Fishing crafts and gear in river Krishna

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Fisheries ecology of entire stretch of river Krishna was investigated during 2001-02 along with the status of fish and fisheries. Documentation of crafts and gears in freshwater sector of India is scanty. This paper is an attempt to record the fishery related indigenous technological knowledge in terms of fishing crafts and gear used in river Krishna. As many as 6 different types of crafts and 10 different gear were encountered during the monsoon survey of the river. The crafts were coracle, plank-built boat, palm-canoe, thermocol raft, rubber tube platform and banana stem raft. The gears were gill net, cast net, push net (triangular), scoop net, ring net, hook and line, lantern net (light trap), box trap and cradle trap.

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Application of crafts and gear in fishery is a result of experiences gained over a long period of time. Every water body has its unique pattern of crafts and gear. There is a well defined pattern and distribution of fishing techniques in the riparian sectors based on the topography, ecology and habitat of the resource available. The saying necessity is the mother of invention is well reflected in fishing crafts and gear, invented by none other than the end users, the fishers. It also gives indication about the economic condition of the fishermen community where they use locally available less costly materials to make substances of technological delight giving maximum return. Some earlier records of fishing crafts and gears from India\textsuperscript{1-6} and abroad\textsuperscript{7-10} are well deserved to be mentioned. For North Indian rivers like the Ganges, some records of crafts and gears were in the literature in both freshwater and estuarine zone\textsuperscript{11,12}. It was described in general the different fishing gears employed along the West and East coasts of India for the capture of prawns\textsuperscript{13}. Fishing gear and methods of river Brahmaputra in Assam were nicely surveyed\textsuperscript{14}. In case of the river Krishna, details about gears used in fishery in its estuarine sector was also documented\textsuperscript{15}. Unfortunately, these Indigenous Technological Knowledge (ITK) were not well documented in freshwater sector of this major river of South India. Present account is an attempt to document the commonly used crafts and gears in the entire stretch of river Krishna.

Materials and methods
Fisheries data along with information on fishing crafts and gear were collected from selected 24 stations along the entire stretch of river Krishna, from Mahuli in upstream up to Penumudi, an estuarine fish landing centre of river Krishna in 2001-02 (Fig. 1 & Table 1). The stations can be divided into 13 in upstream (above Srisailam reservoir) and 11 in downstream, i.e. below the reservoir. OAL of crafts and gear were measured and materials and descriptions were recorded from each sampling stations.

Discussion
Krishna river is one of the 3 major rivers in peninsular India with highest catchment area. It was largely impounded by a number of dams and barrages along its course. The reservoirs formed due to damming were regularly stocked with fingerlings specially that of Indian major carps (IMC). So, IMC occupied a lion's share in the fish catch of the reservoirs in the main stream of Krishna. Srisailam
and Nagarjunasagar reservoirs were two such reservoirs in lower stretch of the river. Other than the reservoirs, the rest portion of the river harboured a variety of fishes. Freshwater prawn, *Macrobrachium malcolmsonii* was one of the major catch in this part of the river. Among other fishes, *Etroplus suratensis*, *Mastacembalus armatus* and *Notopterus notopterus* contributed major share in the catch. As many as 6 different type of crafts and 10 different gears were encountered during the monsoon survey of the river. The crafts were coracle, plank built boat, palm canoe, thermocol raft, rubber tube platform and banana stem raft. The gears were Gill net, cast net, drag net, push net (triangular), scoop net, ring net, hook and line, lantern net (light trap), box trap and cradle trap. Gears are basically of 2 types - active and passive. Fishing with active gears depends on the movement of gears, whereas passive gears rely on the movements of the fishes. Both active and passive gears were observed to be used traditionally to harvest maximum fishes from the river Krishna. Brief discussion of individual crafts and gear are given below.

**Crafts**

**Coracle**

Coracle, a saucer shaped country craft, was one of the major fishing craft used in fisheries of peninsular India. Coracles were prepared by wrapping HDPP sheet over the split bamboo frame with the help of coal tar as an external covering (Fig. 2). Internal diameter varied in a range of 2-3 m with inner depth of around 0.5 m. Apart from being simple and inexpensive, coracle was durable and had very good maneuverability in all types of waters. It was also a versatile craft used for laying and lifting of nets, besides navigation and transport of fish and other materials. This modified version of coracle was cheaper and more durable as the conventional one was made of costly leather.

**Plank built boat**

It is the most common fishing craft used in different stretches of the river (Fig. 3). Only non-mechanised boats were observed to be used in fishing. Length of fishing boats varied in a range of 8-10 m with 1-1.5 m breadth. A detailed account of fishing boats from Vijayawada was reported. It is significant to note that even in large water bodies like Sriaillam or Nagarjunasagar reservoir on the main stream of Krishna, no motorised craft was observed either for fishing or for fish transport.
Palm-canoe

Among different crafts used, dug out canoes carved out of trunk of palm trees were converted into fishing crafts. Length of the canoe was around 7-8 m with internal diameter of 0.3 m. The inside tender part of the old palm tree was carefully removed. About one-fourth of the trunk was longitudinally scooped out from it to make a place suitable for sitting as well as for keeping the catch (Fig. 4). They were observed from Taduvouy up to Thummalapalem and also in Jamkhandi in upstream. The open end remained little up from water surface. It was closed with rubber sheet. A circular steel girder around the frame in that area protected the canoe from split out. Another circular wooden frame used to be placed in the middle to avoid collapse of the canoe and also used for siting.

Thermocol raft

In upper stretch, especially near confluence of Koyna river at Karad, fishermen were observed to use an improvised raft made of thermocol for drag net operation. Slices of thermocols were tied with rope to make a bundle of length 0.4-0.5 m with a diameter of 0.2-0.3 m. Two such bundles were tied with rope on which fishermen used to sit and go for fishing (Fig. 5).

Rubber tube platform

In some stretch of the river, the fishermen were observed to rely on another kind of improvised materials. They showed considerable ingenuity in fabricating makeshift rafts out of discarded old rubber tubes. A wooden platform (~1 sq m in area) was placed over the rubber tube and tied tightly with rope. It was mostly observed from Amaravathy up to Prakasam barrage for hook and line operation and also setting and hauling of gill nets (Fig. 6).

Gears

Gill net

Different mesh size was observed in the gill net used in river Krishna (Fig. 7). There was no mesh size regulation to get rid of juveniles except in

Nagarjunasagar dam where mainly higher size of mesh was operated as the catch was observed to be consisted of big size major carps. It was mostly observed in this zone where water level was comparatively higher. Though it was mostly meant for fishes, large sized prawns (*M. malcolmsonii*) were also observed to be caught frequently. Net with yellow colour dye was better as this faces less tear as told by fisherman in Thummalapalem. A special type of very long gill net of length ~500 m, locally called *Nagin* was operated at Umbroj. After addition of bait made of bread, earth worm, etc. immediately it was set in a circular fashion around the bait and again checked by lifting after a very short time interval.

**Cast net**

It was the most commonly observed gear being operated throughout the river. The obvious reason was that it can be operated single handed. Different mesh and pocket size targeted to particular species were also encountered. In Thummalapalem, only medium size prawns were observed to make the total catch of some of the cast net operation (Fig. 8).

**Drag net**

It was comparatively less in use as it required large man power, plain terrain and relatively low water level. Below Prakasam barrage, the river has a depth of 0.5 - 2 m, where frequent dragnet operations were observed. The accompanied picture is from upstream, near the confluence of Koyna river near Karad (Fig. 9).

A detailed account of size, weight and catch structure from gill nets, cast nets and drag nets and also of fishing boats from Vijayawada was reported^{18}.

**Push net (triangular)**

Triangular push net was observed in estuarine stretch of the river having similarity with *Singidi vala* mention{19}d. It was made of a triangular bamboo frame fitted with a mosquito netting cloth (1/14" mesh) (Fig. 10). Fishermen operated it first by pushing the net and then scooping from the water to catch the seeds of tiger prawn, *P. monodon*. A single fisherman used to go with two such nets. Big one (1.5-2 m arm length) was used to catch prawns and small one (~1 m arm length) was used to cover the mouth of a floating vessel where the catches were preserved in living condition to be used for stocking. Triangular shape of this small net balanced perfectly to keep the vessel erect. It was also observed to be used in some of the places in upper stretch, e.g. Umbroj, Karad and Haripur to catch prawns.

**Circular scoop net (with long handle)**

It was observed in fishing in Penumudi, an estuarine fish-landing centre (Fig. 11). Fishes were attracted with light at night and then caught by lifting the net. Handle length was ~1.5 m and diameter was ~0.3 m. In daytime, it was also used to catch slow moving fishes. As water was shallow (0.5-1.5 m), fishes were visible from surface and so easily caught with this net.

**Lantern net (light trap)**

This cone shaped nets was observed in Amudharlanka, a fish landing centre after Prakasam barrage (Fig. 12). Kerosene gas pressure lamp with incandescent mantle was used to attract the fishes. As soon as fishes came near the base of the light, it was caught by casting the net on stunned fish as river was shallow (0.5-1.0 m). The rod above (~1.2 m) was used as handle to operate it like a dart. Fish was trapped inside the conical net tied with the hoop (diameter 0.3-0.4 m) and caught. Though individual catches per operation are small (one or two *Etroplus*), it takes less time and effort. Catch per night is the sum of many such operations. Trap with similar mechanism was reported from Chilka Lake^{20}.

**Ring net (without handle)**

Ring net without handle was found in Penumudi. Internal diameter of the net was around 0.3-0.4 m. It was used to catch floating slow moving fishes and crabs (Fig. 13).

**Box trap**

Among different fishing traps, box trap was one of the major gears used in prawn fishery in river Krishna^{21}. Trap fishery works in the principle of allowing the fish to enter the trap and then preventing their escape from the trap. Box trap was a cube shaped trap made of bamboo sticks knitted with some durable creepers (Fig. 14). A bicuspid non-returning uni-directional vertical valve along the height of the trap was made to be used as entrance for fishes. The sticks used to make this valve were thinner and knitted with nylon rope. The trap was kept in vertical position under the water facing the water current. A float made of thermocol was tied with the trap with cotton wire to help in locating the position of the trap. A piece of coconut kept inside the trap was used as bait to lure the prawns. Though mostly prawns were being caught by it, sometimes other fishes like *Notopterus* or *Etroplus* were also seen to be trapped.

In general, one prawn was caught in unit effort but
Fig. 2—Coracle, a major fishing craft; Fig. 3—Plank built boat in Thummalapalem; Fig. 4—Palm-canoe in river Krishna (Inset: Close view); Fig. 5—Thermocol raft used in fishing; Fig. 6—Rubber tube platform—craft for poor fishers; Fig. 7—Gill net—main fishing gear in river Krishna; Fig. 8—Hook and line; Fig. 9—Dragnet operation in river Krishna; Fig. 10—Scoop net with long handle; Fig. 11—Push net at Penumudi; Fig. 12—Lantern net (with kerosene pressure lamp); Fig. 13—Ring net and crab catch in Penumudi; Fig. 14—Box trap to catch prawn; Fig. 15—Cradle trap to catch prized prawn; Fig. 16—Making of cast net
more prawns were also observed in the catch of a trap. Similar type of traps and other methods of catching prawns from Orissa were reported22.

**Cradle trap**

Prakasam barrage near Vijayawada diverts most of the water of the main stream of river Krishna into the irrigation canal. During the month of monsoon inflow, i.e. August-October, water is released through the canal. Due to the creeping behaviour of prawns (M. malcomsonii) against the current, they try to enter through the sluice gates. Night is mostly preferred for migration due to their nocturnal behaviour of migration. Similar observations were reported in Godavari23, in Cauvery24 and from Mahanadi and 6 other rivers in Orissa25. Natural prawn seed availability from various river systems in India was reported26, 27. Cradle type device was suspended from top in such a way that the cloth just touches the water (Fig. 15). Cradles were made of muslin cloth fitted with a rectangular bamboo or steel frame with a length of 1 m and breadth of 0.75 m. Fingerling-size prawn juveniles crept through the frame to avoid severe water current near the gate and take rest inside the cradle. Cradles were inspected from time to time to get a good haul of prawns, especially juveniles and then kept in a bag dipped into water for future sale. It should be mentioned here that prawn fishery from Vijayawada anicut was recorded as early in 191028.

**Hook line**

Hook line was observed to be used through out the entire stretch of river Krishna (Fig. 16). This was rampant at Satrasala, a deep pool of 16-18 m, around 10 km below Nagarjunasagar dam and at Thummalapalem, 15 km above Prakasam barrage, due to higher water level and less flow. Using earthworm as living bait and snail-flesh as dead bait, fishermen (and also women) used to catch prawns (M. malcolmsonii) from the river.

**Conclusion**

In both fishing crafts and gear, traditional materials were still prevalent even in this era of mechanisation. Diversity was observed in gears to exploit all elements of the fish community despite the dominance of gill nets. All these crafts and gear indicated the creativity of the fishermen. Even the fishermen were the best person to enlighten us about the fact that which colour of the net could harvest more fish, which material of the net caused less tear or which gear was suitable for which fish. Again to upgrade those ITK with the help of modern technological development, detailed study of every craft and gear is necessary.

It was unfortunate to observe that in some portions of the river especially in Amaravathy, fishermen were not relying upon gear, instead using short-cut method of dynamiting. The less diversity in fish species in this area might be the result of dynamiting. Immediate action is required to stop this method; otherwise, it will have deleterious effects on fishery in lower stretch of river Krishna.

Again in the upper stretches, especially in Brahmanal, Jamakhandi and Galgali, fisheries were getting severely affected by crocodile population. Fishermen were compelled to convert their fishing craft from coracle to boat. Still, frequent loss of lives of fishers and also that of gear were common.

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