

Component 5 (Acoustic)

REPORT

Coastal Area Capability Enhancement in Southeast Asia
Research Institute for Humanity and Nature (RIHN)

Development and improvement of acoustic equipments and systems for shallow area

Yoshinori Miyamoto, Keiichi Uchida, TUMSAT, Japan
Toyoki Sasakura, FUSION INC, Japan, Yap Minlee, RIHN, Japan
Yuttana Theparoonrat, SEAFDEC/TD, Monton Anongponyoskun, KU, Thailand
Kritsada Thongsila, DOF Thailand

Component 5 Activities:

- Activity 1: Developing the new data collection equipments and analysis systems of acoustic survey at coastal area
- Activity 2: Field test of the developed equipments and system
- Activity 3: On-site-Training of new acoustic survey equipments and systems
- Activity 4: Publication of the research protocol guideline of acoustic survey for coastal area

Development and improvement of acoustic equipments and systems for shallow area

This study has been started as part of the RIHN project that is “Coastal area capability enhancement in Southeast Asia”. This project aims at investigating the linkage between livelihoods and ecosystem health in the Southeast Asian coastal area are investigated to fully understand its complexity and consequent vulnerability, particularly from the human-related viewpoints through collaborative holistic researches with local peoples. The acoustic data collection system including equipment modification were conducted for coastal area survey around set-net fishing ground in Rayong province, Thailand. An analysis methodology is also developed and will be using as a tool for acoustic survey methodology education for young scientist. Since, depth of the target research area is about 15 meters. A searching range is too narrow for using the scientific echo sounder with available in the market. The project modified acoustic device with composed of GPS Plotter Fish-Finder (FURUNO GP1670F), Interface box and personal computer (PC) for using as acoustic data collection equipment. The objectives of program are 1) to develop new acoustic data collection system for shallow water, 2) to study on the fisheries resources distribution around set-net fishing ground in Rayong province, Thailand, 3) to estimate the amount of fisheries resources by using acoustic data

and fish catch data of set-net fishing operation, and 4) HRD on new acoustic survey equipment and system through on-site training and publication of guideline of acoustic survey for coastal area.

Activity 1 : Developing the new data collection equipments and analysis systems of acoustic survey at coastal area.

Acoustic data collection system including equipment modification were conducted for coastal area survey in Rayong province. The hardware and software system for data collection were developed at Tokyo University of Marine Science and Technology, Tokyo Japan. The testing of hydro-acoustic equipments and systems for shallow area were conducted at Tateyama Bay, Chiba Prefectures, Japan on October 2012.

Modification of GPS and echo-sounder system for hydro-acoustic data collection

The hydro-acoustic system for data collection was modified by using FURUNO GPS Plotter model GP-1670F. The GP-1670F was equipped with GPS receiver and chart plotter system. The machine was also equipped with echo-sounder with operated on 50 kHz and 200 kHz simultaneously. The GP-1670F provide a total integrated GPS receiver, color video plotter and color fish finder. The built-in GPS receiver provides highly accurate position, courses and speed information. The fish finder presents vivid underwater images on a high quality LCD. The equipment modification was performed by importing the echo-sounder transmitting and receiving signal from transducer cable to newly designed data collection system. The data collection system were composed of Pre-Amplifier and Band Pass Filter, Interface unit, Analog to Digital Converter, and PC computer system. The digital hydro-acoustic data were collected to PC hard disc by using “FishFinder Version 1” software program. The GPS position data was transfer from GP 1670F to PC Computer pass through NMEA to USB port. The GPS position data were recorded to PC by using Windows Hyper-terminal program. The data collection system was design to record the echo-sounder signal of 50 kHz. only.

The equipment test were conducted at Tateyama Training Station of TUMSAT in Chiba prefecture during 23-25 October 2012. The survey echo-sounder data collection system was assembly and conduct the sea trial running test on board TUMSAT training boat number 36. A standard target Tungsten Carbine spear ball diameter 38.1 mm. is used for system calibration.

Activity2: Field test of the developed equipments and system

Several hydro-acoustic equipments and system for shallow waters areas were tested at set-net fishing ground in Rayong province. The series of field test of the developed equipments and system as followings;

March 11-12, 2013

In order to investigate the effect of ship avoidance behavior of fish school during acoustic cruising survey in shallow waters, the tested cruising survey by using small scale fishing boat and auto-pilot kayak boat were conducted in the set net fishing ground at Rayong province. The tested acoustic cruising survey were conducted on board small squid cast-net fishing boat and self auto-pilot kayak boat with running on the same cruising tract in the same day. Program “FishFinder Version 1”, for Windows XP was used for echo data recorded. Data of return echo signal from fish school of both survey were compared for the appearance of fish school. The result showed that no effect by ship avoidance behavior of fish school during acoustic cruising survey in shallow waters by small squid cast-net fishing boat and self auto-pilot kayak boat.

September 11-13, 2013

The calibration of hydro-acoustic equipments and system for shallow waters areas by using standard target ball, (tungsten carbide, 38.1 mm), as well as target strength (TS) of bigeye scad were conducted at concrete water pond of EMDEC Rayong province, Thailand. The return echo signal from operating frequency of 50 kHz were recorded into PC hard disc for data analyzing. Since, concrete water pond depth is 1.5 m., then interference of reflection of echo signal were contaminated to return echo signal of target ball and fish.

October 1-4, 2013

The cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The program “FishFinder Version 2” for Windows XP was using for test running cruise survey. The setting depth range at echo sounder at 20 m. can show more return echo signal detail of echo-gram. The result of survey shows that the “FishFinder Version 2” is working well during the survey, but the recorded acoustic survey data are not completed. The GPS interface unit is not working properly. It need for further improve the software program as well as adjustment and modification of GPS interface unit.

December 17-20, 2013

The cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The program “FishFinder Version 3” for Windows 7 was using for test running cruise survey. The result of survey shows that the “FishFinder Version 3” is working well. The setting depth range at echo sounder at 20 m. can show more return echo signal detail of echo-gram. However, the pre-setting receiver gain at Low and High level are not suitable for shallow waters areas survey. It need for further system adjustment and modification.

April 21-23, 2014

The cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The program “FishFinder Version 3” for Windows 7 and new design receiver gain circuit for 3 step were using for the survey. Total survey area covering for 16.25 km² with running distant of 38.5 km. The hydro-acoustic survey was conducted one day ahead of set-net fishing operation performed. Recorded hydro-acoustic survey data into PC hard disc and set-net catch data are analyzed at Faculty of Marine Science, Kasetsart University.

September 23-25, 2014

In order to investigated on the comparison of abundance of fisheries resources during set-net fishing operation season and off season. Then, the second survey cruise was conducted during no set-net fishing operation performed. The second cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The survey cruising tract was repeated as survey cruise on April 2014. Total survey area covering for 16.25 km² with running distant of 38.5 km. Recorded hydro-acoustic survey data into PC hard disc were analyzed at Faculty of Marine Science, Kasetsart University.

Activity 3: On-site Training of new acoustic survey equipments and systems

Several on-site training activities on acoustic survey equipment and system were promoted under project component 5 as following:

First Acoustic Seminar at KU, Brief introduction of RIHN Project, Basic of underwater acoustic, Principle of fish-finder, Acoustic data collection system, Biomass estimation by acoustic system were presented by Dr. Yap MINLEE, Dr. Yoshinori MIYAMOTO, and Dr. Toyoki SASAKURA. There are 30 student were attained the seminar. March 18 2013.

Coursework is “Marine Geology” of undergraduate students in fourth by Dr. Yuttana Theparoonrat at Kasetsart University. September 3, 2014.

Coursework is “General Oceanography” of undergraduate students in third by Dr. Yuttana Theparoonrat at Kasetsart University. September 4, 2014.

Coursework is “Acoustic Tech.for Fish.Resources Assessment” at Southeast Asian Fisheries Development Center by Dr. Yuttana Theparoonrat at Kasetsart University. August 29, 2014.

Activity 4: Publication of the research protocol guideline of acoustic survey for coastal area

November 2013

Development of the simple system for measurement of fish distribution in shallow water using GPS fish-finder. Souchi Matsushita, Yoshinori Miyamoto, Keiichi Uchida, Kouhei Hasegawa, and Toshiharu Kakihara. The International Conference on Underwater Acoustic for Sustainable Fisheries in ASIA, The Seventh Annual Meeting of Asian Fisheries Acoustic Society, 5-6 **November 2013**, Tokyo, Japan

AFAS (Asia Fisheries Acoustical Society) Bussan, November 2013

- Educational study of acoustic surveys in coastal shallow area at Southeast Asia, MIYAMOTO Yoshinori, UCHIDA Keiichi, THEPAROONRAT Yuttana • ANONGPONYASKUM Monton, ISHIKAWA Satoshi, YAP Minlee, SASAKURA Toyoki, The 1st International symposium on aquatic products processing, Bogor, Nov., 2013
- Development and improvement of acoustic equipments and system for shallow area, MIYAMOTO Yoshinori, SASAKURA Toyoki, THEPAROONRAT Yuttana, YAP Minlee, ANONGPONYASKUM Monton, K. Thongsila, Coastal Area Capability Enhancement in Southeast Asia Project Joint Seminar in Thailand, Bangkok, Nov., 2013
- Development of the simple system for measurement of fish distribution in shallow water using GPS fish-finder, S. Matsushita • Y.Miyamoto • K.Uchida • K.Hasegawa, and T. Kakihara, The Seventh Annual Meeting of Fisheries Acoustics Society, AFAS2013, Tokyo, Nov., 2013
- Education and research for the acoustic resource survey in Southeast coastal shallow water, Miyamoto, Yoshinori Uchida Keiichi • Yuttana Theparoonrat • Monton Anongponyoskun • Ishikawa Satoshi • Yap Minlee • Sasakura Toyoki , The 2014 spring meeting of the Japanese Society of Fisheries Science, Hakodate, March 2014

February 4 -7, 2014

- The proceedings of 52nd Kasetsart University Annual Conference, Subject : Agricultural Extension and Home Economic at Kasetsart University, Thailand.
- Presentation in Hydro-acoustic Equipments for Application Fishery Resource Survey in Coastal Area.

June 10-12, 2014

- **The 4th Marine Science Conference “Blue Ocean Science” , Prince of Songkla University at Songkla University.**

- Presentation in Acoustic Surveys in Area of Setnet Fishing Ground, Rayong Province.

June 26 – 27, 2014

- The 8th Thailand –Taiwan Bilateral Conference” on “Science Technology and Innovation for Sustainable Tropical Agriculture and Food” at Kasetsart University.
- Presentation in Educational study of acoustic surveys in shallow water area at Rayong bay, Thailand