SPECIAL REPORT

Utilizing advanced technology in fishery resources surveys: features and capabilities of EK80

SEAFDEC/Training Department

Scientific echosounders support reliable and non-invasive methods for measuring fish abundance, both in freshwater and marine environments (Demer *et al.*, 2017; Simmonds & MacLennan, 2005). Over the past decades, the precision, accuracy, efficiency, and timeliness of echosounders have evolved. Currently, the EK80 is the most high-end scientific echosounder with modern specifications (**Box 1**) considered an international standard for hydroacoustic surveys and fish stock assessment.

Box 1. Specifications of the echosounder EK80

- Microsoft Windows operating system
- Single and/or split-beam transducers
- Dedicated built-in application for calibration
- High-range resolution and long-range performance for resolved single targets responding to the target frequency continuously
- Operational range between 10 kHz and 500 kHz measure volume backscattering strength (Sv) and target strength (TS) continuously over the entire band
- Improved information on the acoustic characteristics of targets, target species, angle, and size of orientation
- Capable of assessing fish stock through biomass estimation and observing fish behavior and distribution with real-time data collection (Sv and TS) and the association of aquatic organisms with sea bottom environment oceanographic parameters
- Real-time echo integration and target strength analysis in an unlimited number of layers
- Storage of raw data for replay or analysis in one of several post-processing software packages
- Several post-processing alternatives are available for rapid survey analysis and reporting
- Real-time data is displayed on the monitor enhancing the efficiency of the data collection process

SEAFDEC/TD has been conducting surveys on marine fishery resources in Southeast Asia for sustainable management through the use of research vessel M.V. SEAFDEC 2. With budget support from the Japanese Trust Found VI-II, the EK80 system (**Box 2**) was installed on M.V. SEAFDEC 2 in 2021, which was envisaged to be highly beneficial in gathering information during marine fishery resources surveys.

Box 2. EK80 system installed on M.V. SEAFDEC 2

- EK80 processor unit with EK80 software
- EK80 split beam wideband transceivers for 38 kHz, 120 kHz, and 200 kHz
- Copper calibration sphere 38 kHz (TS -33dB, 60 mm), 120 kHz (TS -40.4 dB, 23 mm), and 200 kHz (TS -45.1 dB, 13.7 mm)
- Tungsten calibration sphere (38.1 mm)

Nevertheless, using EK80 requires an understanding of the system. Thus, relevant technical staff from TD trained on hydroacoustics in Japan in Kamisu and onboard Taka Maru in Tateyama, from 7 to 19 November 2022. Subsequently, a series of training courses were conducted by TD on the principles and methods of EK80 and principles and methods of EK80 for fisheries acoustic survey on 20–25 March 2023 and 29 May–2 June 2023, respectively in Samut Prakan, Thailand. In the first training course, the resource persons were from SEAFDEC/IFRDMD and Research Institute for Marine Fisheries, Indonesia and the trainees were researchers from Thailand and TD. In the second course, the resource persons were from the Japan Fisheries Research and Education Agency and the trainees were from Indonesia, Malaysia, Thailand, and TD.

The trainees practiced calibration and noise measurement as well as data collection and analysis (**Figure 1**). The calibration can be operated successfully in all three EK80 transducers with the accepted calibration error of 0.06, 0.19, and 0.33 for 38 kHz, 120 kHz, and 200 kHz, respectively. **Figure 2**, shows the example of the EK80 calibration of the transducer at 38 kHz. Moreover, noise was also measured because it is a critical issue that may lead to uncertainty in data estimation. Low-frequency noise generated by vessel engines may lead to an underestimated fish abundance due to the avoidance of fish, while high-frequency noise may cause a higher and lower estimation in some hydroacoustic variables, such as S_v (Takao & Furusawa, 1995). **Figure 3** depicts that as the vessel speed increased and the noise at different frequencies and water depths also increased. This information can be used for planning the survey by determining the optimum speed and depth during the data collection on the target resource (TS).

Figure 1. *Trainees learn to calibrate and measure the noise of EK80*

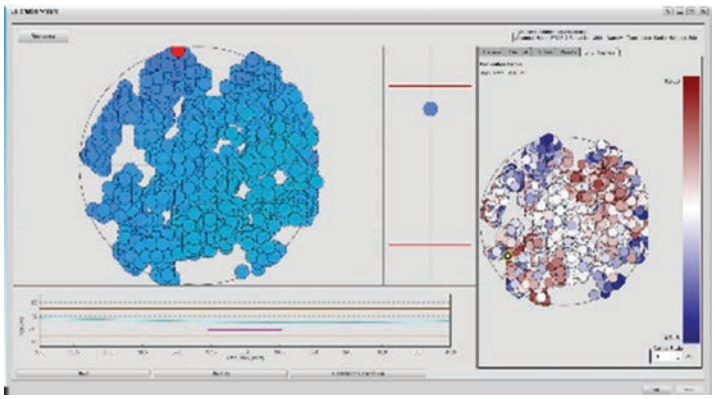

Figure 2. *Calibration of EK80 at 38 kHz*

Utilizing EK80 would lead to substantial improvements in the marine research capabilities of M.V. SEAFDEC 2 by significantly reducing the time and costs of data collection while obtaining precise and reliable data. This advanced device has versatile features and various capabilities including species identification and biomass and distribution estimation; plankton observation; habitat mapping; and fish behavior identification. The efficient data collection process would allow surveys to cover larger areas in a shorter time, leading to a better understanding of marine ecosystems and species. Moreover, the accuracy and reliability of data obtained through EK80 would contribute to more informed decision-making and policy formulation in the conservation of marine fishery resources in the region.

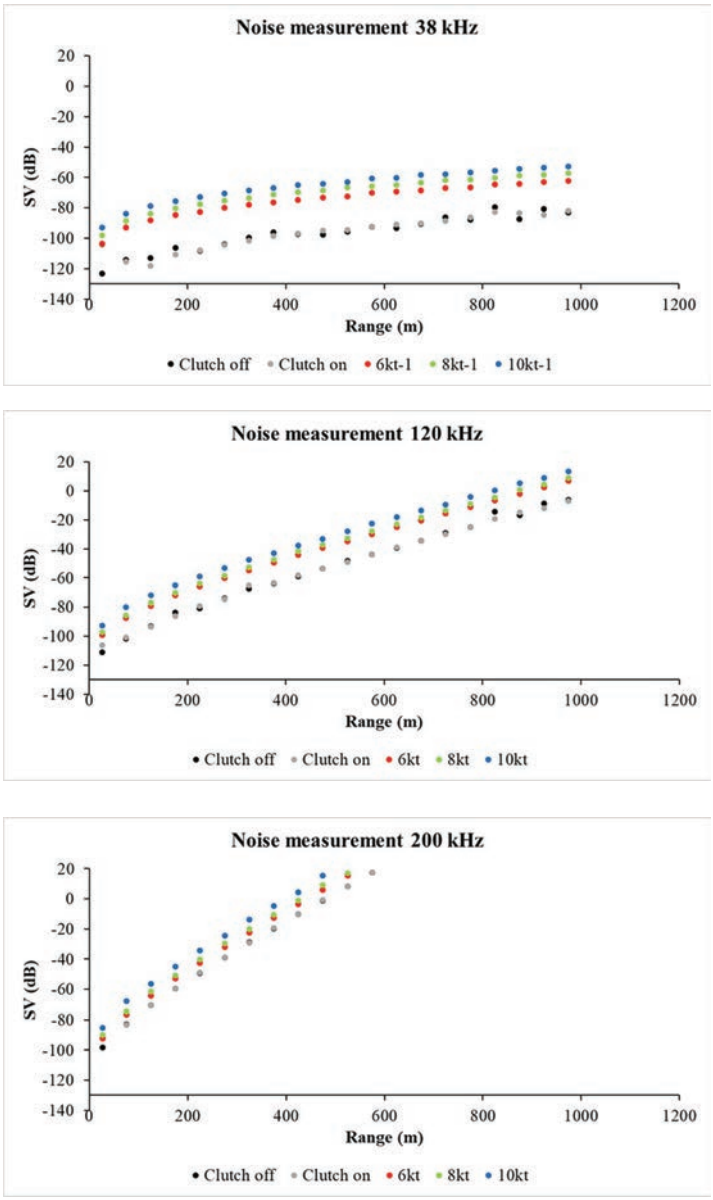

Figure 3. *Measurement of noise at different frequencies of EK80*

References

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