

# Electronic Instruments for Fishing Gear Research

Shri K.Ramakrishnan

Senior Scientist

## Introduction

The present day fishing gears are the result of various modifications undergone during different periods in the hands of fishermen, gear experts and concerned scientists. Among the different fishing methods, trawling occupies a predominant role and major attempts were made on improvement of trawls. Observation of performance of the gear during operation was carried out by different methods. This applies to both prototype testing carried out since time immemorial and also in model testing taken up nowadays. Different methods and instruments were used for measuring the operational parameters of the gear, to assess its performance. Technological improvements especially in the field of marine electronics has contributed to the development of very efficient electronic instruments for precise measurement of the operational parameters.

## Parameters

The following parameters are considered important and hence generally measured for understanding the configuration, behaviour and performance of the underwater trawl. 1. Warp load at ship 2. Warp angle at towing block 3. Warp declination at towing block 4. Boat speed 5. Load in warp due to different components of the net 6. Otter board angle of attack 7. Otter board angle of pitch 8. Distance between otter boards 9. Otter board angle of heel 10. Net mouth spread 11. Vertical opening 12. Trawl speed and 13. Trawl depth. The analytical approach to fishing gear research necessitates the understanding of these parameters independently as well as collectively during full scale testing. Also understanding the pulling power of the towing vessel and its proper matching with the towed gear is an essential pre-requisite for achieving optimum efficiency of the trawl system. **Fig.1** gives a schematic diagram of above parameters.

## Methods

Employing frogmen is a risky job and under water television and photography are expensive. Success of these methods depends on the visibility / illuminated condition of water. Under water recording instruments are mechanical type, less accurate, comparatively heavy and the data can be obtained only after hauling the net, since the instrument is attached to the gear and towed with it. Wire telemetering instruments both acoustic and non-acoustic types are accurate and give instantaneous data. In this case the cable link between the net mounted transducer and ship installed display unit causes some problem due to cable breakage during operation. This problem is eliminated in cable less net monitoring systems developed recently. **Fig.2** gives the different types of net monitoring instruments / methods.

### Instruments developed by CIFT for fishing gear research

Development of more efficient fishing gears is one of the mandates of CIFT and in this connection indigenous electronic instruments were developed by the institute to augment such studies by measuring the operational parameters of the gear and craft. These are wire telemetering instruments with comparatively light weight transducers and are of low cost compared to imported instruments. The sensors are mostly inductive types and rugged in construction to withstand hostile marine conditions. The following are a brief account of the instruments developed by CIFT in this line.

#### 1. Trawl depth meter

For measurement of depth of operation of the under water trawl.

Range – 0 to 100m

#### 2. Warp load meter

Two types of warp load meters have been developed, namely Portable Warp load meter and Ship installed Warp load meter suitable for operation in small and larger types of fishing vessels.

## **2a. Portable Warp load meter**

This instrument is meant for operation in smaller types of vessels by clipping the transducer on the wire rope in between the gallows and the winch.

Range – 0 to 500 kg

## **2b. Ship installed Warp load meter**

This instrument is meant for operation in larger vessel and the installation of transducer depends on the warp lay-out on the deck of the vessel. The transducer installation is based on deflection load principle and only fraction of the actual load is applied on the transducer.

Range – 0 to 1000 kg (Still higher ranges optional)

## **3. Boat speed log**

This instrument measures the speed of operation of the vessel and also the total distance traveled.

Range – 0 to 10 knot

Distance – up to 999999 knot

## **4. Angle of attack meter**

Measures the angle of attack of the otter board.

Range- 0 to 90degree

## **5. Tilt meter**

Measures the side way tilt and fore and aft tilt angles of otter boards, there by gives information regarding stability of performance of the otter boards.

Range –45 deg. to +45 deg.

## 6. Net height meter

This instrument gives precise measurement of vertical opening of the trawl nets using wide beam acoustic transducers.

Range – 1m to 10m

## 7. Mesh distortion meter

Gives information regarding the shape occupied by meshes during operation of the net by measuring the diagonal length of the meshes.

## 8. Catch telemeter

Indicates the quantity of catch progressing in the code end so that the net can be hauled at the right time avoiding further unnecessary towing of the net.

## 9. Universal marine Telemeter

This is a fifteen channel wire telemetering instrument developed to collect data on parameters related to performance of underwater trawl and the marine environment. **Fig.3** shows a schematic representation of performance of the instrument. The sensors mounted on different parts of the net are connected to a multiplexer unit attached to the net which selects the sensors one at a time and transmit these signals through a five core cable to the instrument kept on board, which processes the signals and display the parameters on a display unit. The parameters measured are:

1. Warp load
2. Boat speed
3. Trawl depth
4. Under water tension
5. Otter board angle of attack

6. Board tilt-side way
7. Fore and aft tilt
8. Catch on cod end
9. Net flow
10. Mesh distortion
11. Vertical opening using Echo Sounder
12. Water temperature
13. Salinity
14. Under water radiation
15. Air temperature

## **10. Bollard pull Monitor**

This instrument measures the load developed by the marine engine installed in a fishing vessel by monitoring the pulling power of the boat tied to a bollard and run at different RPM's under static conditions. The instrument can be connected to a recorder for obtaining permanent record of the loading cycle. The above test help to select the right type of the boat for a particular gear and there by help in achieving optimum efficiency of operation by proper match between the craft and gear.

## **Imported instruments for gear studies**

### **1. Under water recording instruments**

These were the earliest types of instruments used in gear studies. These instruments record the parameters on a strip of paper driven by a clock mechanism when switched on and deployed with the net. Data is read after hauling and opening the recording unit of the instrument. Under water tension meter, Net height meter and trawl depth meter are some of such instruments.

### **2. Acoustic wire telemetering instruments**

These instruments help to make instantaneous measurement of the trawl parameters using trawl mounted sensors and electromechanical cable connecting the sensors to the recording unit on board the vessel. Since bulky in

nature these instruments can be operated in comparatively larger vessels.

### **2.a. Trawl Eye**

This instrument records Trawl depth, Vertical opening, fishes in the mouth of the net, trawl position with respect to ground, catch in code end and temperature at trawl depth.

### **2.b. Net Sonde**

This instrument also measures the above parameters and is marketed by Japanese firms.

## **3. Cableless Net Monitoring Systems**

Cable less net monitoring systems are the state of the art technology in this field. They are comparatively light weight systems free from the disadvantages of cable handling problems in the deck compared to the wire telemetering instruments. These instruments commonly measure the following parameters of the net.

1. Vertical opening
2. Horizontal opening
3. Trawl position from surface and bottom
4. Trawl distance from vessel
5. Catch in the net
6. Temperature at trawl depth
7. Trawl speed
8. Sinking speed of the net

The most commonly available cableless net monitoring systems are:

1. Scanmar Catch Control System of M/s. Scanmar Norway.
2. Integrated Trawl Instrumentation System of M/s. Simrad, Norway.
3. Net Nav System of M/s. Seamatrix Inc USA.

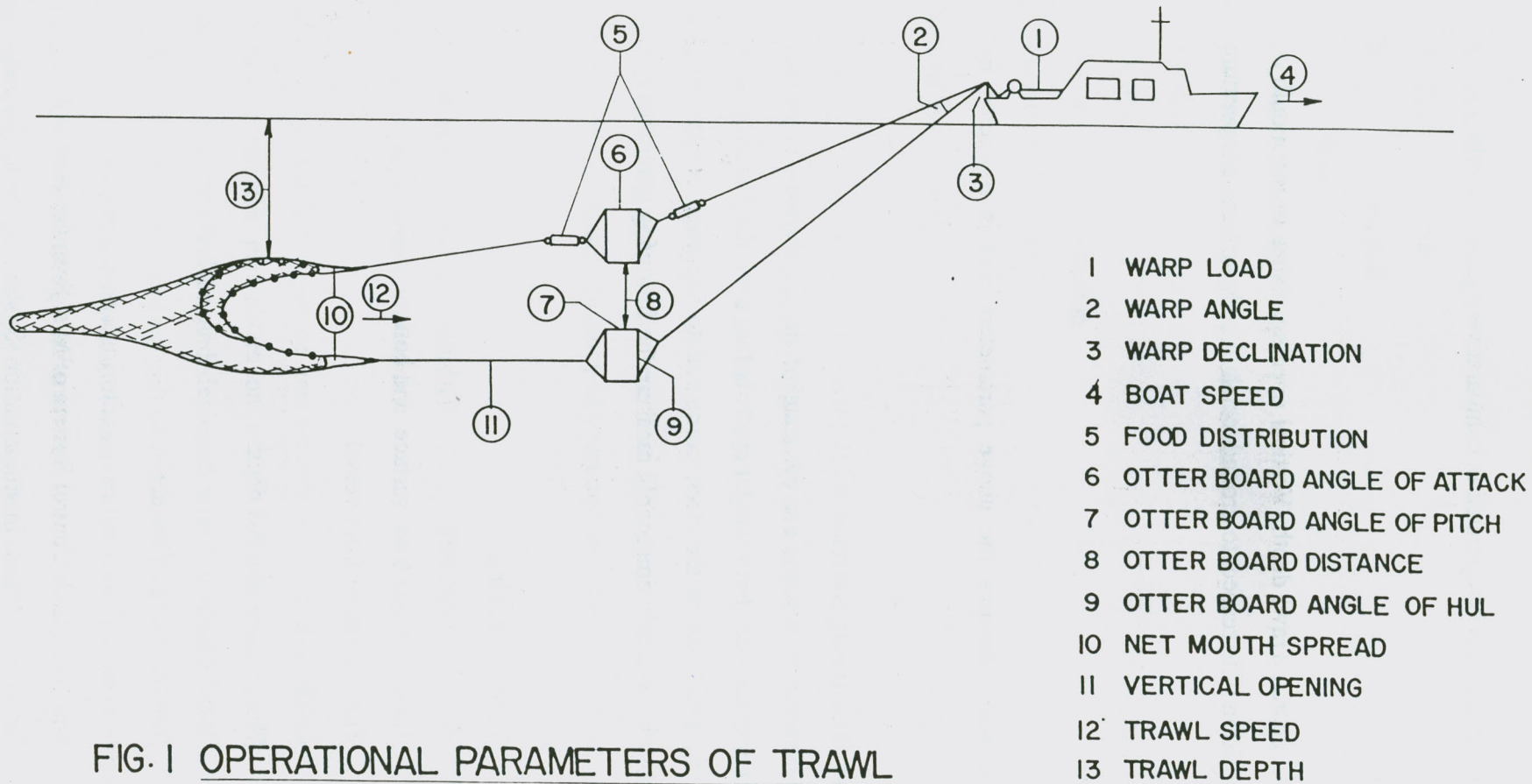


FIG. 1 OPERATIONAL PARAMETERS OF TRAWL

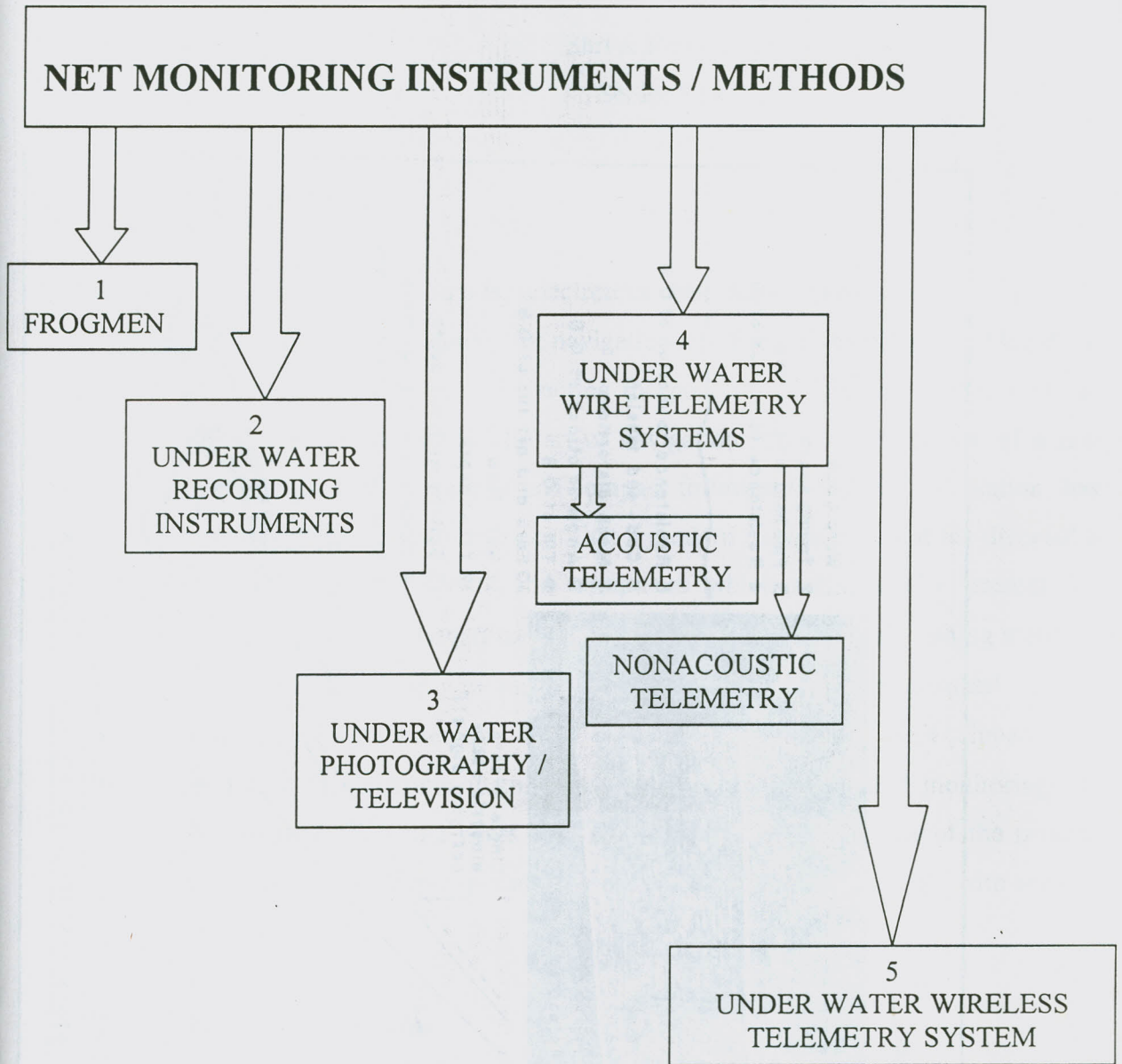


Fig. 2 . Net Monitoring instruments / methods.

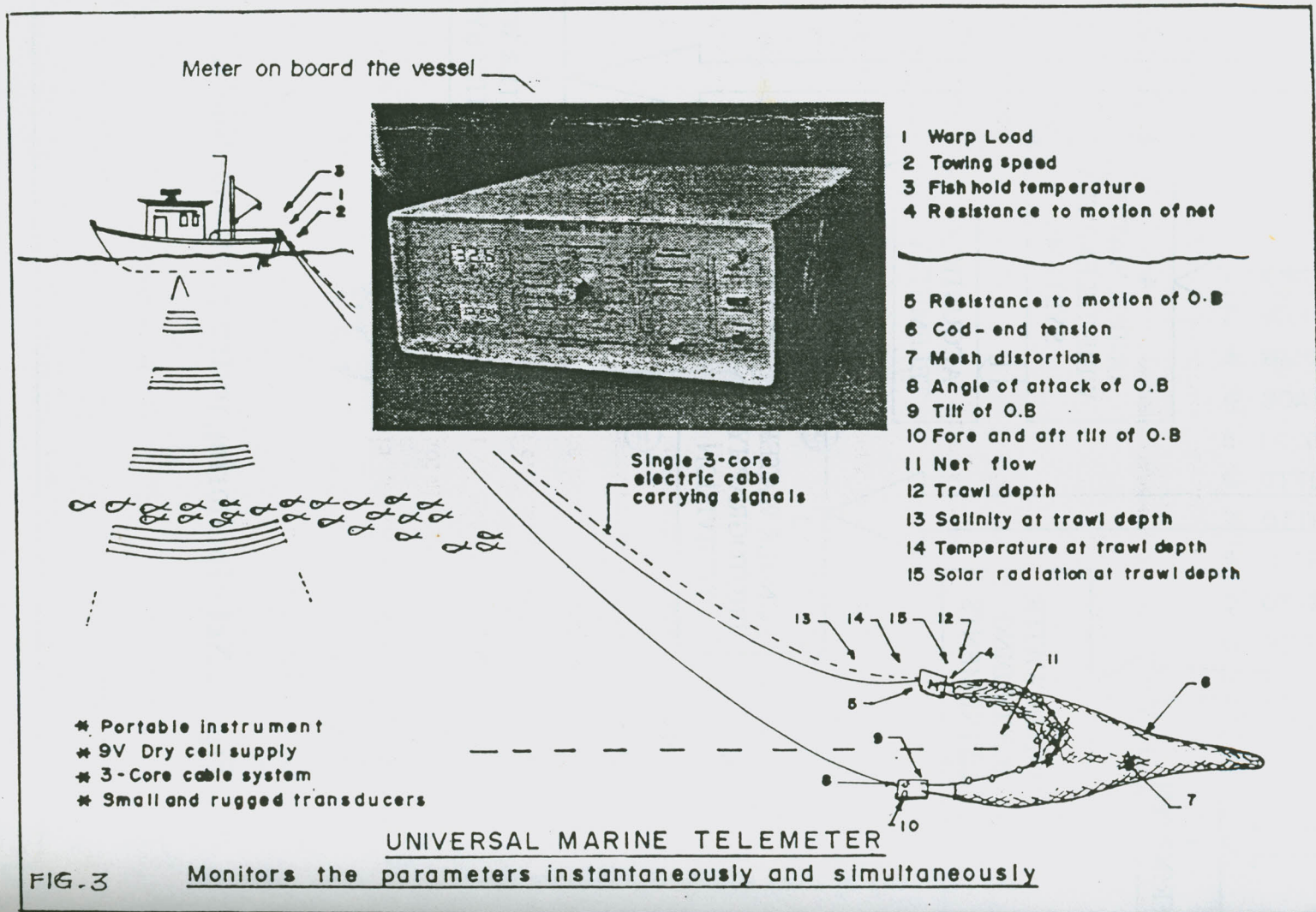


FIG-3