

TARGET STRENGTH AND SCHOOL SIZE
ASSESSMENT OF SCADS USING
HYDROACOUSTIC

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**TARGET STRENGTH AND SCHOOL SIZE ASSESSMENT
OF SCADS USING HYDROACOUSTIC**

By

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Abstract of thesis submitted to the Senate of University Putra Malaysia in fulfillment of the requirements for the degree of Master of Science.

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Faculty : Faculty of Applied Science and Technology

The study has been conducted with two phases. The first phase involving laboratory experiment on fish target strength measurements of three commercially important pelagic fish species of the scads namely Round scad (*Decapterus maruadsi*), Ox-eye scad (*Selar boops*) and Yellow-banded scad (*selaroides leptolepis*). The second phase include both *in situ* side aspect target strength and fish schools estimation attracted around fish aggregating light.

Fish physical characteristics such as total length, fork length, standard length, and weight were recorded in order to study relationship of TS to fish size. The samples sizes of Round scad, Ox-eye scad and Yellow-banded scad ranged from 11.40 to 20.50 cm, 10.0 to 20.7 cm and 7.0 to 15.6 cm (standard length), respectively.

The data for each angle of insonification at 0°, 30° (side aspect), 60° (in between dorsal and side aspect), 90° (dorsal aspect), 120° (in between dorsal and broad side aspect), 150° and 180° (broad side aspect) were recorded by running the data acquisition software.

Six hundred and sixteen target strength experiments were performed in the controlled tank (4.0 x 2.0 x 1.4 m) by using a scientific digital acoustic system (BioSonic DT6000) equipped with a 200 kHz digital split beam transducer.

Results of the average side and dorsal aspects target strength of Round scad, measured in the controlled tank was observed to be nearly similar. The average of side aspect TS was -41.4 ± 2.3 dB and dorsal aspect TS was -42.5 ± 2.4 dB. While for Ox-eye scad there was small variation with side aspect which was -42.3 ± 3.5 dB being stronger than dorsal aspect, -43.2 ± 3.7 dB. However the side aspect target strength of Yellow-banded scad showed larger variations compared to the average target strength characteristic of Round scad with the value of -45.4 ± 3.0 dB and -49.8 ± 2.1 dB for side and dorsal aspect, respectively. Results of this study showed that the average all aspects target strength of the three fish species of scad increases as fish length increases.

The target strength characteristics of the three species when expressed in term of target strength equation ($TS = a \log L - b$), showed that the constant 'a' value vary between 15 to 36. While, the 'b' is -86.99 to -68.44 and tends to be

species specific. This study showed that Ox-eye Scad gave lower 'b' constant than Yellow-banded Scad.

The second phase of the study have been done with the purpose to apply side aspect target strength for quantifying the size of fish schools gathered around and bellow fish aggregating light by comparing them with the actual catch. The *in situ* side aspect target strength values was found varied from -38.1 to -47.5 dB with the average of -44.7 ± 3.3 dB. From the seven attempts the target strength was computed to be -2.4 dB lower than that found under laboratory conditions. However, volume back scattering strength varied from -43.8 to -51.2 dB with the average of -47.9 ± 3.1 dB. It was found that the average schooling density ranged between 0.19 to 3.18 fish/m³. The acoustic estimate of fish quantity ranged from 28.6 to 497.3 kg with the actual catch ranged from 26.4 to 418.1 kg. The results of analysis on the true catch showed that Ox-eye scad was the dominant species (80% of the true catch).