

Marine Environmental Monitoring Systems for Investigations in Fisheries and Allied Fields

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The successful implementation of some instrumentation programmes for acquiring marine environmental data are reported. The instruments are used for instantaneous measurements of water current and direction, salinity, temperature and depth of operation. Sensors with novel features were developed and used in water current meter and salinity - temperature-depth meter. The sensors designed with very low impedance and high level signal outputs have rendered the instruments to be quite reliable with comparatively simpler electronics. A sixteen channel data acquisition system designed for automatic acquisition of coastal environmental data is reported.

The need for marine environmental monitoring has increased recently along with our expanded activities in several marine fields. The various marine environmental data relevant to fisheries and oceanography are current, current direction, salinity, temperature, depth of operation, and oxygen content. There are other parameters like, waves, wave direction, wind, wind direction, air temperature, barometric pressure and humidity indirectly related to fishing and other marine fields. The scientific implementation of the several programmes in other marine fields namely, port and harbour, marine meteorology, coastal zone management, oceanography and offshore mineral prospecting needs enormous data on the above parameters. Instruments for marine environmental measurements can be classified as follows based on their operational features.

1. Laboratory instruments

Here measurements are done in the laboratory after collecting water samples from the fields. Salinity, oxygen content and several pollutants in water etc. are measured in this way. Here the disadvantage is that the samples have to be collected from different depths and locations and brought to the laboratory.

2. In-situ measuring instruments

In this method instruments sense the particular information and display instantaneously in the meter after getting the signals conveyed through wire or wireless means. The advantage here is that the water samples need not be collected; the information is instantaneously obtained and decisions and conclusions are drawn quickly. The instrumentation system has to be designed considering the hostile marine environments unlike the laboratory instruments. One specific advantage of these instruments is their suitability for our warmer waters, where instruments cannot be

kept anchored for long, as they will be fouled by marine growth.

3. Underwater recording instruments

Wherever data is needed continuously for longer durations the instruments are designed with underwater recording facilities, and almost all data acquired can be recorded on magnetic tapes. But many of the instruments under this category cannot be used in tropical waters because of heavy biological growth.

4. Instrument systems

Much of the environmental parameters are needed almost simultaneously for better interpretation of the results. Hence large data acquisition instrumentation systems are designed combining several instruments together with integrated design approach. Such systems are designed for manual as well as automatic operations. In the latter the data is recorded or printed and transmitted to a base station after conversion to em. waves using moored floating buoys.

Environmental monitoring instruments and systems developed in CIFT

The task of developing environmental measuring instruments and systems were taken up as they are not indigenously available.

1. Salinity - temperature-depth meter

The instrument has its remote operated sensors and electronic unit with digital display on board the vessel for recording temperature and salinity. It is very portable with self contained power sources as shown in Fig. 1.

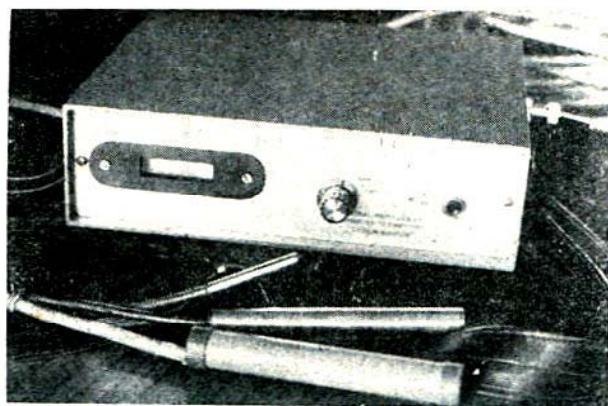


Fig. 1. Salinity-temperature-depth meter

Specifications :

Salinity	0 to 38‰, ± 0.1 ‰
Temperature	15°C to 40°C, ± 1 °C
Depth	200 m, ± 1 m (different ranges available)
Price	Rs. 9,000/-

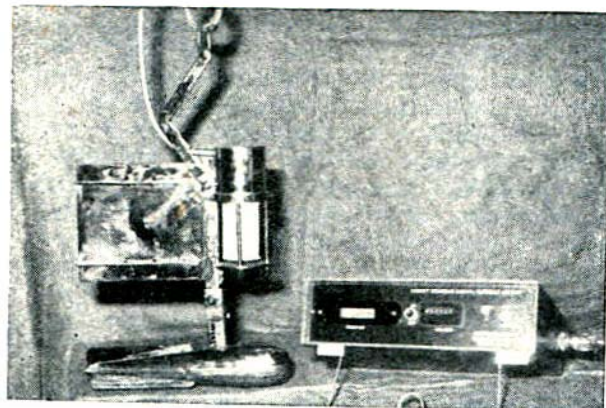


Fig. 2. Direct reading digital current meter.

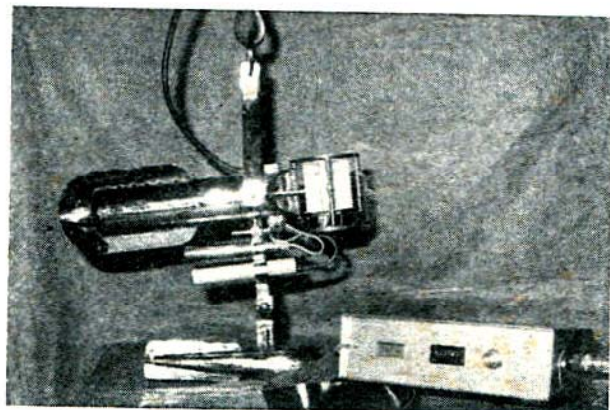


Fig. 3. Ocean tele-lab.

This item has been commercialised through National Research Development Corporation of India.

2. *Direct reading digital ocean current meter*

This instrument indicate digitally the water current and its direction at different depths of the ocean. It has got rotor type current sensor and magnetic direction sensor for sensing current and current direction. The instrument is compact and portable (Fig. 2).

Specifications:

Current	0 to 400 cm/sec, ± 1 cm sec. ⁻¹
Direction	0 to 360°, ± 5
Power	9 V dry cells
Price	Rs. 14,000/-

3. *Trawl-depth meter*

This wire telemetering type instrument was developed for monitoring the depth of operation of trawl-net and under water platforms. It has a pressure transducer mounted on the net or such other objects. The

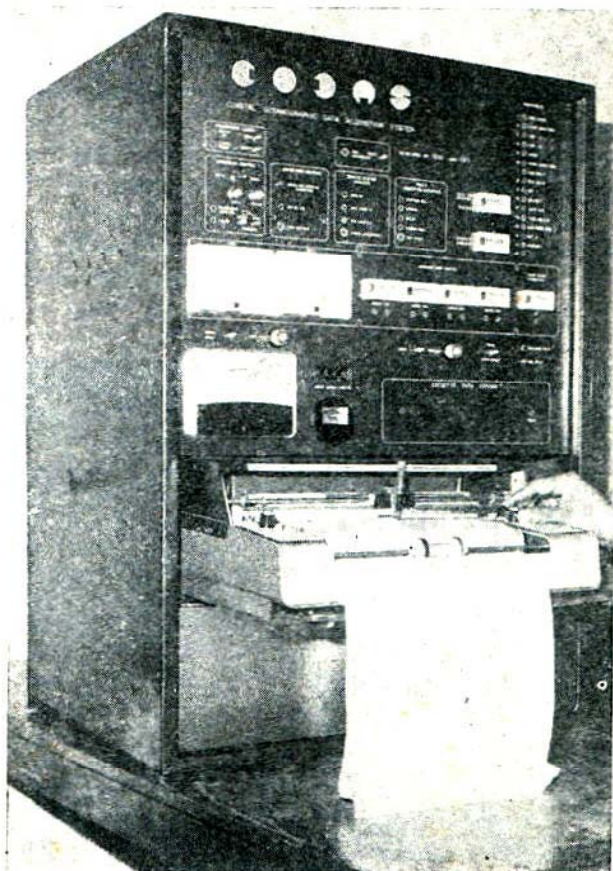


Fig. 4. Data acquisition system

electric signals from the transducer is conveyed to the display meter on board the vessel. This instrument has been commercialised through NRDC.

Range	0 to 200 m, $\pm .1$ m
Power	self contained 9 V D.C.

4. Ocean tele-lab

This is an equipment capable of displaying several information one by one in a single meter after obtaining the respective signals from the different sensors mounted on a single under water sensing probe. It is the novelty and advantage of the system that all the five information are conveyed through a 3-core cable. The instrument measures current, current direction, salinity, temperature and depth. The unique advantage of the system is that all information are obtained in a single operation. The read out unit is compact, portable with self contained power supply (Fig. 3).

Current	0 to 400 ± 1 cm sec ⁻¹
Current direction	0 to 360° $\pm 5^\circ$

Salinity	0 to 38 ‰ ± 0.1 ‰
Temperature	10 to 40°C ± 0.1 °C
Depth	0 to 100 ± 1 m
Power	9 V D.C.

5. Data acquisition systems

It is a 16 channel data acquisition system with a large observation platform installed in 3 km range of water with a 3-core cable connecting the 16 parameters to the shore station where all information are monitored. The data acquired are current (2 depths), current direction (2 depths), salinity, temperature, waves, wave direction, tide, integrated wave volume, counted wave heights in 4 nos. counters, air temperature, wind, wind direction, barometric pressure and humidity. This system can provide much data continuously for detailed studies for fishery ecology (Fig. 4).

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