SWIMBLADDER ON FISH TARGET STRENGTH

Sunardi[1], Anton Yudhana[2], Jafri Din[3], Raja Bidin Raja Hassan[4]
[1, 2, 3] Faculty of Electrical Engineering, Universiti Teknologi Malaysia
Skudai 81310 Johor, Malaysia
[1, 2] Electrical Engineering Department, Universitas Ahmad Dahlan
Umbulharjo 55164 Yogyakarta, Indonesia
[4] Marine Fishery Resources Development and Management Department
Kuala Terengganu 21080 Terengganu, Malaysia
e-mail: sunargm@yahoo.com

Abstract

This paper discusses of Target Strength (TS) for the Selar boops (Oxeye scad) and Megalaspis cordyla (Torpedo scad), the most commercially fish in Malaysia. TS can be determined from in situ measurements and calculation using acoustic fish model. TS value, depth, and position (x-y-z) of fish targeted can be viewed from echogram using FQ-80 Analyzer by in situ measurement. X-ray imaged can be deployed to develop the acoustic fish model. The percentage of length and upper surface area for swimbladder to body fish of Selar boops more than Megalaspis cordyla can be measured after X-ray process. The percentage of width and volume of swimbladders to its each body are no significantly difference for both fish. These data of swimbladder physic are supports the result from in situ measurement which TS of Megalaspis cordyla have more than Selar boops.

Keywords*: target strength, swimbladder, acoustic fish model*

1. INTRODUCTION

Sonar (Sound Navigation and Ranging) is a general term applied to equipment and associated software that receives and possibly transmits sound. An echo sounder is an instrument used by fishers and researchers to transmit and receive sound vertically through the water column [1].

Size and reflectivity of sound are combined into a parameter called the backscattering cross section (σ_{bs}), which is essentially the acoustic size of the object. The backscattering cross section can be expressed as the amount of reflected sound intensity measured one meter away from the target, relative to the amount of energy incident upon the target. This parameter is called the target strength (*TS*) and expressed in dB.

$$TS = 10 \log_{10} (\sigma_{bs}) \quad (1)$$

Transmitter of an echo sounder or sonar sends out a beam of sound through a transducer (a device which converts one type of energy to another, in this case electrical energy to sound energy and vice versa). The pressure wave radiates spherically from its source with the intensity decreasing inversely with the square of the distance traveled. The strength of sound source, called source level (SL), is similarly measured a unit distance away and expressed in units of loudness relative to standard. In underwater acoustic, the unit of loudness is in decibel (dB).

Actually, there are two parameters of sound that relate to its loudness. One is pressure associated with the sound wave. Sound sensor (transducer) responds directly to pressure since the pressure changes are caused by the particle vibrations. The other measure of loudness is sound intensity, or the power/area associated with the sound wave. Sound intensity is proportional to the square of pressure.

When the sound wave encounters a density difference (i.e. target), an echo propagates radially outward from the target back to a receiver. Echoes returning to the sound source are