TARGET STRENGTH AND SCHOOL SIZE ASSESSMENT OF SCADS USING HYDROACOUSTIC

MAMAN HERMAWAN

MASTER OF SCIENCE
UNIVERSITI PUTRA MALAYSIA
1998

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By

MAMAN HERMAWAN

Thesis Submitted in Fulfillment of the Requirements
for the Degree of Master of Science in the
Faculty of Applied Science and Technology
Universiti Putra Malaysia

NOVEMBER 1998

ACKNOWLEDGEMENTS

My thanks to Allah, the Almighty, for giving me life without which this thesis will never be carried out. Thank to Allah who has given me an opportunity to contribute this knowledge to other people.

First and foremost, I would like to express my most sincere gratitude and deep appreciation to the Chairman of my Supervisory Committee, Dr. Khalid Bin Samo for his encouragement and his invaluable contribution, inputs and careful supervision of my Master's Program. Without his constant guidance and encouragement this thesis will never be completed. I also would like to extend my gratitude and deep appreciation to the other members of my supervisory committee, Professor Dr. Hj. .Mohd. Azmi Bin Ambak and Mr. Mohd. Zaidi Zakaria for their, meaningful comments and constructive ideas and suggestions during the period of candidature.

I would like to acknowledge the Universiti Putra Malaysia Terengganu for awarding me a research assistantship during the tenure of my study as a Research Assistant and continued as Graduate Assistant under IRPA project 51031 which was kindly awarded to me during the tenure of my candidature as Master of Science student. I express my deep thanks to all the staff of Faculty of Applied Science and Technology, UPM Terengganu for their hospitality and for their enthusiastic acceptance of me as part of the community.

I also appreciate to assistance of Dean of the Faculty of Applied Science and Technology, and the Dean of Graduate School. I would also like to extend heartfelt thanks to Dr. Siti Aisah Abdullah for editing the thesis thoroughly, Mr. Zainudin Bin Abdul Wahab, Mr. Mohd. Tarmizi Bin Khalid and Mr. Subarjo Merehojono for their assistance in solution of computer problems. I am also indebted to Mr. Manaf Mat Diah, Mr. Mohd. Fazil and crewmembers of Unipertama III for their invaluable assistance and their hospitality throughout my sampling periods. Acknowledgements are also dedicated to all members of Postgraduate Students for their moral support.

I am also grateful to the Sekolah Tinggi Perikanan (Fisheries University) Ministry of Agriculture of Indonesia for granting permission to pursue this Master's degree program.

Finally, these acknowledgements are dedicated to my Parents, my wife, Dra. Raden Roro Dervy Diana, my sons, Rizky Agung Pratama (Agung), Sandy Agung Ramadhan (Dindy), My twin boys Indrawan Dona Kumara (Indra) and Andreawan Doni Purnama (Andre), for their strong moral support, patience and understanding in my absence.

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Chairman: Khalid Samo, Ph.D

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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 ±2.1dB 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/m^3. 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).