

## Artisanal Fishing Gears of Visakhapatnam

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Visakhapatnam along with Kakinada coast shares the status of being the major fish landing Centre in the east coast of India. The traditional fisheries off Visakhapatnam are diverse in terms of fishing gear and methods. In recent years, specific gears have been developed for commercially important species by standardizing the twine size and mesh size. The multi-walled trammel net has been adopted for effective exploitation of crustaceans with necessary changes. Use of monofilament has been popular among fishermen in this area. Fishermen of this coast have adopted certain innovations such as use of artificial lure in place of natural bait. Larger units of hooks and lines have also been in use as a result of motorization of the craft and operations have shifted to deeper waters. Increased competition in the fishing industry coupled with the diminishing returns have resulted in fishermen using codend mesh size up to 5 mm in boat seines and shore seines. In view of these changes, there is an urgent need to assess the present artisanal fishing practices prevailing in the coast in order to promote eco-friendly and low energy fishing practices. This article provides an overview of the traditional fishing gears operated, off Visakhapatnam coast. The technological and operational details of major traditional fishing gear and methods namely gillnets, boat seines, beach seines and lines are described. Suggestions for making indigenous gear more eco-friendly and cost-effective are provided.

**Key words :** Artisanal fishing gear, gill net, hook and line, shore seine, boat seine

In spite of the vast expansion in trawling, the artisanal fishing sector still plays an important role in harvesting of marine fishery resources in Andhra Pradesh. Visakhapatnam is one of the major landing centres of Andhra Pradesh coast with its own fleet of artisanal fishing. About 1,988 mechanized crafts and 7,302 non-mechanized crafts are being operated in Visakhapatnam. About 30,465 units of artisanal fishing gears are used in Visakhapatnam (Anon, 1998). Gill

*nets, shore seines, hooks and lines, boat seines and cast nets are the commonly used traditional fishing gears along the coast of Visakhapatnam. Different types of traditional gears operated along the east coast of India have been described by various authors (Rao et al., 1985; Luther, 1988; Rajan et al., 1991 and Chennubhotla et al., 1999)*

Motorization and mechanization of fishing crafts, which began in middle of sixties, enabled the artisanal fishermen to carry more number of units and venture into deeper waters. After the introduction of synthetic materials in early seventies, cotton has been completely replaced by synthetic netting material. After introduction of synthetic fibres, several innovations and improvements have been tried in order to increase the efficiency of the artisanal gear. Technological details of the different artisanal fishing units are described in this paper, with focus on innovations and adaptations, which have taken place in fishing gear, during recent years.

### **Craft**

The traditional fleet of Visakhapatnam has not changed much during the last few decades. The fishers have accepted fibreglass as boat building material but the changes have been effected only to smaller versions of the traditional fleet. Four types of fishing crafts are popularly used by the traditional fishermen, viz., (i) *teppa* (ii) *kottu padava* (iii) *fibre teppa* and (iv) *fibre boat*.

*Teppa* is a catamaran type craft which is very popular along Andhra Pradesh coast. It is made of three to four light weight wooden logs tied together firmly using hemp rope. The size of *teppa* varies from 4 to 6 m. These are non-mechanized and are powered mostly by sails and sometimes manually. *Kottu padava* is a stitched boat built with six to seven wooden planks which are stitched together with rope. It is generally 5 to 8 m in overall length. This boat is generally operated in the inshore waters and powered either by sails or manually. *Fibre teppa* is a motorised catamaran in which wooden logs are replaced with fibreglass, retaining the basic configuration of the traditional catamaran. The length of the boat ranges from 6.5 to 7.5 m. This boat is powered with a 6.5 hp outboard engine and in favourable conditions, sails are used. *Fibre boat* is a mechanized boat made of fibreglass in the shape of traditional *nava* and powered with 10 hp inboard diesel engine. A fish hold is provided in the middle. Length of this craft ranges between 7.5 to 8.5m. It is also provided with a mast and sail for emergency.

## **Fishing gear**

The varied nature of the shelf area available off Visakhapatnam coast provides scope for operation of a variety of fishing gears. The uneven topography of Visakhapatnam coast permits line fishery to flourish, along with gill nets and seines. Gill nets, shore seines, hooks and lines and boat seines are the most prominent gears used in the artisanal sector.

### ***Gill nets***

Gill nets are the most dominant gear in the artisanal sector, in this coast. The design and construction of the gill nets varied depending on targeted species and in certain aspects from region to region. A recent survey indicated that the synthetic netting material and ropes have totally replaced natural fibres (Table 1). Machine-made polyamide and high density polyethylene (HDPE) are now the most commonly used material for gill nets. Based on the materials used, gill nets of Visakhapatnam can be grouped into four categories.

### **Polyamide monofilament gill nets**

The most widely used polyamide monofilament gill nets are having twine diameter between 0.16 to 0.23 mm and mesh sizes ranging from 20-130 mm with a hanging coefficient of 0.56-0.45. Overall dimensions of the net range from 90 to 540 m in length and 6 to 10 m in depth. The units with 50 mm mesh sizes are used for harvesting mackerels and ribbonfishes. It has been reported that 70.15% of the total mackerel catch landed along Visakhapatnam coast is by gill nets (Luther, 1988). Satyanarayana and Sadanandan (1962) described encircling and free-floating gill nets for harvesting surface shoals of mackerel. Today, these units are no more in use probably due to the reduction in large shoals of mackerel. The mesh sizes ranging from 20 to 40 mm are used to catch sciaenids, engraulids and anchovies. The mesh size of 130 mm is used to catch pomfrets, tunas and seerfishes. The success of gillnet operation during the daytime has been known to depend on the visibility of netting underwater. Light green netting is used for fabrication of the gill nets.

### **Polyamide multifilament gill nets**

The polyamide multifilament gill nets are used to harvest small fishes. Polyamide multifilament netting of twine size 210Dx1x2 and mesh sizes ranging from 20 to 30 mm are used in gill nets to catch sardines, anchovies, seerfishes and ribbonfishes. There are two categories of nets, in terms of overall dimensions.

Table 1. Details of the gill nets operated off Visakhapatnam coast

Gill net type	Mesh size (mm)	Twine size	Dimensions of the unit		Hanging coefficient	No of units operated	Period of operations	Target species
			Length (m)	Depth (m)				
PA mono filament gill net	50	0.16 mm Ø	120-200	6-9	0.55	6-10	Throughout the year; Peak: February to April	Mackerel, clupeids and lesser sardines
	30	0.16 mm Ø	90	10	0.55	5-10	January to September Peak: June to August	Sardines and engraulids
	130	0.23 mm Ø	540	10	0.55	5-6	April to August Peak: April to June	Pomfrets, seerfishes and tunas
PA multi filament gill net	20-40	0.16 mm Ø	140-180	7-8	0.44	10-20	Throughout the year Peak: February to August	Anchovies and mackerel
	30	210Dx1x2	360	10	0.50	3-5	Throughout the year	Ribbonfishes and seerfishes
PA multi filament trammel net	20	210Dx1x2	25-50	3 - 6	0.50	10-15	January to September Peak: June to August	Sardines and anchovies
	50(I) 250(O)	210Dx1x2(I) 210Dx3x3(O)	80	3	0.50(I) 0.70(O)	4	June to December Peak: June to September	Shrimps
	50(I) 250(O)	210Dx1x2(I) 210Dx3x3(O)	46	3.5	0.50(I) 0.70(O)	5-10	June to December Peak: June to September	Shrimps
	20(I) 100(O)	210Dx1x2(I) 210Dx3x3(O)	100	3.5	0.50(I) 0.70(O)	2	June to December Peak: June to September	Shrimps
HDPE gill net	60	2.00 mm Ø	28	9	0.51	30	Throughout the year	Seerfishes and tunas

I: Inner; O: Outer

The first group has an average length of 360 m and depth of 10 m, with a mesh size of 30 mm. These groups of gill nets are used to catch ribbonfishes and seerfishes. Two to four units of the gill nets are tied together during operation. The second group is smaller with an average length of 25 m, depth of 3 m and mesh size of 20 mm. Fleet consisting of fifteen units of this gill net are operated to harvest sardines and anchovies. The sardine fishery along this coast in the past comprised of only lesser sardines, i.e., *Sardinella fimbriata* and *S. gibbosa* and the occurrence of *S. longiceps* was rare. However, since 1985, *S. longiceps* also began to contribute significantly to the sardine landings (Luther, 1994). This probably could have been the reason for the reduction of mesh size to 20 mm, instead of the mesh sizes of 28 mm, 33 mm and 38 mm reported earlier, for sardine nets (Luther, 1994). Satyanarayana and Sadanandan (1962) have also described sardine gill nets of 38 mm mesh size. Joseph and Sebastian (1964) have found out that 33.4 mm mesh size as optimum compared to 28.0 mm, 38.6 mm and 41.8 mm. The present mesh size of 20 mm used by the fishermen of this coast is not appropriate and reportedly land small sardines, which are used as baits in hook and line fishery. Luther (1994) has stated that juvenile sardines account for 94% with 25 mm mesh size, 73% with 28 mm and practically none with 30 and 33 mm mesh gill nets, off this coast. It is apparent from these observations that the present mesh size is not appropriate for the sardine fishery of this coast.

#### **Polyamide multifilament trammel nets**

Trammel nets, popularly known as *disco vala*, is an adaptation of the tripple walled entangling net, which is designed for operating in the bottom mainly targeting shrimps. It has a fine netting of smaller meshes hung loosely between the walls of coarser netting of much larger meshes. The fish passing through the outer wall carry some of the fine netting through the wall to the other side and are retained in the pocket, thus formed.

Two different types of trammel nets are in use. The first type is made of polyamide multifilament netting of twine size 210Dx1x2 and mesh size 50 mm for inner layer and polyamide multifilament netting of twine size 210Dx3x3 and mesh size 250 mm for the two outer layers. This unit is similar to the one used in Kerala coast described by Vijayan *et al.* (1991). The second type is 100 m long with a depth of 3.5 m. This unit consists of polyamide multifilament netting of twine size 210Dx1x2 and mesh size 20 mm, as inner layer and polyamide multifilament netting of twine size 210Dx3x3 and mesh size 100 mm, for the outer two layers. Two separate units are laced together during operation and after setting the nets at the bottom, the head ropes of both the units are held by the

fishermen from their respective boats. The nets are hauled by moving the boat towards each other. The units are then separated and the respective fishermen collect the catch pertaining to each unit.

#### **HDPE twisted monofilament gill nets**

The operation of HDPE gill nets has started very recently in this coast. These units are made with 2 mm HDPE twine having a mesh size of 60 mm and overall dimensions of 28 m length and 9 m depth. Thirty units are tied together and operated in deeper waters for exploiting tunas, catfishes and seerfishes.

#### **Lines**

The line fishing in India has been described by Rao *et al.* (1989), Kartha *et al.* (1973), Hameed (1985) and Menon *et al.* (1991).

#### **Long lines**

Line fishery of Visakhapatnam mainly consists of long lines, which are designed to capture large oceanic species. There are three types of long lines in operation off this coast. The first type of long line has a main line of about 2,000 m in length and branch lines of 10 m each. The unit is fitted with 100 numbers of No. 1 round bent hook (Mustad, Norway) (Table 2). Snood wire consists of two sections of which the section proximal to main line is made of HDPE monofilament, while the distal section is of twisted stainless steel wire. Swivels, which were earlier in use, have been discarded due to the cost factor. This unit is operated as either drifting or set, throughout the year. The main catches landed by these lines are sharks, tunas, sailfishes and seerfishes.

Hook No. 4 (Mustad, Norway) is used for making the second type of long line, used for harvesting tunas and seerfishes. In this gear, the main line is 300 m long and branch lines are 5 m long. As many as 30 hooks are operated. These units are operated throughout the year either set or drifting. The catches landed by this line are tunas, sailfishes and seerfishes. The baits used are cut pieces of tuna and sailfish and whole mackerel, depending on availability.

The third type has an 88 m long main line and branch lines of 9 m each. Only five numbers of hooks (No. 2, Mustad, Norway) are attached to this unit. Ten to fifteen such units are operated at a time, and the lines are either set or allowed to drift. These lines are operated from July to October and catch landed consists of tunas, sharks, sailfishes and dolphin fish.

Table 2. Details of the lines operated off Visakhapatnam coast

Length of main line (m)	Length of branch line (m)	No. of hooks	Hook Characteristics			Baits used	Depth of operation (m)	Period of operation	Target species
			Hook type and make	Size (mm)	Gap (mm)				
2000	10	100	Round bent Mustad	1	30	40	> 100	Throughout the year	Shark, tunas, sailfishes and seerfishes
88	9	5	Round bent Mustad	2	23	29	> 100	July to October	Shark, tunas, sailfishes, and dolphin fish
300	5	30	Round bent Mustad	4	22	28	> 100	Throughout the year	Tuna, seerfishes and sail fish
70	0.5	20	Round bent Mustad	9	13	15	< 60	Throughout the year	Little tunnies, seerfishes and dolphin fish
50	0.2	35	Round bent Mustad	16	06	09	< 45	October to March	Little tunnies, seerfishes, carangids and sciaenids

### **Hand lines and troll lines**

Hand lines and troll lines have been gaining popularity in recent years in the coastal waters of Visakhapatnam. They are either operated from the stationary vessel as hand lines or from the moving vessel as troll lines. In both the mode of operation, the hooks are attached with artificial lures. Coloured polyethylene strips are tied above the hooks to lure the fishes.

Hook No. 9 is used in handlines, which are 70 m long with branch lines of 0.5 m each. Twenty hooks are used in these units, which are operated throughout the year. The main catches landed are little tunnies and seerfishes. Smaller version of this unit is used in the inshore rocky areas. The main line of the unit is 50 m long with a branch line of 0.2 m fitted with 35 numbers of hooks of size No.16. Little tunnies, perches, carangids and seerfishes constitute the main catch of hand lines, which are operated mainly during October to March.

### **Shore seines**

Two types of shore seines are operated along the Visakhapatnam coast. The seines, which are not provided with codend, are locally called as *alivi vala*. The seines that are provided with codend are called *pedda vala*. These nets were first introduced in this coast, during early 1960s. They were fabricated exclusively of cotton material in the beginning, which was later substituted by polyamide.

#### ***Alivi vala***

This is a large shore seine with a length of about 1,000 m consisting of a wall of netting with tapering wings. It is made of polyamide netting of twine size 210Dx6x3. The central part of the net is fabricated with 10 mm mesh netting panel of 15 m in length and 18 m in depth. About 30 units of netting having same length are attached to the middle panel on either side. The mesh size increases from 10 mm in the bunt to 30 mm in the wings and depth gradually tapers from 18 m in the middle to 1.5 m in the wing-ends. A selvedge of eight meshes with thicker twine is used along the upper and lower edge. The netting is attached to head rope and foot rope using a hanging coefficient of 0.50. HDPE ropes of 16 mm dia are used as head rope and foot rope. Floats and stone sinkers are attached to the head rope and foot rope, respectively, at appropriate intervals.

#### ***Pedda vala***

*Pedda vala*, mainly operated off Visakhapatnam coast, has very long wings and a short codend. The length of the net is about 470 m and maximum depth



of 56 m. PE ropes of 16 mm dia are used as head rope and foot rope. The mesh sizes range from 1800 mm in the wing-ends which are made of 4 mm dia to 100 mm, 70 mm and 50 mm meshes towards the codend. Codend is made of 210Dx10x3 polyamide netting. The codend has a mesh size of 10 mm. Polystyrene floats (*thermocol*) of irregular shape and size are attached at regular intervals along the head rope. Stone sinkers are tied to the footrope.

Both *alivi vala* and *pedda vala* are operated in a similar way. About 15-20 fishermen take part in the operation of the gear. One end of the net is held by one group of fishermen on the beach. Two or three fishermen carry the other end of the net to the sea, in a stitched boat. The net is paid out in a semi-circular pattern encircling the inshore waters and the other end of the net is handed over to another group of fishermen on the beach. The two groups of fishermen drag the net to the shore from both the sides. The fishes that are in the encircled area are concentrated in the bunt or in the codend.

The shore seines are operated during calm weather conditions where the grounds are even. The shore seines are generally operated from October to February, along Visakhapatnam coast. The catches from the shore seine comprised of sardines, anchovies, carangids, mackerel, seerfishes, ribbonfishes, silver bellies and mullets. The codend mesh size of 10 mm is very detrimental to the inshore fishery as it retains a large quantity of juveniles.

### **Boat seines**

#### ***Iraga vala***

*Iraga vala* is one of the oldest traditional boat seines used off Visakhapatnam coast. This net consists mainly of three parts, viz., two wings and a short wide mouthed bag. Earlier, this net was exclusively made up of cotton, which has been now substituted by polyamide netting of twine size 210Dx2x3, 210Dx1x2 and HDPE netting of twine size 0.75 mm dia. HDPE ropes of 6 mm dia are used as head rope and foot rope. The wings are of 45 m in length and 100 mm in mesh size. The body starts with mesh size of 600 mm, which is reduced to 10 mm just before the codend. The mesh size of codend is as low as 3 mm.

Synthetic floats are tied to head rope and cement sinkers to foot rope. HDPE rope is attached on each side of the wing during operation. The mouth of the net is kept open by the help of two catamarans sailing in a parallel course at an appropriate distance. The net is first shot across the current. The catamarans then turn about, row parallel to each other in the direction of the current while the net is dragging along the sea bottom. Ribbonfishes, shrimps, silverbellies,

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sciaenids, white bait and other fishes are caught in these nets. Generally, these nets are operated from February to May. The codend mesh size of 3 mm is very detrimental to the fishery as it results in large-scale mortality of juveniles.

The traditional fishing gears have several advantages such as simplicity of construction and operation, cost-effectiveness and low energy requirements. In recent years, it is seen that mesh sizes of the traditional gears have been reduced considerably. Keeping in view of the biodiversity and environmental concerns, there is an urgent need to improve the selectivity of traditional fishing gears and improve their efficiency. Mesh sizes of the traditional gears need to be regulated taking into consideration the biological parameters such as length at first maturity of the target species.

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