Aimed Fishing

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Aimed trawl fishing techniques involves searching for, finding and evaluating fish schools with the sonar, correctly navigating the vessel towards the selected school, establishing the accurate depth and configuration of the school by echo-sounding and steering the trawl to the required depth, as indicated by the net sonde. For a successful fishing operation, acoustic instruments such as echo-sounder, sonar and net sonde are virtually, indispensable. In fisheries, the term 'echosounding (i.e. vertical sounding) is usually restricted to sound transmitted from a vessel and returned to it along a line straight down to the sea bed (or bottom). The equipment, employing this technique is called on 'echo-sounder'. Sonar is equipment based on the same principle but capable of transmitting and receiving in more or less horizontal directions. A 'Net sonde' is equipment which collects information with seasons at the trawl and transmits it for display in the wheel house during trawling (FAO, 1980).

There is no doubt that echosounding and sonar are essential for rational fishery development at all levels. Recent developments in electronics have considerably improved the performance and reliability of the equipment and have lowered costs.

The need for maximum application of electronic aids to trawling is becoming more important from year to year with steadily diminishing fish stocks on traditional grounds and gloomy forecasts from marine biologists, it is essential to maintain optimum fishing. To this end various electronic devices aboard the modern stern trawler play a large part and in some cases benefits derived are greater than was originally visualized. Fish detection echo-sounder, navigational aids and navigational aids and specialized auxiliary equipment, all contribute to overall efficiency, particularly when fishing as a single unit on

unknown grounds. The interpretation of fish detection echo-sounder in recognition of schooling pattern and distribution of fish on a particular ground is most important in terms of gear adaptation and of direction and length of tow. Use of fine navigational systems for position keeping while fishing is also essential and automatic steering devices remove part of the load of the physical aspect of fishing.

Searching for fish occupies about 50% of the time available for fishing even in highly developed trawling and in purse seining it is about 80% (MFGW Vol.III Proffom). Fish finding is a pre-requisite of all rational fishing efforts and is also one of the important determinants of economic efficiency of a fishing operation. Therefore, progress in the instrumentation and techniques for fish location and detection is bound to have significant effects. Introduction of echo-sounders and more precisely sonar techniques will inevitably have a decisive impact on increased catches, improvements in gear and a speedy progress as a whole can well be anticipated. A specific line of development aims at applying echo-sounding in quantitative exploration and assessment of fish stocks and it is certain that commercial fishing will benefit from the instrumentation and techniques developed for and the experiences gained in this work.

Net sonde sounding in trawling especially variable depth trawling in combination with ship's sounder and sonar as well as sophisticated electronic sector scanning sonar techniques have become powerful tools for the observation of fish and their reactions to fishing vessels and gear. This development opens up greatly improved means for the more rational control of fishing operations and further development fo fishing gear and techniques.

Purse-seining has taken a further step towards improving its already high efficiency with the growing impact of fish finding sonar and the subsequent development of larger nets, more powerful hauling machinery like power blocks, larger vessels and the introduction of vessel operational aids like thrusters etc.

The sonar-guided purse-seining technique through which the fishing range and depth could be increased considerably may lead to creating a new conservation problems. Neverthless, it has already enabled the exploitation of so far under exploited or neglected fish stocks and will likely to contribute significantly to the better utilisation of marine resources.

More sophisticated operational tactics are sure to find gradual application like introduction of acoustic instrumentation and their value towards optional exploitation will be a certainty.

Aimed trawling signifies a milestone between blind grouping by trial and error and instrument controlled, rationally directed fishing operations. Of all the fishing techniques, trawling has so far received the most intensive attention from research efforts and recent progress in instrumented observation and measuring systems onboard and on the gear has consequently been impressive. The results and experiences gained on trawl dynamics and the inter relation between vessel, trawl gear and fish reaction, together with technical advances like new materials as yarns, ropes and floats, large mesh size in the forepart and hydrofoil otterboards for reduced tow resistance, better and cheaper echosounders for fish detection; simplified net sonde for better year control and improved trawling techniques in general, are naturally not restricted to large units and highly industrialised fisheries alone but will inevitably promote progress in trawling on all levels.

Aerial Scouting: was started in 1928 as a close link with the early stages of aviations in Iceland and was pioneered by Dr. Alexander Johannesson, a great flying enthusiast at the University of Iceland in herring Scouting which was handicapped in its early stages by difficulties in the communication. The information from the air craft when it reached the fishermen, its usefulness had diminished as the same was few days old and only very few vessels had radio communication to derive the fullest possible benefit.

This was also tried out by the erstwhite Pelagic fishery project of govt. Of India which functioned from the year 1971 and carried out extensive surveys of the S W coastal waters from Rathagiri to Kanyakumari to assess the resource availability of mackerel and sardines.

Satellite Imageries: At present satellite imageries are utilized for locating oceanic features such as ocean temperature, chlorophyll distribution, current boundaries stick and ocean fronts to understand likely areas of concentration of fish especially tunas (Skipjack & yellow fin).

PFZ (Potential Fishing Zone) advisories are brought out by NRSA (Nat.Rem Sen. Agency) give indication of the presence of thermal boundaries originating out of the divergence and resultant upwelling, current boundaries etc. Skipjack tuna fishery being pelagic in nature is expected to show better correlation with PFZ advisories generated out of sea surface temperature data provided by satellite imageries. Evolving a suitable prediction system will help in reducing the searching time for skip jack shoals, thus affecting overall reduction in operational costs.

Ecofriendly Fishing Through Aimed Attempts

The estimated harvestable potential from fisheries resources of India is 3.9 million tonnes from capture fisheries including in-shore (2.21 million tonnes) off-shore and deep sea (1.4 Million tonnes) and oceanic (0.3 million tonnes) realms.

In tropical waters, aimed fishing becomes a difficult proposition and especially shrimp trawling has a high rate of by-catch including the endangered species like turtles. Large trawlers conducting prolonged voyages cause resource depletion by way of discarding substantial quantities of non-target fish leading to socio-economic problems among artisanal fishermen. Introduction of BRD's in trawls have indicated there effectiveness in achieving the desired results.

Fishing with Echo-sounder and Sonar:

Demersal Trawling: The bottom trawl is designated to be towed over the seabed and may have rollers (bobbins) on the ground rope to improve passage over irregularities and obstacles on the bottom . The size and weight of these rollers depends on the type of bottom expected. The main and most common fishing aid for this catching method is the echo-sounder. The other obvious task is to detect any dangerous features of the seabed which may cause hook-up of or damage to the trawl leading to possible loss of money, fishing time and catch. Early warning enables alternations of course and other suitable measures to be taken in order to avoid such incidents.

To avoid damage the user must for instance, be alert to the onset of hard ground. Strong echoes from the power transmitted in the comparatively weak transducer side lobes are obtained from rocks. They produce the echo-length and the oblique side lobe traces below the bottom trace, thus giving a clear warning of possible danger with the rather low towing speeds and the length of warps the warning period provided by the ship's echosounder is one to several minutes before the trawl reaches the rough pack and this is sufficient time for hauling the gear or changing the course if it is thought that damage might result from continuing the tow.

The significance of assessing such bottom features by echo-sounding naturally applies to both Danish (anchor) or Scottish (fly dragging) bottom seining or seine netting.

In many instance, it has been found that bottom fish concentrate along a certain depth contour. To catch this fish it is essential to determine the extent and contour of slopes in order to maintain correct depth of a bottom trawl or to place other fishing gear in the right depth. It has to be appreciated that the sleeper the slope, the more a bottom trawl will tend to slide down it and therefore the shallower the depth under the vessel has to be in order to hold the gear on the required contour. When trawling along very irregular slopes sonar can be used to assess the slope contour in advance.

There are bottom fishing technique such as long lining, hand lining, gill netting or pot fishing for which rough rocky or sloping grounds as well as rock pinnacles and wrecks are advantageous rather than detrimental. Obviously echo-sounding can assist very significantly in finding and evaluating such conditions for putting these gears in the best position. (FAO, 1980).

Midwater trawling:

Mid-water or pelagic trawling curtails trawling in the pelagic or whole water volume from just off the bottom to just below the surface. While bottom hauling may well yield fish from very close to the ground, where they are not recognizable by echo sounding a mid water trawl has always to be aimed at fish in reasonably dense concentrations (Schools, layers) and echo sounding, sonar and net sonde virtually indispensable for successful operation. Echo-sounding alone is sufficient only under very favourable conditions, such as large schools a large no. of schools, compact layers in more or less uniform depth, shallow water, fish near the surface or the bottom and so on.

Having made the contact, the School must be held by the sonar white the vessel approaches and eventually passes over it to assess depth, size and configuration. If found satisfactory, the vessel turns round to shoot the trawl at a distance which will allow it to reach the required fishing depth. The second approach is again sonar guided, if possible even after the vessel has passed the school, the better to ensure that the trawl will not miss the school sideways. If the trawl is already fishing, t must be noted that, subject to turning of the vessel, the trawl is mostly not astern, but follows in a harrowed curve and may therefore miss the school in the horizontal direction. The depth of the trawl is adjusted in varying the towing speed or length of the warp or both. The depth of the school can be estimated from the angle of tilt of the sonar and the fishing depth adjusted tentatively. This depth is confirmed by the ship's echo sounder for final

adjustments. When the trawl reaches the school, last minute adjustments of trawl d[1]epth can be made by altering the towing speed.

Pelagic fish schools vary in their reaction to vessel noise and trawl gear. In most cases, their flight is downward and the trawl depth should therefore be set for the centre or even the lower part of the school. Adjustment of trawl at the most dense part of the school, which may require lifting or lowering the net, depending on the evasive action which the fish take when the net hits the school. For this decisive phase, the net sonde is indispensable, as it is too for towing close to the bottom.

Innovations Introduced on Trawl Design to Make them Eco-friendly

Bottom trawls are highly non-selective in nature and damage the structure that helps to provide fish stock with necessary environment and a wide spectra of benthic organism which are violate in the food chain.

Target specific trawls are now being developed to overcome this eventuality. His Speed Demersal Trawl developed by CIFT for operation from FORV Sagar Sampada is a case in point (Panicker P.A., 1989). The attachment of false ground line 30 cm below the actual ground rope in order to keep the gear just above the sea bed is a research development to safeguard the ecosystem. This arrangement allows shallow water mix and other non-target fin fish resources to escape thereby easing the pressure.

Development of semi-pelagic trawls for vessels powered upto 2000 hp are now available and CIFT has played a major role in development of this eco-friendly trawl gear, which has a high lead line, capable of being used off - bottom with increased fishing capacity from the improved mouth - opening. The gear moves 2 - 3 m above bottom, targeting the resource that aggregate in the water coloum close to the bottom and at the same time causing less damage to the bottom fauna and other non-target fish inhabiting in that area. Less environmental

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degradation and an increase in the product quality are the advantageous features of this type of trawling. Large mesh commonly seen in the forepart of this gear substantially effect exploitation of untapped resources in the above realms, advanced technologies in fishing, acoustic and gear monitoring instrumentation are essential prerequisite. Increasing fish production must now come from deep sea and oceanic areas as the inshore belt is fished more than the optimum level. An urgent need is felt for development suitable responsible fishing gear for operation from larger class of vessels for this purpose and to identify productive areas for judicious future exploitation. The CIFT have made appropriate attempts to cater to this need with experience gained from experimental work carried out onboard FORV Sagar Sampada and came out with target specific trawl fishing gear that are highly effective and eco-friendly by selective in character for the type of fishing envisaged, thereby keeping the environmental damage to the lowest level. Indiscriminate fishing with non-selective gear has led to over exploitation and this will have to be prevented by restricting the proliferating no. of indigenous as well as mechanised fishing vessels. Alternatively either quota system as practiced in Anchovy fishery in Chile or by allocation of total horse power quota for each maritime state as introduced in chinese fishery management can be effectively implemented to overcome excessive fishing leading to depletion of stock. Expenditure on implementation of management measures can be met by imposition of 'Resource Protection Cess' of about 10% of the gross revenue realised through sales. Selectivity of fishing gear is an integral part of eco-friendly fishery management as it permits exploitation of a particular size group of target species. Mesh regulation facilitates escapement of juveniles and sub adults leading to conservation for maintaining their sustainability as a renewable resource.