

## **Chapter V**

### **LINES, TRAPS AND OTHER MISCELLANEOUS GEARS**

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Hooks are the first fishing gear to be used by man. Hooks and lines are among the simplest of fishing gear. However, regardless of the development of fishing on a larger scale and mechanized fishing with nets and seines, hook and lines are still very important in contemporary commercial fishing. About 12% of all the catches in the world are made by hooks and lines (Mathai, 1995)

Hook and lines are more efficient in many cases for catching fish than nets. Large and swift predatory fish especially in transparent waters easily escape from net, which frighten them, whereas appropriately arranged, and set hooks and lines attract them with their bait. Fishing with powerful fishing gears such as the seines and trawls are impossible in rocky and uneven areas, where the more suitable gear is hooks and lines.

The function of the hooks is to ensure that the fish shall not spit out the bait after swallowing it. To ensure this basic premise, the point of the hook is often provided with a barb and its size depend upon its size. Another important function of the hook is to hold the bait properly and for this purpose the barbed point is extremely useful. Hooks are either used with or without baits.

In riverine sector, line fishing is an important fishing method. It is a cheaper method of fishing compared to gillnet and cast net fishing. A large

number of different types of line fishing gears are employed in the riverine sector. The fishermen construct the line fishing gear according to the behaviour of targeted fish and nature of the water body. Rod and line is a universal method of catching fish and is very popular in the rivers (Hamilhan, 1930),

The basic construction and material is almost same in all places. Basically, the lines have mainly two parts. A line made of synthetic twine and a hook. The line is mainly composed of PA monofilament, PP or PE. The basic criteria for the selection of material are that the line should be strong enough to withstand the pressure exerted by the fish.

This chapter deals with different kinds of lines, traps and miscellaneous fishing gear prevalent in the rivers of central Kerala.

### **Review of literature**

A number of studies have been conducted in line fishing all over the world as it is one of the most important fishing aid in the fishing industry. The studies on lines started very early in India (Hornell, 1937). The status of long lines of Ecuador is explained by Anon (1976).

The history of different line systems, their descriptions and status were described by Skeide (1984). Several workers have described about the indigenous gear used in India (Gopinath 1953; John 1936; Kurien and Sebastian 1986; Kurup and Samuel 1985). Different types of line fishing were discussed by Bach, (1989), Abe and Dotsu (1977), different types of

line fishing in Veraval, Gujarat were discussed by Pravin and Ramesan (1998). The techniques of tuna fishing with pole and line was discussed by Ben-Yami (1980). Line fishing gear relevant to Indian conditions was explained by Narsapurkar *et. al.* (1988) with the help of theoretical analysis and model study through mechanical simulation.

Studies of Rao *et. al.* (1989) described the details of shark long lines and offered suggestions to improve the gear and its method of operations. Technological advances in the coastal and deep sea fishing with different fishing gears like gillnet, trammel nets, long lines, troll lines, seines and trawls were discussed by George (1998). The technical details and advantage of the long lines used for sword fish capture was presented by Lizama and Naranjo (1989). The development of long line fisheries in the Indian Ocean was discussed by Gubanov *et.al.* (1992). The method of operation, catch composition, season of operation of these gear were also described in detail. Long lines for shark fishing is less expensive compared to other methods of fishing (Rao, 1989).

Detailed study on long lines in estuarine areas in Karnataka were conducted by Sathyanarayanappa *et. al.* (1987a). There are a number of studies conducted to improve the efficiency of line fishing. Experiments on artificial baits for tuna long lines were discussed by Kobayashi (1975). Studies on vertical long lines in Lkinawa Islands were conducted by Sakamoto *et.al.* (1974). The effect of size and shape of hooks in catching efficiency of long line fishing were described by Takeuchi and Koike (1969)

and Thomas, (1964). Breaking point of long lines were studies by Shinomiya *et. al.* (1985). Recent developments in longline gear, with respect to different gear components like hooks, swivels, main lines and barbs were discussed by Asmund Bjordal (1988). He also explained the conservations aspects of longlines compares with those of trawl gear.

Many modern techniques are used in long line fishing industry. The modern autoline system is widely used in long line vessels operating in Norway (Anon, 1978). Studies on monofilament main lines and snoods in long lines were conducted by Lange (1985). Experiments in long line hooking rate by using two kinds of baits were conducted in the Gulf of Thailand. (Kanehara *et. al.* 1985). The energy intensive long line fishery was discussed by Watanabe and Okubo (1989). Studies on breaking periods of main lines were conducted by Shinomiya *et. al.* (1985).

A number of studies have been carried out for the improvement of the materials used for the different types of lines. (Yanchenko, 1990). The materials have an important influence on gear performance with respect to fishing efficiency, selectivity, gear handling, investment and catch quality (Karlsen, 1988). He found out that the fishing time is important for the condition and quality of the catch of gillnets.

Efficiency and species selectivity of long lines were studied off the south coast of Portugal by Erzini *et. al.* (1996). Selectivity studies on long lines were also conducted by Dimitriou *et.al.* (2000). Comparative studies on of selectivity in different fishing methods like long lines and traps were

carried out in the Mesolongi lagoon in Greece by Dimitriou *et. al.* (2000). The study on the catching efficiency and selection curve of the long line hooks for spiny goby, *Acanthogobius flavimanus* were conducted by Takeuchi and Koike (1969).

Study of Jorgensen (1995) showed that long line were up to 30 times more effective in catching large fish when compared to the trawls. The study of Olsen (1995) revealed efficiency of long lines for deep water fish.

Economic feasibility of longline fishing were studied by Lange(1985). Factors affecting catching efficiency of long lines were studied by Arimoto *et. al.* (1983). Comparative studies were conducted on long line and a bottom trawl by Jorgensen (1995). Cost of operation and advantages of long line for sword fish capture are described by Lizama and Naranjo (1989).

### **5.1. Materials and Methods**

A survey was conducted in the rivers of central Kerala viz., Bharathapuzha River, Puzhakkal River, Keecheri River, Karuvannur River, Chalakudy River, Periyar River and Muvattupuzha River to identify the different types of gears, which are operated in the rivers. During the survey information on the different types of fishing gears operated in the riverine system were collected.

Based on the pilot survey 49 fishing centers were selected from these rivers. The location map of the centres surveyed is given in Fig. 2-8. The fishermen population are concentrated in these centres. Different centres in each rivers selected for the study are given in Table 61. Eight centres from the Bharathapuzha River, seven centres from the Chalakudy River, eight centres from the Karuvannoor River, two centres from the Keecheri River, fourteen centres from the Muvattupuzha River, eight centres from the Periyar River and two centres from the Puzhakkal River were selected.

The design details of different types of lines, traps and miscellaneous gears operated in the selected centres were collected from direct observation and interviews with the fishermen. Different types of lines like rod and line, hand line, long line and a number of miscellaneous gears like different types of traps, dip nets, spears, and other stupefying gears were studied during the survey.

Technical details of the lines such as material for main line and branch line, size and shape of hooks and baits used, method of operation, time and season of operation and the craft used for the operation and number of fishermen engaged in the operation were collected for different type of lines. Details of methods of operations, fishing areas, fishing time, season and catch details were collected through direct observations.

Technical details of traps, dip nets, etc. such as method of construction, mode of operation, operating season and catch details were

collected. The design drawings of these gears were prepared as per conventions followed by Nedelec (1975).

A number of stupefying gears are operated in rivers. Details of different methods used in this category were collected through field survey.

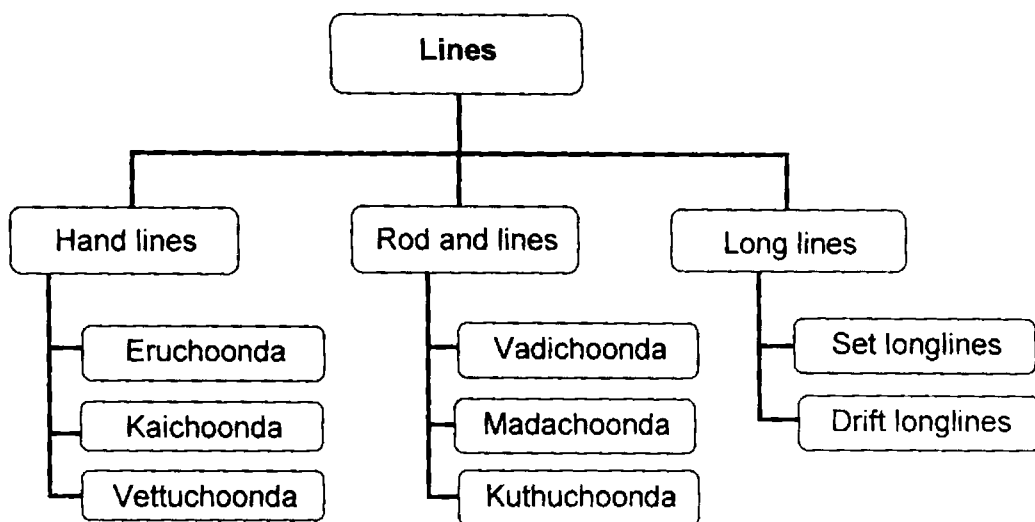
## **5.2. Results and Discussion**

Based on the study conducted in the fishing centres of the central Kerala a number of different types of gears were identified. Lines, traps, dip nets, spears, miscellaneous fishing methods like fishing without gears, vallivala, etc. are discussed in this chapter. In addition to these stupefying methods like use of poisons, explosives and electric fishing are prevalent in riverine sectors of Central Kerala are discussed.

### **5.2.1. Lines**

There are three categories of lines in the riverine sector of central Kerala viz. (i) hand lines (ii) rod & lines and (iii) long lines (Fig. 134). Hand lines are mainly three types viz., Eruchoonda, Kaichoonda and Vettuchoonda. Three types of rod and lines were practiced in riverine sector viz., Vadichoonda, Madachoonda and Kuthochoonda. Longlines were mainly used as set longlines and drift longlines.





**Fig. 134. Classifications of lines operated in Rivers of Central Kerala**

### **Hand Lines**

Hand line is the simplest form of fishing line. A line with a single hook or multiple hooks, with bait is operated by a single man. Hand line with single hook and multiple hooks were prevalent in riverine sector. Handline with multiple hooks is called multiple hand line.

Handline was made of polyamide monofilament line having a terminal lead sinker and a hook. The length of the line varied from 1.5 m to 100 m according to the depth of the area where gear is operated. Various sizes of hooks (No. 5 to 18) and different types of baits were used according to the targeted fish.

## ***Types of hand lines***

### ***Eruchooda***

Two types of handlines locally known as eruchoonda were operated in the area studied, viz., (i) lines with single hook and (ii) lines with multiple hook.

#### ***Eruchoonda with single hook***

It consisted of a main line and a hook, attached to the end of it. The upper end of the line was reeled on a spool and an appropriate length of line was released according to the depth of the fishing area. A small lead weight was attached 30 to 150 cm above the hook. The position of the sinkers varied according to the depth of the river.

The mainline is made of PA monofilament of 1.0 mm to 2.0 mm dia. The length of the line varied from 30 m to 100 m. The line is reeled in spool and released according to the depth and flow of water. (Fig . 135).

The branch line was made of PA monofilament of 1mm dia. The branch line started from the lead sinker. The length of the branch line varied from 50 cm to 150 cm according to the depth of the fishing area.

Small bead like sinkers of 50 to 200 g weight were commonly used and dumbbell shaped sinkers were also used.

A small thermocole float is used in calm waters, where the flow is minimum. The thermocole float of size 50x30x30 mm was attached a little above (50 to 150 cm) the sinker. Hook No. 5 to 14 were used in this line.

### **Operation**

On reaching the fishing ground, the fishermen throw the baited hooks with line. The line was released according to the depth and current of the river. Due to the presence of the small sinker the hook sinks to the bottom.

The gear was pulled back when the fishermen felt the hooked fish on the line and the fish is collected. The commonly used baits were small prawns and small live fishes. The catch comprises *Puntius* spp., *Oreochromis* spp., *Etroplus* sp. and cat fishes.

### **Eruchoonda with multiple hooks**

In upstream areas of Periyar and Muvattupuzha River (Bhoothathankettu, Kadumpidy and Moolamattom) some of the eruchoonda operated have 3 to 5 branch lines.

The main line was made of PA monofilament of 1.0 to 2.0 mm thickness. The length of the line varied from 30 m to 100 m. The branch line was made of PA monofilament of 1.0 mm thickness. The length of the branch line varied from 30 to 50 cm. The distance between the lines was little more than the length of the branch line. (Fig. 136).

The lead sinkers of 100 to 500 g used as weight in this gear. It was attached at the tip of the main line. Floats are absent in this type of lines. Hooks No. 7 to 14 were used in this gear and hook No.7 and 8 were very common. Live baits were used for the operation and commonly used baits were small prawns and small miscellaneous fishes.

### ***Operation***

The fishing was carried out in fairly deeper waters. The fishermen released the lines after the baits were fixed to the hooks. After that the fishermen wait for 10 to 30 minutes. After 30 minutes the twine was reeled to the spool and the hooked fishes if any, were collected and the process was repeated. The catch comprises *Oreochromis* spp., *Etroplus* sp. cat fishes and eels.

### ***Kaichoonda***

The simplest method employed for catching fish was the Kaichoonda. It has a main line, branch line, lead sinker and a hook.

The main line consisted of a PA monofilament of 1.0 mm to 2.0 mm dia., wound on a wooden piece. The length of the line varied from 5 to 30 m. The lower end of the line was provided with a lead weight of 50 to 100 g.

The branch line started from the lead sinker. The branch line was made of PA monofilament of 1 mm dia. The length of the branch line

varied from 50 to 150 cm depending on depth of the water column. (Fig. 137)

The hook was tied at the end of the branch line and the lead sinker was tied between the mainline and branch line. The lead sinker kept the line straight and also served as a cushion when sudden strain is applied to the line. A small thermocole float was used in deeper waters. The hook No. 7 to 8 was commonly used in most of the areas.

Live and dead baits were used according to the species of fish targeted. The live baits were small prawns, small fishes, earthworms and tadpole. The dead baits included pieces of fishes, chicken waste, tapioca, etc. Tapioca was mainly used for catching *Catla catla*. The tapioca was fried made in to small balls, and used as bait for *Catla catla*.

### **Operation**

This fishing was carried out in calm waters. The fishermen released the line to the water after baiting the hooks. The fishermen consciously attend any movement of the line and when the presence of fish was felt in the hook, the line was pulled out immediately to collect the hooked fish. The catch of this gear comprises *Oreochromis* spp., cat fishes and *Catla* sp.

### **Vettuchoonda (*Vala choonda*)**

Vettuchoonda otherwise known as Vala choonda was mainly used for catching Vala (*Wallagu attu*), and hence the term *vala choonda*. It is

very simple in construction. It has a main line made of PA monofilament of 1.0 to 2.0 mm dia. or PP twines of 2.0 to 2.5 mm dia. The length of the gear varied from 2.0 to 3.0 m. At the end of the main line, a steel wire of 2.0 mm dia is attached. The length of the steel wire was 30 to 50 cm with a hook of size 5 to 7 at the tip of it. (Fig. 138).

### **Operation**

Generally, the gear was fastened to the nearby trees or small shrubs keeping the steel wire of the gear below water level. The live baits attract the fish to be caught. Different kinds of baits such as small prawns, tadpole, small fishes, pieces of fish and chicken waste were used as bait.

### **Rod and line**

Rod and line is a very common fishing method practiced in the riverine sector. The construction of the gear is very simple and can be easily fabricated by fishermen themselves. The cost of the gear is also very less, compared to other fishing methods such as gillnet and cast net. The rod and line has several local varieties such as *Vadi choonda*, *Vettuchoonda*, *Mada choonda* and *Vala choonda*.

#### ***Vadi choonda***

In vadi choonda a PA monofilament line is tied to a long bamboo pole or any other hard wooden pole. The hooks of different sizes (No. 6 to No. 14) are used according to the fish sought after. The commonly used baits were small prawns, earthworms and small fishes.

The simplest kind of gear with baited hooks was the vadi choonda (rod and line). The gear has three parts viz., a pole, a line and a hook.

The typical poles were made of bamboo or some other hardwood. The length of the pole varied from 2.0 to 3.0 m and was approximately 50 mm dia at the butt and tapered towards the tip. They are seized with twines or steel wires at bottom and top to prevent splitting. In some cases the butt end of the pole was wound with small twines to provide a firm gripping surface. (Fig. 139).

The line was firmly tied at the tip of the pole. The length of the line varied from 2 to 3.5 m. The line was made of PA monofilament of 0.5 to 1.5 mm dia. At the tip of the line, the hook was attached. Hook size varied from No. 6 to 14.

A small float was attached 50-100 cm above the hook. The distance varied according to the depth of operation. The float is made of thermocole or locally available floating materials like pith of tapioca or small pieces of reed.

Live baits like small fishes, prawns, earthworms and tadpoles and dead baits like pieces of fishes, chicken waste, and fried tapioca pieces were used for pole and line fishing.

### ***Operation***

Usually 1 to 3 poles were used at a time by a single fisherman. The operation was carried out mainly during day time. After reaching the fishing

ground the fishermen released the baited hooks and consciously watch the movements of the float. The bait varied according to the fish sought. The movements of the live bait attract the fish, and immediately the fish swallows the bait with hook. The jerking movements of the float indicated the presence of fish in the hook. Immediately after the fish took the bait the fisherman jerked the rod and pulled out the catch. Fried tapioca pieces were used as bait for catching *Catla catla*.

### ***Madachoonda***

It is a special type of line which is mainly used for the capture of fish living in crevices locally known as 'mada' and therefore it is called *madachoonda*. In areas like Moolamattom this gear is called as *malamchoonda*. It has three parts a pole, a line and a hook.

The pole used has a length of 100 cm to 150 cm and was made of bamboo or nayinkana (*Saccharum spontaneum*) or some other hardwood.

A small length of line was attached at the end the pole. The length of the line varied from 25 cm to 40 cm. The line was made of PA monofilament of 1.0 mm to 2.0 mm dia.. A single hook of size No. 7 or 8 was fixed at the end of the line (Fig. 140).

Live baits like prawns of small fishes were used in this gear. In certain areas, this gear was used without a pole and such types of gears are locally called *Vettuchoonda*.



## **Operation**

After the live bait was fixed on the hook, the pole is pushed deep into the crevices. The movements of the live bait attracted the fish present in the crevices and the bait was taken by the fish and the fishermen pulled out the gear immediately to collect the catch.

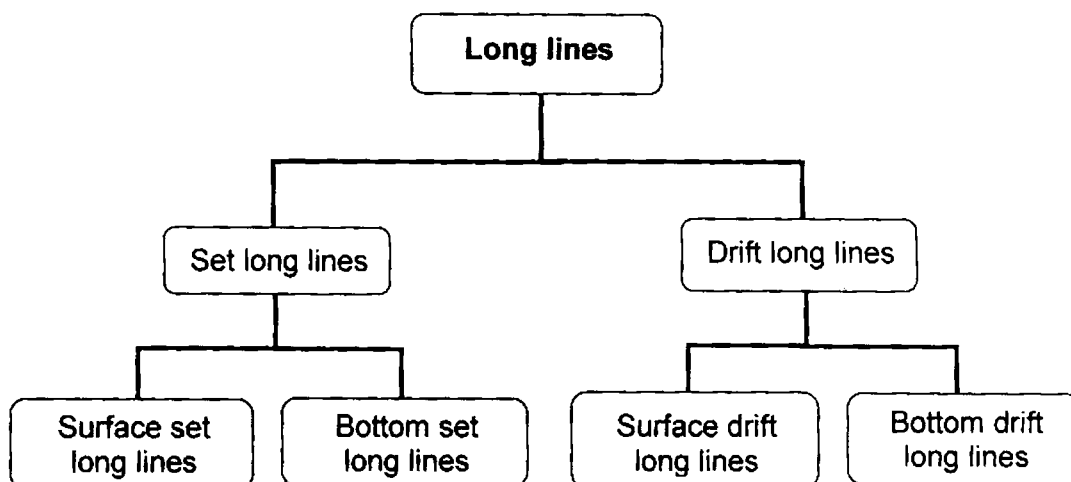
In the operation of *Vettuchoonda*, the baited hooks were lowered into the crevices with the help of small twigs. The other end of the rope was tied to a small piece of wood and firmly held in hand. The catch comprised mainly of cat fishes.

## ***Kuthu choonda***

Kuthu choonda is a rod and line gear with slight modification. The length of the pole was only 1.5 m and bamboo poles were commonly used (Fig. 141). One to two numbers of PP twines ( 1.0 to 2.0 mm) were twisted together and used as line. The length of the line is only 1.0 m and hook (No. of 6 to 8) was tied to the line. Small fishes were used as bait. *Vala* (*Wallagu attu*), eel, cat fishes were the main catch in this gear.

## **Long lines**

Long line is a common fishing gear in riverine sector of central Kerala. It has a long main line (10 to 100 m) and a number of small branch lines (10 to 50 Nos.). At the end of the branch line, the hook was attached. On the basis of operation the long lines are divided into set long line and drift long lines (Fig. 142).



**Fig. 142. Classification of long lines**

### ***Set long lines***

Set long lines are set on the bottom or surface and they are not free to drift with the current. Two types of set long lines were operated in riverine sector, viz., bottom set long lines and surface set long lines.

*Bottom set long lines:* In the bottom set long lines were anchored or attached to the bottom. The gear was tied to roots of the trees or to the rocks or submerged objects in the water. Three to seven numbers of sinkers were attached to the gear. Locally available material like stone, brick and tile pieces were used as sinkers (Fig. 143).

*Surface set long lines:* In the surface set long lines, the lines were tightened to the rocks or twigs / roots of the neighbouring trees in such a way that free movement of the gear was arrested.

### ***Drift long lines***

Drift long lines are without fixed attachment to the bottom and which were free to drift along with the current. Drift long lines could be either floating or submerged type.

*Bottom drift long lines:* In the bottom drift long lines, one end of the gear was attached to the submerged obstacles like rocks, roots or the trees and the other end is left free (Fig. 144). In some gears, one sinker was placed near the anchored end of the gear. The gear was mainly for the bottom dwelling fishes like catfish and eel.

*Surface drift long lines:* In this type of gears, one end of the gear was attached to the twigs and the other end was free. One to five floats were attached to the gear, to facilitate its floating.

Small fishes, pieces of fish, tadpoles, earthworms and prawns were used as bait. Catfish, eel, vala (*Wallagu attu*) etc are the target fishes. Long lines were mainly operated by fishermen in areas where other gear cannot be operated.

### ***Structure***

Aayiram choonda is the common name used for the long line in the riverine sector of central Kerala. It consisted of a long rope called the main line, with attached branch lines carrying hooks and bait.

The main line material varied from place to place and station-to-station and immediately available suitable material was used as mainline of the gear (Table 76). In areas like Cheruvaloor, Kalady, Karakunnam, Kurumassery, Mannarkadu, Moolamattom and Ooramana, the main line was made of PA monofilament of 1.5 to 2.5 mm dia and 20 to 60 m long. In Bhoothathankettu, Illikal, Irumpanam, Kadumpidy, Kanjar, Kothamangalam, Moorkanadu, Mrala, Palamittam and Thattekkadu PP or PE twines of 2 to 3 mm dia were used as main line. In Karakunnu and Kurumassery areas different types of materials like PA monofilament, PP and PE twines were used as main line.

The number of branch lines varied from 7 to 25 numbers. The length of the branch lines varied from 1 to 5 m. The branch line was made of different materials in different stations. PA monofilament of 1.0 to 1.5 mm dia, PP twine of 1.5 to 2.0 mm dia, PE twine of 2.0 mm dia. and PA multifilament twine of 210Dx8x3/210Dx10x3 were used as branch lines. The distance between the branch lines was adjusted a little more than the double length of the branch line and is usually 1.0 to 2.0 m. The hooks of specification No. 7 to 12 were used in this lines.

In order to keep the master line afloat and for demarcating of line, each set of line was provided with a small plastic can or float attached to it.

Rock pieces were mainly used as sinkers in the bottom set long lines. Three to seven numbers of rock pieces weighing 100 to 500 g each

were tied to the main line by using small pieces of PP or PE twine of 2 to 3 mm dia of 10 to 30 cm length.

Live baits like small fishes, prawns, earthworms and tadpoles and dead baits like pieces of fishes and chicken waste were used in long line operating in rivers of Central Kerala.

### ***Operation***

A unit consists of 1 to 5 sets of lines with a length of about 10 to 60 m were operated by a crew of 1 or 2 men. After reaching the fishing ground, the hooks were baited and the line was arranged across the river as a setline. The line was tied to the twigs or rock pieces on either side of the river. In fast flowing waters the line was never set across the river and instead the gear was set parallel to the water flow. In bottom set lines, 3 to 12 numbers of weights were attached to the main line. Granite stones, tile pieces or concrete pieces were used as sinkers.

In drift long line, one end of the line was attached to the twigs or roots of the plants in the rivers, and the other end was left free to drift. One to five numbers of floats were attached to the gear to facilitate floatation and also for locating the position of the gear.

The lines were hauled after 2 to 10 hours of soaking. The weight was lifted and the main line retrieved and pulled in by hand and coiled and kept in the craft. The hooked fish was removed and kept separately.

The entire operation took about 3 to 12 hours. In most cases, the fishermen waited till morning to start hauling of the line.

### **5.2.2. Traps**

Traps and other miscellaneous fishing gears like urivala, vadivala, vallivala and spears are very common in the riverine sector of central Kerala. A number of such gears are operated from upstream to downstream areas. Several workers have described the indigenous gear used in Indian waters (John, 1936; Gopinath, 1953; Kurup and Samuell, 1985; Kurien and Sebastian, 1986). Different types of miscellaneous gears are reported by Hornell (1938) in Travancore and Malabar coast.

Traps are one of the important gears after gillnets and lines in the riverine sector. It is generally operated seasonally in the midstream areas of the rivers. It is very simple in construction and operation. Because of the simplicity in construction the fisherman fabricated most of the traps by himself. The shape and structure of the traps vary from station to station and river to river. Eventhough the basic construction is generally same the differences exist in the materials used and dimensions of the traps. Improvements in designs are suggested by Miyamoto (1962), Nair (1993), Rajan and Meenakumari (1982) and Rajan *et.al.* (1981; 1988).

In riverine sector two types of traps are recognised viz., filter traps and screen barriers. In filter traps, the water is filtered out and fish are entrapped and collected, and on screen barriers the fish is guided to the

trap enclosure and collected by using scoop net. Nedelec and Prado (1990) classified traps according to fishing methods. Based on the method of trapping, shapes, position of entrance, materials used for making it, the traps are of several types.

### **Filter traps**

Various types of filter traps were in use in different areas of the rivers and a number of local varieties were available in these rivers. Typically trap is a simple cylinder of closely set mid-rib slivers of palm leaflets or bamboo. It usually consisted of a cylinder of large size and a curved, fan shaped apron, the end of which was inserted into the mouth of the cylinder when the trap was placed in position (Baiju and Hridayanathan, 2000).

Water flows on to the apron and fishes or prawns that enter are led by the sides of the apron into the cylinder where they are entrapped. These types of traps were common in mid-stream areas during rainy season.

### **Aaro koodu**

It is a type of trap mainly used to capture eel and vala (*Wallagu attu*). The length of the gear was 150 to 200 cm. The body of the trap was cylindrical in nature with a diameter of 30 to 50 cm. It is made of split bamboo pieces arranged in cylindrical fashion. Split bamboo slivers of 30-50 cm length, were tightened by using coir ropes (Fig. 145).

The tail end of the cylinder was tapered and closed by using the split bamboo. The other end of the trap was open and filtered with a cone like structure called *vakkoodu*. The *vakkoodu* was a fan like structure made of bamboo poles and steel rings. This fan like structure guided the fishes towards the trap. The outer most and inner most circles of the *vakkoodu* were made of steel rods. An opening was provided near the back end of the trap for collecting the trapped fishes, and it is closed by using a small door made of split bamboo.

Traps of the large size were used in areas like Ooramana and Peruvanmuzhy. The body of the trap was cylindrical and the length varied from 150 to 250 cm and the circumference extended up to 150 cm. The whole body of the traps was made of steel rods and pieces of bamboo. (Fig. 146). Galvanised iron rods were also used for the construction of traps in these areas.

### **Operation**

The Aaro koodu was mainly operated during winter season. (June to September). The fishermen reached the fishing ground in the evening and kept the trap in the channels. The fish was guided to the trap enclosure by *vakkoodu*. Once the fish entered the trap, it cannot easily escape from the trap. During early morning, the fisherman examined the trap and collected the trapped fishes through the opening in the body. When the catch of the fish was high, the fishermen examined the trap every hour during night and also collected the fish during day time. The most



important aspect was that the fishermen could collect the catch without disturbing the position of the trap.

### **Iruvaachi**

It is a type of filter trap similar in many aspects to *Aarokodu*. The difference was that it had two *Vakkoodu* over on each end, so that fish can enter from both sides and it cannot escape from the trap. The operation of the gear is same as that of above.

### **Screen barriers**

Screen barriers are commonly used in the down stream areas of the rivers and in backwaters. The screen barriers observed in riverine sector were made of split bamboo or arecanut slivers. Narrow split strips of bamboo or arecanut were laced together with coir rope in transverse rows. The length of these sleeves varied from 1.0 to 2.5 m depending on the depth of the water column. At short intervals, strong bamboo poles or some hard wood poles were used to give extra strength to this barrier and these poles were fixed by driving them into the mud. (Fig. 147). Such screens were arranged as a vertical wall of screening and set in a circular or rectangular fashion and each end was curved inward and brought closed together leaving only a narrow passage leading into the trap enclosure in between (Rajan, 1993). The fishermen could easily collect these fishes by using a scoop net.

### **5.2.3. Miscellaneous gears**

#### **Handpicking**

Hand picking was a very common method of fish collection practiced in shallow waters of the river where the flow of the water was slow. Mainly ladies were engaged in handpicking. They dived into the water and collected the fish with bare hand and stored it in the basket or threw it into the land. The small children present in the land collected the catch and kept it in a pot.

#### **Thettali (Cross bow or *Parangi pathi*)**

Cross bow is very popular in fishing sports in European countries. It is made of plastic alloy and fibreglass compressed Limbs ([www.hunting-fishing-gear.com](http://www.hunting-fishing-gear.com)).

The cross bow was extensively used in Cochin-Travancore areas in the beginning of this century (Hornell, 1938). Nowadays this gear is very rarely used as a fishing device. During the present study the gear was observed in certain areas mainly in the upstream and midstream areas of rivers. The bow was made of several thin wooden slivers (2 to 4) of arecanut tree. These slivers were tightened by using coir rope or metal wires and fitted to the rectangular opening provided in the forepart of a wooden butt. At the distal end of the butt a handle is provided and a trigger. Both ends of the sliver were connected by using a strong rope (Fig.

148). An arrow is fired from the bow. The arrow was made of wood with sharpened metal tips.

It was used for shooting the fish in rivers and backwaters. The fishermen constantly watched in the water for a fish. The trigger is pressed and the arrow released from the cross bow on locating the fish. This gear was mainly used for big sized fishes.

### **Plunge Basket (*ottal*) .**

The plunge basket locally known as 'Ottal' was operated in shallow waters especially in tributaries and paddy fields when the water level is low. It was very common in rainy season. It consisted of a sub-conical, tapered cylinder with closely-set ribs of split bamboo. Both ends of the cylinder were open. The upper opening was narrower just wide enough to pass the arm. The lower opening was widely spread. The bamboo slivers were tightened together with coir ropes at every 20 to 30 cm so the ribs are kept in position. Height of the gears varied from 50 to 60 cm and the diameter at the bottom of the basket varied from 40 to 60 cm. The lower part of the ribs were pointed and projected. The upper opening of the gear was laced with coir ropes to give protection to the arm during operation (Fig. 149). Plunge basket used in the Malabar coast has been described by Hornell (1938).

The operation of the ottal was very simple. The fishermen moved through the water with the ottal and when any fish was located within

striking distance, the *ottal* was skilfully dropped over the fish. The fisherman pressed the mouth of the ottal into the mud with one hand and passed the other hand through the narrow upper opening and collected the trapped fishes. The plunge basket was operated during day and night. In night, it was operated with the help of a light.

### **Vallivala**

*Vallivala* was very common in shallow areas of the rivers studied. The gear was operated where the water is relatively calm and clear. In some areas it was called as *Vellavely*.

The gear consisted of a long coir rope of 70 - 100 m length. In this coir rope pieces of plastic carry bag of size 50 cm x 3 cm were fixed between the layers of ropes as shown in the figure (Fig. 150). The plastic pieces were fixed every 50 cm in the coir ropes. Only white plastic pieces were used for this purpose, because the glittering of the white coloured plastic pieces were thought to frighten the fish. In Bharathapuzha River, the same type of gear was in operation. However, here coconut leaves were used instead of plastic pieces. A similar type of gear was also reported by Kurup (1991) as *Kuruthola valikkal*.

### **Operation**

The operation of vallivala was mainly during day time. Usually 5 to 7 fishermen were engaged in the operation of this gear. In preparation for the operation, two fishermen stood side by side at a distance of

approximately 10 m. One end of the rope was tightened to the right leg of the left fisherman and the other end was tied to the left leg of the right fisherman. The fishermen then moved forward through the water and the ropes formed a semi-circular shape in water.

The other five members moved back to follow the gear as shown in figure. (Fig. 150). When the rope with plastic pieces moved thorough the surface of the water, the glittering of the plastic pieces frightened the fishes, which tried to dig into the bottom sand/mud. The fishermen identified the smashing of the mud and collected the fish with bare hand and put it into the folding of the dress (dhoti). This process was continued for 1 to 3 hours.

The life of the gear was about six months for the coir rope and 2 weeks for the plastic pieces. Every two weeks the plastic pieces were replaced.

The gear was mainly used for catching pearl spot (*Etroplus suratensis*). The average earning of this gear varied from Rs. 500 to 1500 per day.

### **Urivala**

Urivala was a common fishing gear operated in most of the rivers. It was mainly used for catching crabs and prawns. It had a piece of circular webbing fixed on a ring of steel or cane of 50 to 100 cm dia. PA or PP webbings of 20 to 30 mm mesh size were used for this purpose. The

webbing was attached to the steel ring by using PE or PP twines of 1 to 1.5 mm dia. Three or four PP twines of 2.5 to 3 mm dia were used as legs, one end of which was fixed on the circular ring at equal intervals. The length of the twine varied from 1.0 m to 3.0 m. (Fig. 151). A big piece of thermocole or plastic can was used as float, which was fixed at the end of the PP twine for locating the gear.

### **Operation**

The gear was kept in the water with a weight of 250-500 g of granite piece in the centre of the gear. Pieces of fishes and chicken waste were used as bait, which was kept in the centre of the gear along with weight. The length of the float line were adjusted according to the depth of the water column.

In certain areas, the gear was tied using lines to the branches of nearby trees instead of using floats. The fishermen periodically examined the gear and collected the catch. The catch was mainly prawns and crabs.

### **Vadivala**

This gear was operated in down stream areas of Muvattupuzha River. The net was 7.0 to 15.0 m long, 3.0 to 5.0 m wide with 30 to 50 mm mesh sizes. Material of webbing is PA multifilament with a twine size of 210Dx1x2. Selvedges of 60 mm to 200 mm mesh size of PA multifilament with twine size 210Dx3x2 or 210Dx3x3 were used in upper and lower parts of the gear. (Fig. 152). The head rope and foot rope were made of PP

ropes of 6.0 to 8.0 mm dia. The middle portion of the gear was provided with a codend where catch was concentrated.

Ten to twelve bamboo poles were used in this gear. The length of the poles varied from 1.0 to 1.5 m. These poles were fixed between the head rope and foot rope. So the gear was kept open at all times. The poles at both ends were little longer than others (30 to 50 cm longer). These poles were fixed to the bottom of the river.

### ***Operation***

The gear was kept in the water against the water flow. The poles at both ends were fixed into the bottom areas of the water body. These poles were strengthened by providing additional support to the neighbouring trees or rocks. Water flowed through the gear and along with this the fishes also moved towards the cod end and they are entrapped. The backward movement of the fish was little difficult due to the presence of loose webbings in the middle of the cod end. The fishermen periodically collected the fishes by opening the codend or by lifting the gear itself.

This gear was operated in some other way also. Two fishermen were engaged in the operation of the gear. They hold the poles at both end and move along through the water and after sometime they came closer and closed the mouth of the gear when some fishes entered in the gear and the catch was collected. Catch comprises cat fishes, *Etroplus* sp., *Puntius* sp. and other miscellaneous fishes.

## **Spears**

Use of spears has been reported in the fishing sector in earlier times by Hornell (1938). Only a few numbers of spears were in operation in the riverine sector of central Kerala during the period of study.

## **Kuthukol**

*Kuthukol* was a type of spear seen in the riverine sector. It was made of wooden pole or iron rod of 2.0 to 2.5 m long. One end of the iron rod was pointed. The wooden pole was fitted with metallic arrow like pointer at the distal end (Fig. 153).

It was mainly used for collecting crab, prawns and occasionally fishes. When used to catch prawns the fishermen were careful not to damage the body of the prawns. In some gear, the other end of the rod was curved and this was used for collecting prawn and fishes from crevices.

## **Muppally**

An arrow like fishing gear called muppally were in use for collecting of *Attu konchu* (*Macrobrachium rosenbergii*). It has a long wooden pole, at the end of which a three forked arrow was fixed (Fig. 154). The pole is made of hard wood of length 2.0 to 2.5 m. Arecanut slivers were also used as poles. The arrow was made of steel rod. The total length of the arrow was 30 to 50 cm, out of which the length of forked end was 20 to 30 cm.



## **Operation**

The operation was mainly conducted in the night for the capture of prawns and occasionally certain big fishes. The fishermen used a torch light with high beams for locating the prawns. The prawn was stuck using the *muppally* and the gear was pulled back to collect the catch.

## **Fish Aggregating Devices**

The Fish Aggregating Devices (FAD) are very common in fishing industry all over the world. A number of studies have been carried out in different parts of the world on different types of FADs. (Wood, 1989; Cannizzaro 1999). In traditional fisherman, bundles of branches of trees like cashew nut tree and bamboo are used for the construction of FADs. In earlier time it was called as 'bush fishing' (Hornell, 1938)

The fishermen construct FADs mainly using branches of cashew nut trees (*Anacardium occidentale*) or branches of bamboos (*Dendrocalamus* sp.). The length of branches varied (2.0 to 3.0 m) according to the depth of the water column. These branches were fixing in the mud in the bottom parts of the river in an area of 15 to 25 m dia. After fixing the FADs, the fishermen wait for 20 to 30 days for aggregating the fishes. The submerged bundles of twigs or branches of trees make attractive hiding places for fishes. The movement of water in this area is little less compared to other areas of the water body and as a result a number of fishes aggregate in this area (Fig. 155).

After 20 to 30 days, the fishermen cover the FADs with the help of an encircling gillnet and then the tree branches are removed. Pushing the gear to the centre reduces the circumference of the gear and finally the fishermen collect the fish with hand or by using scoop net.

### **Stupefying fishing practices**

Different types of stupefying fishing practices were observed in the rivers of central Kerala. Poisons and explosives were the common stupefying methods. This practice was mainly concentrated in the upstream and midstream areas of the rivers. Indiscriminate use of poison to collect fish from pools and refugial pockets where fish take shelter when rivers dry up, and dynamiting to collect fish in large numbers, would result in complete elimination of the fish species, since both juveniles and breeding fishes and other non-target species all fall prey to such destructive methods. (Remadevi, 1997). The use of explosive or poisonous substances have been banned under The Indian Forest Act, 1927. The Indian Fisheries Act IV of 1897 prohibited the use of poisons and explosives for the purpose of catching fish. The practice has, however, persisted throughout the province, especially in the hilly tracts.

### **Explosives**

Explosives were a common stupefying method of fishing in the upstream areas of the rivers. The explosive material (*thotta*) was readily

available in these areas as it was required for granite quarries and for frightening the wild animal away from the agricultural crops.

After lighting the explosives, they were thrown into the water. The effects of explosion affected all the aquatic organisms in a wide area and its environment. The dead and stupefied organisms afloat in the water surface, were collected by using small scoop net or by bare hand. In rivers like Chalakudy River and Karuvannoor River, this method was practiced in the down stream areas also.

### **Poisoning**

Poisoning was observed to be very common in upstream areas where other fishing practices were difficult. It affects the ecological balance of the aquatic habitat, as all organisms in this area and nearby waters are affected.

The commonly used materials for this purpose were bleaching powder, lime, copper sulphate, Bordeaux mixture, nanchu (*Croton klosteschianus*), and veli-avanakku (*Jatropha curcas*). As a result of poisoning, the affected species come out of the crevices and creeks in an unconscious stage and were then collected by a scoop net.

### **Electric fishing**

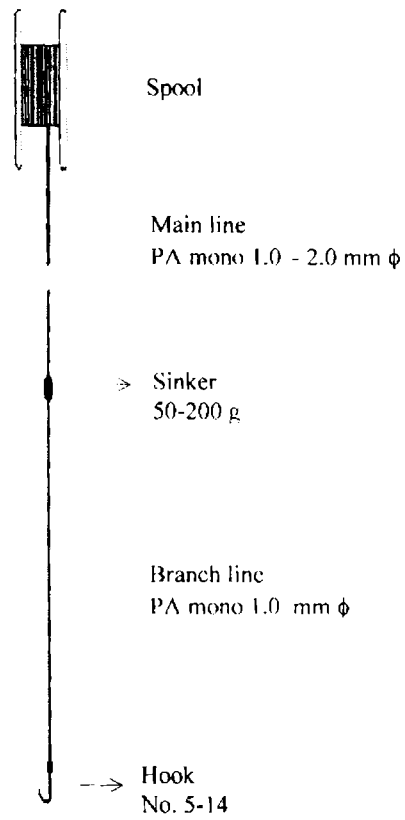
Electric fishing was very common in most of the areas of the rivers. The equipment for the electric fishing mainly has three parts: a battery, a step-up transformer and a rod. Automobile battery was used for this

purpose. The step-up transformer converts 12 volt current to 240 volt and with the help of the plastic pole the live terminal is dipped into water to pass the electric current for a second. As a result of this the fish, in the surrounding areas were narcotised or killed and float to the surface of water. The electro-narcoted and electrocuted fishes were collected using a scoop net or by bare hand.

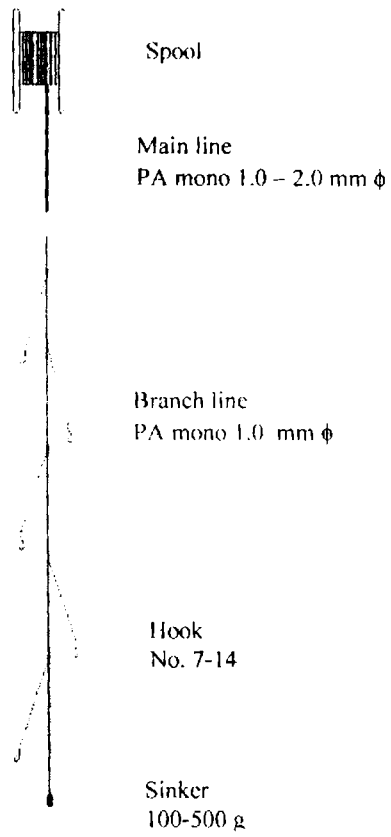
Another type of electric fishing was also common in riverine sector. In this case, the high voltage electric line was passed across the river. A cycle chain was fixed at one end of an electric cable, and the fishermen fix the cable to the high voltage line by throwing the cycle chain to the line. The other end of the cable which is attached to a dry wooden pole was dipped into the river for a fraction of a second. The fishes which were electro-narcoted or electrocuted floated to the water surface and the fishermen collected them by using a scoop net. It is a very dangerous fishing practice, where many deaths were reported from different parts of the state due to accidental electrocution. In some areas electric current from nearby electric motor shed or nearby houses were used for this type of fishing.

**Table. 76. Location-wise specifications of riverine long lines operated in Central Kerala**

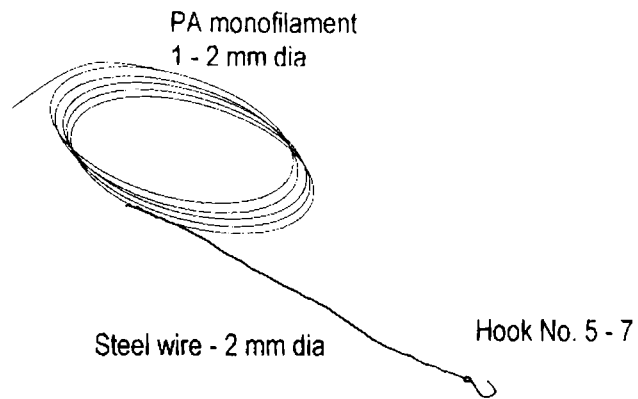
Place	Main line		Branch line		Hook size (No.)
	Material	Diameter (mm)	Material	Diameter (mm)	
Bhoothathankettu	PP	2-3	PP	1.5	7-10
Cheruvaloor	PA Mono	2	PA Mono	1-1.5	8-10
Illikkal	PE	2.5-3	PA Multi	210Dx8x3	7-8
		2.5	PE	2	7-10
	PP	3	PA Multi	210Dx8x3	8
Irumapanam	PP	2.5	PA Multi	210Dx10x3	8-12
		3	PP	1.5	8-10
Kadumpidy	PP	3	PA Mono	1	8-10
Kalady	PA Mono	1.5-2	PA Mono	1	7-8
Kanjara	PP	2.5	PA Mono	1	8-10
		2.5	PP braided	2	8-10
Karakkunnu	PA Mono	2	PA Mono	1	7-12
	PP	2-3	PA Mono	1	8-12
Kothamangalam	PP	2.5	PA Mono	1	8-10
Kurumassery	PA Mono	2	PA Mono	1	7-10
	PP braided	2.5	PA Mono	1	10
Mannarkadu	PA Mono	2	PA Mono	1	8-12
Moolamattam	PA braided	2.5	PE	2	8-10
Moorkanadu	PP	2.5	PP	1.5	7-10
Mrala	PP	3	PP	2	7-10
Ooramana	PA Mono	1.5-2	PA Mono	1	6-10
Palamittom	PE	2.5-3	PP	2	7-8
	PP	2-3	PP	1.5	7-8
Thattekkadu	PP	2.5-3	PA Mono	1	7-10



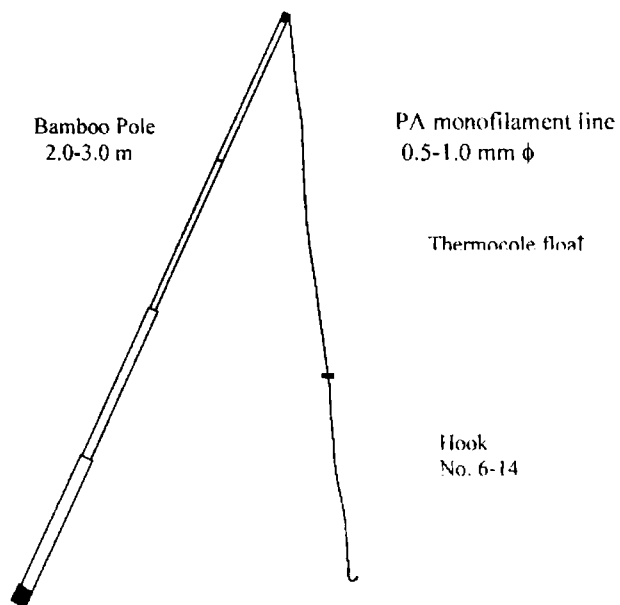
**Fig. 135. Eruchoonda with single hook**



**Fig. 136. Eruchoonda with multiple hooks**

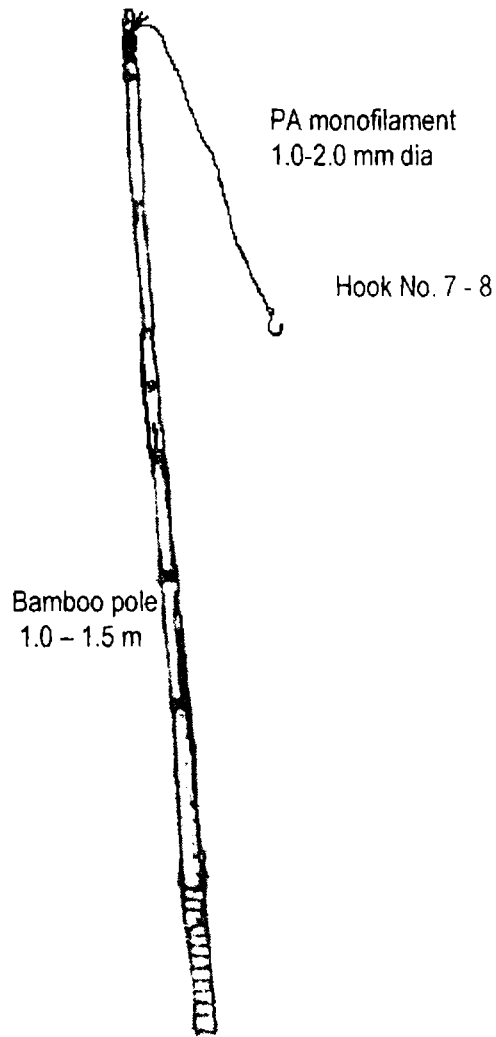


**Fig. 138. Vettuchoonda**

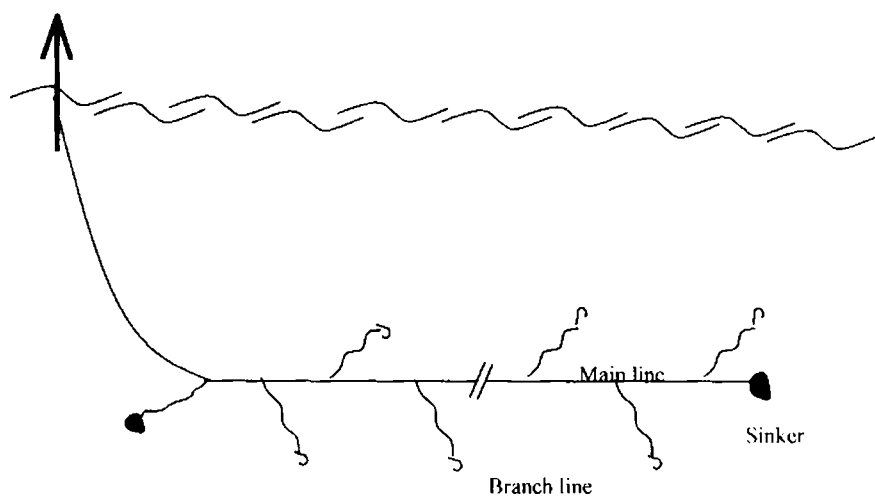


**Fig. 139. Rod and line – Vadi chunda**

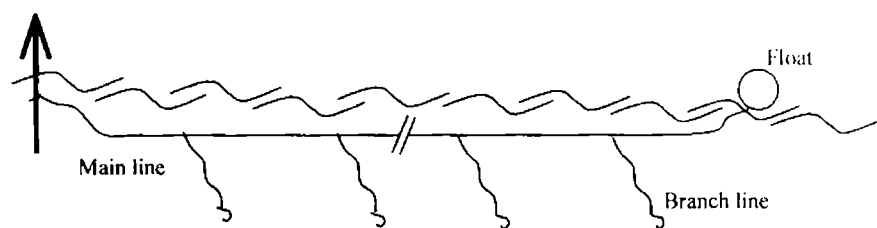




**Fig. 140. Madachoonda**



**Fig. 143. Set longline**



**Fig. 144. Drift longline**

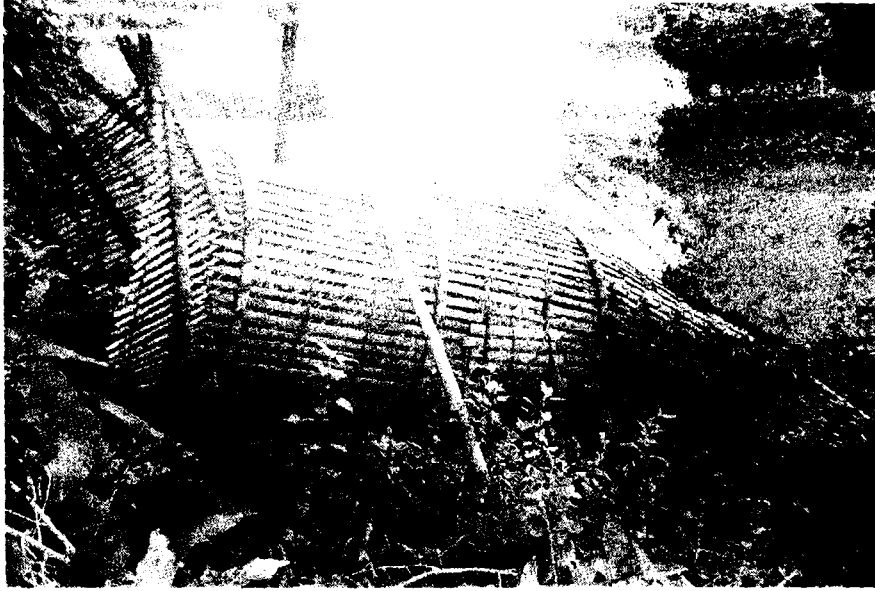
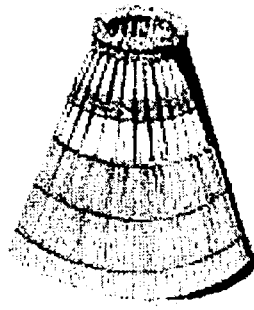


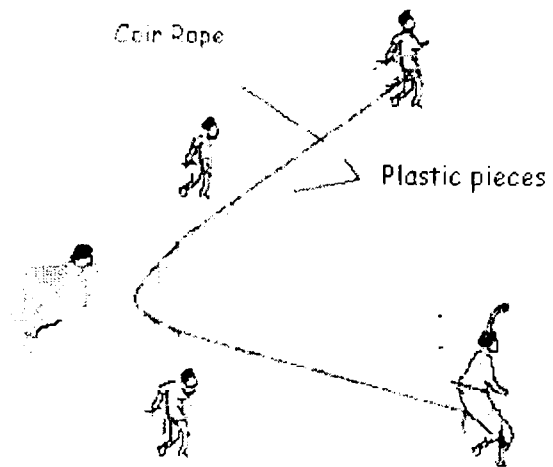
Fig. 145. Aarokoodu (Indigenous)



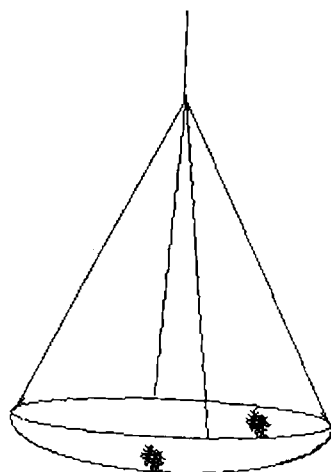
Fig. 146. Aarokoodu (Modern)



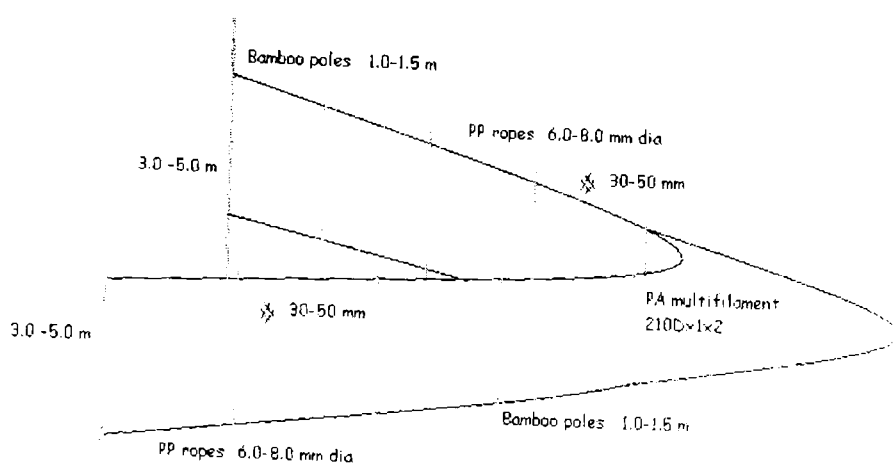
**Fig. 149. Plunge basket**



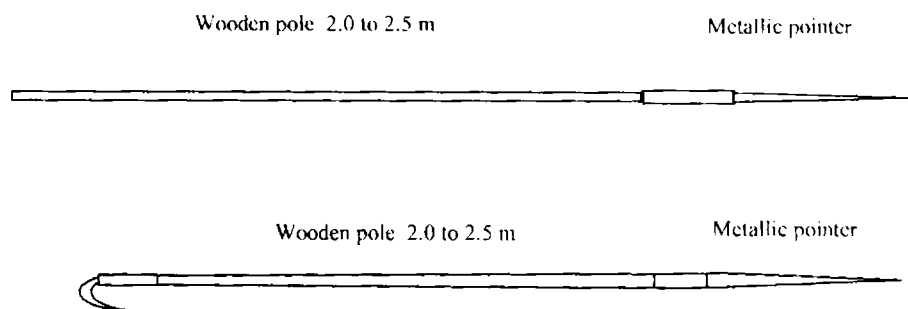
**Fig. 150. Vallivala**



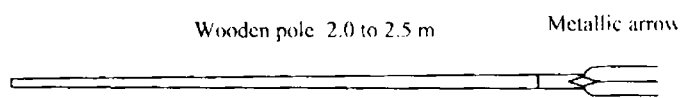
**Fig. 151. Urivala**



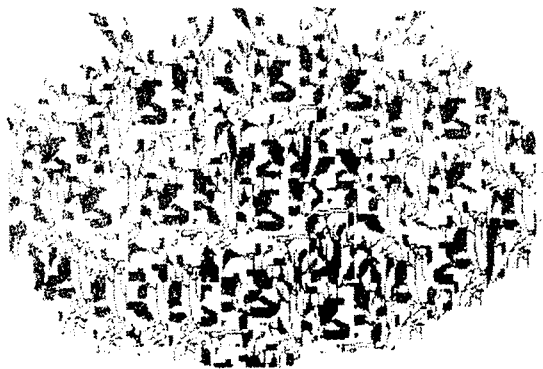
**Fig. 152. Vadivala**



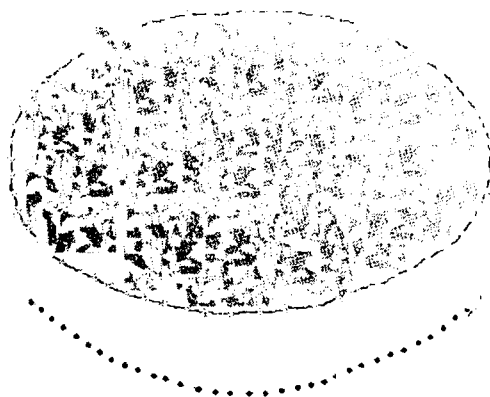
**Fig. 153. Kuthukol**



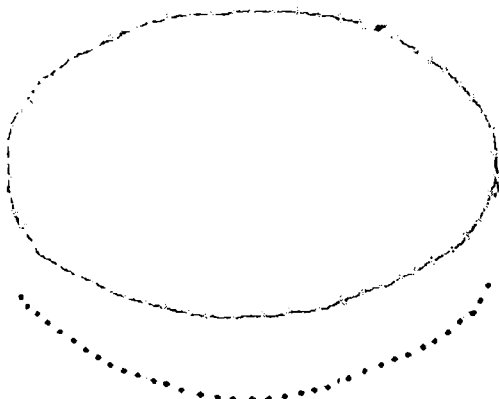
**Fig. 154. Muppally**



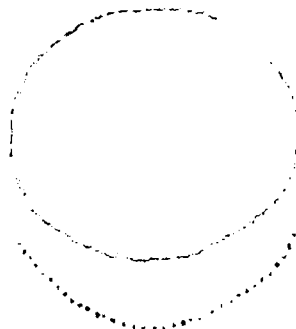
Implanting of tree branches



Encircling with gillnet



After removing branches



Reducing the area

**Fig. 155. Operation of FADs in rivers of Central Kerala**