE recorded in the prawn trap.

Gill net was found to be the most common gear used in the inland sector, particularly in riverine fisheries as reported by many researchers (Mitra et al., 1987; Singh, 2009; Manna et al., 2011; Laxmappa and

Bakshi, 2014; Bhakta et al., 2017 and 2018). Though the mesh size regulations of gill net were not evident in the river Tapti, the mesh size variations of gill nets were noted to vary with season and the nets with larger mesh were mostly used in the river during monsoon in comparison to the other seasons. During monsoon, the heavy rainfall surge and associated higher water depth in the river Tapti favoured catching larger carps and catfishes with the gill nets of larger mesh size, as reported from other major rivers (Manna et al., 2011; Laxmappa & Bakshi, 2014). The usage of Mahajal, a non-selective gear, was mostly observed along the river during the pre-monsoon or summer season when the water depth remained less. Though higher CPUE was noted in the gear, its catch comprised of small indigenous fishes, juveniles of carps, catfishes, and prawns. Riverine fisheries are complex, and the use of crafts and gears by the fishers depends upon the aspects like land topography, water depth, water flow velocity, socio-economic conditions of fishers, etc. In river Tapti, an organised fishing activity on a commercial basis was found limited to certain specific locations in the lower stretch of the river where proper marketing facilities were available. Fishers in the river stretch mostly relied upon traditional and sometimes illegal fishing methods. There is lack of knowledge on efficient fishing gears and methods and impoverished economic conditions of the inland fishermen also led to either overexploitation or under exploitation of fish resources.

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