PELAGIC FISH ABUNDANCE DETERMINED FROM ACOUSTIC BACKSCATTERED DATA OFF TERENGGANU WATERS USING SPLIT BEAM ECHO SOUNDER

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Introduction

To date quantitative acoustic techniques are known to represent a powerful tool for fisheries management. It is the interest of fisheries scientists to number the fish per unit area because it forms the basis of their analysis of population. In an acoustic survey if relatively a multiple targets (such as schools of fish) are found, echo integration technique is used. The output of an echo integrator (relative density) is the accumulation of the all energy reflected from the insonified volume. If the average energy per fish (i.e. target strength) is known, the echo integrator output can be scaled to fish density.

This study was initiated to evaluate the usefulness of acoustic techniques and its applicability to estimate the *in situ* target strength and the population size in a small area adjacent to Pulau Bidong in Terengganu waters. This paper describes only the acoustic data collected by using DT6000 (BioSonics) which was conducted on 11th August in 1997. It attempts to discuss the concept and implications of acoustic stock assessment for fisheries management and some results, which have been obtained utilizing this technique.

Materials and Methods

Acoustic trials were conducted around Pulau Bidong at two different times namely on the 9th July and 12th August 1997. A GRP vessel belonging to UPM was used for the surveys. The acoustic surveys track consisted of six parallel transects each with a distance of 6.6 km and separated with interspacing distance of approximately 2.2 km. The survey area covers an area of nearly 60 km^2. The volume back scattering echoes reflected by fish schools were directly recorded into the computer's hard disk for every 2.2-km interval by means of "data acquisition program" in real time.

The fundamental acoustic principle for estimating fish abundance in a large segment is to compute the fish abundance in a small segment of the large area (Johennesson and Mitson, 1983). The smaller area (km^2) is assigned to Elementary Statistical Sampling Rectangle (ESSR). The Elementary Statistical Sampling Rectangle is an expansion of Elementary Sampling Distance Unit (ESDU) to the corresponding parallel survey grid with equidistant inter-transect spacing [Dt] to all Elementary Statistical Sampling Rectangles will have an equal area sizes given by:

$$ESSR = Dt \times (ESDU)\ km^2$$

By using the relationship between mean volume of back scattering strength and target strength of the fish, the fish biomass in the surveyed sampling intervals can be estimated by the following equation:

$$Q = n.w.a.d$$

Therefore, the accumulative biomass in the sampled area acoustically could be calculated.

Results and Discussion

The average *in situ* target strength for the same target steel ball at sea in both surveys was -42.0 dB at 29 °C. The calibration offset compensated for both surveys was -2.6 dB. Since both surveys were performed in the same area, the results of fish quantity were taken as the average of the two surveys. The calculations were performed using the average *in situ* target strength of the individual fish detected along the survey track. The average volume back-scattering strength fluctuated between -76.6 to -51.7 dB with the mean of -64.6 ± 6.9 dB suggesting that the fish schools detected were of different sizes and most likely of different species. The high fluctuations in target strength distribution ranging from -32.1 to -55.3 dB with an average -44.0 ± 7.1 dB observed suggested that the fish might consists of different length. Assuming that the majority of the fish detected during the survey comprises of the three species investigated in the laboratory, the average fish size in the schools can be estimated to be about 18 cm. The results of our *in situ* target strength and volume back scattering strength also agreed with those reported by Musse et al. (1998).

Since the laboratory TS and *in situ* TS agreed well with TS of fish in the study area the average value can be applied for biomass estimation in the area with confident. Using equation 2, a conservative estimate of fish biomass in the trial area was about 380 tons with an average density of 6.3 tons/km^2. The study shows that higher concentrations of fish occurred adjacent to Bidong and this is agreement to the report by (Leong and Yasin, 1984).

Conclusions

This report provides information, which would be helpful in the determination of the present status of waters around Bidong Island. The data seem to be very small, however, it agrees that with former studies conducted by the Department of Fisheries; hence it can be said it represents the true status of the fishing grounds. However, taking into account seasonal migrations, behavioural patterns, it is advisable to carry out more integrated acoustic surveys on population size and migration patterns. This would ensure up-to-date information on the resources are at hand and more improvement can be dedicated the future development of fisheries and increase the understanding of the optimal exploitation rates.

References

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