Provisional Prospectus

Expert Consultation on Target Strength Measurement Methods For Biomass Estimation in Southeast Asia

29-30 July 2025, SEAFDEC/TD

Introduction

Hydroacoustic surveys are essential tools in fisheries resource assessment, providing an efficient means of estimating fish biomass, which is critical for sustainable fisheries management. One of the key challenges in utilizing hydroacoustic surveys effectively is the accurate estimation of biomass, which requires precise measurement of the target strength (TS) of fish (Simmonds & MacLennan, 2005). TS, a measure of the reflectivity of sound waves from individual fish, is a critical parameter in converting acoustic backscatter into reliable biomass estimates (Yasuma *et al*., 2009). Among the parts of the fish body, the swimbladder is the main source of its acoustic scatter, with approximately 90-95% of the whole scattering signals (Foote, 1980; Ye and Farmer, 1997). Therefore, morphological characters are an important consideration in relation to TS (Yasuma *et al*., 2003).

While there are several available TS measurement techniques, challenges persist in both in-situ and ex-situ measurements. However, there may be certain challenges with In-situ TS measurements of target species in their natural environment, which might result in inaccurate TS data, such as excessive density of fish in some schools that make it difficult to distinguish individual fish (Li *et al*., 2024). Similarly, there has been insufficient consideration given to the ex-situ method. These include physical constraints physical constraints due to the size of the experimental tank and the frequency used, and issue related to preserved fish samples. There exist multiple ex-situ measurement techniques, each with its own strengths and limitations. Unless these issues are clearly organized and measures to address them are considered, it will be difficult to arrive at reliable TS measurement result

To overcome these challenges, theoretical models have been developed to estimate the TS value by numerical simulations based on morphological measurement of the swimbladder and fish body with the 'soft x-ray' technique. Many models have been developed such as the prolate spheroid model (PSM; Furusawa, 1988), the deformed-cylinder model (DCM; Ye *et al*., 1997), and the Kirchhoff-ray mode model (KRM; Clay and Horne, 1992), which has also been thoroughly confirmed that the projected results were compatible with both in-situ and ex-situ TS measurement (Kang *et al*., 2004; Kusdinar *et al*., 2014). Nevertheless, 'soft x-ray' are expensive and not easily accessible for many research institutions, including SEAFDEC. It is crucial to understand what is currently feasible based on prior research and the present capabilities of SEAFDEC and its member countries. Setting realistic goals accordingly is essential.

In light of these considerations, the Southeast Asian Fisheries Development Center (SEAFDEC) under 'Enhancing the capacities of SEAFDEC/TD and SEAFDEC Member Countries researchers in Hydroacoustic Science' proposed to organize this Expert Consultation. The aim is to explore and set the direction for more widely applicable TS estimation methodologies that maintain scientific rigor and support sustainable fisheries management across Southeast Asia.

Goal and Objective

This workshop aims to explore and set the direction for a low-budget, and accessible methodology for TS estimation that maintains scientific validity and will be applicable for acoustic surveys in Southeast Asia.

In order to achieve this goal, the objectives are as follows:

- To develop a draft of the research direction for a low-budget and accessible methodology for TS estimation supporting the hydroacoustic survey of SEAFDEC Member Countries.
- Identify issues and challenges of the current situation regarding the hydroacoustic surveys in SEAFDEC Member Countries and TS studies.
- To strengthen regional capacity in hydroacoustic survey techniques through knowledge exchange among experts, SEAFDEC/TD, SEAFDEC/MFRDMD, and SEAFDEC/IFRDMD.

Expected Outputs

The workshop will deliver several outputs to advance hydroacoustic capabilities in the region:

- **Proposal for TS studies** – the research proposal for developing TS estimation methodology with scientific accuracy, tailored to the SEAFDEC capacities following the expert recommendations.
- **Technical report** – gained details during the workshop, including the current situation regarding the hydroacoustic studies in Indonesia, Malaysia, and Thailand, and ways forward to further apply the TS estimation method in regional fisheries.
- **Technical network** – the establishment of a collaborative network for ongoing technical exchange and support in hydroacoustic science.

Expected Outcomes

- Improved understanding and insights into the challenges faced by SEAFDEC and the potential opportunities, providing for planning hydroacoustic research projects that align with the requirements of SEAFDEC Member Countries.
- Strengthened regional capacity in developing and applying practical TS estimation methodologies for acoustic surveys in Southeast Asian waters.
- Enhanced technical collaboration among SEAFDEC departments, fostering the integration of hydroacoustic methods into national fisheries assessment programs.

Resource Persons

1.	Dr. Koki Abe	SEAFDEC/TD
2.	Dr. Yuttana Theparoonrat	Thailand
3.	Dr. Koichi Sawada	Japan Fisheries Research and Education Agency
4.	Dr. (Prof.) Kazuo Amakasu	Tokyo University of Marine Science and Technology

Participants

This workshop will bring together a group of people with expertise and interest in hydroacoustic applications for fisheries management:

1.	Dr. Worawit Wanchana	SEAFDEC/TD
2.	Dr. Nopporn Manajit	SEAFDEC/TD
3.	Mr. Nakaret Yasuk	SEAFDEC/TD
4.	Ms. Saruttaya Jaroonpongsawat	SEAFDEC/TD
5.	Mr. Santiphong Putsa	SEAFDEC/TD
6.	Mr. Krittapas Suchato	SEAFDEC/TD
7.	PPMD Officer	SEAFDEC/TD
8.	Mr. Freddy Supriyadi	SEAFDEC/IFRDMD
9.	Mr. Muhammad Amirullah Amin Ayob	SEAFDEC/MFRDMD
10.	Mr. Deeka Ratanachamnong	Department of Fisheries, Thailand

Total expected participants: 14 technical experts and researchers

Date and Venue

The two (2) days consultation will be held between 29 and 30 July 2025 at the SEAFDEC Training Department (SEAFDEC/TD) in Samut Prakan, Thailand.

Provisional Agenda

Agenda 1	Welcome and open the workshop
Agenda 2	Sharing knowledge and experiences on Hydroacoustic and TS Estimation Techniques by hydroacoustic experts
Agenda 3	Sharing each experience/plan for stock assessment, including challenges of biomass estimation using Hydroacoustic
Agenda 4	SEAFDEC operation for TS estimation
Agenda 5	Discussion on the development of the appropriate TS estimation method and ways forward to apply the TS estimation method
Agenda 6	The result of the Inland water biomass survey using Hydroacoustic in Thailand by IFRDMD
Agenda 7	Wrap up the workshop
Agenda 8	Closing ceremony

Provisional Timetable

Date and time	Agenda	Remarks
29 July 2025		
08.30-09.00	Registration	
09.00-09.45	**Agenda 1: Welcome and open the workshop** - Opening speech - Overview of the objectives - Introducing resource persons and participants - Implementation plan and project direction on the Research study on the Target Strength (TS) of the economically important fish species (Activity 3.2.1) under JTF 7	SEAFDEC SG/TDC, MC and resource persons, RDDH All participants Dr. Nopporn Manajit
09.45-10.00	Group photo and Refreshment Break	
10.00-11.30	**Agenda 2: Sharing knowledge and experiences on Hydroacoustic and TS Estimation Techniques by hydroacoustic experts** - Dr. Yuttana Theparoonrat, Thailand - Dr. Koki Abe, SEAFDEC/TD	Resource person *(30 min for Dr. Yuttana and 1 hr for Dr. Abe to present, including Q&A)*
11.30-12.30	Lunch break	
12.30-14.30	**Agenda 2: Sharing knowledge and experiences on Hydroacoustic and TS Estimation Techniques by hydroacoustic experts** *(continuous)* - Dr. Koichi Sawada, FRA - Dr. (Prof.) Kazuo Amakasu, TUMSAT	Resource person *(1 hr to present including Q&A)*
14.30-14.50	Refreshment break	
14.50-15.50	**Agenda 3: Sharing each experience /plan for stock assessment, including challenges of biomass estimation using Hydroacoustic** - Malaysia by SEAFDEC/MFRDMD - Indonesia by SEAFDEC/IFRDMD - Thailand by DOF/Thailand	SEAFDEC/MFRDMD, SEAFDEC/IFRDMD, and DOF/Thailand *(20 min to present, including Q&A for each person)*
15.50-16.00	Wrap up day 1	SEAFDEC/TD
18.00	Dinner	

Date and time	Agenda	Remarks
30 July 2025		
09.00-09.30	**Agenda 4: SEAFDEC operation for TS estimation** - SEAFDEC activity to develop the TS method - Current situation, issues, and challenges of TS estimation	SEAFDEC/TD (LTO, and Activity Leader)
09.30-10.15	**Agenda 5: Discussion on the development of the appropriate TS estimation method and ways forward to apply the TS estimation method** - Develop a draft proposal for the future implementation of the TS estimation method - Discussing the collaboration between SEAFDEC on TS estimation and the way forward	LTO, Activity Leader, and all participants
10.15-10.30	Refreshment Break	
10.30-11.30	**Agenda 5: Discussion on the development of the appropriate TS estimation method and ways forward to apply the TS estimation method** *(continuous)*	
11.30-13.00	Lunch	
13.00-14.00	**Agenda 5: Discussion on the development of the appropriate TS estimation method and ways forward to apply the TS estimation method** *(continuous)*	
14.00-15.00	**Agenda 6: The result of the Inland water biomass survey using Hydroacoustic in Thailand by IFRDMD**	SEAFDEC/IFRDMD, and DOF Thailand
15.00-15.15	**Agenda 7: Wrap up the workshop**	SEAFDEC/TD
15.15-15.30	Refreshment Break	
15.30-16.00	**Agenda 8: Closing ceremony**	SEAFDEC DSG

Responsible contact persons

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