



REPORT ON THE REGIONAL TECHNICAL MEETING COLLABORATIVE RESEARCH SURVEY ON MARINE FISHERIES RESOURCES AND MARINE ENVIRONMENT IN THE GULF OF THAILAND (CAMBODIA, THAILAND, AND VIET NAM WATERS)

SEAFDEC Training Department, Thailand
24-26 July 2018



**SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER
TRAINING DEPARTMENT
2018**



TD/RP/202



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BACKGROUND

Currently, attempts of countries in the Southeast Asia have increasingly focused to expand their fishing activities to the offshore areas in their Exclusive Economic Zones where fisheries resources are still under-utilized as alternative marine fisheries resources. With the Resolution and Plan of Action No. 18 describes that “*Investigate the potential of under-utilized fisheries resources and promote their exploitation in a precautionary manner based upon analysis of the best available scientific information*”, SEAFDEC has duties to provide technical support to the Member Countries to explore these under-utilized offshore fisheries resources through various programs, e.g. Technical meetings, Workshops, and Trainings course in related to fisheries resource exploration, fisheries abundance, as well as stock assessment.

In order to fulfill the needs of the SEAFDEC Member Countries on the exploitation of marine fisheries resources and study on marine environment in the specific offshore areas, SEAFDEC/TD works in close collaboration with these Member Countries and other relevant partners at national, sub-regional, and regional levels, to conduct marine fisheries resources and study on marine environment by utilizing SEAFDEC research vessels, M.V. SEAFDEC and M.V. SEAFDEC 2 with two (2) major specific areas: (i) Fisheries research and oceanographic survey; (ii) Human resource development on fisheries and oceanographic research survey, onboard navigation, and marine engineering training. Since 2004, SEAFDEC has technically supported to Member Countries by utilization M.V. SEAFDEC 2 for the survey the fisheries resources in EEZs of these Member Countries. The outputs from the survey include cruise reports of the survey, technical documents related to fisheries, marine environment and other specific requirements.

Recently, SEAFDEC has increasingly strengthened on the sub-regional cooperation of marine fisheries resource management. Data collection by shipboard survey has become important to support the sub-regional fisheries resource management in particular pelagic fisheries resources as share stock and transboundary fisheries resources. The envisage success example on the collaboration of SEAFDEC Member countries presented by the Joint Research Program for Tuna Research Survey in Sulu-Sulawesi Sea (SSSs) that has been collaboratively initiated by SEAFDEC in collaborate with SEAFDEC Member Countries around Sulu and Sulawesi Seas, *i.e.* Indonesia, Malaysia, and Philippines (IMP-Countries) since 2013.

With the significant recommendation of SEAFDEC Council Directors, during the 44th Council Meeting of SEAFDEC Meeting in year 2012, and a reiterated recommendation of the 45th SEAFDEC Council Meeting in following year, tuna research studies and two (2) cruise surveys on the Joint program on tuna resource were carried out in collaboration among IMP-Countries and SEAFDEC by M.V. SEAFDEC 2 in year 2014 and 2015. Training Department (TD) and Marine Fisheries Resource Development and Management Department (MFRDMD) is implementing departments under Offshore Fisheries Resources Exploration in Southeast Asia with the support from Japanese Government through Japanese Trust Fund for SEAFDEC.

In 2017, the 40th Program Committee Meeting of SEAFDEC has adopted the Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand under the SEAFDEC Project Offshore Fisheries Resources Exploration in Southeast Asia with the support from Japanese Government through Japanese Trust Fund for SEAFDEC. The technical consultation, Regional Technical Meetings and cruise survey on marine fisheries resources and marine environment has been developed by SEAFDEC Training Department in close collaboration with the relevant SEAFDEC Member Countries, *i.e.* Cambodia, Thailand and Viet Nam. The overall objectives of collaborative research survey are to support SEAFDEC Member Countries to conduct marine fisheries and environment data and information collection by research vessel, and to promote the offshore fisheries resources exploration through the research and human resources capacity by utilization of SEAFDEC’s Training and Research Vessel, M.V. SEAFDEC 2. The major envisage outputs of the survey are (i) Baseline data on marine fisheries resources and marine environmental situation for scientific reference as well as the status of marine fisheries resources in the Gulf of Thailand, (ii) Increasing number of experience researchers on marine fisheries resources and marine environment of



SEAFDEC Member Countries, (iii) Strengthen network of fisheries and oceanography scientist/researcher in Southeast Asia, and (iv) Maximizing the efficiencies and benefit of the SEAFDEC research vessel, research equipment to support on marine fisheries resources and marine environment survey of SEAFDEC Member Countries.



Series of publication on the Collaborative Research Survey on the Marine Fisheries Resources
and Marine Environment Survey in the Gulf of Thailand since 1996

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SUMMARY REPORT
THE REGIONAL TECHNICAL MEETING
COLLABORATIVE RESEARCH SURVEY ON MARINE FISHERIES
RESOURCES AND MARINE ENVIRONMENT IN THE GULF OF THAILAND
(CAMBODIA, THAILAND, and VIET NAM WATERS)
SEAFDEC Training Department
24 - 26 July 2018

INTRODUCTION

Currently, attempts of countries in the Southeast Asia have increasingly focused to expand their fishing activities to the offshore areas in their Exclusive Economic Zones where fisheries resources are still under-utilized as alternative marine fisheries resources. With the Resolution and Plan of Action No. 18 describes that “Investigate the potential of under-utilized fisheries resources and promote their exploitation in a precautionary manner based upon analysis of the best available scientific information”, SEAFDEC has duties to provide technical support to the Member Countries to explore these under-utilized offshore fisheries resources through various programs, e.g. Technical meetings, Workshops, and Trainings course in related to fisheries resource exploration, fisheries abundance, as well as stock assessment.

In order to fulfill the needs of the SEAFDEC Member Countries on the exploitation of marine fisheries resources and study on marine environment in the specific offshore areas, SEAFDEC/TD works in close collaboration with these Member Countries and other relevant partners at national, sub-regional, and regional levels, to conduct marine fisheries resources and study on marine environment by utilizing SEAFDEC research vessels, M.V. SEAFDEC and M.V. SEAFDEC 2 with two (2) major specific areas: (i) Fisheries research and oceanographic survey; (ii) Human resource development on fisheries and oceanographic research survey, onboard navigation, and marine engineering training. Since 2004, SEAFDEC has been technically supporting Member Countries on the utilization M.V. SEAFDEC 2 for the survey on the fisheries resources in EEZs of these Member Countries. The outputs from the survey include cruise reports of the survey, technical documents related to fisheries, marine environment and other specific requirements.

Recently, SEAFDEC has increasingly strengthened the sub-regional cooperation in marine fisheries resource management. Data collection by shipboard survey has become important to support the sub-regional fisheries resource management in particular share resources, and trans-boundary resources. The envisage successful example on the sub-regional collaboration of SEAFDEC Member Countries presented by the Joint Research Program for Tuna Research Survey in Sulu-Sulawesi Sea that has been collaboratively initiated by SEAFDEC in collaborate with SEAFDEC Member Countries around Sulu and Sulawesi Seas, e.g. Indonesia, Malaysia, and the Philippines, since 2013. With reference to the significant recommendation of SEAFDEC Council Directors, during the 44th SEAFDEC Council Committee Meeting in year 2012, and a reiterated recommendation of the 45th SEAFDEC Council Committee Meeting in following year, Joint Research Program for Tuna Research Survey in Sulu-Sulawesi Sea and two (2) cruise of tuna resource research survey in Sulu-Sulawesi Sea were carried out in collaboration among Indonesia, Malaysia, the Philippines, and SEAFDEC Training Department (TD) and Marine Fisheries Resource Development and Management Department (MFRDMD) by using M.V. SEAFDEC 2, during year 2014 to 2015. The surveys had been implemented under the Project Offshore Fisheries Resources Exploration in Southeast Asia that supported by Japanese Government through Japanese Trust Fund for SEAFDEC.

In 2017, the 40th Program Committee Meeting of SEAFDEC has adopted the Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand under the SEAFDEC Project



Offshore Fisheries Resources Exploration in Southeast Asia with the support from the Government of Japan through the Japanese Trust Fund for SEAFDEC. The overall aims of collaborative research survey are to encourage SEAFDEC Member Countries to strengthen marine fisheries and environment information collection by research vessel, and to promote the offshore fisheries resources exploration through the research and human resources capacity by utilization of SEAFDEC's Training and Research Vessel, M.V. SEAFDEC 2.

In response to Member Countries' needs and requirements, in early 2018, the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand has been drafted by the SEAFDEC Training Department. Recently, a series of consultation meetings on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand has been successfully organized by SEAFDEC/TD in collaboration with Fisheries Administration (FiA), Cambodia on 9 March 2018, with the Directorate of Fisheries (D-FISH) and Research Institute for Marine Fisheries (RIMF), Viet Nam on 7-8 March 2018, and with the Department of Fisheries (DoF), Thailand and local academic institutions and agencies on 30 April 2018. The meetings discussed and came up with the research topics, draft cruise plan, and concerned details on the Collaborative Research Survey for further discussion, development and preparation prior to the survey.

To ensure the preparedness and success of this collaborative survey in the Gulf of Thailand, it is therefore necessary for Participating Countries and agencies to technically and administratively discuss and agree on the survey cruise plan and all concerned arrangements prior to the cruise survey which is scheduled from 17 August to 9 November 2018, starting by Thailand, Cambodia and Viet Nam waters respectively, SEAFDEC Training Department plans to organize the Regional Technical Meeting on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters), from 24 to 26 July 2018, at SEAFDEC Training Department. The overall aims of the Meeting is to finalize the research activities, cruise plan of M.V. SEAFDEC 2, onboard researchers, and administrative matters e.g. port entry, logistics arrangement, and supply of provisions.

OBJECTIVES

The Regional Technical Meeting on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters) was envisaged to:

- 1) Finalize the research activities, cruise plan, , areas, and stations, cruise by utilizing M.V. SEAFDEC 2 for the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand;
- 2) Finalize the sampling methods and time management, Standard operational procedure;
- 3) Appoint the representatives and researchers from participating countries, namely: Cambodia, Thailand, and Viet Nam to be onboard M.V. SEAFDEC 2;
- 4) Agree upon the information and data sharing schemes among Participating Countries and agencies;
- 5) Discuss on responsibilities of researchers onboard at each station through the cruise survey;
- 6) Discuss on administration, customs, immigration and port clearance including logistics arrangement (researchers, equipment, samplings loading/unloading) and supply of provisions; and



EXPECTED OUTPUTS

- 1) The proposed research topics which agreed by all Participating Countries;
- 2) List of responsible researchers on each proposed research topics;
- 3) The tentative cruise plan of M.V. SEAFDEC 2 to conduct Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters);
- 4) Agreed protocol to administrate the port entry, i.e. customs, immigration, port clearance including logistics arrangement (researchers, equipment, samplings loading/unloading) and supply of provisions.
- 5) Update the survey permission of each Participating Countries
- 6) Identify issues and constraints on the fisheries resources survey and their solutions:
- 7) Researchers of Cambodia, Thailand and Viet Nam have opportunity to exchange idea on fisheries resources and marine environmental

RESPONSIBLE AGENCIES

The Meeting was hosted by the Training Department of Southeast Asian Fisheries Development Center (SEAFDEC/TD) in cooperation with concerned government authorities and academic institutions with budgetary support from the Government of Japan through the Japanese Trust Fund for SEAFDEC under the project entitled Offshore Fisheries Resources Exploration in Southeast Asia.

COLLABORATIVE AGENCIES

The Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand was carried out by the SEAFDEC/TD in cooperation with concerned Government Authorities and academic institutions as follows:

1. Fisheries Administration (FiA), Cambodia
2. Directorate of Fisheries (D-FISH), Viet Nam
3. Research Institute for Marine Fisheries (RIMF) Viet Nam
4. Department of Fisheries (DoF), Thailand
5. Department of Marine and Coastal Resources (DMCR), Thailand
6. Office of Atoms for Peace (OAP), Thailand
7. Burapha University (BUU), Thailand
8. Chulalongkorn University (CU), Thailand
9. Kasetsart University (KU), Thailand

DATE AND VENUE:

1. The Meeting had been organized from 24 to 26 July 2018,
2. The venues at SEAFDEC Meeting Room, the 2nd floor of Fishing Workshop Building, SEAFDEC Training Department, Samut Prakan, Thailand.



SUMMARY OF MEETING

AGENDA 1: Opening session

The Meeting was warmly welcomed by Mr. Akito Sato SEAFDEC Deputy Secretary General and Deputy Chief of Training Department. DSG reiterated the main objective of the collaborative survey is to strengthening the marine fisheries and environment and to promote the offshore fisheries resources exploration collection by using SEAFDEC Training and Research Vessel; M.V. SEAFDEC 2. He expressed his appreciation to all participants and observers on their kind supporting the Meeting including all project Participating Countries *i.e.* Cambodia Viet Nam and Thailand, for the unceasing and great efforts to make the survey plan complete.

AGENDA 2: Introduction, objectives, outputs, outcomes and adoption of the agenda

1. Dr. Taweekiet Amornpiyakrit representing SEAFDEC, presented the background of the survey started since 2007 and 2013 in the Gulf of Thailand (GOT) (as a follow up action on the recommendation on the result of marine fisheries resources and environmental research survey in the GOT), main objectives, expected output, and agenda of meeting. Prospectus, Agenda and Timetable is presented in Annex 1
2. The Meeting nominated Mr. Isara Chanrachkij, Head of Research and Development Division to serve the meeting as chairman of the meeting.
3. All Participating Countries adopted the agendas of the Meeting and organizer requested a group photo.
4. List of Participant is presented in the Annex 2.

AGENDA 3: Discussion on Research Programs

5. SEAFDEC researchers presented 43 topics from 45 proposed research topics and requested for comments and suggestion from the Participating Countries.
6. In this connection, SEAFDEC also requested Participating Countries to nominate list of researcher to collaborate with responsible researcher of these topics.
7. The Meeting agreed on the proposed topics and further suggested the responsible researchers to revise the sampling protocols and its activities to avoid the duplication of the works. The secretariat of the Meeting took note the comments, recommendation made by Participating Countries and relevant agencies and to consolidate and revise as necessary upon agreement among the researchers and reconsider research topics that are not clear on proposal. Comments and suggestions of all 43 topics are presented in Annex 3.
8. In response to SEAFDEC's requests on the nomination of researcher to collaborate with responsible researchers of these topics;
 - 8.1 Cambodia will nominate the researchers to join the research groups. Cambodia requested support on human resource capacity building and enhancement (marine fisheries resources survey). This request includes SEAFDEC to speed up data and sample analysis of the previous surveys;
 - 8.2 Thailand will nominate the researchers to join the research groups;
 - 8.3 Viet Nam will nominate the researchers to join the research groups. Viet Nam is willing to contribute the human resources to the region by sharing knowledge and experiences, specifically the hydro-acoustic survey techniques and its analysis
9. Participating Countries suggested SEAFDEC to produce the Standard Operational Procedure (SOP) to survey in the Gulf of Thailand
10. SEAFDEC informed the Meeting that in preparation for the Hydro-acoustic survey to be carried out in the Gulf of Thailand, SEAFDEC will send an official letter for requesting a



permission from the D-FISH of Viet Nam on the utilization of the Hydro-acoustic equipment of the RIMF installed onboard M.V. SEAFDEC 2. In this connection, SEAFDEC also would like to invite RIMF Staff(s) to set up the system and its accessories and to introduce the instruction and Operation to scientists onboard in Thailand prior to the survey cruise in the GOT.

11. In this regards, representative of D-FISH and RIMF of Viet Nam responded the request of SEAFDEC that Viet Nam is willing to contribute the human resources to the region by sharing knowledge and experiences, specifically the hydro-acoustic survey techniques and its analysis.
12. RIMF of Viet Nam informed the Meeting that Viet Nam has a constraint on the budget support on the data analysis since the survey is not a regular annual activity of RIMF and budget will not be allocated to support any activities related to the survey. Representative of RIMF and D-FISH of Viet Nam requested financial support for sample and data analysis, and report of search study.
13. Representative of Cambodia informed the Meeting that FiA of Cambodia has the constraint on the budget support on the data analysis and less human resources capacity. Cambodia requested to SEAFDEC support both constraint. Cambodia also sought support from all Participating Countries on the collaborative survey.
14. SEAFDEC has informed to all Participating Countries, universities and agencies that SEAFDEC cannot provide financial support for expenditure of the sample and data analysis, and report of search study. SEAFDEC will issue an official letter to FiA of Cambodia and D-FISH and RIMF of Viet Nam requesting for supporting for sampling and data analysis and report expenditure.

AGENDA 4: Discussion on tentative cruise plan

15. Mr. Nobphadol Somjit, Ship and Fleet Operation Section Head and Captain M.V. SEAFDEC presented the Ports of call, administration (Customs, Immigration and Port clearance including Logistics and Supply of provisions) to the Meeting.
16. Mr. Isara Chanrachkij presented the drafted cruise plan, and number of researcher onboard remain unchanged as agreed as shown in the Annex 4: Survey Proposal on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand
17. Participating Countries agreed in principle on the following issues;
 - 17.1 Cruise plan: The Meeting discussed on the tentative cruise plan that can be separated into four (4) legs of the cruise survey in Thai waters starting from 17 August to 28 September 2018 and then proceed to Sihanoukville of Cambodia. The survey in Cambodia waters will start from 5 October to 17 October 2018. The survey in Viet Nam waters starts from 25 October to 5 November 2018 and supposed to arrive at SEAFDEC/TD on 11 November 2018 tentatively;
 - 17.2 Port of call: The Meeting discussed on Port of call, arrangement for port entry to Cambodia and Viet Nam. Port of call are namely; Prachuab Khirikhan province and Songkhla province of Thailand, Sihanoukville of Cambodia and Phu Quoc Island of Viet Nam;
 - 17.3 Number of researcher onboard remains unchanged as agreed and stated in the working paper is 10 researchers from the host countries. However SEAFDEC may request to reduce the quota of Cambodia researchers and increase the taxonomist onboard M.V. SEAFDEC 2;
 - 17.4 Viet Nam and Cambodia will send ship agency names to SEAFDEC;



- 17.5 SEAFDEC representative informed the Meeting that the administration process e.g. customs, immigration and port clearance including logistics of sampling and supply of provisions at the Port of call of Thailand will be conducted by SEAFDEC;
 - 17.6 Representative of Viet Nam and Cambodia informed the Meeting that both countries have constraint on the budget support for local transportation due to the survey that is not a regular annual activity. Representative of both countries requested financial support for local transportation;
 - 17.7 Representative of Cambodia additionally informed the Meeting that the accommodation and living cost in Port of call, Sihanoukville is very high. He requested SEAFDEC to provide living space on M.V. SEAFDEC 2 while Cambodia researchers come to embark the ship. Captain of M.V. SEAFDEC 2 responded to representative of Cambodia that he will appropriately prepare for the requests from Cambodia;
 - 17.8 SEAFDEC reiterated the difficulties on the financial support for local transportation and accommodation to national researchers and scientists and researchers from the universities and agencies.
18. Representative of Thailand recommended SEAFDEC to modify the stations survey by reducing nine (9) stations around Moo KohAnghong Archipelago to one (1) station, and reducing six (6) stations around Koh Chang Archipelago to one (1) station. She informed the Meeting that these stations are able to conduct the survey by Department of Fisheries Research Vessel(s). In addition, she also suggested to SEAFDEC to reduce the survey stations can reduce days and cost of survey.
19. Viet Nam delegate suggested SEAFDEC to reroute the Hydroacoustic track survey in the Viet Nam waters.
20. Status of the permission to conduct the survey in all Participating Countries was concluded on the following issues;
- 20.1 Thailand issued the permission document and allowed SEAFDEC to carry out a survey in Thai waters.
 - 20.2 SEAFDEC will send an official letter to Cambodia and Viet Nam for receiving a permission to carry out a survey in Cambodia and Viet Nam waters as soon as possible.
21. Regarding to the numbers of research topic, Participants of the Regional Technical Meeting concerned and suggested SEAFDEC prepare the information of onboard working. To respond this concern, Mr. Sukchai Arnupapboon, SEAFDEC researcher, presented the list of sampling gear that is the tool to collect sample in for each research topics. Series of activities of each research topic is also listed in order to understand the process of the sample after processing onboard M.V. SEAFDEC 2. He also presented the list of sampling activities separated in morning session and afternoon session. List of Sampling Gear and Research Topic and Sample Handling Procedure is presented in Annex 5.

AGENDA 5: Discussion on data sharing schemes

22. Chairman reiterated that the copies of the analyzed data as well as raw data that will be stored at Countries, SEAFDEC-TD and scientists who analyze the sample or data. Copyright to publish scientific report of sample and data in national waters is under the Government consideration. In case SEAFDEC and academic institutions and agencies in Thailand would like to publish or present the research paper, SEAFDEC or academic institutions and agencies will submit the proposal to publish the scientific report of sample and data in the regional perspective.
23. SEAFDEC follows the data sharing scheme referred to the original Survey Proposal on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (page 8) enclosed herewith the Annex 4: Survey Proposal on the



Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand;

24. The Meeting agreed in principle on the data sharing scheme.
25. All Participating Countries suggested SEAFDEC to develop the Technical Working Group (TWG) from each country that will help support focal point on the monitoring of data analysis and facilitate coordination between scientists and countries.
26. Representative of Viet Nam expressed the concern and informed Meeting on the national regulations to export the samples/specimens out of the country. Viet Nam will conduct the analysis works by country scientists but still encountering budget constraint. Viet Nam requested SEAFDEC to consider financial support on the analysis works.
27. SEAFDEC responded the concerns of Viet Nam and other Participating Country, universities and agencies that SEAFDEC cannot provide financial support for expenditure of the sample and data analysis, and report of search study. SEAFDEC, however, informed the Meeting that in case countries have constraint on the budget of the expenditure of the sample and data analysis, and report of research study, SEAFDEC will try to identify the competent academic institutions and agencies in Thailand to conduct the sample and data analysis for Participating Countries without any expenditure. SEAFDEC-TD will be responsible for coordination and oversight the analysis of sample and data by all these institutions and agencies in Thailand. In this regards, TWG of each countries will help support focal point on the monitoring of data analysis and facilitate coordination between scientists and countries.
28. Representatives of Cambodia reiterated that the FiA of Cambodia has a limitation for this research study and sought assistance from SEAFDEC and all countries to write the reports, after grouping the research topics. In this regards, Cambodia will keep in touch with the group by assigning researchers to join and dispatch.

AGENDA 6: Other matters (e.g. Human Resource Development Program, Way forward)

29. Chairperson requested all participants to provide recommendations on the preparation for the space onboard M.V. SEAFDEC2 after having an observation. He summarized over-all results of discussion, needs re-grouping of research topics, constraints occurred in Viet Nam on budget constraint, SEAFDEC will develop the Term of Reference (TOR), TWG, requested the researchers to serve the TWG. In addition, he also proposed the Meeting to consider the following issues;
30. HRD program on pre-survey cruise and post-survey cruise, to consider the following issues;
 - 30.1 The pre-survey cruise of the HRD on the hydro-acoustic survey introduction and practices, how to store, transfer obtained data, Representative of Viet Nam agreed to provide technical support analyzing the data (partial data), how to interpret, and may not be complete for the whole survey, SEAFDEC will seek funding support for the HRD program;
 - 30.2 Regarding the hydro-acoustic survey, Representative of Viet Nam reminded that country must prepare the researchers to dispatch the Vietnamese hydro-acoustic team, needs 10 hours per day to continuously monitor the echogram, Representative of Viet Nam suggested SEAFDEC to assign 3 persons, rotating in a day, sought assistance to install a screen on the navigation bridge for the crews to monitor, Vietnamese researcher will bring the display to install onboard, so that this will require two (2) computers, one is mainly used the other one for spare;
 - 30.3 Regarding the training on hydro-acoustic, Representative of Viet Nam is willing to share the experience, for the first leg of the survey, the pre-survey training is needed, to make sure to follow the protocols, processing of the echogram, it consumes much time;



- 30.4 Representatives of Viet Nam realizes that Thailand uses LSSS application program to for processing the obtained hydro-acoustic data, they do not have any software (expensive), with that Representatives of Viet Nam encouraged the SEAFDEC and Participating Countries to establish the hydro-acoustic group among 3 countries, to confirm the smooth operation of the post-survey processing. In addition, this hydro-acoustic group among three (3) Participating Countries should be expanded to the SEA region;
 - 30.5 Regarding the hydro-acoustic survey, Representatives of Thailand is undertaking the collaborative project with Food and Agriculture Organization on the Fridtjof Nansen Project in the Andaman Sea, specifically in Myanmar and Thai waters. The project welcomes to collaborate with researchers on the hydro-acoustic, offering a chance to work and share the information, data in the future;
 - 30.6 Representatives of Thailand also informed the Meeting that the project of Fridtjof Nansen will hold a seminar on hydro-acoustic as a platform to share the information, and she is willing to share information on this collaborative survey to the Fridtjof Nansen Project; and
 - 30.7 Representatives of Cambodia agreed on the HRD program on the hydro-acoustic survey.
31. Regional Seminar/Conference to report the results of the survey, to consider the following issues;
- 31.1 Representatives of Viet Nam supported the Regional Seminar/Conference to report the results of the survey, to be presented. However in some cases, research studies cannot be completely fulfill in all research topics, alternatively, a specific seminar can be another choice in order to launch as soon as possible before the result is out of date to the public;
 - 31.2 Chairman clarified the timeframe of Regional Seminar/Conference which was asked by the representative from the Office of Atoms for Peace. He informed the Meeting that regional seminar/conference should link with the timeframe appear in the survey proposal. He also commented that in practical, it may be delayed; However SEAFDEC will follow up through the focal point (to monitor as well). The Regional Seminar/Conference will be tentatively organized in 2020; and
 - 31.3 In consistent with Regional Seminar/Conference, Representatives of Viet Nam encouraged all researchers to launch the publications, journal, of article in international bulletin.
32. Representatives of Cambodia and Viet Nam suggested SEAFDEC to present a certificate of participation to all researchers who join the survey cruise.
33. Representatives of Cambodia reiterated the concern on the survey results of Koyo Maru carried out previously in Cambodia waters (3-year project on the marine resources survey in the areas jurisdiction of Cambodia by the National Fisheries University, Japan) through the support by the Government of Japan), Cambodia requested the progress of the report in the previous years. Cambodia requires the results to report to the high fisheries authorities or the cabinet.
34. In response to Cambodia's concerns, Chairperson as Research and Development Division Head of SEAFDEC will speed up the partial report and send to Cambodia as much as possible without any anticipation from the National Fisheries University, Japan.
35. Representatives of Thailand reiterated that a total of 43 proposed research topics exist at the moment, some topics may be combined, regrouped, then the report will be finished by the specific researchers, SEAFDEC will try to combine as appropriate in one for all.



36. In addition, chairperson informed the Meeting that SEAFDEC requested the representatives from the countries (national researchers) to develop the scientific report, when the scientific report is finished, SEAFDEC encourages the invited researchers to write the report in a regional view. Before making the regional view report, *e.g.* hydro-acoustic, SEAFDEC must inform the country through the focal point and SEAFDEC will not touch upon the national report.
37. Representatives of Thailand sought clarification on the levels of scientific reporting, *e.g.* national level (in national jurisdiction) and regional level. If the national researchers wish to submit the papers for promotion, we can use the final report under the Department of Fisheries, Thailand or not. Chairman reiterated the data sharing scheme that partial data must be stored at SEAFDEC, SEAFDEC will focus only for regional report, in case the country wishes to publish, SEAFDEC will not intervene, even though the process expense are responsible by the professors/universities, writing a national report is under consideration by the country (somehow in respectful manner to the owner of the research topics).
38. Representatives of Viet Nam commented on the 43 topics in total and to be discussed and combined later. They require more detail for the document, prepare the protocol as well. Researchers should have proposal of each research topic, and should circulate to all for comments. Chairman responded the comment from representatives of Viet Nam that due to the time constraint, the researchers cannot guarantee to make it in time or not, researchers will try having proposal for each research topic. Nevertheless SEAFDEC will request some information to prepare a SOP but not requesting the full proposal.
39. Chairman reiterated that the survey cruise cannot be postponed, the funding must be spent within this year according to the policy of the JTF, Japan and the restoration of M.V. SEAFDEC 2 supported by JICA, Japan is also to be carried out by the end of 2018, SEAFDEC will try to coordinate to get the proposals and SOPs, will coordinate with the professors, to make grouping of the research topics.
40. Representatives of Viet Nam concurred by Thailand suggested SEAFDEC to identify common concerns/interests on the marine fisheries and marine environmental research studies in the Gulf of Thailand *e.g.* fisheries resources (pelagic, demersal), marine debris, and etc., that is the concern for all Participating Countries. Chairman responded to suggestion made by Viet Nam and Thailand that these common concerns/interests discussion may take another day. He proposed to discuss through the email, to prepare a ranking score, common interest assessment, and need each country's focal point to help facilitate. SEAFDEC will send out the research works and request the country fulfill the list of common concerns/interests and to score them. This process would be communicated through the internet and email. Even though this may take time, it is a cost and effectiveness.
41. Representatives of Viet Nam agreed with chairman's proposal and suggestion but requested to add up with the information on capacity of the country that can do or cannot do research works.

AGENDA 7: Conclusion

42. Chairman presented the summary key point of for 2-day meeting in brief to the Meeting. The Meeting consider the 43 research topics (referred to PPT file) Participating Countries agreed in principle to conduct the proposed research topics but need to Re-arrange categories of research topic, Combine some research topics and Reconsider research topics. Standard Operational Procedure (SOP) is one of the significant publications that is needed as reference for the survey.
43. Chairman concluded that collaborative work between all parties of collaborative research survey. SEAFDEC will established Technical Working Group (TWG) and consider to develop TOR of such TWG. All Participating Countries should nominate the researchers to join the research groups or technical working group as requested during the meeting.



Cambodia Thailand and Viet Nam agreed to nominate the researchers to join the technical working group. Technical Working Group (TWG) from each country will help support focal point on the monitoring of data analysis and facilitate coordination between scientists and countries.

44. In addition, Cambodia requested support on human resource capacity building and enhancement (marine fisheries resources survey). Viet Nam is willing to contribute the human resources to the region by sharing knowledge and experiences, specifically the hydro-acoustic survey techniques and its analysis.
45. Representatives of Cambodia requested SEAFDEC to consider to technical support on the analysis works.
46. Representatives of Viet Nam expressed the concern and informed the Meeting on the National regulations to export the samples/specimens out of the country. Viet Nam will conduct the analysis works by countries scientists but still encountering budget constraint.
47. All Participating Countries agreed in principle on cruise plan, port of call, and number of researcher on board. In addition, Viet Nam and Cambodia will send ship agency names to SEAFDEC.
48. The Meeting agreed in principle on the data sharing scheme.
49. Technical Working Group (TWG) from each country will help support focal point on the monitoring of data analysis and facilitate coordination between scientists and countries.
50. Thailand issued the permission document and allowed SEAFDEC to carry out a survey in Thai waters. SEAFDEC will send an official letter to Cambodia and Viet Nam for receiving a permission to carry out a survey in Cambodia and Viet Nam waters as soon as possible.
51. Additional information to be added to the letter sent to Viet Nam SEAFDEC will support DSA, Foods, and requests D-FISH to support for sample and data analysis and report, as well as local transportation for implementing the cruise survey. Otherwise SEAFDEC will request both countries to consider the sample analysis which will be done by researchers of Thailand under the collaboration and oversight by SEAFDEC without any expenditure.
52. Participating Countries agreed in principle on the Human Resource Development on the Fisheries Resource Survey by using Hydro-acoustic Equipment and Regional Seminar/conference to report the result of the survey.
53. Regarding large amount of research topics, Viet Nam and Thailand suggested the Meeting to consider the identification and prioritization of common interest on research topics that can help prioritize research works.





LIST OF ANNEX

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- Annex 2:** List of research topics identified in the Regional Technical Meeting on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters), SEAFDEC Training Department, 24-26 July 2018
- Annex 3:** Number and List of Participant in the Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters), SEAFDEC Training Department, 24-26 July 2018
- Annex 4:** Comments and recommendations on 43 Research Topics Agenda 3 (24-25 July 2018)
- Annex 5:** Survey Proposal on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand
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- Annex 9:** Research Equipment
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Annex 1 Prospectus, Agenda and Timetable of the Regional Technical Meeting on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters), SEAFDEC Training Department, 24-26 July 2018



PROVISIONAL PROSPECTUS
THE REGIONAL TECHNICAL MEETING
COLLABORATIVE RESEARCH SURVEY ON MARINE FISHERIES
RESOURCES AND MARINE ENVIRONMENT IN THE GULF OF THAILAND
(CAMBODIA, THAILAND, and VIET NAM WATERS)
SEAFDEC Training Department
24 - 26 July 2018

INTRODUCTION

In 2017, the Fortieth Program Committee Meeting of SEAFDEC has adopted the Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand under the SEAFDEC Project Offshore Fisheries Resources Exploration in Southeast Asia with the support from the Government of Japan through the Japanese Trust Fund for SEAFDEC. The overall aims of collaborative research survey are to encourage SEAFDEC Member Countries to strengthen marine fisheries and environment information collection by research vessel, and to promote the offshore fisheries resources exploration through the research and human resources capacity by utilization of SEAFDEC's Training and Research Vessel, M.V. SEAFDEC 2.

In response to Member Countries' needs and requirements, in early 2018, the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand has been drafted by the SEAFDEC Training Department. Recently, a series of consultation meetings on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand has been successfully organized by SEAFDEC/TD in collaboration with Fisheries Administration (FiA), Cambodia on 9 March 2018, with the Directorate of Fisheries (D-FISH) and Research Institute for Marine Fisheries (RIMF), Viet Nam on 7-8 March 2018, and with the Department of Fisheries (DoF), Thailand and local academic institutions and agencies on 30 April 2018. The meetings discussed and came up with the research topics, draft cruise plan, and concerned details on the Collaborative Research Survey for further discussion, development and preparation prior to the survey.

To ensure the preparedness and success of this collaborative survey in the Gulf of Thailand, it is therefore necessary for participating countries and agencies to technically and administratively discuss and agree on the survey cruise plan and all concerned arrangements prior to the cruise survey which is scheduled from 17 August to 9 November 2018, starting by Thailand, Cambodia and Viet Nam waters respectively, SEAFDEC Training Department plans to organize the Regional Technical Meeting on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters), from 24 to 26 July 2018, at SEAFDEC Training Department. The overall aims of the Regional Technical Meeting is to finalize the research activities, cruise plan of M.V. SEAFDEC2, onboard researchers, and administrative matters e.g. port entry, logistics arrangement, and supply of provisions.

In 2017, the 40th Program Committee Meeting of SEAFDEC has adopted the Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand under the SEAFDEC Project



Offshore Fisheries Resources Exploration in Southeast Asia with the support from the Government of Japan through the Japanese Trust Fund for SEAFDEC. The overall aims of collaborative research survey are to encourage SEAFDEC Member Countries to strengthen marine fisheries and environment information collection by research vessel, and to promote the offshore fisheries resources exploration through the research and human resources capacity by utilization of SEAFDEC’s Training and Research Vessel, M.V. SEAFDEC 2.

In response to Member Countries’ needs and requirements, in early 2018, the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand has been drafted by the SEAFDEC Training Department. Recently, a series of consultation meetings on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand has been successfully organized by SEAFDEC/TD in collaboration with Fisheries Administration (FiA), Cambodia on 9 March 2018, with the Directorate of Fisheries (D-FISH) and Research Institute for Marine Fisheries (RIMF), Viet Nam on 7-8 March 2018, and with the Department of Fisheries (DoF), Thailand and local academic institutions and agencies on 30 April 2018. The meetings discussed and came up with the research topics, draft cruise plan, and concerned details on the Collaborative Research Survey for further discussion, development and preparation prior to the survey.

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AGENDA AND TIMETABLE

Time	Agenda
	17 July 2018 (Tuesday)
09:00 – 09:15	Agenda 1: Opening session
09:15 – 09:30	Agenda 2: Introduction, objectives, outputs, outcomes and adoption of the agenda
09:30 – 12:00	<p>Agenda 3: Discussion on Research Programs (referred to the list of proposed 44 research topics, within 10 min for each presentation)</p> <ul style="list-style-type: none"> ❖ Title ❖ Objective ❖ Expected output ❖ Standard Operating Procedure-SOP on data collection onboard (including sampling material/equipment and method) ❖ Responsible researcher <p>Expectation: Participating countries agree on the proposed research topics</p>
13:00 – 16:45	Agenda 3: Discussion on Research Programs (<i>Continued</i>)
16:45 – 17:00	Wrap up Day 1
	18 July 2018 (Wednesday)
09:00 – 12:00	Agenda 3: Discussion on Research Programs (<i>Continued</i>)
13:00 – 17:00	Agenda 3: Discussion on Research Programs (<i>Continued</i>)
16:45 – 17:00	Wrap up Day 2



Time	Agenda
19 July 2018 (Thursday)	
09:00 – 12:00	Agenda 4: Discussion on tentative cruise plan <ul style="list-style-type: none"> ❖ Finalized cruise plan ❖ Port of call ❖ Number of researcher onboard ❖ Administration, customs, immigration and port clearance including logistics and supply of provisions (Note: local transportation will not be supported)
13:00 – 14:00	Agenda 5: Discussion on data sharing schemes
14:00 – 15:00	Agenda 6: Other matters (<i>e.g.</i> Human resource development program, Way forward)
15:00 – 16:00	Agenda 7: Conclusion
16:00	Agenda 8: Closing session

Remark:
 10:30-10:45 Refreshment break
 12:00-13:00 Lunch break
 15:00-15:15 Refreshment break



Annex 2: List of research topics identified in the Regional Technical Meeting on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters), SEAFDEC Training Department, 24-26 July 2018

- 1) Some biological data of pelagic and demersal fish in the Gulf of Thailand by using bottom trawl
- 2) Demersal fish survey using hydro-acoustic instrument
- 3) Demersal fisheries resources survey in Viet Nam EEZ
- 4) Small pelagic resource survey by hydro-acoustic instrument, i.e. scientific echo-sounder Simrad EK-60
- 5) Biomass estimation by Hydro-acoustic method in the Gulf of Thailand
- 6) Marine Species Identification
- 7) Water Column Condition and Near-Bottom Water Hypoxia in the Gulf of Thailand
- 8) Residual current from ship ADCP
- 9) Geostrophic current in the Gulf of Thailand
- 10) Three dimensional circulation in the Gulf of Thailand during southwest monsoon
- 11) Water and material exchanges at the mouth of the Gulf of Thailand
- 12) Relationship Between Chlorophyll-a Concentration in the Gulf of Thailand and Ocean Color from Remote Sensing
- 13) Inherent Properties of Sea Water in Gulf of Thailand
- 14) Sedimentary properties and sedimentation rate of sediment in the Gulf of Thailand
- 15) Temporal distribution of mercury and trace metals in sediment
- 16) Integrates Low-cost Sonar Imagery and GIS to Map Underwater Habitat
- 17) Microplastics Accumulations in Fish, Sediment, and Seawater
- 18) Distribution of Total Organic Matter in Marine Sediments of the Gulf of Thailand
- 19) Mercury and arsenic in seawater
- 20) Flux of nutrient and nutrient pool in sediment
- 21) Iron-sulfur-phosphorus cycling
- 22) Mercury and trace elements contamination in the surface sediment
- 23) Spatial sedimentology and source area composition of sediment in the Gulf of Thailand
- 24) Petroleum hydrocarbon)as chrysene (and polycyclic aromatic hydrocarbon)PAHs
- 25) Total Petroleum Hydrocarbons)TPHs (in surface seawater)as chrysene)
- 26) Mercury accumulation in tissues and risk assessment for consumption
- 27) Radiation Dose and Radiological Risk Assessment in Marine Biota and Seafood Consumers
- 28) Carbon dioxide flux and primary productivity in The Gulf of Thailand Nutrient and nutrient pool in seawater
- 29) Collection of Hydrographic In-situ Data for Validation in the Gulf of Thailand to Compare with Multi-satellite and Model Products
- 30) Zooplankton Diversity in the Gulf of Thailand)BU
- 31) Density and diversity of phytoplankton in the Gulf of Thailand
- 32) Species and Distribution of Palalarvae and Cephalopods in the Gulf of Thailand



- 33) Composition and distribution of fish larvae in the Gulf of Thailand
- 34) Fish larvae distribution of Scombridae and Engrulidae in the GulfThailand
- 35) Some Biological Aspects for Elasmobranch in Gulf of Thailand
- 36) Distribution and abundance of parasite in bony fish in the Gulf of Thailand
- 37) Diversity of benthic microcrustaceans and micromollusks in the Gulf of Thailand
- 38) Meiofauna abundance and distribution in surface sediment
- 39) Microbiome composition and function in sediment
- 40) Microbiome composition and function in seawater
- 41) Attached living organism on floating garbage in Thai waters
- 42) Genetic Diversity and Population Genetic Structure of Three-Banded Mantis Shrimp Miyakellanepa caught by Trawl Nets Fisheries in the Gulf of Thailand
- 43) Distribution of Bottom Plastic Debris in the Gulf of Thailand
- 44) Investigation of stock of marine debris in Gulf of Thailand
- 45) Composition and potential source of aerosol



Annex 3: Number and List of Participant in the Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters), SEAFDEC Training Department, 24-26 July 2018

a) Number of Participants

Participant	Number	Remark
SEAFDEC Participating Countries	12	<ul style="list-style-type: none"> Four (4) Participants from Department of Fisheries of Participating Countries (Cambodia, Thailand, and Viet Nam)
SEAFDEC Training Department	12	<ul style="list-style-type: none"> Ten (10) Researcher of Research and Development Division Two (2) Training and Research Supporting Division (Ship and Fleet Operation Section Head / Acting Captain of M.V.SEAFDEC and Captain of M.V.SEAFDEC2)
SEAFDEC Secretariat	1	<ul style="list-style-type: none"> Deputy Secretary General of SEAFDEC
Resource Person	10	<ul style="list-style-type: none"> Two (2) Department of Coastal Marine and Resources Two (2) Office of Atoms for Peace Burapha University Two (2) Chulalongkorn University Two (2) Kasetsart University
Administrative staff	1	Ms. RadaRadma
Observers	7	<ul style="list-style-type: none"> One (1)RFPN of SEAFDEC One (1) Department of Fisheries of Thailand Four (4) Ship and Fleet Operation Section
Total	43	(35 Participants, 7 Observers and 1 Administrative staffs)

b) List of Participants in the Regional Technical Meeting on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand (Cambodia, Thailand, and Viet Nam Waters), SEAFDEC Training Department, 24-26 July 2018

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**Annex 4:** Comments and recommendations on 43 Research Topics Agenda 3 (24-25 July 2018)**a) Summary in general**

There are currently a total of 43 research topics as proposed by all Participating Countries for the current collaborative research survey in the Gulf of Thailand. Some topics are needed to be re-arranged and grouped, SEAFDEC will re-group and discuss with the concerned researchers for better arrangement.

Viet Nam

Viet Nam generally provided comments on sampling, technical requirements of sampling, volume and capacity of space onboard M.V.SEAFFDEC 2, time frame, time consumption and space for 43 topics. Currently, 2 stations a day (day time/night time) is quite a difficult task. It would be great, if we can make prioritization by selecting some possible stations. We should consider also on the interference when working with the device that emits frequencies. An alternative way/choice is needed to avoid the interference.

As for other arrangements like the involvement of the countries, encouragement should be made to the country to involve all topics. We should also utilize the full capacity of the agencies, discuss the way to work together. After the cruise, we would have huge works for laboratory, processing, analysis of the samples, publication, scientific papers, journal and so on. The findings and results will contribute to the science and management of the resources in the region. Finally, Viet Nam encouraged all scientists concerned to join the research group.

Cambodia

Cambodia is willing to learn the past research survey results as carried out by M.V.SEAFFDEC 2 and the new entries of the research topics. Cambodia requested SEAFDEC to rectify the group of the research topics in order that Cambodia can assign the researchers to join the group.

Regarding the past research survey carried out by SEAFDEC in Cambodia waters, an accident occurred during the conduct of the survey, finally damaged fishermen's gear and the compensation for such loss was paid to fishermen (insurance, gear lost, gear damage). To avoid such unwanted incidence, the Fisheries Administration will cooperate with the high authorities e.g. navy or military which can help solve or reduce this problem. Cambodia suggested SEAFDEC to minimize the work load. Cambodia also sought technical support from the Government of Japan in the future continuously.

b) Comments made regarding the operation of sampling gear**Viet Nam**

Viet Nam requested a detailed plan for each country for all topics including the SOP. Otherwise it would be difficult to combine data and the sequence of the survey. Viet Nam strongly suggested that the bottom trawl survey for demersal species should be carried out at daytime while the demersal species disperse to the surface.

Regarding the hydro-acoustic survey (110 stations), the bottom trawl sampling must be done to check and confirm the species composition for processing with the echograms. Spare time is also required for this activity as well. Viet Nam further suggested to select the common topic for 3 countries and to give the priority to the common topic first. A transect line is an alternative way to cover all sampling and survey if possible.

DoF Thailand

Thailand generally agreed on the comments and recommends made by Viet Nam and Cambodia. Since the country has their ultimate goals for the survey, therefore the objectives may vary from



country to country. DoFThailand suggested to have a SOP for a particular survey to harmonize the obtained data from the survey.

SEAFDEC

SEAFDEC informed and reiterated the purpose of this collaborative survey that focuses on the regional level for 3 Participating Countries (Cambodia, Thailand and Viet Nam). If a common understanding and intention do not meet the requirements of the countries' needs, SEAFDEC will separately conduct the survey considering country to country. The survey activity would exclusively planned to suit each country's requirement.

c) Comments and recommendations on 43 Research Topics

No.	Research Topic	Comments and recommendations
1	Some biological data of pelagic and demersal fish in the GOT	<p>Cambodia sought assistance from Thailand and Viet Nam on this issue to enhance human capacity and to update the information on marine resources through these research activities and will be taken into consideration by SEAFDEC.</p> <p>Viet Nam refer to the resources survey on pelagic and demersal species, Viet Nam shared the experiences that demersal species are usually collected by bottom trawl and used only for resource assessment. Practically, using the hydro-acoustic technique is difficult for assessment. As for the small pelagic resources, distributed at the surface and mid water levels, it's also difficult to use the bottom trawl, therefore, using the hydro-acoustic is suggested in this case. While for the demersal species, the survey should focus on using the bottom trawl but how can the findings be linked together. Care on the ship speed during cruising along the survey track will be carefully taken as appropriate. Viet Nam also suggested that a transection route track can be made as an alternative way of the cruise survey track or re-routing the survey track. Viet Nam expressed a willingness to contribute the experiences and knowledge on the hydro-acoustic techniques for human resources capacity building to the region.</p> <p>Thailand interested in the operation and techniques of hydro-acoustic for the resources survey as contributed by Viet Nam. DoFThailand further requested SEAFDEC to share the information by organizing short orientation on the hydro-acoustic to the operators prior to the survey (HRD program).</p>
2	Demersal fish survey using hydro-acoustic instrument	
3	Demersal fisheries resources survey in Viet Nam EEZ	
4	Small pelagic resource survey by hydro-acoustic instrument, e.g. scientific echosoundersimrad EK-60	
5	Biomass estimation by hydro-acoustic method in the GOT	
6	Marine species identification	
7	Water column condition and near-bottom water hypoxia in the GOT	<p>SEAFDEC was requested to revise the content of the sampling method (missing information). SEAFDEC requested a nomination of scientists from Cambodia and Viet Nam who are interested in participating this research activity.</p> <p>Cambodia expressed its willingness to participate this research activity specifically, the water condition for supplying the aquaculture.</p>
8	Residual current from ship ADCP	SEAFDEC was requested to revise the content of the



No.	Research Topic	Comments and recommendations
		sampling method (missing information).
9	Geostrophic current in the GOT	No comments
10	Three dimensional circulation in the GOT during southwest monsoon	SEAFDEC was requested to revise the content of the sampling method (missing information).
11	Water and material exchanges at the mouth of the GOT	SEAFDEC reconfirmed the meeting that the research area covers the whole Gulf of Thailand and probably the title of the research topic may be renamed later by the responsible researchers (the opening of the Gulf of Thailand).
12	Relationship between chlorophyll-a concentration in the GOT and ocean color from remote sensing	<p>Viet Nam requested to consider reducing the number of sampling in order to reduce the time consumption.</p> <p>BUU informed the Meeting that attempts have been made many time as suggested to reduce the number of sampling but to obtain the value of chlorophyll-a and fluorescent chlorophyll-a. It requires more protocol and not easy to do so practically.</p> <p>DMCR informed the meeting that if time is not constraint, then the vertical distribution sampling can be possibly made. Then the variations can be seen if the equipment is available.</p> <p>SEAFDEC informed the Meeting that the TSG will be also carried out to examine the chlorophyll-a, 6 second interval along the cruise track.</p>
13	Inherent properties of sea water in the GOT	<p>SEAFDEC was requested to revise the content of the sampling method (missing information).</p> <p>BUU clarified the definition of the area of the research that focusing on the coastal waters not for the ocean or any involvement by the people.</p>
14	Sedimentary properties and sedimentation rate of sediment in the GOT	No comments
15	Temporal distribution of mercury and trace metals in sediment	<p>Viet Nam suggested to extend the study to the entire water column as well. Viet Nam expressed its willingness to participate this research activity (analysis work is possibly made by Viet Nam).</p> <p>DoF Thailand suggested to continuously take the sample annually to monitor the annual variation of the trace metal.</p> <p>CU clarified that surface sediment sampling will be carried out separately, using the core sampler that can be traced back to the past so called “depth profile sediment”.</p> <p>DMCR clarified that the nuclear technology ‘gamma count’ will be used to analyze to date back to the accumulation and</p>



No.	Research Topic	Comments and recommendations
		to re-establish the particular area, DMCR will provide more information in the future.
16	Integrated low-cost sonar imagery and GIS to map underwater habitat	<p>Viet Nam suggested to combine this research topic with 14 and 15 in order to see the whole picture of the mapping.</p> <p>SEAFDEC informed the Meeting that this activity will be only operated at night time 3-4 kt since the emitted frequency from the device may interfere with others <i>e.g.</i> hydro-acoustic equipment.</p> <p>BUU responded the query made by the Meeting that the final product of this research study is the habitat mapping by using the structure scan, using the image process to identify and to compare with other methods like core sampling.</p>
17	Microplastics accumulations in fish, sediment and seawater (Pontipa)	<p>DMCR had 2 suggestions as follows;</p> <ol style="list-style-type: none"> 1) Regarding the objective, determine the accumulation rate is linked with time, but sampling only once 2) Regarding the transportation in the food chain, the top level of the chain is not mentioned, also the selection on food chain and level is required.
18	Distribution of total organic matter in marine sediments in the GOT	<p>SEAFDEC informed the Meeting that this research activity is envisaged to follow up the survey carried out 2004 and possible traced back to 1998. Different sampling method will be used to collect sampling only at night time (once a day). SEAFDEC will provide a reference on how to analyze the total organic matters as requested by CU.</p> <p>DoF Thailand suggested the Meeting to consider extending the study onto the marine mammals <i>e.g.</i> the abundance of whale, dolphin and dugong.</p> <p>DMCR informed the Meeting that DMCR would like to carry out this research <i>e.g.</i> whale sighing (also was previously carried out by SEAFDEC) but time requirement is the major concern. To identify the species of found whale, pictures are needed to help identify the species, vessel must stop to examine closely, and then the smooth cruising may be interrupted. Therefore a separated cruise is required.</p>
19	Mercury and arsenic in seawater	Withdrawn by the responsible researchers (no container, device is out of order)
20	Flux of nutrient and nutrient pool in sediment	20, 22, 23, 24 combined and discussed
21	Iron-sulfur-phosphorus cycling	Withdrawn by the responsible researchers (no container, device is out of order)
22	Mercury and trace elements contamination in the surface sediment	Viet Nam expressed its willingness to participate this research activity.



No.	Research Topic	Comments and recommendations
23	Spatial sedimentology and source area composition of sediment in the Gulf of Thailand	SEAFDEC requested Cambodia and Viet Nam to provide the name list of researchers who wish to work with this research activity.
24	Petroleum hydrocarbon (as chrysene) and Polycyclic aromatic hydrocarbon (PAHs)	DoF Thailand is interested in learning through this research activity. Cambodia is interested in learning through this research activity.
25	Total petroleum hydrocarbons (TPHs) in surface seawater (as chrysene)	DMCR suggested that the samples must be extracted immediately otherwise no space onboard to keep the samples. Space is required. DMCR will check the availability of the storage with SEAFDEC .
26	Mercury accumulation in tissues and risk assessment for consumption	SEAFDEC reiterated the importance of this concern to all participating countries since it involves the seafood safety in the region. Viet Nam would consider nominating some scientists to collaborate with this study. Viet Nam offers assistance on sample analysis. Cambodia: Cambodia expressed its concerns and would consider allocating scientists to participate this research activity.
27	Radiation dose and radiological risk assessment in marine biota and seafood consumers	SEAFDEC was requested take into consideration on the storage of the samples. SEAFDEC further requested the participating countries to coordinate with the concerned agencies in the respective countries to work on this closely. OAP responded question of SEAFDEC on the main outputs of this research study that the establishment of national and regional database can be made with reference to the nuclear accident occurred in Japan. In close collaboration with Cambodia, Thailand and Viet Nam, the establishment of the risk database, radioactive database can be made. A technical working group can be established. Obtained data will be shared at regional database maintained by the Philippines. Data sharing depends on the country's decision as well. OAP further requested the focal points from Cambodia and Viet Nam to work closely with to ensure the transparency of the research work.
28	Carbon dioxide flux and primary productivity in the Gulf of Thailand nutrient and nutrient pool in seawater	SEAFDEC requested the responsible researchers (KU) to check whether the portable ADCP is available onboard or need an installation. SEAFDEC further suggested KU to consider the emitted frequency from the ADCP that may interfere the functions of hydro-acoustic equipment when operating simultaneously.
29	Collection of hydrographic in-situ data for validation in the Gulf of Thailand to compare with multi-satellite and model products	
30	Zooplankton diversity in the GOT	Viet Nam expressed its willingness to participate this



No.	Research Topic	Comments and recommendations
	presented	<p>research activity and suggested if this research topic can be applied to all participating countries in this survey. Viet Nam further suggested that the researchers should consider collecting the sample above the bottom 2 m to all ranges of the depth to the surface, not only 20 m from the surface.</p> <p>Cambodia: Cambodia expressed its willingness to participate this research activity (with support from SEAFDEC on HRD) and will nominate researchers to cooperate and to work with.</p> <p>Thailand: DoFThailand expressed its willingness to participate this research activity. DoFThailand further suggested to rename the word “marine aquatic” instead of fisheries.</p>
31	Density and diversity of phytoplankton in the GOT	<p>Viet Nam agreed on this research topic and further suggested to apply for the whole Gulf of Thailand. Regarding the sampling method, Viet Nam suggested to collect the sample as same as the whole water column made with the study on zooplankton. Viet Nam will nominate researchers to work with this research activity.</p> <p>Cambodia will nominate researchers to work with this research activity (HRD program).</p> <p>SEAFDEC responded to the query made by Viet Nam that the method to collect the zooplankton, not using the vertical trawl since it will clog up easily by its nature and leads to error. So it is not to be used for the whole column of the water in this survey. However, SEAFDEC took note the suggestion made by Viet Nam.</p>
32	Species and distribution of paralarvae and cephalopods in the GOT	<p>Viet Nam suggested to carry out the sampling for the same method as 32, 33 and 34</p>
33	Composition and distribution of fish larvae in the GOT	
34	Fish larvae distribution of scombridae and engraulidae in the GOT	<p>Viet Nam suggested to carry out the sampling for the same method as 32, 33 and 34 and combine the research topics 32-33-34 as one topic.</p> <p>Study on shrimp was also raised by Viet Nam (needs another sampling gear). Regarding this, Viet Nam will contribute for the identification for shrimp larvae.</p>
34	Fish larvae distribution of scombridae and engraulidae in the GOT (Cont.)	<p>Viet Nam will nominate researchers to work with this research activity. Viet Nam further suggested on the sampling made by the bongo net that, 3 m from the bottom to the surface would be better.</p> <p>KU responded the query made by the DoFThailand on the sampling method that topic 33 focuses on fish larvae group (family level) but 34 focuses on species level (trans-boundary species for the region).</p>



No.	Research Topic	Comments and recommendations
		<p>SEAFDEC will coordinate with RIMF of Viet Nam how to study the shrimp larvae.</p>
35	Some biological aspects for elasmobranch in the GOT	<p>Viet Nam suggested to combine with topics 1 (biology) and 36 (parasite) and to include some commercial species and demersal species and sharks.</p>
36	Distribution and abundance of parasite in bony fish in the GOT	<p>Cambodia will participate this research activity.</p> <p>DoFT hailand suggested that regarding the study on elasmobranch, the ectoparasite and endoparasite are the original intention to study. It requires further discussion to come up with composition and distribution.</p> <p>Viet Nam suggested to group all parasite topics in one. It is acceptable to study the endo-parasite for all species. The study should extend to some other species. Viet Nam suggested to add endo-parasite to be a sub-topic and to include the shark study to topic 1.</p> <p>SEAFDEC took note that topic 36 is similar to that of topic 1 and will discuss with the researchers how to cover all studies. Practically, the study on age is identified by the vertebrae.</p>
37	Diversity of benthic microcrustaceans and micromollusks in the GOT	<p>Viet Nam suggested to merge topics 37 and 38 as a benthos study and to macro-benthos as well. Viet Nam will participate the study, having researchers on meiofauna.</p>
38	Meiofauna abundance and distribution in surface sediment	<p>Cambodia quite disagreed with Viet Nam to merge topics 37 and 38 since the sampling method is different and can greatly impact to the whole study,</p> <p>SEAFDEC would work on this comment and further discuss with the responsible researchers on how to combine and merge the works as appropriate.</p>
39	Microbiome composition and function in sediment	<p>CU invited all participating countries to participate these research activities, not only for Thai waters.</p>
40	Microbiome compositions and function in seawater	<p>Cambodia expressed an interest in participating these research works and requested resource persons to share the knowledge and experiences.</p> <p>Viet Nam expressed its willingness to participate these research activities and will nominate scientists to take part in (not from RIMF).</p>
41	Attached living organism on floating garbage in Thai waters	<p>Viet Nam and Cambodia suggested to combine topics 43 and 44 with 41.</p> <p>CU would discuss on the research topic once again with the responsible researchers whether it can be expanded the area of study to Cambodia and Viet Nam or not since this study is</p>



No.	Research Topic	Comments and recommendations
		important for the region as well.
41	Attached living organism on floating garbage in Thai waters (Cont)	BUU agreed upon the suggestion to combine those topics together. However, the sampling methods may vary and the reporting also can be done separately depending on topic with specific interest.
42	Genetic diversity and population genetic structure of three-banded mantis shrimp <i>Miykellanea</i> caught by trawl nets fisheries in the GOT	<p>DoF Thailand suggested to consider to cluster/group the existing research topics e.g. larvae, parasite, plankton, benthos, debris.</p> <p>SEAFDEC took note the suggestions made by DoF Thailand for better clarification.</p> <p>BUU: the main researcher's intention, proposed to do all area, will be the new database for the region.</p>
43	Distribution of bottom plastic debris in the Gulf of Thailand	BUU responded to the query made by Thailand on the sampling method to collect the bottom plastic debris, BUU clarified that the bottom trawl will be use commonly. The plastic debris is considered as by-catch product sampling and this is to be done simultaneously with the fish sampling when operating the bottom trawl. Collected debris sample represents the demersal debris, not the whole water column. BUU further explained that the calculation of the area will be based on the swept area of the bottom trawl (referred to FAO's method). Obtained information will be shared.
44	Investigation of stock of marine debris in the Gulf of Thailand	<p>SEAFDEC informed the Meeting that the Neuston net will be used to collect the debris apart from the bottom trawl.</p> <p>Viet Nam shared the experiences regarding the utilization of hydro-acoustic technique to obtain more information on marine debris that it's possible to detect the debris by an echo-sounder but the target strength of plastic debris varies depending the type of plastic (which bubbles can lead to difficulties to identify). This may need a trial to estimate the target strength of the debris and it concerns on time consumption. In fact, the composition of the debris is unknown and it is necessary to know the type of the debris. This issue can be taken into consideration in the future.</p>
45	Composition and potential source of aerosol	<p>Viet Nam expressed its concern on the contamination by unwanted factors during cruising e.g. exhausted gas. Normally, to carry out this experiment, a fixed buoy is used.</p> <p>BUU explained that the researchers would avoid any contamination by setting up the equipment at the bow of the vessel during cruising. Care will be taken on the wind direction when collecting data. Data collection will not be carried out throughout 24 hrs. Previously in 2013, a hand-held sun photo meter was used and the current research will also use the same method.</p>



Acronyms used to describe in this matrix

SEAFDEC: Southeast Asian Fisheries Development Center

BUU: Burapha University, Thailand

CU: Chulalongkorn University, Thailand

KU: Kasetsart University, Thailand

DoF Thailand: Department of Fisheries, Thailand

DMCR: Department of Marine and Coastal Resources, Thailand

OAP: Office of Atoms for Peace, Thailand

GOT: The Gulf of Thailand



Annex 5 Survey Proposal on the Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand

SURVEY PROPOSAL
THE REGIONAL TECHNICAL MEETING
COLLABORATIVE RESEARCH SURVEY ON MARINE FISHERIES
RESOURCES AND MARINE ENVIRONMENT IN THE GULF OF THAILAND
(CAMBODIA, THAILAND, and VIET NAM WATERS)

Prepared by
Research and Development Division
Southeast Asian Fisheries Development Center
Training Department

INTRODUCTION

Currently, attempts of countries in the Southeast Asia have increasingly focused to expand their fishing activities to the offshore areas in their Exclusive Economic Zones where fisheries resources are still under-utilized as alternative marine fisheries resources. With the Resolution and Plan of Action No. 18 describes that “Investigate the potential of under-utilized fisheries resources and promote their exploitation in a precautionary manner based upon analysis of the best available scientific information”, SEAFDEC has duties to provide technical support to the Member Countries to explore these under-utilized offshore fisheries resources through various programs, e.g. Technical meetings, Workshops, and Trainings course in related to fisheries resource exploration, fisheries abundance, as well as stock assessment.

In order to fulfill the needs of the SEAFDEC Member Countries on the exploitation of marine fisheries resources and study on marine environment in the specific offshore areas, SEAFDEC/TD works in close collaboration with these Member Countries and other relevant partners at national, sub-regional, and regional levels, to conduct marine fisheries resources and study on marine environment by utilizing SEAFDEC research vessels, M.V. SEAFDEC and M.V. SEAFDEC 2 with two(2) major specific areas: (i) Fisheries research and oceanographic survey; (ii) Human resource development on fisheries and oceanographic research survey, onboard navigation, and marine engineering training. Since 2004, SEAFDEC has technically supported to Member Countries by utilization M.V. SEAFDEC 2 for the survey the fisheries resources in EEZs of these Member Countries. The outputs from the survey include cruise reports of the survey, technical documents related to fisheries, marine environment and other specific requirements.

Recently, SEAFDEC has increasingly strengthened on the sub-regional cooperation of marine fisheries resource management. Data collection by shipboard survey has become important to support the sub-regional fisheries resource management in particular pelagic fisheries resources as share stock and transboundary fisheries resources. The envisage success example on the collaboration of SEAFDEC Member countries presented by the Joint Research Program for Tuna Research Survey in Sulu-Sulawesi Sea (SSSs) that has been collaboratively initiated by SEAFDEC in collaborate with SEAFDEC Member Countries around Sulu and Sulawesi Seas, i.e. Indonesia, Malaysia, and Philippines (IMP-Countries) since 2013.

With the significant recommendation of SEAFDEC Council Directors, during the 44th Council Meeting of SEAFDEC Meeting in year 2012, and a reiterated recommendation of the 45th SEAFDEC Council Meeting in following year, tuna research studies and two (2) cruise surveys on the Joint program on tuna resource were carried out in collaboration among IMP-Countries and SEAFDEC by M.V. SEAFDEC 2 in year 2014 and 2015. Training Department (TD) and Marine Fisheries Resource Development and Management Department (MFRDMD) is implementing departments under Offshore Fisheries Resources Exploration in Southeast Asia with the support from Japanese Government through Japanese Trust Fund for SEAFDEC.



In 2017, the 40th Program Committee Meeting of SEAFDEC has adopted the Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand under the SEAFDEC Project Offshore Fisheries Resources Exploration in Southeast Asia with the support from the Government of Japan through Japanese Trust Fund for SEAFDEC. The technical consultation, Regional Technical Meetings and cruise survey on marine fisheries resources and marine environment has been developed by SEAFDEC Training Department in close collaboration with the relevant SEAFDEC Member Countries, i.e. Cambodia, Thailand and Viet Nam. The overall objectives of collaborative research survey are to support SEAFDEC Member Countries to conduct marine fisheries and environment data and information collection by research vessel, and to promote the offshore fisheries resources exploration through the research and human resources capacity by utilization of SEAFDEC's Training and Research Vessel, M.V. SEAFDEC 2. The major envisage outputs of the survey are (i) Baseline data on marine fisheries resources and marine environmental situation for scientific reference as well as the status of marine fisheries resources in the Gulf of Thailand, (ii) Increasing number of experience researchers on marine fisheries resources and marine environment of SEAFDEC Member Countries, (iii) Strengthen network of fisheries and oceanography scientist/researcher in Southeast Asia, and (iv) Maximizing the efficiencies and benefit of the SEAFDEC research vessel, research equipment to support on marine fisheries resources and marine environment survey of SEAFDEC Member Countries.

OBJECTIVE

1. Update situation of marine fisheries resources, oceanography and marine meteorology in the Gulf of Thailand
2. Technical supports on the human resources capacity building programs
 - a. Collaborative marine research survey among researchers from difference research agencies and among SEAFDEC MCs in particular Cambodia, Thailand and Viet Nam
 - b. Capacity building programs for the junior scientist and university students to conduct and practices on board marine research
3. Strengthen fisheries and oceanography scientist/researcher network marine fisheries resources and marine environmental scientists in the Gulf of Thailand sub-region.
4. Promote on utilization of research equipment and SEAFDEC research vessel for maximizing it efficiencies and benefit for Southeast Asia region.

EXPECTED OUTPUT

1. Baseline data on marine fisheries resources and marine environmental situation for scientific reference
2. Status of marine fisheries resources in the Gulf of Thailand
3. Skill and experience on marine fisheries resources and marine environmental of the researchers of SEAFDEC Member Countries
4. Promoting and developing the marine science study in Thailand, Cambodia and Viet Nam
5. Network on the marine fisheries resources and marine environmental scientists in the Gulf of Thailand sub-region.
6. Maximizing the efficiencies and benefit of the SEAFDEC research vessel, research equipment through the collaborative research cruise survey of M.V. SEAFDEC2



PARTICIPATING COUNTRIES

1. Cambodia (Fisheries Administration or FiA, Cambodia)
2. Thailand (Department of Fisheries or DoF, Thailand)
3. Viet Nam (Directorate of Fisheries of D-FISH, Viet Nam)

Remark: Relevant agencies and academic institutes/universities (under consideration by FiA of Cambodia, DoF of Thailand, and D-FISH of Viet Nam)

RESPONSIBLE DEPARTMENT

Southeast Asian Fisheries Development Center, Training Department (SEAFDEC/TD)

PERIOD

Survey period is planned to conduct 17 August 2018 to 11 November 2018 (87 days)

SURVEY AREA

1. Survey area is cover with the Gulf of Thailand, in the Exclusive Economic Zoe of 1) Cambodia, 2) Thailand, and 3) Viet Nam. Station survey is excluded the dispute area or the area in the Gulf of Thailand. Total numbers of stations survey are 110 stations covered EEZ of Cambodia, Thailand and Viet Nam. Overall survey stations are shown in the table 1 below;
 - a. 24 Stations in Cambodia waters
 - b. 62 Stations in Thailand waters
 - c. 24 Stations in Viet Nam waters
2. Arrangement of survey station is presented in Table 1. Survey map and station is presented in Figure 1. Latitude, Longitude and distance of all positions are presented in Annex 2;

Day	Survey Station	Port of Call
D1-D9	St.1-17 (17 St.)	Prachuap-khirikhan province Thailand
D10-D21	St.18-29, 33, 37-39 (17 St.)	Songkhla, Thailand
D22-D32	St. 49 - 62 (14 St.)	Songkhla, Thailand
D33-D43	St.30-32, 34-36, 40-48 (15 St.)	Songkhla, Thailand
D 44- D48	Voyage from Songkla (Thailand) to Sihanoukville	Sihanoukville, Cambodia
D49- D61	St.63-86 (24 St.) Stop at Sihanoukville (Cambodia)	Sihanoukville, Cambodia
D62-D67	Voyage from Sihanoukville to PhuQuoc	PhuQuoc, Viet Nam
D68- D81	St.87-110 (24 St.) Stop at PhuQuoc (Viet Nam)	PhuQuoc, Viet Nam
D82-D84	Voyage from PhuQuoc to SEAFDEC/TD	

Table 1 Survey stations in the Collaborative Research Survey on Fisheries Resources and Marine Environment of the Gulf of Thailand

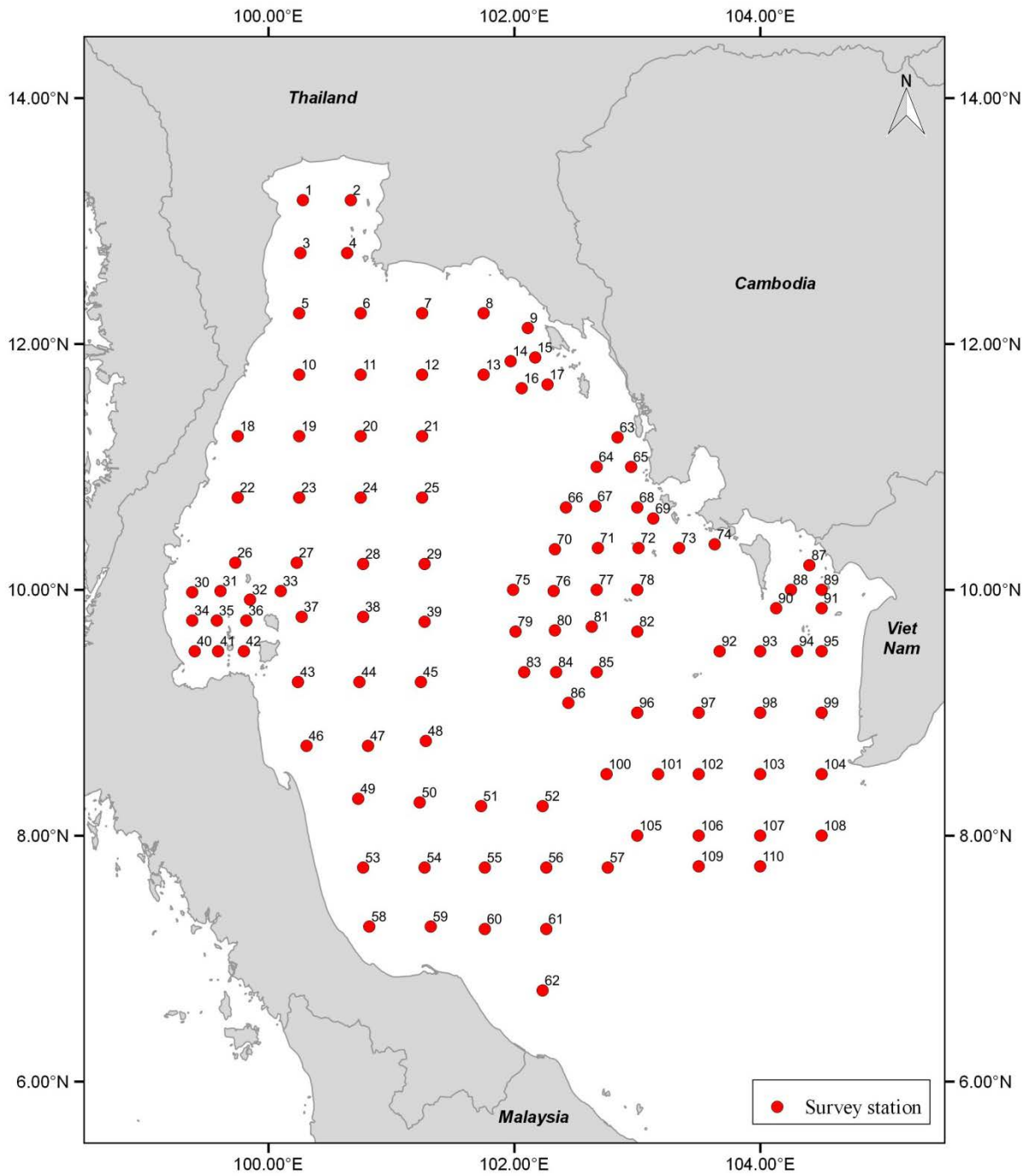


Figure 1 Survey station of the Collaborative Research Survey on Fisheries Resources and Marine Environment of the Gulf of Thailand

Note: No survey stations in the Dispute area, Historic waters and JDA Thailand- Malaysia



PERSONNEL ONBOARD

1. Number of personnel onboard is thirty-four (34)
 - a. SEAFDEC Crew (15)
 - b. SEAFDEC Researcher (5)
 - c. Invited researcher under SEAFDEC management (4)
 - d. Researcher of host countries (10)
2. There will be no other countries to join the country survey other than host researcher/observer. However, SEAFDEC will invite 5 researchers to work for SEAFDEC (not for country). In addition, all Participating Countries and SEAFDEC agreed to have additional trainees from Member Countries to join the cruise with the objective of human resource development on marine fisheries resource survey. It was further noted that these trainees have no authorization to publish research paper.
3. Managing the number of additional trainee from Member Countries is one (1) person for one (1) leg.
4. Quota of these additional trainees is under SEAFDEC Researcher.

SURVEY MATERIAL AND METHOD

Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand will be undertaken by dividing in to three (3) main activities, *i.e.*

1. Regional Technical Meeting on the Collaborative Research Survey on Fisheries Resources and Marine Environment of the Gulf of Thailand. The meeting will be organized by SEAFDEC Training Department to prepare research cruise plan. In the meeting, researcher from all Participating countries will meet and discuss on the research topics, scientific working group, and responsible person for facilitate the research activities. Expected output is the detail and schedule of cruise survey, list of working group, and working, mechanism of the survey. Standard Operation Procedure for the survey will be drafted and circulate to all members.

2. The shipboard survey
 - a. Research Vessel

The Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand will be conducted by using a SEAFDEC research vessel, M.V. SEAFDEC2, 211 GT, of SEAFDEC Training Department (See Annex 3)

- b. Research Equipment

Research survey will be carried out with the operations of CTD, Current Indicator, Thermo-Salino Graph (TSG) system, Temperature and Depth Recorder (TDR), Weather information. Plankton and larvae survey will be composed with phytoplankton net, zooplankton net, bongo net and Neuston net. Sediment and benthos sampling will be carried out by using core and grab. SEAFDEC will prepare the oceanographic winches to operate during Marine environment and oceanographic survey. Concerning the demersal fisheries resources survey, it is necessary to carry out bottom trawling in order to update the present status of fisheries resources in the GOT specifically the demersal species. FiA Cambodia and RIMF of Viet Nam suggested SEAFDEC applying the bottom trawl in the collaborative survey, in all 3 participating countries. In this connection SEAFDEC/TD will select trawl net design and prepare the trawl nets and their fishing accessories to operate during the collaborative research survey.



c. Small pelagic resource survey by hydro-acoustic instrument

Scientific echo-sounder, Simrad EK-60, is required to conduct the small pelagic resource survey due to bottom trawl has less efficiency to collect small pelagic fisheries samples. In addition, Viet Nam is capable of conducting the hydro acoustic survey by itself while willing to contribute and supporting the resource persons/experts and equipment for the survey to the region.

d. Standard Operation Procedure (SOP)

Recommendation provided by RIMF of Viet Nam that SOP will be the effective tool for the study on the marine fisheries resource, marine environment, and meteorological. SOP will be agreed among scientists of Participating Countries and disseminated to all participating countries prior to the collaborative research survey.

e. Oceanographic equipment calibration

The calibration of the oceanographic equipments is necessary to standardize (inter-calibration) prior to the collaborative research survey.

f. Partial detail of oceanographic equipment

List of Oceanographic and sampling gears use in the cruise survey are appeared in Table 2 and Annex 4. Specifications and pictures of some oceanographic equipment are presented in Annex 4. The proposed research topics are presented in Annex 5.

3. The second Regional Technical Meeting on the Collaborative Research Survey on Fisheries Resources and Marine Environment of the Gulf of Thailand. The meeting will be organized by SEAFDEC Training Department in collaboration with RIMF of Viet Nam to summarize the research cruise. In the meeting, preliminary result of the cruise survey will be presented and follow up activities will be discussed and reported.

Oceanographic and sampling gear	Responsibility
Trawl nets and accessories	M.V.SEAFDEC2
Scientific Echo sounder SIMRAD EK-60	M.V.SEAFDEC2 and RIMF Viet Nam
CTD	M.V.SEAFDEC2
Current Indicator	M.V.SEAFDEC2
Temperature and Depth Recorder (TDR)	M.V.SEAFDEC2 and RIMF Viet Nam
Weather information	M.V.SEAFDEC2
Thermo Salino Graph (TSG) system	M.V.SEAFDEC2
Phytoplankton and zooplankton net	M.V.SEAFDEC2
Bongo net	M.V.SEAFDEC2
Neuston net	M.V.SEAFDEC2
Sediment sampler (Core and grab)	M.V.SEAFDEC2
Benthos (grab)	M.V.SEAFDEC2
Sample store (Bottles, bags, etc.)	M.V.SEAFDEC2
Oceanographic winch	M.V.SEAFDEC2

Table 2List of Oceanographic and sampling gears use in the cruise survey



REPORTING

1. Cruise report - SEAFDEC
2. Preliminary survey report - SEAFDEC and Researchers
3. Technical paper - SEAFDEC and Researcher in collaborative agencies
4. Seminar - SEAFDEC

Remark: Copyrights of the results/outputs from the survey

- a. At national level, copyrights of the outputs from the survey in each national waters (including data, samples, technical papers, etc.) will be under authorization by national cooperative agency. However, SEAFDEC may request to collect some outputs for further analysis upon an approval by national agency.
- b. At regional level, joint authors of the technical papers on specific research based on the research activity of the survey could also be done.
- c. SEAFDEC will organize the Regional Technical Meeting on the Collaborative Research Survey on Fisheries Resources and Marine Environment of the Gulf of Thailand to identify the topic of research study and responsible researcher before starting of the cruise (period will be considered)
- d. SEAFDEC in collaboration with Participating Countries will develop the policy data sharing in the region select technical working group to report the final results.

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PROJECT COORDINATOR

1. Mr. IsaraChanrakhij Research and Development Division Head
2. Dr. TaweekietAmornpiyakrit Senior Program Officer
3. Mr. SukchaiAnupapboon Fishing Ground and Fishery Oceanography Section Head

CRUISE COORDINATOR

1. Mr. IsaraChanrakhij Research and Development Division Head
2. Mr. SukchaiArnupapboon Fishing Ground and Fishery Oceanography Section Head
3. Mr. VudthiratVudthipanyo Captain of M.V.SEAFDEC2



Annex 6 Draft Cruise Plan

1. **CRUISE NO.** : M.V. SEAFDEC 2 No. XX-X/2018
2. **PERIOD** : (87 Days)
3. **AREA OF OPERATION** : Gulf of Thailand (Cambodia waters, Thailand waters and Vietnam waters)
4. **Port of Call** :
 1. Prachuap-khirkhan province (Thailand)
 2. Songkhla province (Thailand)
 3. Sihanoukville (Cambodia)
 4. PhuQuoc Island (Viet Nam)
5. **Objectives** : To carry out fisheries resources survey by using following equipments and sampling gears;
 1. Fisheries resources survey sampling by bottom trawl and Hydro-acoustic survey by using multi acoustic frequency (38, 120 and 200 KHz.) Simrad EK-60
 2. Oceanographic survey by using CTD, Current Indicator, Thermo Salino Graph (TSG) system, Temperature and Depth Recorder (TDR), Weather information. Plankton and Larvae survey will be composed with phytoplankton net, zooplankton net, Bongo net, and Neuston net.

6. Tentative schedule

M.V. SEAFDEC2 Tentative schedule (87 days)

17 August 2018 (Fri.)

- 0900 hrs. : Leave SEAFDEC/TD for the Research survey station.2.
 1300 hrs. : Arrive station 2.
 1300-1800 hrs. : Bottom trawl and Oceanographic survey St.2.
 1800 hrs. : Start Hydro-acoustic survey then proceed to St.1.

18 August 2018 (Sat.)

- 0600-1900 hrs. : Bottom trawl and Oceanographic survey St.1, 3.
 1900 hrs. : Sailing to St.4.

19 August 2018 (Sun.)

- 0600-1900 hrs. : Bottom trawl and Oceanographic survey St.4, 5.
 1900 hrs. : Sailing to St.6.

20 August 2018 (Mon.)

- 0600-1900 hrs. : Bottom trawl and Oceanographic survey St.6, 7.
 1900 hrs. : Sailing to St.8.

21 August 2018 (Tue.)

- 0600-1900 hrs. : Bottom trawl and Oceanographic survey St.8, 9.
 1900 hrs. : Sailing to St.14.

22 August 2018 (Wed.)

- 0600-1900 hrs. : Bottom trawl and Oceanographic survey St.14, 15.
 1900 hrs. : Sailing to St.17.



23 August 2018 (Thu.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.17, 16.
1900 hrs.	: Sailing to St.13.
24 August 2018 (Fri.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.13, 12.
1900 hrs.	: Sailing to St.11.
25 August 2018 (Sat.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.11, 10.
1900 hrs.	: Sailing to Prachuap-khirikhan Province.
2200 hrs.	: Arrive Prachuap-khirikhan Province.
26-27 August 2018 (Sun.-Mon.)	
0800-1700 hrs.	: Replenish fresh water and provision.
	: Unloading all samples.
28 August 2018 (Tue.)	
0800-1800 hrs.	: Researchers embark the ship.
1900 hrs.	: Leave Prachuap-khirikhan Province or St.10.
2200 hrs.	: Arrive St.10 then start Hydro-acoustic survey to St.18.
29 August 2018 (Wed.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.18, 19.
1900 hrs.	: Sailing to St.20.
30 August 2018 (Thu.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.20, 21.
1900 hrs.	: Sailing to St.25.
31 August 2018 (Fri.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.25, 24.
1900 hrs.	: Sailing to St.23.
1 September 2018 (Sat.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.23, 22.
1900 hrs.	: Sailing to St.26.
2 September 2018 (Sun.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.26, 27.
1900 hrs.	: Sailing to St.28.
3 September 2018 (Mon.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.28, 29.
1900 hrs.	: Sailing to St.39.
4 September 2018 (Tue.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.39, 38.
1900 hrs.	: Sailing to St.37.
5 September 2018 (Wed.)	
0600-1900 hrs.	: Bottom trawl and Oceanographic survey St.37, 33.
1900 hrs.	: Sailing to Songkhla Province.



6 September 2018 (Thu.)

1700 hrs.

: Arrive Songkhla Province.

7-8 September 2018 (Fri.-Sat.)

0800-1700 hrs.

: Replenish fresh water and provision.

: unloading all samples.

: Loading the fuel.

9 September 2018 (Sun.)

0800-1600 hrs.

: Researchers embark the ship.

1700 hrs.

: Leave Songkhla for the Research survey St.49.

10 September 2018 (Mon.)

0600-1900 hrs.

: Bottom trawl and Oceanographic survey St.49, 50.

1900 hrs.

: Sailing to St.51.

11 September 2018 (Tue.)

0600-1900 hrs.

: Bottom trawl and Oceanographic survey St.51, 52.

1900 hrs.

: Sailing to St.57.

12 September 2018 (Wed.)

0600-1900 hrs.

: Bottom trawl and Oceanographic survey St.57, 56.

1900 hrs.

: Sailing to St.55.

13 September 2018 (Thu.)

0600-1900 hrs.

: Bottom trawl and Oceanographic survey St.55, 54.

1900 hrs.

: Sailing to St.53.

14 September 2018 (Fri.)

0600-1900 hrs.

: Bottom trawl and Oceanographic survey St.53, 58.

1900 hrs.

: Sailing to St.59.

15 September 2018 (Sat.)

0600-1900 hrs.

: Bottom trawl and Oceanographic survey St.59, 60.

1900 hrs.

: Sailing to St.61.

16 September 2018 (Sun.)

0600-1900 hrs.

: Bottom trawl and Oceanographic survey St.61, 62.

1900 hrs.

: Sailing to Songkhla Province.

17 September 2018 (Mon.)

0900 hrs.

: Arrive Songkhla Province.

1000-1700 hrs.

: Unloading all samples.

18-19 September 2018 (Tue.-Wed.)

0800-1600 hrs.

: Replenish fresh water and provision.

: Researchers embark the ship.

1700 hrs.

: Leave Songkhla Province for St. 49.

20 September 2018 (Thu.)

0200 hrs.

: Arrive St.49 then start Hydro-acoustic survey to St.46.

0600-1900 hrs.

: Bottom trawl and Oceanographic survey St.46, 47.

1900 hrs.

: Sailing to St.48.



- 21 September 2018 (Fri.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.48, 45.
1900 hrs. : Sailing to St.44.
- 22 September 2018 (Sat.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.44, 43.
1900 hrs. : Sailing to St.42.
- 23 September 2018 (Sun.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.42, 36.
1900 hrs. : Sailing to St.35.
- 24 September 2018 (Mon.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.35, 41.
1900 hrs. : Sailing to St.40.
- 25 September 2018 (Tue.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.40, 34.
1900 hrs. : Sailing to St.30.
- 26 September 2018 (Wed.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.30, 31.
1900 hrs. : Sailing to St.32.
- 27 September 2018 (Thu.)**
0600-1200 hrs. : Bottom trawl and Oceanographic survey St.32.
1200 hrs. : Sailing to Songkhla.
- 28 September 2018 (Fri.)**
0800 hrs. : Arrive Songkhla Province.
0900-1700 hrs. : Replenish fresh water and provision.
- 29-30 September 2018 (Sat.-Sun.)**
0800-1700 hrs. : Loading the fuel.
: Unloading all samples.
: Immigration and Custom clearance.
- 1 October 2018 (Mon.)**
0800-1400 hrs. : Preparation for departure.
1500 hrs. : Leave Song Khla for Sihanoukville, Cambodia.
- 3 October 2018 (Wed.)**
0800 hrs. : Arrive Sihanoukville, Cambodia.
0900-1700 hrs. : Immigration and Custom clearance.
- 4 October 2018 (Thu.)**
0800-1700 hrs. : Replenish fresh water and provision.
: Researchers embark the ship.
- 5 October 2018 (Fri.)**
0800 hrs. : Leave Sihanoukville for the Research survey.
1300-1900 hrs. : Bottom trawl and Oceanographic survey start St.63.
1900 hrs. : Sailing to St.65.



- 6 October 2018 (Sat.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.65, 64.
1900 hrs. : Sailing to St.66.
- 7 October 2018 (Sun.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.66, 67.
1900 hrs. : Sailing to St.68.
- 8 October 2018 (Mon.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.68, 69.
1900 hrs. : Sailing to St.73.
- 9 October 2018 (Tue.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.73, 74.
1900 hrs. : Sailing to St.72.
- 10 October 2018 (Wed.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.72, 71.
1900 hrs. : Sailing to St.70.
- 11 October 2018 (Thu.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.70, 75.
1900 hrs. : Sailing to St.76.
- 12 October 2018 (Fri.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.76, 77.
1900 hrs. : Sailing to St.78.
- 13 October 2018 (Sat.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.78, 82.
1900 hrs. : Sailing to St.81.
- 14 October 2018 (Sun.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.81, 80.
1900 hrs. : Sailing to St.79.
- 15 October 2018 (Mon.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.79, 83.
1900 hrs. : Sailing to St.84.
- 16 October 2018 (Tue.)**
0600-1900 hrs. : Bottom trawl and Oceanographic survey St.84, 85.
1900 hrs. : Sailing to St.86.
- 17 October 2018 (Wed.)**
0600-1200 hrs. : Bottom trawl and Oceanographic survey St.86.
1200 hrs. : Leave for Sihanoukville.
- 18 October 2018 (Thu.)**
0700 hrs. : Arrive Sihanoukville, Cambodia.
0900-1700 hrs. : Immigration and Custom clearance.
: Unloading all sample.



19-20 October 2018 (Fri.-Sat.)

0800-1700 hrs.

: Replenish fresh water and provision.
: Researchers disembark the ship.

21 October 2018 (Sun.)

1000 hrs.

: Leave Sihanoukville for PhuQuoc, Viet Nam.

1700 hrs.

: Arrive PhuQuoc pilot station.

22 October 2018 (Mon.)

0800 hrs.

: Alongside PhuQuoc port, Viet Nam.

0900-1700 hrs.

: Immigration and Custom clearance.

23 October 2018 (Tue.)

0800-1700 hrs.

: Replenish fresh water and provision.

: Loading the fuel.

: Researchers embark the ship.

24 October 2018 (Wed.)

0800 hrs.

: Leave PhuQuoc for the Research survey.

1400-1900 hrs.

: Bottom trawl and Oceanographic survey St.87.

1900 hrs.

: Sailing to St.88.

25 October 2018 (Thu.)

0800-1900 hrs.

: Bottom trawl and Oceanographic survey St.88, 89.

1900 hrs.

: Sailing to St.90.

26 October 2018 (Fri.)

0800-1900 hrs.

: Bottom trawl and Oceanographic survey St.90, 91.

1900 hrs.

: Sailing to St.95.

27 October 2018 (Sat.)

0800-1900 hrs.

: Bottom trawl and Oceanographic survey St.95, 94.

1900 hrs.

: Sailing to St.93.

28 October 2018 (Sun.)

0800-1900 hrs.

: Bottom trawl and Oceanographic survey St.93, 92.

1900 hrs.

: Sailing to St.96.

29 October 2018 (Mon.)

0800-1900 hrs.

: Bottom trawl and Oceanographic survey St.96, 97.

1900 hrs.

: Sailing to St.98.

30 October 2018 (Tue.)

0800-1900 hrs.

: Bottom trawl and Oceanographic survey St.98, 99.

1900 hrs.

: Sailing to St.104.

31 October 2018 (Wed.)

0800-1900 hrs.

: Bottom trawl and Oceanographic survey St.104, 103.

1900 hrs.

: Sailing to St.102.

1 November 2018 (Thu.)

0800-1900 hrs.

: Bottom trawl and Oceanographic survey St.102, 101.

1900 hrs.

: Sailing to St.100.



- 2 November 2018 (Fri.)**
0800-1900 hrs. : Bottom trawl and Oceanographic survey St.100, 105.
1900 hrs. : Sailing to St.106.
- 3 November 2018 (Sat.)**
0800-1900 hrs. : Bottom trawl and Oceanographic survey St.106, 107.
1900 hrs. : Sailing to St.108.
- 4 November 2018 (Sun.)**
0800-1900 hrs. : Bottom trawl and Oceanographic survey St.108, 110.
1900 hrs. : Sailing to St.109.
- 5 November 2018 (Mon.)**
0800-1200 hrs. : Bottom trawl and Oceanographic survey St.109.
1200 hrs. : Sailing to PhuQuoc.
- 6 November 2018 (Tue.)**
0800 hrs. : Arrive PhuQuoc, Viet Nam.
0900-1700 hrs. : Immigration and Custom clearance.
- 7-8 November 2018 (Wed.-Thu.)**
0800-1700 hrs. : Replenish fresh water and provision.
: Researchers disembark the ship.
: Loading the fuel.
: Unloading all samples and equipments.
- 9 November 2018 (Fri.)**
1000 hrs. : Leave PhuQuoc for SEAFDEC/TD.
- 11 November 2018 (Sun.)**
0800 hrs. : Arrive SEAFDEC/TD.

7. PERSONNEL

Personnel onboard

1. Number of personnel onboard is thirty-four (34)
 - a. SEAFDEC Crew (15)
 - b. SEAFDEC Researcher (5)
 - c. Invited researcher under SEAFDEC management (4)
 - d. Researcher of host countries (10)
2. There will be no other countries to join the country survey other than host researcher/observer. However, SEAFDEC will invite 5 researchers to work for SEAFDEC (not for country). In addition, all Participating Countries and SEAFDEC agreed to have additional trainees from Member Countries to join the cruise with the objective of human resource development on marine fisheries resource survey. It was further noted that these trainees have no authorization to publish research paper.
3. Managing the number of additional trainee from Member Countries is one (1) person for one (1) leg.
4. Quota of these additional trainees is under SEAFDEC Researcher


Annex 7: Survey Station

Leg 1 (Thai waters)

To Station	Lat.			Long.			Depth (m.)	Course	Distance (Nm)	Remarks
SEAFDEC TD		–			–		–	–	28.0	TD to St.2
2	13	10.08	N	100	40.02	E	18	270	23.1	2
1	13	10.02	N	100	16.50	E	18	181	25.8	1
3	12	44.28	N	100	15.84	E	24	090	22.0	3
4	12	44.10	N	100	38.28	E	35	219	39.1	4
5	12	15.00	N	100	15.00	E	28	090	30.0	5
6	12	15.00	N	100	45.00	E	27	090	30.0	6
7	12	15.00	N	101	15.00	E	32	090	30.0	7
8	12	15.00	N	101	45.00	E	27	105	30.0	8
15	12	7.56	N	102	6.36	E	20	165	15.0	15
17	11	53.10	N	102	10.38	E	40	156	14.4	17
16	11	39.96	N	102	16.26	E	42	263	12.5	16
14	11	38.40	N	102	3.66	E	45	338	14.2	14
13	11	51.54	N	101	58.26	E	50	–	30.0	13
Ko Chang		–			–		Total distance		344.1	Ko Chang

Leg 2 (Thai waters)

To Station	Lat.			Long.			Depth (m.)	Course	Distance (Nm)	Remarks
		–			–		–	–	50.0	Thailand Leg 2
13	11	45.00	N	101	45.00	E	50	270	29.7	13
12	11	45.00	N	101	15.00	E	45	270	29.7	12
11	11	45.00	N	100	45.00	E	38	270	29.7	11
10	11	45.00	N	100	15.00	E	35	225	42.2	10
18	11	15.00	N	099	45.00	E	42	090	29.7	18
19	11	15.00	N	100	15.00	E	45	090	29.7	19
20	11	15.00	N	100	45.00	E	50	090	29.7	20
21	11	15.00	N	101	15.00	E	53	180	30.0	21
25	10	45.00	N	101	15.00	E	60	270	29.8	25
24	10	45.00	N	100	45.00	E	57	270	29.7	24
23	10	45.00	N	100	15.00	E	47	270	29.7	23
22	10	45.00	N	099	45.00	E	45	138	42.9	22
27	10	13.02	N	100	13.80	E	50	090	32.0	27
28	10	12.54	N	100	46.08	E	60	090	29.7	28
29	10	12.54	N	101	16.08	E	70	180	28.1	29
39	09	44.46	N	101	16.14	E	65	274	30.0	39
38	09	46.56	N	100	46.08	E	55	–	60.0	38
KoSamui.							Total distance		570.1	KoSamui



Leg 3 (Thai waters)

To Station	Lat.			Long.			Depth (m.)	Course	Distance (Nm)	Remarks
		–			–		–	–	50.0	Thailand Leg 2
42	09	30.00	N	099	48.24	E	12	004	15.3	
36	09	45.24	N	099	49.44	E	15	270	14.3	
35	09	45.18	N	099	35.04	E	23	178	15.2	
41	09	30.00	N	099	35.64	E	4	269	11.6	
40	09	29.88	N	099	24.00	E	5	356	15.4	
34	09	45.24	N	099	22.92	E	17	001	13.3	
30	09	58.50	N	099	23.04	E	22	085	13.7	
31	09	59.64	N	099	36.78	E	30	027	15.0	
26	10	13.02	N	099	43.80	E	45	158	19.0	
32	09	55.38	N	099	50.82	E	34	076	15.3	
33	09	59.16	N	100	5.76	E	48	141	16.2	
37	09	46.56	N	100	16.08	E	25	183	31.5	
43	09	15.12	N	100	14.28	E	29	090	29.8	
44	09	15.18	N	100	44.22	E	38	090	29.8	
45	09	15.18	N	101	14.22	E	65	175	29.1	
48	08	46.14	N	101	16.68	E	60	266	28.1	
47	08	44.04	N	100	48.48	E	32	270	29.9	
46	08	44.04	N	100	18.48	E	24	136	36.3	
49	08	17.70	N	100	43.62	E	25	176	33.7	
53	07	44.10	N	100	46.08	E	30	–	40.0	
KoSamui							Total distance		570.1	KoSamui

Leg 4 (Thai waters)

To Station	Lat.			Long.			Depth (m.)	Course	Distance (Nm)	Remarks
Songkhla to St.58		–			–		–	–	15.0	Thailand Leg 4
58	07	15.54	N	100	49.20	E	20	090	30.0	
59	07	15.54	N	101	19.20	E	40	092	26.6	
60	07	14.52	N	101	45.78	E	50	137	41.0	
62	06	44.52	N	102	13.68	E	50	004	30.0	
61	07	14.52	N	102	15.78	E	50	045	42.3	
57	07	44.46	N	102	45.66	E	80	270	29.9	
56	07	44.46	N	102	15.66	E	75	357	30.2	
52	08	14.58	N	102	13.92	E	75	270	29.9	
51	08	14.58	N	101	43.92	E	55	177	30.2	
55	07	44.46	N	101	45.66	E	65	269	29.5	
54	07	44.10	N	101	16.08	E	40	356	32.1	
50	08	16.08	N	101	13.62	E	40	–	80.0	
Songkhla Province							Total distance	446.7	Songkhla Province	



Total distance from Songkhla, Thailand to Sihanoukville, Cambodia is 280 Nm

Leg 5 (Cambodia waters)

To Station	Lat.			Long.			Depth (m.)	Course	Distance (Nm)	Remarks
Sihanoukville to St.74		–			–		–	–	40.0	Cambodia waters
74	10	22.20	N	103	37.60	E	25	281	17.3	
73	10	20.50	N	103	20.50	E	25	308	15.6	
69	10	35.00	N	103	08.00	E	28	303	9.8	
68	10	40.40	N	102	59.70	E	35	352	19.7	
65	10	59.90	N	102	57.00	E	28	335	15.7	
63	11	14.20	N	102	50.40	E	28	216	17.4	
64	11	0.10	N	102	40.00	E	45	217	25.0	
66	10	40.10	N	102	25.00	E	60	088	14.5	
67	10	40.50	N	102	39.70	E	50	178	20.1	
71	10	20.40	N	102	40.50	E	55	269	20.4	
70	10	20.00	N	102	19.90	E	65	182	20.5	
76	09	59.50	N	102	19.20	E	65	272	19.7	
75	10	00.20	N	101	59.30	E	70	177	20.6	
79	09	39.60	N	102	00.50	E	70	089	19.3	
80	09	39.90	N	102	20.00	E	70	179	20.2	
84	09	19.70	N	102	20.50	E	65	271	20.0	
83	09	20.00	N	102	04.80	E	70	120	29.6	
86	09	05.00	N	102	26.20	E	70	043	20.4	
85	09	20.00	N	102	40.10	E	70	354	21.8	
81	09	41.70	N	102	37.90	E	60	095	22.1	
82	09	39.80	N	103	0.10	E	50	316	28.3	
77	10	0.00	N	102	40.10	E	55	090	19.8	
78	10	0.00	N	103	00.10	E	40	001	20.5	
72	10	20.50	N	103	00.50	E	35	–	40.0	
Sihanoukville Cambodia							Total distance	538.3	Sihanoukville Cambodia	

Total distance from Sihanoukville, Cambodia to PhuQuoc Island, VN is 70.0 NM



Leg 6 (Viet Nam waters)

To Station	Lat.			Long.			Depth (m.)	Course	Distance (Nm)	Remarks
87	10	12.00	N	104	24.00	E	8	201	15.0	87
88	10	00.00	N	104	15.00	E	10	089	15.0	88
89	10	00.00	N	104	30.00	E	10	241	23.8	89
90	09	51.00	N	104	07.80	E	15	090	22.0	90
91	09	51.00	N	104	30.00	E	13	156	21.0	91
95	09	30.00	N	104	30.00	E	15	276	12.0	95
94	09	30.00	N	104	18.00	E	20	266	17.9	94
93	09	30.00	N	104	00.00	E	23	265	19.7	93
92	09	30.00	N	103	40.20	E	35	224	50.0	92
96	09	00.00	N	103	00.00	E	40	086	29.8	96
97	09	00.00	N	103	30.00	E	45	091	29.8	97
98	09	00.00	N	104	00.00	E	30	090	29.8	98
99	09	00.00	N	104	30.00	E	20	190	30.0	99
104	08	30.00	N	104	30.00	E	23	269	29.9	104
103	08	30.00	N	104	00.00	E	25	270	29.9	103
102	08	30.00	N	103	30.00	E	30	269	19.7	102
101	08	30.00	N	103	10.20	E	45	271	25.1	101
100	08	30.00	N	102	45.00	E	50	271	33.4	100
105	08	00.00	N	103	00.00	E	75	089	29.9	105
106	08	00.00	N	103	30.00	E	50	094	29.9	106
107	08	00.00	N	104	00.00	E	30	097	29.9	107
108	08	00.00	N	104	30.00	E	30	247	33.5	108
110	07	45.00	N	104	00.00	E	40	251	29.9	110
109	07	45.00	N	103	30.00	E	50	–	140.0	109
PhuQuoc Island		–			–		Total distance	789.9		

Total distance from PhuQuoc Island, Viet Nam to SEAFDEC/TD is 330.0



Annex 8: M.V. SEAFDEC2 ship particular

Main Dimensions

Length Overall (Loa)	33.24 m
Breadth, Molded (B)	7.2 m
Design draft, Molded (D)	2.7 m
Gross tonnage	211 t (international)

Machinery

Main Engine Output 1000 Ps	1 Unit
Electric Generator 120 KVA	2 Unit

Speed and endurance

Maximum speed at sea trial	12.5 knot
Service speed	12.0 knot
Fuel oil consumption (24 hours)	3.83 ton/day
Endurance about	39,000 nautical miles

Complement

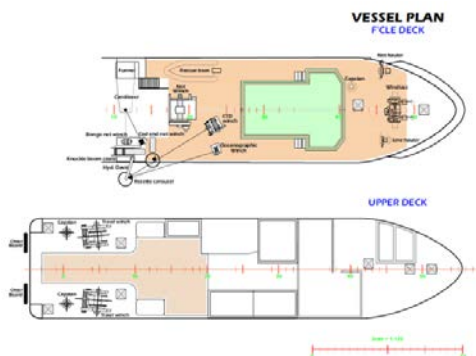
Crew	15 persons
Instructor/scientist/participants	22 persons
Total	37 persons

Ship Builder

Niigata, Japan

Delivery

2004






Nautical and electronics equipment: Magnetic compass, Gyro Compass and Auto Pilot, GPS navigator, Radar, Digital sea water/Ambient thermometer.

Oceanographic Equipment: Conductivity Temperature and Depth System, Thermo-salinograph and Fluormeter, Expandable Bathythermograph, Profiling Reflectance Radiometer System. Temperature and Depth Recorder, Water Sampler, Core sampler, Bottom Sediment Sampler, and Plankton Net System

Fishing Equipment: Direction finder, Color fish finder, Scanning sonar, Trawl monitor, Underwater television, Fishing gear: Bottom trawl, Midwater trawl, Pelagic longline, Bottom longline, Drifting gillnet, and Automatic squid jigging






Annex 9: Research Equipment

No.	Equipment	Details	Picture
1	Conductivity, Temperature and Depth (CTD)	The system (Seabird 911 plus equipped with accessory sensors) is designed for real-time data acquisition and control to measure in situ temperature, salinity, Oxygen, pH, fluorescence and depth. The system is able to operate until 1,500 meter deep.	
2	Profiling Reflectance Radiometer System (PRR)	The system includes an underwater radiometer (PRR-2600), on deck references radiometer (PRR-2610) and software for operation and data acquisition.	
3	Temperature/Depth Sensor	The instrument is designed for measuring and recording temperature and depth. Maximum depth 500 m.	






No.	Equipment	Details	Picture
Water sampler			
4	Van Dorn 10 L	Van Dorn water sampler is suited for collecting large volume of water in middle layer. The tube is made of polyethylene.	
5	Rosette Multi-bottle Arrays with 12 Niskin 1.7 L	Rosette Multi-bottle arrays with 12 Niskin 1.7 L can be remotely actuate either independently, or in conjunction with CTD system.	
Sediment sampler			
6	Piston Core	The piston core sampler is a kind of gravity type free drop system core sampler with pilot bottom sampler. It is used for collecting a depth profile of sediment (dia. approx. 40 mm, length 0.5m).	



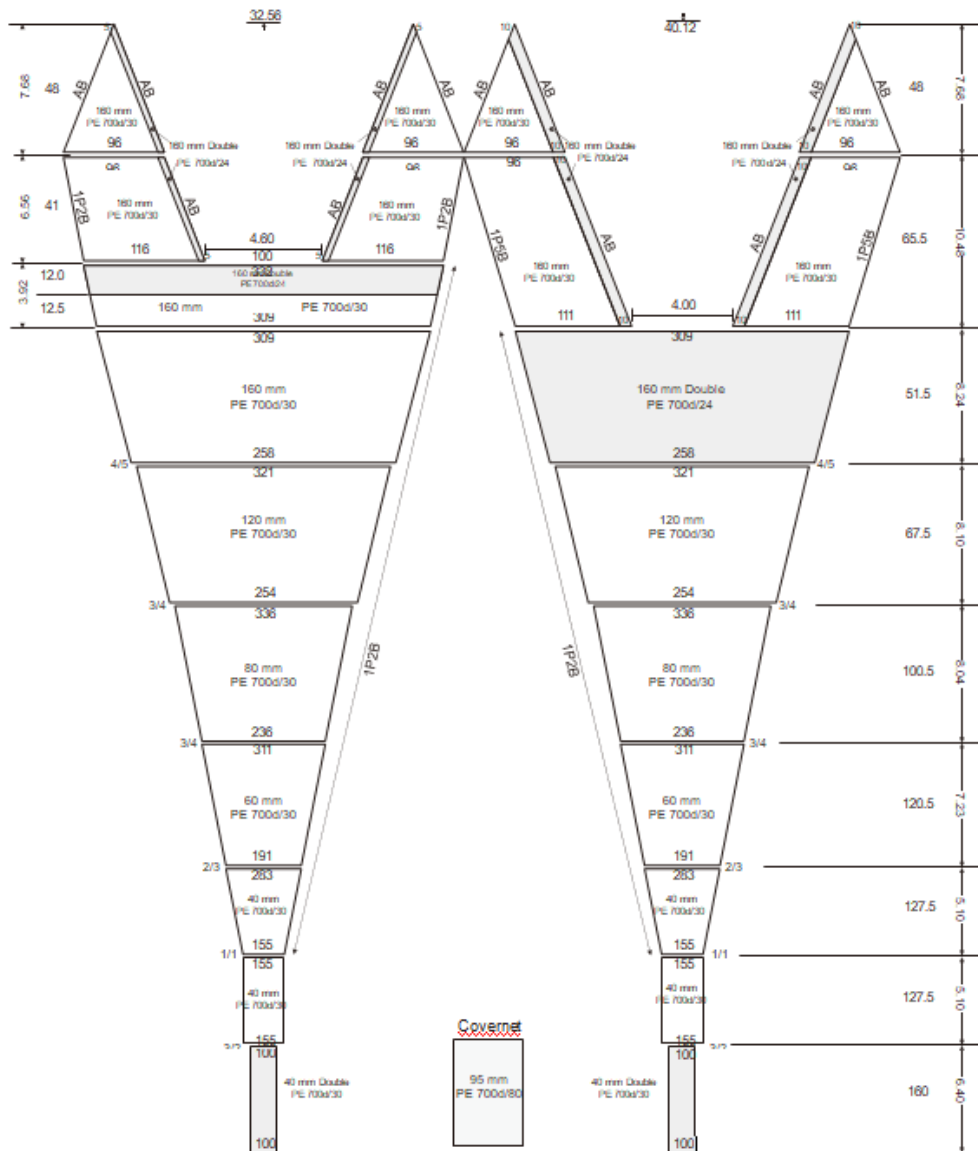
No.	Equipment	Details	Picture
Sediment sampler			
7	Gravity Core	<p>The gravity core sampler is a free drop system core sampler. It is used for collecting a depth profile of sediment. (Dia. approx. 50 mm, length 1 m).</p>	
8	Box Core	<p>The box core sampler is used for collecting soft sediment. Size 30 × 30 × 60 cm.</p>	
9	Smith McIntyre Grab	<p>The Smith McIntyre bottom sampler is designed to take samples ranging from soft mud to hard bottom ground. Size 33 × 33 cm.</p>	



No.	Equipment	Details	Picture
Plankton net			
10	Bongo Net	<p>The Bongo net is designed for long oblique tows. It consists of two stainless steel frames (cylindrical shape with 45 cm. inside diameter) and 1 set of bongo net, which includes a zooplankton net 330μm and larvae net 500 μm. Towing depth is observed/monitored by using Net SONDE (depth meter).</p>	
11	Neuston Net	<p>Rectangular mouthed Neuston net with mesh size of upper part 1,000 μm and lower part 600 μm is used for the juvenile fish collection at the surface layer.</p>	
12	Phytoplankton Net	<p>Plankton net, mesh size 20 μm is used for vertical towing or filtrate phytoplankton from sea water.</p>	



Bottom Trawl Net



Bottom Trawl net, which are operated by dragging or towing the flexible net through the water by fishing craft. In particular otter board is operated from the stern of the vessel. Bottom trawl is operated by drawing the net along the sea bed to scoop up fish on or near the bottom, depending on manner in which the gear is constructed and rigged, its operating characteristic can be altered for use on various types of bottom and for many species of fish. Bottom trawl net used in the survey has specification as follow;

- | | |
|-----------------------|----------|
| 1) Ground rope length | 40.12 m. |
| 2) Head rope length | 32.56 m. |
| 3) Total net length | 58.11 m. |
| 4) Codend length | 6.40 m. |
| 5) Wing net mesh size | 160 mm. |
| 6) Codend mesh size | 40 mm. |



Annex 10: Proposed Research Topics

Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
Fisheries Resource						
1) Some Biological Data of Pelagic and Demersal Fish in the Gulf of Thailand by Using Bottom Trawl	<ul style="list-style-type: none"> - To study catch rate, species composition and size composition - To study fish abundance and distribution - To study length-weight relationship 	<ul style="list-style-type: none"> - Capture rate, species and size composition of pelagic and demersal fish in the Gulf of Thailand - Abundance and distribution of pelagic and demersal fish in the Gulf of Thailand - Relationship between the length and weight of pelagic and demersal fish in the Gulf of Thailand 	- Bottom trawl	<ul style="list-style-type: none"> - Fish samples will be collected by using trawl operated during daytime. - Trawling time will be one hour for each station. - Sample will be divided into seven groups, i.e. pelagic fish, demersal fish, cephalopods, shrimps, crabs, true trash fish, and miscellaneous species including shell, mantis shrimp, and flathead lobster. - After identification, sample will be weighted and measured the length by using 0.5 cm. interval punching paper. - Total length will be applied for fishes, mantle length for cephalopods, total length for shrimps and mantis shrimp, and carapace width for crabs. 	6 months	<ol style="list-style-type: none"> 1. Mr. Tanut Srikhum 2. Mr. Nirun Chusuan (DoF Thailand)
2) Demersal Fish Survey Using Hydro-acoustic Instrument	<ul style="list-style-type: none"> - To study species and composition by using trawl - To study catch per unit effort and catch per unit area - To analyze density and distribution at different depth. 	- Biomass and density of demersal fish can be estimated by integrating traditional trawling and acoustic survey.	- Scientific echo-sounder	<ul style="list-style-type: none"> - Fish sample will be collected by trawling at the trawling speed of 2.5 knot. - Species will be identified and size will be measured by punching on punching paper. - Acoustic data will be collected by scientific echo-sounder at the speed of 8 knot. 	6 months	<ol style="list-style-type: none"> 1. Mr. Pavarot Noranarttragoon 2. Ms. Anyanee Yamrungrueng 3. Mr. Sakol Pheaphabattana 4. Mr. Sichon Hoimuk (DoF Thailand)
3) Demersal Fisheries Resources Survey in Viet Nam EEZ	- To assess the demersal fisheries resources, in the marine waters of Vietnam by trawl	- Report on the Biomass of the Demersal Fisheries Resource of the Southern Viet Nam	<ul style="list-style-type: none"> - Scientific echo-sounder - Bottom trawl 	- Hydro-acoustic survey: Simrad EK-60 by using multi acoustic frequency (38, 120, and 200 kHz), average cruise speed of the vessel is 5 knots (more or less depending on the sea condition)		<ol style="list-style-type: none"> 1. Mr. Nguyen Viet Nghia (Team leader of Viet nam) (RIMF-Viet Nam)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
	net and using hydro-acoustic survey			- Demersal fish sampling by otter board trawl		
4) Small pelagic Resource Survey by hydro-acoustic Instrument, i.e. Scientific Echo-sounder Simrad EK-60	- To assess the small pelagic fisheries resources, including: anchovy, herring, mackerel, hairtail, scad, yellow-tail scad, etc in the marine waters of Vietnam by using hydro-acoustic survey	- Report on the Biomass of the Small Pelagic Fisheries Resource of the Southern Viet Nam	- Scientific echo-sounder - Bottom trawl	- Hydro-acoustic survey: Simrad EK-60 by using multi acoustic frequency (38, 120, and 200 kHz), average cruise speed of the vessel is 5 knots (more or less depending on the sea condition) - Small pelagic sampling by otter board trawl		1. Mr. Nguyen Viet Nghia (Team leader of Viet nam) (RIMF-Viet Nam)
5) Biomass Estimation by Hydro-acoustic Method in the Gulf of Thailand	- Biomass estimation in the Gulf of Thailand	- Distribution of biomass in the Gulf of Thailand	- Scientific echo sounder - ADCP - CTD - Total biomass - Duration	- The reflection signal of scientific echo sounder could be interpreted the distribution of biomass		1. Dr. Monton Anongponyoskun (KU)
6) Marine Species Identification			- Bottom trawl	- Demersal fish sampling by otter board trawl		Wait for leader (FiA Cambodia)
Environment (Physical)						
7) Water Column Condition and Near-Bottom Water Hypoxia in the Gulf of Thailand	- To investigate water column condition during the cruise survey and the relationship between water column condition and the	- Status of water column condition in the Gulf of Thailand and the influence of water mass from the South China Sea will be clarified. - The development	- CTD 911 plus	- Using CTD 911 plus collect the environment data from the surface to bottom at all survey station	6 months	1. Dr. Anukul Buranapratheprat (Burapha University) 2. Mr. Sakda Arbsuwan (DoF Thailand) 3. Mr. Sukchai Arnupapboon 4. Ms. Pontipa Luadnakrob (SEAFDEC)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
	development of near-bottom hypoxic water - To investigate the influence of the South China Sea on water column condition and near-bottom hypoxic water	of near-bottom hypoxic water and related oceanographic condition will be elucidated.				
8) Residual Current from Ship ADCP	- To investigate the residual surface current pattern based on the ship drift data	- Residual current pattern based on ship drift data	- Onboard ADCP	- Record position of ship during stationed for the whole period and record Current data at several depths in every one hour throughout the cruise survey	6 month	1. Dr. Suriyan Saramul 2. Dr. Patama Singhruck (CU) 3. Dr. Anukul Buranapratheprat (BU)
9) Geostrophic Current in the Gulf of Thailand	- To investigate the geostrophic current based on temperature, salinity, and pressure data	- Geostrophic current in the Gulf of Thailand	- CTD 911 plus	- Temperature, salinity, and pressure recorded by CTD		1. Dr. Suriyan Saramul 2. Dr. Patama Singhruck 3. Dr. Pramot Sojisuporn (CU)
10) Three Dimensional Circulation in the Gulf of Thailand During Southwest Monsoon	- To study 3-D circulation model in the Gulf of Thailand	- Circulation pattern based on tide, wind, and density forcing	- CTD 911 plus - Onboard wind speed and direction	- Temperature, salinity, and pressure recorded by CTD - Wind speed and direction during the cruise - Recorded sampling position	6 months	1. Dr. Suriyan Saramul 2. Dr. Patama Singhruck (CU)
11) Water and Material Exchanges at the Mouth of the Gulf of Thailand	- To estimate the exchange of water mass between the Gulf Of Thailand	- The amount of seawater & freshwater being transferred between	- CTD 911 plus	- Temperature, salinity, and pressure recorded by CTD	12 months	1. Dr. Pramot Sojisuporn 2. Dr. Suriyan Saramul (CU)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
	(GOT) and South China sea (SC)	the two water bodies.				
12) Relationship Between Chlorophyll- <i>a</i> Concentration in the Gulf of Thailand and Ocean Color from Remote Sensing	<ul style="list-style-type: none"> - To explain chlorophyll-<i>a</i> concentration distribution in the Gulf of Thailand - To find out relationship between Chlorophyll-<i>a</i> concentration of the Gulf of Thailand and ocean color from remote sensing with ESA case2 algorithm (coastal area) 	<ul style="list-style-type: none"> - To introduce the ESA case2 algorithm to monitor or estimate chlorophyll-<i>a</i> in the Gulf of Thailand 	<ul style="list-style-type: none"> - GFF filter paper - Acetone - 100 um to 150 um mesh size plankton net - Aluminum foil - Magnesium carbonate - Vacuum pump 	<ul style="list-style-type: none"> - Collect surface water - Pre-filtering through a nylon net of 100 um to 150 um mesh size to remove zooplankton (some species have chlorophyll) - Filter 1 liter of water sample through GFF filter paper (Vacuum pump ~0.5 bar) - Added on the filters, with Magnesium carbonate to preventing acid degradation of chlorophyll - Fold the filters and keep in Aluminium Foil (label properly) - Keep in -20°C (up to eight weeks) for storage and transfer to lab 	6 months	<ol style="list-style-type: none"> 1. Dr. Wirote Laongmanee 2. Ms. Penchan Laongmanee 3. Dr. Prasarn Intacharoen (BU) 4. Ms. Siriporn Pangsorn (SEAFDEC) 5. Dr. Penjai Sompongchaiyakul (CU)
13) Inherent Properties of Sea Water in Gulf of Thailand	<ul style="list-style-type: none"> - To estimate the inherent optical properties 	<ul style="list-style-type: none"> - Understanding bio-optical properties of coastal waters to improve the accuracy of derived water constituents from ocean color data 	<ul style="list-style-type: none"> - PRR 2600 - Van Dorn - Filter set 	<ul style="list-style-type: none"> - Using PRR 2600 collect the upwelling radiance and downwelling irradiance of sea water from the surface to bottom at all survey station - Collect water sample about 5 l. at surface layer using Van Dorn <p>To collect sample for measuring Chlorophyll-<i>a</i></p> <ul style="list-style-type: none"> - Filtered 100 ml of water sample through Whatman GF/F 25 mm - Rinse the funnel and filtered filter with 0.2 µm filtered seawater <p>Collect the filtrated water in 7ml of N,N-Dimethylformamide (DMF) and store at -20°C until processing in the laboratory</p>	6 months	<ol style="list-style-type: none"> 1. Dr. Jitraporn Phaksopa 2. Ms. Jutarak Luang-on (KU)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
13) Inherent Properties of Sea Water in Gulf of Thailand (Cont.)				<p><i>To collect sample for measuring phytoplankton absorption coefficient</i></p> <ul style="list-style-type: none"> - filtered 1-2 l. of water sample through - Whatman GF/F 25 mm - Rinse the funnel and filtered filter with 0.2 µm filtered seawater - Collect the filtrated water in a dark container and store at -80°C until processing in the laboratory <p><i>To collect sample for measuring Total Suspended Matter – TSM</i></p> <ul style="list-style-type: none"> - Water samples (≈ 0.5 – 1L) collected from sea surface are filtered under low vacuum (<5 in Hg) through 47 mm, 0.2 µm Whatman Nucleopore polycarbonate filters. - Rinse the filtered filter with 0.2 µm filtered seawater. - Wash the filtered filter at least 50 ml of MilliQ through the filtration apparatus to remove any salt. Repeat this procedure three times. - With the vacuum pressure still on, carefully remove the filtration cup and using a pipet gently wash the outer edge (unfiltered area) of the filter. - Stop the vacuum pressure and store the filtrated filter in plastic petri dish at -20°C (-80°C, if available) until processing in the laboratory. - <i>To collect sample for measuring Colored Dissolved Organic Matter – CDOM (m-1)</i> <p>Water samples collected from sea surface</p>		



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
13) Inherent Properties of Sea Water in Gulf of Thailand (Cont.)				<p>are directly used to wash the glass brown bottles and caps three times and collect 200 ml of seawater in the bottles.</p> <ul style="list-style-type: none"> - Filtered the water sample through 47 mm, 0.2 μm WhatmanNuclepore polycarbonate filters at a vacuum pressure of 120 mm Hg, - Wash the glass brown bottle and cap with the small volume of filtered water three times. The bottles and filtered - water should not be contaminated with any phytoplankton cells, - Store the last 100ml of filtered water in the washed glass brown bottles. Cap the bottles and store in a refrigerator (-4°C). 		
14) Sedimentary Properties and Sedimentation Rate of Sediment in the Gulf of Thailand	<ul style="list-style-type: none"> - To document and interpret primary and secondary sedimentary structures - To correlate synchronous laminations between different cores 	<ul style="list-style-type: none"> - Understanding of sedimentary properties and the processes of structures - sediment redistribution and sediment accumulation 	<ul style="list-style-type: none"> - Gravity corer - Freezer 	<ul style="list-style-type: none"> - Sediment core-samples keep frozen/cooled to bring back to CU's laboratory - Analysis by X-ray radiography will be performed in the laboratory 		<ol style="list-style-type: none"> 1. Dr. Penjai Sompongchaiyakul 2. Dr. Supitcha Chanyotha 3. Dr. Butsawan Bidorn 4. Dr. Sujaree Bureeku (CU) 5. Dr. Yuttana Toomnoi (OAP)
15) Temporal Distribution of Mercury and Trace Metals in Sediment	<ul style="list-style-type: none"> - To investigate spatial distribution and annual variations of mercury and trace metals - to investigate pollution status for mercury and trace 	<ul style="list-style-type: none"> - Understanding historical development in the watershed surrounding the Gulf of Thailand 	<ul style="list-style-type: none"> - Gravity corer - Freezer 	<ul style="list-style-type: none"> - Sediment core-samples keep frozen/cooled to bring back to CU's laboratory - Sub-sample will be done after analysis by X-ray radiography in the laboratory 		<ol style="list-style-type: none"> 1. Dr. Penjai Sompongchaiyakul 2. Dr. Sujaree Bureeku (CU) 3. Dr. Yuttana Toomnoi (OAP)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
	metals from surrounding watershed					
16) Integrates Low-cost Sonar Imagery and GIS to Map Underwater Habitat	<ul style="list-style-type: none"> - To describe the characteristic of bottom habitat - To identification the underwater habitat - To produce the important underwater habitat mapping of Gulf of Thailand 	<ul style="list-style-type: none"> - Important underwater habitat mapping of Gulf of Thailand 	<ul style="list-style-type: none"> - Lawrence structure scan system - Data storage - Portable GPS connect to structure scan system 	<ul style="list-style-type: none"> - Data recorded as 3-4 knots speed of vessel with GPS operation by zigzag track for 10 minute of each station. - 	6 months	<ol style="list-style-type: none"> 1. Dr. Wirote Laongmanee 2. Ms. Penchan Laongmanee (BU) 3. Ms. Siriporn Pangsong (SEAFDEC)
Environment (Chemical)						
17) Microplastics Accumulations in Fish, Sediment, and Seawater	<ul style="list-style-type: none"> - To determine the accumulation rates of microplastics in dominant and economically important fish - To determine the accumulation rates of microplastics in seawater - To determine the accumulation rates of microplastics in sediment - To estimate to possibility of microplastics transportation in food chains in the 	<ul style="list-style-type: none"> - Information on the microplastics accumulation in fish, sediment, and in seawater 	<ul style="list-style-type: none"> - Otter board trawl - Neuston net - Smith McIntyre grab 	<p>To collect fish</p> <ul style="list-style-type: none"> - Six species of fish will be collected by trawl net. Three species will be from dominant groups and three species will be from the economically important fish group - At least 15 individuals of each species will be collected - All fish will be kept at -20°C for further investigation <p>To collect seawater</p> <ul style="list-style-type: none"> - Towed Neuston net at surface layer at least 20 minutes at each station - All water samples will be transferred to plastic bottle and kept at -20°C for further investigation - At least 10 stations will be investigated <p>To collect sediment</p>	10 months	<ol style="list-style-type: none"> 1. Ms. Pontipa Luadnakrob (SEAFDEC) 2. Dr. Voranop Viyakarn 3. Dr. Suchana Chavanich (CU)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
	sea			<ul style="list-style-type: none"> - Smith McIntyre grabs will be operated - At least 1 kg of sediments will be collected at each station - All sediment samples will be transferred into plastic bag and kept at -20°C for further investigation - At least 10 stations will be investigated 		
18) Distribution of Total Organic Matter in Marine Sediments of the Gulf of Thailand	<ul style="list-style-type: none"> - Study on Total Organic Matter in sediment of the Gulf of Thailand 	<ul style="list-style-type: none"> - Changing of total organic matter of sediment indicated the enrichment status of sediment and reflecting the sufficient organic food source for organism in sediment 	<ul style="list-style-type: none"> - Box core - CTD 199 plus 	Sediment samples from box corer. <ul style="list-style-type: none"> - Cut the sediment samples by cut plate. - Cut vertically into 10 depth ranges as 0-0.5, 0.5-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, 8-9 and 9-10 cm. - Keep the samples in plastic bag (zip lock bag). - Study on sediment characteristic such as size, color, composition and smell of sediment samples. Then, keep the sediment samples at -20°C until analysis. - The method for Total Organic Matter apply by loss-on-ignition techniques (Verardoet <i>al.</i>, 1990) 	6 months	1. Dr. Shettapong Meksumpun (KU)
19) Mercury and Arsenic in Seawater	<ul style="list-style-type: none"> - To determine Hg and As concentration in seawater 	<ul style="list-style-type: none"> - Baseline of Hg and As in seawater of the Gulf of Thailand 	<ul style="list-style-type: none"> - Rosette - CU - Acid prewashed bottles 	<ul style="list-style-type: none"> - Clean handed sampling techniques Water samples keep frozen to bring back to CU's laboratory 		1. Dr. Penjai Sompongchaiyakul 2. Dr. Sujaree Bureekul (CU)
20) Flux of Nutrient and Nutrient Pool in Sediment	<ul style="list-style-type: none"> - To investigate nutrient concentration in overlying water, porewater and sediment 	<ul style="list-style-type: none"> - Understanding of sediment's roles in contribution of nutrient of the water column 	<ul style="list-style-type: none"> - Box corer 	Overlying water 4 short core sediment samples Core 1 <ul style="list-style-type: none"> - sub-section and keep frozen to bring back for grain size, readily oxidizable organic matter, total organic carbon, carbonate 		1. Dr. Penjai Sompongchaiyakul 2. Dr. Sujaree Bureekul (CU)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
				content, mercury and trace metals analysis at CU's laboratory		
21) Iron-sulfer-phosphorus Cycling	- To investigate iron and sulfur concentration in porewater of sediment	- Understanding of sediment's roles in controlling trace metals availability under reducing condition	- Box corer	Core 2 - Measuring of for vertical profile of iron and sulfur in sediment on-board using Core 3 - electrochemical technique - Porewater squeezing on-board and analysis for nutrients on-board - After porewater extraction, sub-section and keep frozen to bring back for nutrient analysis at CU's laboratory		1. Dr. Penjai Sompongchaiyakul 2. Dr. Sujaree Bureekul (CU)
22) Mercury and Trace Elements Contamination in the Surface Sediment	- To determine Hg and trace elements concentration in surface sediment	- Identification of potential sources of pollutants accumulated in sediment		- Porewater squeezing on-board and analysis for nutrients on-board - After porewater extraction, sub-section and keep frozen to bring back for nutrient analysis at CU's laboratory		
23) Spatial Sedimentology and Source Area Composition of Sediment in the Gulf of Thailand	- To investigate sediment properties including size fraction, readily organic matter, total organic matter, carbonate and nutrients.	- Identification of potential sources of sediment		Core 4 Sediment will be sub-section and keep frozen to bring back for petroleum and PAHs analysis at CU's laboratory		3. Dr. Penjai Sompongchaiyakul 4. Dr. Sujaree Bureekul (CU)
24) Petroleum Hydrocarbon (as chrysene) and Polycyclic Aromatic Hydrocarbon (PAHs)	- To determine total PHCs (as chrysene equivalent) and PAHs accumulated in sediment	Identification of potential sources of PAHs and risk area		- Similar with No. 23		1. Dr. Penjai Sompongchaiyakul 2. Dr. Sujaree Bureekul (CU) 3. Dr. Danai Tipmanee (PSU)
25) Total Petroleum Hydrocarbons (TPHs) in Surface Seawater (as chrysene)	- To determine concentration of TPHs in surface seawater	- Contamination and distribution of TPHs in surface seawater of the Gulf of Thailand	- Dropped bottle system	- 3 L of seawater sample of each station will be collected and preserved by 50 ml. of n-hexane until analytical procedure (IOC/UNESCO, 1988) - Seawater samples will be extracted by 150 ml. of n-hexane.	6 months	1. Ms. Suthida Kantareklap 2. Mr. Supawat Kantareklap (DMCR)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
25) Total Petroleum Hydrocarbons (TPHs) in Surface Seawater (as chrysene)				<ul style="list-style-type: none"> - Remove water from extracted samples by using anhydrous sodium sulphate. - Samples will be concentrated to 10 ml. by rotary evaporator and analyze by Fluorescence spectroscopy technique, Luminescence (Perkin-Elmer, model LS-55B, using Chrysene as standard, Excitation wavelength = 310 nm. and Emission wavelength = 360 nm. (Farrington <i>et al.</i>, 1988) 		
26) Mercury Accumulation in Tissues and Risk Assessment for Consumption	<ul style="list-style-type: none"> - To determine Hg accumulated in demersal fish - To determine trace metal in demersal fish - To compare the amount of trace metal accumulating in each species - To assess risk of obtaining trace metal from consumption 	<ul style="list-style-type: none"> - Hg and trace metal in demersal fish - Estimation of trace metal accumulation from seafood consumption - Suggested amount of seafood for safe consumption 	<ul style="list-style-type: none"> - Otter board trawl 	<ul style="list-style-type: none"> - Fish samples, 3 individuals for each species of each station - Fish samples keep frozen to bring back to CU's laboratory 		<ol style="list-style-type: none"> 1. Dr. Penjai Sompongchaiyakul 2. Dr. Sujaree Bureekul (CU) 1. Ms. Tasawan Khawsejan 2. Mr. Somchai Vibunpant 3. Ms. Thitiporn Suppanirun 4. Mr. Patinya Sreesamran (DoF Thailand)
27) Radiation Dose and Radiological Risk Assessment in Marine Biota and Seafood Consumers	<ul style="list-style-type: none"> - To determine radio activity from both natural and artificial radio nuclides in seawater and sediment - To calculate radiation doses and risks in marine 	<ul style="list-style-type: none"> - High quality scientific data to be used for setting up the national radiological safety guideline values of the local marine organisms and the seafood consumers - The national marine 	<ul style="list-style-type: none"> - Smith McIntyre Grab - Van Dorn - NaI detectors 	<p>To collect Seawater</p> <ul style="list-style-type: none"> - 25 Liters of surface seawater is collected and acidified to be 1.6 using 14 M HCl to avoid an absorption of radionuclides on a container - <u>Natural radionuclide measurement</u> <ul style="list-style-type: none"> ▪ 5 L of the seawater is dried to 1 L and is then placed into a 1 L bottle ▪ The bottle containing 1 L of the sample is gamma-counted using a 	6 month	<ol style="list-style-type: none"> 1. Dr. Yutthana Tumnoi 2. Dr. Suputra Visetpotjanakit 3. Ms. Darunwan Chuenbubpar 4. Ms. Prannicha Hongpitakpong 5. Mrs. Natchakan Nakkaew 6. Mr. Chitsanupong Khrautongkieo



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
<p>27) Radiation Dose and Radiological Risk Assessment in Marine Biota and Seafood Consumers</p>	<p>biota and seafood consumers</p> <ul style="list-style-type: none"> - To establish the national safety guideline values for protecting local marine organisms and seafood consumers from possible radiological hazards - To establish the national marine environmental radioactivity database and mapping to be used as a reference in future nuclear and radiological emergencies - To share obtained data with the regional and the international databases 	<p>environmental radioactivity and radiation dose database and mapping</p> <p>-</p>		<p>gamma</p> <ul style="list-style-type: none"> ▪ Spectrometry for 3 hours or longer followed by calculation of radioactivity from the natural radionuclides <p>- <u>Cs-137 measurement</u></p> <ul style="list-style-type: none"> ▪ 0.26 grams of CsCl is added into 20 L of the stirred seawater ▪ 4 grams of Ammonium Phosphomolybdate (AMP) is then added followed by 1 hour stirring ▪ The solution is then left overnight prior to a filtration using 5B filter paper ▪ 1 M HNO₃ is used to rinse all residual and the prepared sample is placed into a plastic pettish disc with a diameter of 5 cm and a thickness of 0.5 cm prior to overnight dryness at the room temperature ▪ The sample is then placed into a gamma spectrometry for 3 hours or longer followed by calculation of Cs-137 radioactivity in the sample <p><i>To collect Sediment</i></p> <ul style="list-style-type: none"> - 1 kg of surface sediment is collected using a sediment grab and placed into a sealed plastic bag - The sediment is then dried at the room temperature for few days prior to grinding - The ground sample is placed into a cylinder container followed by a 3 hour (or longer) measurement using a gamma spectrometry and calculation of radioactivity from natural and artificial 		<p>(OAP)</p>



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
27) Radiation Dose and Radiological Risk Assessment in Marine Biota and Seafood Consumers				<p>radionuclides</p> <p>To collect Biota</p> <ul style="list-style-type: none"> - 1 kg of individual marine biota is sampled and frozen prior to a sample preparation - Only edible parts are taken from the biota to be dried in an oven at 150°C for 8 hours - Prior to grinding, the sample is ashed in a furnace at 400-430°C for 16 hours - The ground sample is dried in an oven at 80°C for 24 hours or until a constant weight is achieved - The prepared sample is gamma-counted using a gamma spectrometry for 3 hours or longer prior to calculation of radioactivity from natural and artificial radionuclides <p>Real-time and online gamma radiation dose measurement</p> <ul style="list-style-type: none"> - NaI detectors is installed on the research vessel and gamma radiation dose at the - surface seawater is measured <p>Gamma radiation dose rate data is real-time transmitted to a computer for generating a gamma radiation dose mapping for the entire expedition</p>		
28) Carbon Dioxide Flux and Primary Productivity in The Gulf of Thailand Nutrient and Nutrient Pool in Seawater			<ul style="list-style-type: none"> - Rosette - CTD 911 plus Filtering set 	<p>Water samples from each depth for analyses of</p> <p>On board</p> <ul style="list-style-type: none"> - DO - Alkalinity - Dissolved Inorganic nutrients <p>In the laboratory</p> <ul style="list-style-type: none"> - Suspended solids 		<ol style="list-style-type: none"> 1. Dr. Penjai Sompongchaiyakul 2. Dr. Sutaporn Bunyajetpong 3. Dr. Sujaree Bureekul (CU)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
				<ul style="list-style-type: none"> - Dissolved organic nutrient - Particulate nutrients 		
29) Collection of Hydrographic In-situ Data for Validation in the Gulf of Thailand to Compare with Multi-satellite and Model Products	<ul style="list-style-type: none"> - Validate the models by collection of hydrographic in-situ data 	<ul style="list-style-type: none"> - The good validation of these data in the Gulf of Thailand will conduce us very useful information about the environmental condition and fishing ground in GOT. 	<ul style="list-style-type: none"> - CTD - TSG - ADCP 	<ul style="list-style-type: none"> - Using CTD 911 plus collect the environment data from the surface to bottom at all survey station - Using TSG collect temperature and salinity along cruise tract 	6 months	<ol style="list-style-type: none"> 1. Dr. Monton Anongponyoskun (KU) 2. Dr. Hiroji Onishi (HU) 3. Ms. Siriporn Pangsorn (SEAFDEC)
Environment (Biological Oceanography)						
30) Zooplankton Diversity in the Gulf of Thailand (BU)	<ul style="list-style-type: none"> - Investigation to describe zooplankton diversity in the Gulf of Thailand, - To provide an estimation of zooplankton community structure; abundance, composition, and their distribution. 	<ul style="list-style-type: none"> - Relationship of fisheries and zooplankton abundance in the Gulf of Thailand 	<ul style="list-style-type: none"> - Plankton net mesh size 300 μm - Flow meter 	<ul style="list-style-type: none"> - Tows a Zooplankton net with 300 μm mesh size from 20 meters below the water surface to the surface - If the station depth is less than the specified depth, the tow is taken from two meters above the bottom - The sample is concentrated into the sample bucket and is transferred to a sample storage bottle - Preserve in 10% buffered formalin immediately 	9 months	<ol style="list-style-type: none"> 1. Dr. Vichaya Gunbua (BU) 2. Dr. Kornrawee Aeumsomboon 3. Dr. Porntep Pannarak (CU)
31) Density and Diversity of Phytoplankton in the Gulf of Thailand	<ul style="list-style-type: none"> - To study density and diversity of phytoplankton in the Gulf of Thailand. 	<ul style="list-style-type: none"> - Density and diversity of phytoplankton in the Gulf of Thailand - Structure and composition of phytoplankton according to the depth and area in the 	<ul style="list-style-type: none"> - Van Dorn - Phytoplankton net (20-μm mesh size) 	<ul style="list-style-type: none"> - 40 l of Water sample will be collected by 10-L Van Dorn at the surface and chlorophyll Maximum - Seawater will be filtered through net (20-μm meshed) and preserved with buffered formalin. 	12 months	<ol style="list-style-type: none"> 1. Ms. Nirucha Udomwongyont (DoF Thailand) 2. Dr. Shettapong Meksumpun (KU)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
		Gulf of Thailand				
32) Species and Distribution of Palalarvae and Cephalopods in the Gulf of Thailand				<ul style="list-style-type: none"> - To collect Cephalopod sample - Bottom trawl surveys for 1 hr. - Sampling Cephalopod and keep in refrigerator for identification in laboratory - To collect palalarvae sample - Bongo net with 330 um mesh size and 45 in diameter will be used to collect palalarvae by oblique towing from the surface to 5 m above bottom. - The speed of wire release is 0.3m/s and retrieve is 0.6 m/s. - The palalarvae sample will be transferred to plastic bottom and preserve with 10% of buffered formalin. 	6 months	<ol style="list-style-type: none"> 1. Dr. Charauy Sukhsangchan 2. Ms. Sonthaya Phuynoi (KU)
33) Composition and Distribution of Fish Larvae in the Gulf of Thailand	<ul style="list-style-type: none"> - To study composition of fish larvae in the Gulf of Thailand - To study distribution of economic fish larvae in the Gulf of Thailand - To build capacity of young scientists in the field of fish larvae research 	<ul style="list-style-type: none"> - Fish larvae composition and distributions map in the Gulf of Thailand - An up-to-date fish larvae database in the Gulf of Thailand - Capacity building of young scientists in the field of fish larvae research 	<ul style="list-style-type: none"> - Bongo net diameter 55 cm with mesh size of 330 and 500 μm - Neuston net size 100 x 70 cm with mesh size of 1,000 μm - T.S-flow meter 	<ul style="list-style-type: none"> - Bongo net with flow meter attached at the net mouth will be used as a larvae sampler. - Oblique tow upward from 10 m from sea floor to the surface will be done (Bongo net). - Neuston net with 1,000 μm mesh size attached with flow meter will be used for surface horizontal tow. - Samplings will be preserved in 10% buffer formalin in plastic containers - Fish larvae identification will be done in laboratory to family level by professional biologists together with young scientists for capacity building. 	6 months	<ol style="list-style-type: none"> 1. Mrs. Niracha Songkaew 2. Mrs. Piyawan Hussadee 3. Mr. Patinya Srisumran 4. Mr. Somkiart Ketnarai (DoF Thailand) 5. Dr. Teerapong Duangdee (KU) 6. Mr. Rakkiet Punsri (SEAFDEC) 7. Dr. Kornrawee Aeumsomboon (CU)
34) Fish larvae Distribution of Scombridae and Engraulidae in the	<ul style="list-style-type: none"> - To study distribution of fish larvae of Scombridae and 	<ul style="list-style-type: none"> - An up-to-date Scombridae and Engraulidae larvae database in the Gulf 	<ul style="list-style-type: none"> - Bongo net diameter 55 cm with mesh size of 	<ul style="list-style-type: none"> - Bongo net with flow meter attached at the net mouth will be used as a larvae sampler. - Oblique tow upward from 10 m from sea floor to the surface will be done (Bongo net). 	6 months	<ol style="list-style-type: none"> 1. Mrs. Niracha Songkaew 2. Mrs. Piyawan Hussadee 3. Mr. Patinya Srisumran 4. Mr. Somkiart Ketnarai



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
Gulf of Thailand	Engraulidae in the Gulf of Thailand	of Thailand	330and500 µm - Neuston net size 100 x 70 cmwith mesh size of 1,000 µm - T.S- Flow meter	- Neuston netwith 1,000 µm mesh size attached with flow meter will be used for surface horizontal tow. - Samplings will be preserved in 10% buffer formalin in plastic containers - Fish larvae identification will be done in laboratory to family level by professional biologists together with young scientists for capacity building.		(DoFThailand) 5. Dr. Teerapong Duangdee (KU) 6. Mr. Rakkie tPunsri (SEAFDEC) 7. Dr. Kornrawee Aeumsomboon (CU)
35) Some Biological Aspects for Elasmobranch in Gulf of Thailand	- To study on catch composition of elasmobranches in the Gulf of Thailand - To study on age determination of shark using vertebrae - To study on the diversity of ecto and/or endoparasites in the elasmobranches	- Base line study and update on catch composition and bio diversity of elasmobranches in Gulf of Thailand - Diversity of ecto and/or endoparasites found in elasmobranches in Gulf of Thailand	- Trawl net	Catch composition sample will be obtained by trawl survey, - Elasmobranches sample will be separated and taking photograph with scale - Sample will be separated roughly and measuring the length – weight individually and preserved in 10% formalin solution before move to identification in laboratory - Species will be identified using FAO species identification guide for fishery purpose “The Living Marine Resources of the Western Central Pacific” (FAO, 2001) as a main document together with other references - Vertebrae will be taken using field surgical equipment before clean with brush carefully and dried before further used for age determination	6 months	1. Dr. Thanitha Darbanandana (KU) 2. Dr. Thungtong Jutagate (URU) 3. Mr. Supapong Pattarapongpan (SEAFDEC)
35) Some Biological Aspects for Elasmobranch in Gulf of Thailand				Sample for parasites will be separated after measuring the length and weight, the whole body will be checked for ectoparasites while the endoparasite will be observed by cross section. - Parasites sample will be preserved in 10% formalin or 70% ethanol before moved for		



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
				identification in laboratory		
36) Distribution and Abundance of Parasite in Bonyfish in the Gulf of Thailand	- To examine external and internal parasite of bony fish.			<ul style="list-style-type: none"> - Collect bony fish from field and record data - Placed into plastic bags (1 fish/a bag) and then kept directly on ice - When the fish carried into laboratory, it should be kept in -20°C until examination 		<ol style="list-style-type: none"> 1. Dr. Molruedee Sonthi 2. Ms. Penchan Laongmanee 3. Mr. Worrawit Maneepitaksanti (BU) 4. Dr. Supanee Leethochawalit(CMU)
37) Diversity of Benthic Microcrustaceans and Micromollusks in the Gulf of Thailand	- To establish a preliminary checklist of microcrustaceans and micromollusks in the Gulf of Thailand	- Species list and description of microcrustaceans and micromollusks which provide taxonomic and biological data on these group	- Smith McIntyre Grab	<ul style="list-style-type: none"> - The material will be collected Using Smith McIntyre Grab - Each sample will be first decanted using filtered seawater into a plastic container - The residue then will be stirred slowly in water to loosen any clinging macrobenthic organism and sieved through a 500 mm mesh until all sediment has been removed and preserved in 70% alcohol - On board, macrobenthic specimens will be partly sorted to taxa in clean water and preserved for microscopic study in 70% ethanol. 	6 months	1. Dr. Koraon Wongkamhaeng (KU)
38) Meiofauna Abundance and Distribution in Surface Sediment	- To determine composition and abundance of meiofauna in the Gulf of Thailand	- Composition and abundance of meiofauna in the Gulf of Thailand	<ul style="list-style-type: none"> - Smith McIntyre Grab/Box core - Plastic core tube (syringewith 3 cm internal diameter) 	<ul style="list-style-type: none"> - Mass of sediment sample will be collected by using Smith McIntyre grab or Box core - The sediment samples will be carefully brought on the ship preventing the disturbance on the surface sediment as much as possible - Meiofauna samples (3 replicates) will be collected by using a plastic core tube (~3 cm internal diameter) take undisturbed surface sediment to a depth of 5 cm 		1. Ms. Itchika Sivaipram (CU)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
				<ul style="list-style-type: none"> - The sediment samples will be transferred into a container (plastic bottle or Zip-lock bag) and preserved in 4% formalin, stained with Rose Bengal 		
39) Microbiome Composition and Function in Sediment	<ul style="list-style-type: none"> - To investigate microbial community in surface sediment 	<ul style="list-style-type: none"> - Obtain information on microbiome and its functions 	<ul style="list-style-type: none"> - Smith McIntyre Grab 	<ul style="list-style-type: none"> - Approximately 50 gram sediment keep in plastic zipped-lock bag and store at 4°C - Approximately 2 kg of sediment in selected stations (2-3 stations) store at 4°C 		1. Dr. Onruthai Pinyakong 2. Dr. Penjai Sompongchaiyakul (CU)
40) Microbiome Composition and Function in Seawater	<ul style="list-style-type: none"> - To investigate microbial community in seawater 	<ul style="list-style-type: none"> - Obtain information on microbiome and its functions 	<ul style="list-style-type: none"> - Rosette - Bucket - CTD 911 plus 	<ul style="list-style-type: none"> - Filter 5 L of sample - 0.5 L filtered seawater samples store at 4°C - Filters store at 4°C 		1. Dr. Onruthai Pinyakong 2. Dr. Penjai Sompongchaiyakul(CU)
41) Attached Living Organism on Floating Garbage in Thai Waters 41) Attached Living Organism on Floating Garbage in Thai Waters	<ul style="list-style-type: none"> - The floating marine garbage can travel far away from its origin and can be a vector for the planktonic alien species to be established in other waters. This study aims to identify species composition and abundance of plankton attached on the floating garbage. 	<ul style="list-style-type: none"> - The dispersion of plankton via the floating garbage. 	<ul style="list-style-type: none"> - Handy scoop 	<ul style="list-style-type: none"> - At all stations, the observed floating garbage nearby research vessel will be collected by scoop net - All collected garbage will be took the photograph with the scale for estimating the surface area. - Preparing sample for analysis - Some garbage will be sampled and cut into small pieces and shaken them with filtered seawater in the plastic bottle for 3 minutes - Pouring the shaken water sample through 20 µm. mesh and then transfer the sample remained sample on the filter net into a small plastics bottle, make volume with filter seawater to 100 ml. preserved with final formalin concentration of 2%. - The preserved plankton sample will be identified and enumerated under light microscope. - Species diversity, density per garbage area 	12 months	1. Dr. Thaithaworn Lirdwitayaprasit 2. Dr. Kornrawee Aemsomboon (CU)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
				and statistical test will be analyzed.		
42) Genetic Diversity and Population Genetic Structure of Three-Banded Mantis Shrimp <i>Miyakellanea</i> Caught by Trawl Nets Fisheries in the Gulf of Thailand	<ul style="list-style-type: none"> - To identify genetic variation and population structure in <i>M. nepa</i> populations by using Amplified Fragment Length Polymorphism (AFLP) and novel microsatellites markers 	<ul style="list-style-type: none"> - DNA markers are useful for identification of species with same species and similar morphology. They could be also applied for investigation of species authentication in food products. In this study, AFLP and microsatellites analysis were used to determine the genetic diversity and the relationship among <i>M. nepa</i> populations. The results will be useful to provide a scientific basis for protection and rational development and utilization of its germplasm resources. 	<ul style="list-style-type: none"> - Bottom trawl 	<ul style="list-style-type: none"> - Bottom trawl surveys for 1 hr. - The body weight and total body length of each mantis shrimp were measured - Specimens were kept at -30°C until required. - DNA extraction Total DNA was extracted from a piece of pleopod of each shrimp using a phenol-chloroform-proteinase K method (Sambrook and Russell, 2001) - The concentration of extracted DNA was spectrophotometrically estimated. - DNA was stored at 4 °C until used. - In order to get the best effectiveness of AFLP amplification, the conditions will be optimize following by the previous research (Voset al., 1995) - Novel Microsatellites marker will be optimize as described in Na-Nakornet al. (2010). 	12months	<ol style="list-style-type: none"> 1. Dr. Rachanimuk Hiransuchalert 2. Ms. Penchan Laongmanee 3. Dr. Wirote Laongmanee 4. Dr. Anyalak Wachirachaikarn 5. Ms. Patchari Yocawibun (BU and CU)
Environment (others)						
43) Distribution of Bottom Plastic Debris in the Gulf of Thailand	<ul style="list-style-type: none"> - To analyze local and regional density of plastic marine debris in the Gulf of Thailand - To identify types and sizes of marine litter 	<ul style="list-style-type: none"> - Study result will be baseline of bottom marine debris of the Gulf of Thailand - Information for responsible agency to manage the bottom marine debris 	<ul style="list-style-type: none"> - Bottom trawl 	Follow "Methodology for Monitoring Marine Litter on the Seafloor (continental shelf) <ul style="list-style-type: none"> - Bottom trawl surveys for 1 hr. - Record haul position & orientation - Record haul speed & duration - Record haul start and end - Collect all plastic marine debris in the bag with label 	6 months	<ol style="list-style-type: none"> 1. Ms. PenchanLaongmanee 2. Dr. WiroteLaongmanee (BU) 3. Mr. NakaretYasook (SEAFDEC) 4. MrChalermPhusriit (DoF Thailand)



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
				- Weighting in laboratory		5. Dr. Tanuspong Pokavanich(KU)
44) Investigation of Stock of Marine Debris in Gulf of Thailand	- To preliminary assess the stock of marine debris in the Gulf of Thailand that includes floating debris, buoyant debris and sunk debris at the seafloor.		- Neuston net - Bottom trawl	Assessing the stock of the marine debris using data from direct debris collection from the sea and echo-sounder signal post-processing corrected with fish abundance data and sea sediment character. To Collect Surface debris - Collect the sample by Neuston net - All non-living sample move to the black plastic bag and store in cool and dark environment. The sample will be sorted, dry and weight at laboratory on land. To Collect buoyant debris - Trawling using normal bottom net. Collect all non-living sample to the black plastic bag and store in cool and dark environment. The sample will be sorted, dry and weight at laboratory on land.		1. Dr. Monton Anongponyoskun 2. Dr. Jitraporn Phaksopa (KU)
44) Investigation of Stock of Marine Debris in Gulf of Thailand (Cont.)				To collect sunk debris - Collection of any debris collected during Trawling. To Collect Buoyant and sunk debris measurement - In-direct measurement using scientific echo-sounder		
Meteorology						
45) Composition and Potential Source of Aerosol (CU)			- High volume air samplers	- Air pumping at the set position (away from the exhaust of the ship) during sailing.		1. Dr. Sujaree Bureekul 2. Dr. Penjai Sompongchaiyakul



Title	Objectives	Output	Sampling material	Sampling method	Expected report	Researcher
			<ul style="list-style-type: none"> - Cascade for aerosol - Teflon and Quartz filters - Filter discs - Samples containers - 			(CU) 3. Dr. Wirote Laongmanee (BU)

BU: Burapha University; CU: Chulalongkorn University; CMU: Chiang Mai University; DMCR: Department of Marine and Coastal Resources, Thailand; DoF: Department of Fisheries, Thailand; FiA Cambodia: Fisheries Administration, Cambodia; HU: Hokkaido University; KU: Kasetsart University; OAP: Office of Atoms for Peace; PSU: Prince of Songkla University; RIMEF: Research Institute of Marine Fisheries, Viet Nam; URU: UbonRatchathani University



Annex11: List of Sampling Gear and Research Topic and Sample Handling Procedure

Sampling gear	Relevant research topic	Sample Handling Procedure
Trawl net/SEAFDEC	<ul style="list-style-type: none"> - Some biological data of pelagic and demersal fish in the Gulf of Thailand by using bottom trawl (DoF Thailand) - Demersal Fish Survey using Hydro-acoustic instrument (DoF Thailand) - Small pelagic resources survey by hydro-acoustic Instrument, <i>e.g.</i> Scientific echo-sounder Simrad EK-60 (RIMF Viet Nam) - Marine species identification (Cambodia) - Microplastics accumulations in fish, sediment, and seawater (SEAFDEC & CU) - Mercury accumulation in tissues and risk assessment for consumption (CU) -Radiation dose and radiological risk assessment in marine biota and seafood consumers (OAP) - Species and distribution of paralarvae and cephalopods in the Gulf of Thailand (KU) - Some biological aspects for elasmobranch in Gulf of Thailand (SEAFDEC & KU) - Distribution and abundance of parasite in bony fish in the Gulf of Thailand (BUU) -Genetic diversity and population genetic structure of three-banded mantis shrimp <i>Miyakellanepa</i> caught by trawl nets fisheries in the Gulf of Thailand (BUU/C) - Distribution of bottom plastic debris in the Gulf of Thailand (BUU/C & SEAFDEC) - Investigation of stock of marine debris in Gulf of Thailand (KU) 	<ul style="list-style-type: none"> -Sorting for marine debris and marine organisms Marine debris -Specimens for debris will be dried and kept into the bag for weighing at BUU Marine organisms -Identify at species level -Sampling and length-weight measuring -Specimens for Microplastic will be kept into a freezer for analyzing at CU -Specimens for mercury will be kept into a freezer for analyzing at CU -Specimens for radiation will be kept into a freezer for analyzing at OAP -Specimens for cephalopod will be kept into a freezer for identifying at KU -Specimens for elasmobranch will be kept into a freezer for aging study and identifying parasite at SEAFDEC -Specimens for parasite in bony fish will be kept into a freezer for identifying parasite at BUU -Specimens for DNA of mantis shrimp <i>Miyakellanepa</i> will be kept into a freezer for analyzing at BUU
Bongo net/SEAFDEC	<ul style="list-style-type: none"> -Species and distribution of paralarvae and cephalopods in the Gulf of Thailand (KU) (330um) - Composition and distribution of fish larvae in the Gulf of Thailand (DoF & SEAFDEC & KU & CU) (330+500um) - Fish larvae distribution of scombridae and engraulidae in the Gulf Thailand (DoF & SEAFDEC & KU & CU) (330+500um) 	<ul style="list-style-type: none"> -Transfer sample into plastic container and preserve with 10% buffered formalin -Specimens will be transferred to SEAFDEC for further arrangement, fish larvae will be identified by SEAFDEC and DoF Thailand and paralarvae will be identified by KU -Shrimp <i>Check with responsible researcher</i>



Sampling gear	Relevant research topic	Sample Handling Procedure
Neuston Net/SEAFDEC (1+1 times)	<ul style="list-style-type: none"> - Composition and distribution of fish larvae in the Gulf of Thailand (DoF & SEAFDEC & KU & CU) - Fish larvae distribution of scombridae and engraulidae in the Gulf of Thailand (DoF & SEAFDEC & KU & CU) -Investigation of stock of marine debris in Gulf of Thailand(KU) -Attached living organism on floating garbage in Thai Waters (CU) -Microplastics accumulations in fish, sediment, and seawater 	<p>1stNeuston net operation</p> <ul style="list-style-type: none"> -Remove all marine debris from the Neuston net <p>Marine debris</p> <ul style="list-style-type: none"> -Take photograph of marine debris and shaken in filtered seawater -Filter seawater by 20 um mesh filter and preserve in 2% formalin/ specimen will be transferred to CU for identifying attached living organisms -Marine debris will be dried and kept in a bag for weighing at KU
Neuston Net/SEAFDEC (1+1 times) (Cont.)		<p>Fish larvae</p> <ul style="list-style-type: none"> -Transfer seawater from inside neuston net into plastic bottle and preserve with 10% buffered formalin -Seawater Specimen will be transferred to SEAFDEC for identifying fish larvae by SEAFDEC and DoF-Thailand <p>2ndNeuston net (only evening station)</p> <ul style="list-style-type: none"> -Transfer seawater from the neuston net to a plastic bottle and keep in a freezer -Specimen will be transferred to CU for analyzing the micro-plastic
CTD with Rosette/ SEAFDEC	<ul style="list-style-type: none"> -Water column condition and near-bottom water hypoxia in the Gulf of Thailand (BUU & SEAFDEC) - Geostrophic current in the Gulf of Thailand (CU) - Three dimensional circulation in the Gulf of Thailand during southwest monsoon (CU) - Water and material exchanges at the mouth of the Gulf of Thailand - Relationship between Chlorophyll-a concentration, primary production of the Gulf of Thailand and ocean color from remote sensing (CU) - Distribution of Total Organic Matter in marine sediments of the Gulf of Thailand (KU) 	<ul style="list-style-type: none"> -All water sample collected by rosette will be responsible by <i>Dr. Penjai Sompongchaiyakul</i> in order to study as follows; -Microbiome -DO (on board) -Alkalinity (on board) -Dissolved Inorganic nutrient (on board) -Suspended solid -Dissolved organic nutrient



Sampling gear	Relevant research topic	Sample Handling Procedure
CTD with Rosette/ SEAFDEC (Cont.)	<ul style="list-style-type: none"> - Mercury and arsenic in seawater (CU) - Carbon dioxide flux and primary productivity in The Gulf of Thailand Nutrient and nutrient pool in seawater (CU) - Collection of hydrographic in-situ data for validation in the Gulf of Thailand to compare with multi-satellite and model products (Japan) -Microbiome composition and function in seawater (CU) - Biomass Estimation by hydro-acoustic method in the Gulf of Thailand (KU) - Relationship between Chlorophyll-a concentration, primary production of the Gulf of Thailand and ocean color from remote sensing (CU) -Carbon dioxide flux and primary productivity in the Gulf of Thailand nutrient and nutrient pool in seawater (CU) 	-Particulate nutrient
PRR 2600/SEAFDEC	-Inherent properties of sea water in the Gulf of Thailand (KU)	-PRR data will be transferred to KU
Dropped Bottle/ DMCR	-Total Petroleum Hydrocarbons (TPHs) in surface seawater (as chrysene) (DMCR) (3L)	-Sample will be kept in a brown glass bottle and transferred to DMCR for analyzing TPHs
Zooplankton net/BUU	- Zooplankton diversity in the Gulf of Thailand (BUU & CU)	-Preserve sample in 10% buffer formalin and transfer to BUU and/or CU for identifying zooplankton
Vandorn/DoF Thailand	- Density and diversity of phytoplankton in the Gulf of Thailand (DoF, KU) (at chlorophyll max layer)	-Filter 40 L of water sample by 20 um mesh and preserve by XXX % buffered formalin and transfer to KU and/or DoF-Thailand for identification (Check concentration with responsible researchers)
Smith McIntyre/ SEAFDEC (2+1 times)	<ul style="list-style-type: none"> - Diversity of benthic microcrustaceans and micromollusks in the gulf of Thailand -Investigation of stock of marine debris in Gulf of Thailand(KU) - Meiofauna abundance and distribution in surface sediment (CU) -Microbiome composition and function in sediment (CU) - Spatial sedimentology and source area composition of sediment in the Gulf of Thailand (CU) - Radiation dose and radiological risk assessment in marine biota and seafood consumers (OAP) (1kg) -Microplastics accumulations in fish, sediment, and seawater (SEAFDEC&CU) 	1 st Smith McIntyre operation -Specimen will be sieved and stirred slowly by sea water Marine debris -Remove marine debris and dry and keep in a bag and transfer to KU for weighing Benthos -Residual sediment remained on the sieve will be kept in the plastic container and preserve with 10% formalin and transfer to KU



Sampling gear	Relevant research topic	Sample Handling Procedure
Smith McIntyre/ SEAFDEC (2+1 times) (Cont.)		<p>2nd Smith McIntyre operation</p> <p>Meiofauna -3 replicate will be sampled by plastic core tube and kept in the plastic bottle preserved with 4% formalin and stained in rose Bengal, transferring to CU for identifying Meiofauna</p> <p>Microbiome -50 to 2,500 g of sediment will be sampled and kept in a plastic zip-lock bag and stored at 4°C, transferring to CU for Microbiome study</p> <p>Sedimentology -500 g of sediment will be sampled and kept in plastic zip-lock and stored at 4°C, transferring to CU for spatial sedimentology</p> <p>3rd Smith McIntyre operation</p> <p>Micro-plastic -1 kg of sediment will be sampled and kept in plastic zip-lock bag and stored at -30 °C, transferring to CU for micro-plastic study</p> <p>Radiation -1 kg of sediment will be sampled and dried at room temperature then kept it a plastic container and transferred to OAP for radiation study</p>
Box core/ SEAFDEC	<ul style="list-style-type: none"> - Distribution of Total Organic Matter in marine sediments of the Gulf of Thailand (KU) - Flux of nutrient and nutrient pool in sediment (CU) - Mercury and trace elements contamination in the surface sediment (CU) - Petroleum hydrocarbon (as chrysene) and polycyclic aromatic hydrocarbon (PAHs) (CU) 	<p>-4 tubes will inserted into box core for sampling sediment profile</p> <p>- First tube of sediment profile will be vertically cut into 10 cm thickness ranges as 0-0.5,0.5-1,1-2,2-3,3-4,4-5,5-6,6-7,7-8,8-9,9-10. All specimens will be recorded on size, color, composition and smell. Then, keep in a zip-lock bag and stored at -40°C, transferring to KU for study on TOM.</p>



Sampling gear	Relevant research topic	Sample Handling Procedure
Box core/ SEAFDEC (Cont.)		<ul style="list-style-type: none"> - Second tube of sediment profile will be cut sub-section and kept frozen to bring back for grain size, readily oxidizable organic matter, total organic carbon, carbonate content, mercury and trace metals analysis at CU's laboratory - Third tube of sediment profile will be analyzed as follows; <ul style="list-style-type: none"> > Electrochemical technique > Pore water squeezing onboard and analysis for nutrients on-board > After pore water extraction, sub-section and kept frozen to bring back for nutrient analysis at CU's laboratory - Fourth tube of sediment profile will be cut sub-section and kept frozen to bring back for petroleum and PAHs analysis at CU's laboratory
Gravity corer/ SEAFDEC (2-3 stations per leg)	<ul style="list-style-type: none"> - Sedimentary properties and sedimentation rate of sediment in the Gulf of Thailand (CU) - Temporal distribution of mercury and trace metals in sediment (CU) 	<ul style="list-style-type: none"> - Remove inner tube, cap at top and bottom. The specimen will be kept in a freezer and transferred to CU for sediment properties, sedimentation rate, mercury and trace metal studies.
Lawrence structure scan/ SEAFDEC	<ul style="list-style-type: none"> - Integrates low-cost sonar imagery and GIS to Map underwater habitat 	<ul style="list-style-type: none"> - Data recorded as 3-4 knots speed of vessel with GPS operation by zigzag track for 10 minutes at each station.
Bucket surface	<ul style="list-style-type: none"> - Relationship between Chlorophyll-a concentration of the Gulf of Thailand and ocean color from remote sensing (BUU/C & SEAFDEC) - Inherent properties of sea water in Gulf of Thailand (KU) - Radiation dose and radiological risk assessment in Marine biota and seafood consumers (OAP) - Density and diversity of phytoplankton in the Gulf of Thailand (DoF, KU) (at surface layer) 	<ul style="list-style-type: none"> Sea surface sampling will be collected for measuring as follows; <ul style="list-style-type: none"> - Filter (GFF) 1-10L for chlorophyll-a analysis done by CU and BUU - Filter (GFF) 0.5-2L for absorption of particle analysis done by KU - Filter (0.2 um) 0.3L for colored dissolved organic matter analysis done by KU - Filter (0.2um) 0.5-1L for total suspended matter analysis done by KU - 5L of sea water will be dried to 1L for Gamma Spectrometry analysis done by OAP - Filter (5B) 20L for Cs-137 analysis done by OAP - Filter 40 L of water sample by 20 um mesh and preserve by ???% buffered formalin and transfer to KU and/or DoF-Thailand for identification



Sampling gear	Relevant research topic	Sample Handling Procedure
Scientific echo-sounder, TSG, high volume air samplers and NaI detectors		Continuous recording

Acronyms:

BU: Burapha University; CU: Chulalongkorn University; CMU: Chiang Mai University; DMCR: Department of Marine and Coastal Resources, Thailand; DoF: Department of Fisheries, Thailand; FiA Cambodia: Fisheries Administration, Cambodia; HU: Hokkaido University; KU: Kasetsart University; OAP: Office of Atoms for Peace; PSU: Prince of Songkla University; RIMF: Research Institute of Marine Fisheries, Viet Nam; URU: UbonRatchathani University

