



United Nations
Environment Programme



UNEP/GEF South China Sea
Project



Global Environment
Facility

***Reversing Environmental Degradation Trends
in the
South China Sea and Gulf of Thailand***

REPORT

**Eighth Meeting of the Regional Working Group for
the Fisheries Component**

Bangka Belitung Province, Indonesia, 1st – 4th November 2006



First published in Thailand in 2007 by the United Nations Environment Programme.

Copyright © 2007, United Nations Environment Programme

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder provided acknowledgement of the source is made. UNEP would appreciate receiving a copy of any publication that uses this publication as a source.

No use of this publication may be made for resale or for any other commercial purpose without prior permission in writing from the United Nations Environment Programme.

UNEP/GEF
Project Co-ordinating Unit,
United Nations Environment Programme,
UN Building, 2nd Floor Block B, Rajdamnern Avenue,
Bangkok 10200, Thailand
Tel. +66 2 288 1886
Fax. +66 2 288 1094
<http://www.unepscs.org>

DISCLAIMER:

The contents of this report do not necessarily reflect the views and policies of UNEP or the GEF. The designations employed and the presentations do not imply the expression of any opinion whatsoever on the part of UNEP, of the GEF, or of any cooperating organisation concerning the legal status of any country, territory, city or area, of its authorities, or of the delineation of its territories or boundaries.

Cover Photo:

For citation purposes this document may be cited as:

UNEP, 2007. Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Eighth Meeting of the Regional Working Group on Fisheries. UNEP/GEF/SCS/RWG-F.8/3.

Table of Contents

1. OPENING OF THE MEETING	1
1.1 WELCOME ADDRESS ON BEHALF OF UNEP	1
1.2 INTRODUCTION OF PARTICIPANTS	1
2. ORGANISATION OF THE MEETING.....	1
2.1 ELECTION OF OFFICERS	1
2.2 DOCUMENTATION AND ADMINISTRATIVE ARRANGEMENTS.....	2
2.3 ORGANISATION OF WORK.....	2
3. ADOPTION OF THE MEETING AGENDA	2
4. STATUS OF THE ADMINISTRATIVE REPORTS FOR 2005 AND 1ST HALF 2006: PROGRESS REPORTS; EXPENDITURE REPORTS; AND AUDIT REPORTS	2
5. DEVELOPMENT OF A LIST OF CANDIDATE FISHERIES <i>REFUGIA</i> SITES IN THE SOUTH CHINA SEA AND GULF OF THAILAND.....	3
5.1 REVIEW OF INFORMATION COLLATED BY THE FISHERIES AND HABITAT COMPONENTS OF THE SOUTH CHINA SEA PROJECT ON SPECIFIC LOCATIONS IMPORTANT TO THE LIFE-CYCLES OF SIGNIFICANT FISH SPECIES	3
5.2 PAST AND ON-GOING RESEARCH RELATING TO THE DISTRIBUTION AND ABUNDANCE OF LARVAL AND JUVENILE FISH IN THE GULF OF THAILAND AND SOUTH CHINA SEA	4
5.3 OUTCOMES OF COUNTRY CONSULTATIONS ON THE IDENTIFICATION OF FISHERIES <i>REFUGIA</i> SITES	6
6. MATTERS RELATING TO THE ESTABLISHMENT OF A REGIONAL SYSTEM OF FISHERIES <i>REFUGIA</i> IN THE GULF OF THAILAND AND THE SOUTH CHINA SEA	8
6.1 PREPARATION OF A DRAFT REGIONAL STRATEGY AND NATIONAL PLANS FOR A REGIONAL SYSTEM OF FISHERIES <i>REFUGIA</i>	8
6.2 ESTABLISHMENT OF AN ONLINE INFORMATION AND MAPPING SYSTEM IN SUPPORT OF A REGIONAL SYSTEM OF FISHERIES <i>REFUGIA</i>	9
6.3 STRENGTHENING COLLABORATION WITH SEAFDEC FOR THE DEVELOPMENT OF A REGIONAL SYSTEM OF FISHERIES <i>REFUGIA</i>	9
7. DEVELOPMENT OF GUIDELINES FOR IMPROVING THE INTEGRATION OF FISHERIES AND HABITAT MANAGEMENT IN RELATION TO THE DEMONSTRATION SITES.....	10
8. FINALISATION OF FISHERIES COMPONENT INPUTS TO THE REGIONAL STRATEGIC ACTION PROGRAMME.....	10
9. UPDATE OF THE REGIONAL GIS DATABASE AND META-DATABASE AND EFFICIENT USE OF THE PROJECT WEBSITE.....	11
10. CONSIDERATION OF THE PROPOSED SOUTH CHINA SEA PROJECT TRAINING ACTIVITIES REGARDING THE FISHERIES COMPONENT.....	11
11. REVISION OF THE WORKPLAN AND ACTIVITIES FOR THE REGIONAL WORKING GROUP ON FISHERIES.....	12
12. DATES AND PLACE OF THE NINTH MEETING OF THE REGIONAL WORKING GROUP ON FISHERIES	12
13. ANY OTHER BUSINESS.....	12
14. ADOPTION OF THE REPORT OF THE MEETING	12
15. CLOSURE OF THE MEETING	13

List of Annexes

- ANNEX 1** List of Participants.
- ANNEX 2** List of Documents.
- ANNEX 3** Agenda.
- ANNEX 4** Critical Spawning and Nursery Areas for Important Fish Species in the Gulf of Thailand and South China Sea.
- ANNEX 5** Distribution and Abundance of Fish Larvae in the Gulf of Thailand and South China Sea.
- ANNEX 6** Sites for Inclusion in an Initial Regional System of Fisheries *Refugia*.
- ANNEX 7** Regional and National Plans for a System of Fisheries *Refugia*.
- ANNEX 8** Developing a National Programme of Activities for the Implementation for the Fisheries Component of the Revised Strategic Action Programme.
- ANNEX 9** Preliminary Syllabus for the Training Course on Larval Fish Identification and Early Life-History Science.
- ANNEX 10** Work Plan and Timetable for the Regional Working Group on Fisheries 2007.

Report of the Meeting

1. OPENING OF THE MEETING

1.1 Welcome Address on behalf of UNEP

1.1.1 Mr. Christopher Paterson, the Fisheries Expert of the Project Co-ordinating Unit opened the meeting, at 8.30 am on 1st November 2006, and welcomed participants on behalf of the Executive Director of UNEP, Dr. Achim Steiner; the Officer-in-Charge of the UNEP Division of Global Environment Facility Co-ordination, Mr. Olivier Deleuze; and the Project Director, Dr. John Pernetta.

1.1.2 Mr. Paterson noted that the meeting was attended by representatives of all countries participating in the fisheries component of the project, and noted with delight that Ms. Chee Phaik Ean was once again able to join the Working Group on behalf of the Department of Fisheries Malaysia. He extended a warm welcome to the new Regional Expert, Professor Nygiel Armada.

1.1.3 Mr. Paterson informed the meeting that he had met with staff of the SEAFDEC Secretariat during the inter-sessional period to discuss a programme of meetings and workshops aimed at strengthening collaborative efforts to establish a regional system of fisheries *refugia*. In this connection he noted once again the strong representation of SEAFDEC in the meeting, and welcomed the SEAFDEC supported observers from Viet Nam and Thailand.

1.1.4 Mr. Paterson noted that the agenda was quite extensive and that the group would need to give careful consideration to matters relating to the identification of candidate fisheries *refugia* sites and fisheries component inputs to the Regional Strategic Action Programme. He expressed the hope that despite the heavy workload the meeting would be both enjoyable and productive.

1.2 Introduction of Participants

1.2.1 Mr. Paterson noted the large number of participants in the meeting and invited participants to introduce themselves. There followed a *tour de table* during which participants introduced themselves and indicated their respective roles in the project. The list of participants is provided in Annex 1 of this report.

2. ORGANISATION OF THE MEETING

2.1 Election of Officers

2.1.1 Members were reminded that during the sixth meeting of the Regional Working Group on Fisheries (RWG-F) held in Kudat, Sabah, Malaysia 5th-8th September 2005, Mr. Pirochana Saikliang, Focal Point from Thailand, Mr. Parlin Tambunan, Focal Point from Indonesia, and Dr. Dao Manh Son, Focal Point from Viet Nam were elected as, Chairperson, Vice-Chairperson, and Rapporteur respectively. Members recalled that at the last meeting of the RWG-F held in Bangkok, Thailand 16th-18th May 2006, Mr. Parlin Tambunan, Focal Point from Indonesia, Mr. Ing Try, Focal Point from Cambodia, and Mr. Noel Barut, Focal Point from the Philippines were elected as, Chairperson, Vice-Chairperson and Rapporteur respectively.

2.1.2 Members recalled that in order to facilitate consistency between the seventh and eighth meetings of the Regional Working Group, it was agreed during the last meeting that the officers elected during the seventh meeting should serve the same office for the eighth meeting. It was noted that Mr. Try was unable to participate in the meeting due to serious illness and that the group would need to consider the re-election of Mr. Parlin and Mr. Barut, and election of a Vice-Chairperson.

2.1.3 The members recalled further that the rules of procedure state that, the Regional Working Group shall elect, from amongst the members, a Chairperson, Vice-Chairperson and Rapporteur to serve for one year. The rules state further that, officers shall be eligible for re-election no more than once, and therefore Mr. Parlin and Mr. Barut were eligible for re-election. Mr. Paterson then called for nominations for Chairperson, Vice-Chairperson and Rapporteur.

2.1.4 Mr. Barut nominated Mr. Parlin as Chairperson, and Ms. Chee seconded the nomination. Ms. Chee nominated Dr. Son as Vice-Chairperson and Mr. Barut seconded the nomination. Mr. Parlin, Dr. Son, and Mr. Barut were duly elected by acclamation.

2.2 Documentation and Administrative Arrangements

2.2.1 The Chairperson invited Mr. Paterson, the Project Co-ordinating Unit Member of the Working Group to introduce the documentation available to the meeting. Mr. Paterson reviewed the documents listed in document UNEP/GEF/SCS/RWG-F.8/Inf.2 and noted that these had been lodged on the project website and were also available to participants in electronic format. He briefly highlighted the contents of the discussion documents indicating the key issues requiring discussion and decision by the Regional Working Group. Members were invited to table any additional documents including copies of new national reports if any, and the full list of documents available to the meeting is contained in Annex 2 of this report.

2.3 Organisation of Work

2.3.1 The Chairperson then invited Mr. Paterson to introduce the draft programme for the conduct of business contained in document UNEP/GEF/SCS/RWG-F.8/Inf.3. Mr. Paterson noted that the meeting was scheduled to take place over four days and that the working group could form small working groups to elaborate on matters overnight should the need arise. He noted that formal sessions of the meeting would be conducted in English and in Plenary.

3. ADOPTION OF THE MEETING AGENDA

3.1 The Chairperson introduced the Provisional Agenda prepared by the PCU for the meeting as document UNEP/GEF/SCS/RWG-F.8/1, and the Annotated Provisional Agenda, document UNEP/GEF/SCS/RWG-F.8/2 and invited members to propose any amendments or additional items for consideration.

3.2 Dr. Worawit Wanchana of SEAFDEC proposed and the Working Group agreed that the SEAFDEC supported participants Ms. Nguyen Giang Thu and Dr. Joompol Sanguansin be provided an opportunity to deliver short presentations on national level activities to promote the fisheries *refugia* concept. There being no further proposals or amendments to the agenda the draft as prepared by the PCU was adopted by the meeting and is presented in Annex 3 of this report.

4. STATUS OF THE ADMINISTRATIVE REPORTS FOR 2005 AND 1ST HALF 2006: PROGRESS REPORTS; EXPENDITURE REPORTS; AND AUDIT REPORTS

4.1 The Chairperson, Mr. Parlin invited the PCU Member to introduce document UNEP/GEF/SCS/RWG-F.8/4, "*Current Status of Budgets and Reports from the Specialised Executing Agencies in the Participating Countries*" and to draw to the attention of the meeting any outstanding issues or matters requiring the attention of the Working Group.

4.2 Mr. Paterson reminded members that UNEP provides to the Specialised Executing Agencies in each country, Cash Advances on a six monthly basis to meet the costs of producing the national outputs specified in each Memorandum of Understanding, according to an agreed work plan and timetable. He noted that financial and administrative reports are critical for review of expenditures in relation to project activities and outputs, and to evaluate the extent, to which, agreed government co-financing has been provided in cash and in-kind by the Specialised Executing Agency concerned.

4.3 Mr. Paterson reminded members that audit reports for each calendar year were required under UN financial rules and drew the attention of the meeting to Table 2 in the document. He noted that no audit report had been received for Thailand for 2004 and that only Viet Nam submitted an audit report for 2005 before the 31st March deadline. He noted further that no final audit reports for 2005 had been received from Indonesia, Philippines, and Thailand.

4.4 Mr. Paterson drew the attention of the meeting to Table 3 in the document. He noted that Thailand had only submitted a draft progress report for the entire year of 2005 and had not submitted a report for the first half of 2006. He highlighted that only Viet Nam had submitted the final signed version of the 6 month progress and expenditure reports relating to the first half of 2006. He noted further that Cambodia and the Philippines had yet to submit final reports for the first half of 2006, and that Indonesia had not submitted reports for this period despite holding a large cash balance in hand.

4.5 Mr. Paterson reminded members that according to the decision of the Project Steering Committee, all six-monthly administrative reports for the first half-year of 2006 should have been sent to the PCU by 15th July 2006. He highlighted that only Viet Nam had been consistent in ensuring the timely submission of reports. The members from Indonesia, the Philippines, and Thailand noted that they had necessary documentation on hand to resolve these reporting matters during the course of the meeting.

5. DEVELOPMENT OF A LIST OF CANDIDATE FISHERIES REFUGIA SITES IN THE SOUTH CHINA SEA AND GULF OF THAILAND

5.1 Review of Information Collated by the Fisheries and Habitat Components of the South China Sea Project on Specific Locations Important to the Life-Cycles of Significant Fish Species

5.1.1 The Chairperson invited the PCU Member to introduce document UNEP/GEF/SCS/RWG-F.8/5, "*Review of Information Collated by the Fisheries and Habitat Components of the South China Sea Project on Specific Locations Important to the Life-Cycles of Significant Fish Species*".

5.1.2 Mr. Paterson noted that the RWG-F considered a preliminary inventory of known spawning areas in the Gulf of Thailand for significant pelagic, demersal, and invertebrate species during the seventh meeting. He reminded the Working Group that members had agreed during that meeting to compile information on (a) the UNEP/GEF South China Sea Project's Habitat Demonstration Sites that are critical inshore nursery *refugia* for important demersal species, (b) locations in the South China Sea and Gulf of Thailand that are utilised by significant pelagic species for spawning, and (c) fisheries management areas that may qualify as candidate sites of fisheries *refugia*.

5.1.3 Mr. Paterson highlighted that to assist in this task he had compiled all information collated by the fisheries and habitats components of the South China Sea Project on fish life-cycle and critical habitat linkages. He noted that the sources of this information included:

- National Reports on Fisheries,
- National Reports on Coral Reefs, Seagrass, Mangroves, and Wetlands,
- 142 Habitat Site Characterisations,
- Habitat Demonstration Site Project Documents,
- South China Sea Online Meta-Database, and
- Information Contributed Directly by Fisheries and Habitat Focal Points.

5.1.4 Mr. Paterson suggested and the meeting agreed that the RWG-F should review this information to identify known fish spawning and nursery areas in the Gulf of Thailand and South China Sea. Mr. Barut suggested that members should also table any additional information sources that could assist in ensuring the completeness of the review. It was agreed that country-based sessional working groups would be formed to conduct the review and that information regarding spawning and nursery areas would be tabulated on a country basis for collective review by the Working Group.

5.1.5 There followed a lengthy discussion regarding the types of information to extract from the review for known spawning and nursery areas. It was agreed that members would compile information regarding the name of the site, the geographic location, the species that utilise the site for critical phases of their life-cycles, the known usage of the site by these species (either nursery or spawning), the time of the year that the site is used by a given species, and reference to the source of information. A template was then prepared for the tabulation of information by the sessional working groups.

5.1.6 The completed country tabulations were compiled into a regional list of 46 known significant spawning and nursery areas in the South China Sea and Gulf of Thailand. This list was reviewed and amended by the Working Group as it appears in Annex 4 of this report. Focal Points agreed that they would work during the inter-sessional period to compile more complete information regarding the usage of the sites by significant species. A map of known spawning and nursery areas was generated to highlight the distribution of sites to the meeting.

5.2 Past and On-Going Research Relating to the Distribution and Abundance of Larval and Juvenile Fish in the Gulf of Thailand and South China Sea

5.2.1 The Chairperson invited the PCU member to introduce document UNEP/GEF/SCS/RWG-F.8/6, "Review of Past and On-Going Research Relating to the Distribution and Abundance of Eggs and Larval Fish in the Gulf of Thailand and South China Sea".

5.2.2 In introducing this document Mr. Paterson informed the meeting that he had recently met with Dr. Yasuhisa Kato, Dr. Somboon Siriraksophon, Mr. Somsak Chullasorn, and Mr. Pirochana at the SEAFDEC Secretariat to discuss past and ongoing fish early-life history research work in the Gulf of Thailand and South China Sea. Mr. Paterson noted that this meeting identified that data collected through ongoing research activities initiated by SEAFDEC in the 1990s may provide a more recent and accurate information base for use in identifying significant spawning and nursery areas. He explained that Dr. Somboon of SEAFDEC was subsequently invited to the eighth meeting of the RWG-F to deliver a presentation on (a) SEAFDEC's past and on-going fish early-life history research, and (b) known spawning and nursery areas.

5.2.3 The Chairperson invited Dr. Somboon to make a presentation entitled "Fish Early Life History Research Work using M.V. SEAFDEC from 1996-1999, and Probable Spawning and Nursery Areas for Significant Fish Species in the Gulf of Thailand and the South China Sea". Dr. Somboon informed the meeting that SEAFDEC conducted a series of Marine Fisheries Resources Surveys during the 1990s. He noted that these activities were part of the SEAFDEC Interdepartmental Collaborative Research Programme operated by the SEAFDEC Marine Fisheries Resources Development and Management Department, the SEAFDEC Training Department, and national fisheries departments and research institutes.

5.2.4 Dr. Somboon noted that the main surveys of interest to the task of identifying fish spawning areas in the Gulf of Thailand and South China Sea were conducted using the SEAFDEC Research Vessel M.V. SEAFDEC in 4 main areas:

- Gulf of Thailand and East Coast of Peninsular Malaysia (81 stations)
- West Coast of Sabah, Sarawak, and Brunei Darussalam (79 stations)
- West Coast of Luzon, Philippines (31 stations)
- Vietnamese Waters (58 stations)

5.2.5 Dr. Somboon noted that the surveys focused on the collation of important fisheries-related information including the distribution and abundance of key resources, the fisheries biology of significant species, the primary production of coastal oceans (including distribution and abundance of phytoplankton), fisheries oceanographic information, and other environmental information. He noted that a total of 249 larval fish samplings were conducted in the period of post-northeast monsoon (April-May) from 1996-1999.

5.2.6 Dr. Somboon highlighted that an analysis of all larval fish combined identified 4 key areas with high larval fish abundances ($>6,000$ individuals per m^3). These were the upper Gulf of Thailand, Thailand (Lat 12.30N Long 100.25-100.75E), the east coast of Samui Island, Thailand (Lat 9.30N, Long 100.25E), the Miri Coastal Area of Sarawak, Malaysia (Lat 4.30N, Long 114.00E), and the Quang Tri Coastal Area of Viet Nam (Lat 15.00N, Long 107.00E).

5.2.7 Dr. Somboon noted that in terms of the relative abundance of the larvae of important pelagic species, the larvae of 4 groups of species were highly abundant in the upper Gulf of Thailand. These were *Stolephorus* spp. ($\approx 2,000$ individuals per $1000m^3$), *Caranx* spp. ($\approx 1,000$ individuals per $1000m^3$), *Decapterus* spp. (≈ 500 per $1000m^3$), and *Selaroides leptolepis* (≈ 500 per $1000m^3$). Larvae of *Decapterus* spp. and *Stolephorus* spp. were also observed to be scattered at lower abundances in the central Gulf of Thailand and areas off Sarawak, Malaysia.

5.2.8 Dr. Somboon highlighted that nearly all larvae of *Sardinella* spp. were observed to be concentrated off the east coast of Samui Island in Thailand and the transboundary area between Thailand's Narathiwat Province and Kota Baru in Malaysia. He noted that large densities of *Rastrelliger* spp. larvae were also observed adjacent to Samui Island, with lower densities observed in the southern Gulf of Tonkin off Quang Tri Province and at the Mekong River Mouth in Viet Nam. The larvae of *Scomberomorus* spp. were shown to be most abundant at the lower end of the Gulf of Tonkin and adjacent to Con Dao Island in Viet Nam.

5.2.9 Dr. Somboon noted that the abundances of most tuna larvae were very low, except for *Euthynnus affinis* which were observed in significant quantities in the Gulf of Tonkin, Viet Nam. He highlighted that the larvae of this species appeared to be strongly associated with underwater sea mounts along the northern coast of Viet Nam. In terms of demersal species he noted that the upper Gulf of Thailand appeared to be most important for larvae.

5.2.10 Dr. Somboon concluded that based on the post-monsoon data there appears to be three main sites utilised by fish larvae of significant species in the Gulf of Thailand and the South China Sea: (1) Gulf of Tonkin, Viet Nam, (2) Upper Gulf of Thailand (*Stolophorus* spp., *Decapterus* spp., and *Caranx* spp.), and (3) Samui Island (*Rastrelliger* spp., *Sardinella* spp., and *Nemipterus* spp.). He also noted with interest the absence of larvae from Malaysian waters in areas other than Sarawak, and the large abundances of larvae in the upper Gulf of Thailand. Detailed figures of larval fish distribution and abundance are attached in Annex 5 of this report.

5.2.11 In terms of on-going fish early-life history research, Dr. Somboon noted that SEAFDEC are currently utilising M.V. SEAFDEC 2 for the conduct of fisheries resources assessment surveys. He informed the meeting that 20 cruises have been conducted using this vessel since 2004, and that larval fish have been and continue to be sampled at all survey locations using a bongo net up to depths of 150m. He pointed out some recent survey areas that may be of interest to the Working Group, including those conducted in the Gulf of Thailand, including Cambodian waters, waters adjacent to West Kalimantan Province in Indonesia, the Sulu Sea in the Philippines, and the coast of Viet Nam. He noted that fish larvae samples from these cruises could be used to study known usage of sites by important species.

5.2.12 Professor Armada recommended that it would be useful to link larval fish distributions and abundances with an ocean circulation model for the Gulf of Thailand or the South China Sea. He noted that this would assist in identifying spawning locations and explaining why larvae are more dense in the three locations identified by Dr. Somboon. The Working Group agreed that linking an oceanographic circulation model to the distribution and abundance of fish larvae would enable the group to develop a better understanding of the sources and sinks of fish larvae of significant species.

5.2.13 Mr. Somsak noted that while the results of the surveys reported on by Dr. Somboon provided some insight into the distribution and abundance of larvae during the post-monsoon period (April-May), there is in his view a need for surveys during other periods of the year to better reflect seasonal differences in the spawning dynamics of many species. He noted that many species had previously been thought to spawn from January-April and that surveys during this period may enable the identification of actual spawning times and locations. Ms. Chee agreed that seasonality is an important consideration in using larval fish information to identify peak spawning areas and seasons.

5.2.14 Mr. Somsak also noted that surveys conducted during the 1970s identified relatively high abundances of *Decapterus* spp. larvae in the central Gulf of Thailand, whereas the information presented by Dr. Somboon showed very little larvae of this group in that area and high abundances in the upper Gulf of Thailand. Dr. Somboon noted that he had also recognised this shift and showed the meeting that large areas of the central Gulf have been developed for the oil and gas industry, and suggested that perhaps this had caused a shift in the utilisation of this area by this group.

5.2.15 Mr. Pirochana noted that past studies had identified large numbers of juvenile Indo-Pacific mackerel in the Trat Province area of Thailand and that anecdotal information suggested that this species may spawn in Cambodian waters. He questioned whether the results of surveys in Cambodian waters had identified Indo-Pacific mackerel larvae. Dr. Somboon demonstrated that the overall abundance of larvae in Cambodian waters was low in all areas and that very few Indo-Pacific mackerel were found in the samples collected.

5.2.16 Dr. Son noted that the survey results identified large volumes of anchovy larvae in the Gulf of Tonkin. He noted further that no larvae of this species were identified in waters adjacent to Phu Quoc Island, which is a known significant spawning area for this species in Viet Nam.

5.2.17 The meeting then proceeded to compare areas of high fish larvae abundance with the country tables and a map of known spawning and nursery areas produced in Agenda Item 5.1. It was identified that most areas with high abundances of fish larvae were located within the spawning and nursery areas identified and summarised in Annex 5. On this basis the group agreed that the country tables of known spawning and nursery areas provided a suitable starting point for the development of

a list of fisheries *refugia* sites. Focal points then developed a list of fisheries *refugia* sites for initial inclusion in a regional system of fisheries *refugia*. This list is included attached as Annex 6 of this report.

5.2.18 In recognition of the fact that the identification of most spawning and nursery areas by the RWG-F was based on secondary information sources, Ms. Chee, Mr. Somsak, and Dr. Somboon formed a small sessional working group to develop a list of research activities for further development of the *refugia* system. The meeting reviewed and amended the proposed research activities as follows:

- Conduct of fish egg and fish larval surveys in nearshore areas
- Compilation of existing information on fisheries in *refugia* areas
 - Fishing gears and practices (methods)
 - Pre-recruitment size of fish
 - Status of fisheries resources in overall area
 - Current management measures
 - Rare and endangered species
 - Oceanographic information
- Determination of the location and size of the *refugia* area
- Determination of appropriate fishing gears and methods for use at the site
- Collection of biological information for relevant species – fish life-cycle, reproductive season, size at first maturity, stages of sexual maturity
- Compilation of indigenous knowledge on fisheries in the *refugia* area
- Identification of appropriate indicator(s) for monitoring the implementation of fisheries *refugia*
- Conduct of socio-economic studies in the *refugia* area

5.3 Outcomes of Country Consultations on the Identification of Fisheries *Refugia* Sites

5.3.1 The Chairperson invited the focal points, experts, and observers to make presentations regarding activities at the national level to identify candidate fisheries *refugia* sites. He noted that presenters should try to focus on any significant achievements and challenges encountered to date.

5.3.2 Mr. Pirochana reviewed the history of the development of the Prachuap Khiri Khan, Chumphon, and Surat Thani fisheries management area in Thailand to protect spawning and juvenile fish. He noted that the main species for which the site is managed is the Indo-Pacific mackerel (*Rastrelliger neglectus*). He highlighted that the two main spawning grounds for this species are offshore from Thailand's Surat Thani Province and Prachuap Khiri Khan Province. He noted that young fishes migrate from these spawning grounds to the inner Gulf of Thailand for feeding, moving back offshore early in the year.

5.3.3 Mr. Pirochana explained that this area has been recognised as a fisheries *refugia* site in Thailand and highlighted two key challenges faced by the Thai Department of Fisheries in managing the site. The first challenge relates to constant pressure from fishers calling for a reduction in the area of the site by 3000 km² offshore from Chumphon. The second challenge relates to the fishing practice of “dropping” heavily ballasted gill nets (up to 14 km in length) onto schools of mackerel that have been detected using echo-sounders. He noted that this fishing practice had been recently adopted to curtail fishing gear regulations in the fishery. He highlighted that consultations with fishers had recently been convened with an aim of extending the results of recent research that investigated the importance of the site as a spawning and nursery *refugia*.

5.3.4 Mr. Barut informed the meeting that he had conducted two orientation seminars and stakeholder consultations on the identification and establishment of fisheries *refugia*. He noted that these activities were conducted in San Fernando City, La Union 27th December, 2005 and in Masinloc, Zambales on 30th June, 2006. He noted further that, representatives from local government units, academe, regional government agencies, law enforcers, fisherfolk organisations, non-governmental organisations, people's organisations, and national fishery committee members had participated in the consultations.

5.3.5 Mr. Barut highlighted that the purpose of the consultations was to introduce participants to the concept of fisheries *refugia* and the procedures for the identification and selection of *refugia* sites. He noted that the key recommendations of the consultation were: (1) clearly define the concept of fisheries *refugia*, and the processes involved in the establishment of *refugia*; (2) before proceeding be sure that the *refugia* concept is clear to all the participants; (3) reach out to the local government legislative body to ensure that a municipal or local ordinance is passed for the establishment of fish *refugia*; and that (4) technical assistance should be provided to provincial and local governments even after the establishment of any fish *refugia*.

5.3.6 Professor Armada briefly informed the meeting of activities conducted to identify fisheries *refugia* in the Philippines. He reviewed studies conducted at the Calamianes Group of Islands, Northern Palawan, which had produced information regarding the density distribution of fish eggs and larvae in Coron Bay. He highlighted that a simulation had been conducted to predict the dispersal of fish eggs and larvae with the area, enabling the identification of source and sink areas of fish larvae for the establishment of fisheries *refugia*. Professor Armada stressed the importance of developing networks of *refugia* across the life-cycle of species.

5.3.7 Dr. Son noted that community consultations on the identification of fisheries *refugia* had been conducted in Viet Nam. He informed the meeting that a questionnaire survey had been used to collect information regarding important nursery and spawning areas, and highlighted that six areas had been proposed as candidate *refugia* sites. These were (1) the Haiphong - Nam Dinh coastal area including the Xuan Thuy National Park, (2) the Bach Long Vi Island area adjacent to Hai Phong, (3) the Hon La – Hon Nom Islands in Quang Binh Province, (4) Phu Quoc Island in Kien Giang Province, (5) southeastern coastal water areas of Viet Nam from Binh Thuan Province to Con Dao Island, and (6) southwestern coastal waters of Viet Nam from Hon Chuoi to Phu Quoc Island. Dr. Son presented known information regarding the distribution of fish eggs and larvae in Viet Nam and highlighted that the proposed *refugia* sites in Viet Nam represent key fish spawning and nursery areas in Viet Nam. Dr. Son suggested that, due to the complexity of establishing six sites at once, Viet Nam would initially establish four sites for inclusion in a preliminary system of fisheries *refugia*. The sites proposed were Bach Long Vi Island, Hon La – Hon Nom Islands, Phu Quoc Island, and coastal water areas from Binh Thuan Province to Con Dao Island.

5.3.8 Ms. Thu of Viet Nam's Ministry of Fisheries reviewed regional and national efforts for fisheries *refugia* establishment. She informed the meeting that two training workshops had been conducted in collaboration with the SEAFDEC-Sida Project in Phu Quoc and in Quang Binh during 2006. She noted that these workshops had focused on defining the similarities and differences of MPAs and fisheries *refugia*, and on improving the understanding of the fisheries *refugia* concept at the national level. She noted further that the Phu Quoc workshop agreed that "fisheries resources protection area" is suitable terminology for promoting the *refugia* concept in Viet Nam. She highlighted that three fisheries *refugia* sites were proposed to SEAFDEC during the Quang Binh meeting. These were Bach Long Vi Island, Hon La – Hon Nom Islands, and Phu Quoc Island.

5.3.9 Mr. Parlin informed the meeting that a National Fishery Committee Meeting on the Identification of Candidate Fisheries *Refugia* Sites was held in Bogor, West Java from 9th-10th June, 2006. He noted that this meeting was attended by representatives of the Ministry of Marine Affairs and Fisheries, universities, research agencies (BRKP and LIPI) and relevant NGOs. Mr. Parlin noted further that this meeting was aimed at gathering the necessary information for the identification of candidate fisheries *refugia* sites in Indonesia. He highlighted that five candidate fisheries *refugia* sites have since been identified in Indonesia including (1) the east coast of northern Sumatra, (2) the coastline of Riau Province, (3) the waters adjacent to Riau Islands, (4) Bangka Belitung waters, and (5) waters adjacent to West Kalimantan Province.

5.3.10 Ms. Chee highlighted the distribution of important fisheries habitats adjacent to the east coast of Peninsular Malaysia and the States of Sarawak and Sabah. She noted that substantial work has been conducted on quantifying mangrove area and fish production linkages in Malaysia, especially in relation to the Matang mangrove site and associated fisheries. She noted further that the seagrass area off Johor State is perhaps the largest along the east coast of Peninsular Malaysia and supports a large number of juveniles and pre-recruits of significant fish, shrimp, and crab species. She noted that despite numerous studies highlighting the importance of this area to fisheries, the Johor State seagrass site is increasingly being impacted upon by coastal development activities.

5.3.11 Dr. Joompol reviewed the important role of the Koh Chang Strait/Trat Bay area in the eastern Gulf of Thailand as a spawning and nursery area for a large number of economically important fish species. He noted that approximately 1,500 small-scale fishing vessels operate in the vicinity of the site, including many push net operators. Mr. Joompol noted further that, in his view, this area may qualify as an important fisheries *refugia* site in the Gulf of Thailand. He expressed his hope that the UNEP/GEF South China Sea Project and SEAFDEC would be able to support any Thai Department of Fisheries initiatives to establish a fisheries *refugia* site in this area.

6. MATTERS RELATING TO THE ESTABLISHMENT OF A REGIONAL SYSTEM OF FISHERIES REFUGIA IN THE GULF OF THAILAND AND THE SOUTH CHINA SEA

6.1 Preparation of a Draft Regional Strategy and National Plans for a Regional System of Fisheries *Refugia*

6.1.1 The Chairperson invited the PCU member to introduce document UNEP/GEF/SCS/RWG-F.8/7, "*Developing a Regional Strategy and National Plans for a System of Fisheries Refugia in the South China Sea and Gulf of Thailand*".

6.1.2 Mr. Paterson reminded the Working Group that during the sixth meeting a draft framework strategy for the development of the regional system of *refugia* was discussed and agreed as a reasonable starting point for the development of both the strategy and the system itself. He noted that during that meeting the group also agreed on: (a) a goal, objectives and expected outcomes for a regional system of fisheries *refugia*; (b) priority *refugia* types, key fisheries problems that *refugia* may assist in resolving, and (c) the challenges that are anticipated in developing a system of *refugia*; (d) guiding principles for the *refugia* system, criteria for *refugia* identification and selection, and indicators that can be used to evaluate *refugia* performance.

6.1.3 Mr. Paterson reminded the working group that the draft framework strategy and the above elements for inclusion in a regional fisheries *refugia* strategy were reviewed and amended during the Seventh Meeting. He suggested that these outputs of the group could be used to formulate a Regional Fisheries *Refugia* Strategy, and noted that such a strategy may be useful in guiding the development of a regional system of fisheries *refugia* beyond the scope of the South China Sea Project. He also reminded members of the need to develop National Fisheries *Refugia* Plans, and suggested that the desired content and a timeline for the completion of these plans should be agreed during the meeting.

6.1.4 There followed an extensive discussion of the practicalities of implementing a fisheries *refugia* strategy. Professor Armada noted that the Working Group had identified candidate fisheries *refugia* sites during the course of the meeting, and noted further that the group has little specific information that can serve as a baseline for the implementation of a fisheries *refugia* system. Dr. Kato agreed and suggested that for the system to be effective there is strong need for acceptance by fishers of *refugia* sites and associated management measures. In this connection, he noted the need for detailed information about fish usage of *refugia* sites for use in convincing fishing communities of the potential benefits of any interventions.

6.1.5 The Working Group identified that the development of a regional strategy is constrained at this stage by a lack of baseline information and experience in the establishment and management of *refugia* sites. Dr. Kato noted that in the context of SEAFDEC, regional management initiatives are always difficult to implement due to differences in fisheries management systems between countries. In this connection, Ms. Chee suggested and the meeting agreed that a pilot site approach to the establishment of some initial *refugia* may enable the identification of the practical challenges and other issues that a regional strategy would need to consider.

6.1.6 Project component focal points agreed to establish one fisheries *refugia* pilot site and prepare a draft of a detailed plan for the implementation of activities at that site by 30th June 2007. The Working Group then considered and agreed on (a) a procedure for the development of fisheries *refugia* pilot sites, (b) minimum content for national fisheries *refugia* plans, and (c) a detailed work plan for the establishment of *refugia* pilot sites and the preparation of national fisheries *refugia* plans. These are attached as Annex 7 to this report.

6.2 Establishment of an Online Information and Mapping System in Support of a Regional System of Fisheries *Refugia*

6.2.1 The Chairperson invited Mr. Paterson to introduce the Fisheries *Refugia* Information Portal <<http://refugia.unepscs.org>>.

6.2.2 Mr. Paterson reminded members that several meetings of the Working Group had identified that a simple online mapping system showing (a) geographical information about the projects habitat demonstration sites, (b) known inshore nursery and spawning areas for significant fish species, and (c) currently managed areas in the South China Sea and Gulf of Thailand would greatly enhance the work of this group. He noted that in response to this a simple and user friendly Google Earth Mapping system was developed to represent information about specific locations in the South China Sea and Gulf of Thailand.

6.2.3 Mr. Paterson noted that this mapping tool had been recently integrated into an online web portal to serve as an information system in support of the project activity of establishing a regional system of fisheries *refugia*. He highlighted the mapping system featured a user friendly and intuitive online tool for adding new sites and revising information about sites online. He noted further that fisheries component focal points and staff of SEAFDEC can use this tool for adding and revising sites from their offices. The group was unanimous in agreeing that this tool was extremely valuable as a means of sharing information and enhancing understanding of the work of the group.

6.2.4 Mr. Paterson proceeded to highlight the sections of the information portal that had been developed for the storage of national reports and awareness raising materials on responsible fisheries. Focal points agreed to deliver electronic copies of all awareness raising materials and national language reports to the PCU member for loading to the portal by the end of November 2006.

6.2.5 Dr. Worawit asked what would happen to the information portal at the completion of the South China Sea Project. It was noted that in principle it would be possible to transfer responsibility for all or part of the information portal to an organisation in the region involved in efforts to develop a system of *refugia*, such as SEAFDEC.

6.2.6 Dr. Somboon asked whether it was possible to plot the actual area of sites and an overlay map of ocean circulation patterns on the Google Earth map. Mr. Paterson noted that he was not aware of any technical barriers preventing this and agreed that this would be a valuable addition to the map. He indicated that he would attempt to integrate ocean circulation pattern information into the map by the end of 2006.

6.3 Strengthening Collaboration with SEAFDEC for the Development of a Regional System of Fisheries *Refugia*

6.3.1 In introducing this agenda item Mr. Paterson advised members that the development of a collaborative programme of technical consultations, working group meetings, and training workshops, aimed at strengthening efforts to establish a regional system of fisheries *refugia* in the Gulf of Thailand and the South China Sea, was discussed with SEAFDEC during August 2006. He noted that all project component focal points had participated in several SEAFDEC meetings and consultations during the year, and that SEAFDEC had been strongly represented in all recent meetings of the RWG-F and had made substantive contributions to the work of the group during the course of the eighth meeting.

6.3.2 The group was unanimous in agreeing that such collaborative arrangements had strengthened work of the RWG-F, especially in relation to the *refugia* activity. There followed a lengthy discussion regarding the implementation of the proposed South China Sea Project training course on Establishing and Managing Fisheries *Refugia* and the Joint Workshop on Identifying and Establishing Fisheries *Refugia* in Transboundary Waters proposed by the SEAFDEC-Sida project. It was identified that, in order to minimise any duplication of effort, Mr. Paterson would meet with Dr. Worawit before the end of 2006 to finalise programmes for each of these activities for comment by members of the RWG-F.

7. DEVELOPMENT OF GUIDELINES FOR IMPROVING THE INTEGRATION OF FISHERIES AND HABITAT MANAGEMENT IN RELATION TO THE DEMONSTRATION SITES

7.1 The Chairperson invited Mr. Paterson to introduce document UNEP/GEF/SCS/RWG-F.8/8 "*Preparation of Guidelines for Improving the Integration of Fisheries and Habitat Management in Relation to the Demonstration Sites*". Mr. Paterson reviewed the deliberations of the RWG-F and the Regional Working Groups for the Habitat Sub-Components regarding this matter. He presented the agreed framework for assessing the effects of fishing and aquaculture in the context of the habitat demonstration sites. He also introduced an outline for a set of guidelines on improving the integration of fisheries and habitat management in relation to the demonstration sites.

7.2 There followed a lengthy discussion regarding the premise of the framework. Mr. Paterson reminded members that this activity was initiated with an aim of providing simple and easily accessible guidance to the project's habitat demonstration sites with regards to improving the integration of fisheries and habitat management in those areas. He noted that the content of the framework was based on effects of fishing and aquaculture that had been identified by habitat demonstration site managers and habitat component focal points.

7.3 It was recommended by Dr. Kato that the guidelines be designed to focus on issues associated with the management of juveniles of economically important species. Ms. Chee suggested and the meeting agreed that highlighting the critical links between fisheries habitats and the juveniles of many species in the guidelines would give additional support to the *refugia* activity of the project.

7.4 Mr. Barut noted that the existing framework focuses on the negative aspects of fisheries and aquaculture. He suggested that any guidelines produced may be more inspiring for individuals at the local and the provincial government levels if they were to promote examples of success stories in coastal fisheries management in Southeast Asia.

7.5 It was agreed that focal points would submit to the PCU case studies of success stories or examples of good practice in managing the effects of fishing on juveniles before 31st December 2006. It was further agreed that Mr. Paterson would compile these case studies for circulation amongst members of the RWG-F by 26th January 2007 and that members would make comment on the desired content of the guidelines by 24th February 2007.

8. FINALISATION OF FISHERIES COMPONENT INPUTS TO THE REGIONAL STRATEGIC ACTION PROGRAMME

8.1 The Chairperson invited Mr. Paterson to introduce document UNEP/GEF/SCS/RWG-F.8/9 "*Regional Working Group for the Fisheries Component Inputs to the Regional Strategic Action Programme*".

8.2 Mr. Paterson reminded members that during the Sixth Meeting of the Regional Scientific and Technical Committee in December 2005 it was agreed that the RWG-F should evaluate the wording of all activities in relation to the targets and target dates revised during the Sixth Meeting of the RWG-F since it had been some time since these were initially discussed by the RWG-F. Mr. Paterson noted that during its Seventh Meeting the RWG-F evaluated the identified actions in order to ensure that these were consonant with recent developments resulting from the work of the RWG-F.

8.3 Mr. Paterson noted that the RWG-F agreed during its Seventh Meeting that members would proceed to develop a programme of national level actions that were site specific and costed for consideration during the Eighth Meeting of the working group in November 2006. As no focal points had a programme of national level actions available for presentation during the meeting, country based sessional working groups were formed to draft these programmes.

8.4 It was noted that Mr. Paterson would compile these programmes in an Annex of the meeting report for consideration by the Seventh Meeting of the Regional Scientific and Technical. He advised members that he would inform them of RSTC deliberations regarding this before the end of November 2006. The preliminary programmes of national level actions as prepared by the members of the RWG-F are attached as Annex 8 of this report.

9. UPDATE OF THE REGIONAL GIS DATABASE AND META-DATABASE AND EFFICIENT USE OF THE PROJECT WEBSITE

9.1 The Chairperson invited Mr. Paterson to introduce document UNEP/GEF/SCS/RWG-F.8/10 "*Status of the UNEP/GEF South China Sea Project Website, Online Tools, and Activities to Promote the Fisheries Component of the Project*".

9.2 Mr. Paterson reminded members that the South China Sea Online Meta-Database provides a central online location for the collation and searching of meta-data regarding coastal habitat, fisheries, and pollution datasets in Southeast Asia. He reminded focal points that it is a "living" database that can be revised and updated online and urged focal points to update their sections of the database. Mr. Barut noted that his assistant was currently working on contributing new meta-data entries to the database.

9.3 Mr. Paterson noted that since the Seventh Meeting of the RWG-F the PCU had finalised the South China Sea Projects Database <<http://projects.unepscs.org>>. He reminded the group that during the preparatory phase of the South China Sea Project, project component focal points compiled information on past and on-going coral reef, seagrass, mangrove, wetland, fisheries, and land-based pollution projects implemented in areas of the South China Sea and Gulf of Thailand. He noted that the Projects Database was developed to provide a facility for the efficient online storage and searching of this information.

9.4 Mr. Paterson highlighted that focal points can revise and edit existing information in the Projects Database via a secure online login. He noted that focal points can also easily add information about new projects as it becomes available, and that it is also possible for other organisations such as SEAFDEC to contribute information to the database online.

9.5 Mr. Paterson introduced the idea of sending a regular fisheries component e-mail newsletter to members of the group to advise them of approaching deadlines regarding the completion of tasks for the establishment of pilot fisheries *refugia* sites. The group was unanimous in agreeing that this would assist in maintaining momentum for the *refugia* activity.

10. CONSIDERATION OF THE PROPOSED SOUTH CHINA SEA PROJECT TRAINING ACTIVITIES REGARDING THE FISHERIES COMPONENT

10.1 The Chairperson invited Mr. Paterson to brief the meeting regarding the status of the South China Sea Project Training Activities regarding the Fisheries Component.

10.2 Mr. Paterson informed the meeting that since the Seventh Meeting of the RWG-F he had met with staff of the SEAFDEC Secretariat and Training Department to discuss the development of proposals for the training courses on (a) larval fish identification, and (b) establishing and managing fisheries *refugia*. Mr. Paterson highlighted that Dr. Somboon was responsible for developing SEAFDEC's proposal for the larval fish identification course. In this connection Dr. Somboon was invited to inform the meeting of progress to date in finalising the proposal.

10.3 Dr. Somboon noted that he had prepared a draft syllabus for the training course, prepared an inventory and costing of all required materials, and had made contact with several experts, including SEAFDEC's larval fish expert, Dr. Konishi, regarding their interest in acting as course instructors. The amended draft syllabus presented by Dr. Somboon is attached as Annex 9 of this report. It was agreed that Dr. Somboon would submit the larval fish training programme proposal to the PCU by 31st December 2006.

10.4 Dr. Kato suggested and the meeting agreed that the activities of the national seminar component of the training course should be conducted in relation to the implementation of pilot fisheries *refugia* site activities. It was further suggested that, where possible, commonly used small-scale fishing gears should be used when demonstrating the collection of fish larvae in areas of the pilot fisheries *refugia* sites.

11. REVISION OF THE WORKPLAN AND ACTIVITIES FOR THE REGIONAL WORKING GROUP ON FISHERIES

11.1 The Chairperson invited the PCU Member to introduce document UNEP/GEF/SCS/RWG-F.8/11, "*Work Plan for the Regional Working Group on Fisheries for 2007-2008*". Mr. Paterson informed the meeting that he had revised the work plan to take into account prior agreements regarding the submission of outputs and development of pilot fisheries *refugia* site activities.

11.2 The revised work plan was projected and items considered and discussed in detail by the members taking into account discussions under earlier agenda items. The amended tables and agreed work plan and schedule are contained in Annex 10 of this report.

12. DATES AND PLACE OF THE NINTH MEETING OF THE REGIONAL WORKING GROUP ON FISHERIES

12.1 The Chairperson reminded the RWG-F that past meetings of the RWG-F have been held successively in: Bangkok, Thailand, 2002; Phuket, Thailand, 2002; Siem Reap, Cambodia, 2003; Manila, Philippines, 2004; Phu Quoc, Viet Nam, 2004; Sabah, Malaysia, 2005; and Bangkok, Thailand, 2006.

12.2 Members of the Regional Working Group were reminded that, in accordance with the decision of the Project Steering Committee, all Regional Working Group meetings are to be convened at the demonstration sites.

12.3 The members suggested that the Ninth Meeting of the RWG-F should be convened from 10th-13th July 2007 to provide for the timely review of national level progress in the establishment of pilot fisheries *refugia* sites. The member from the Philippines noted that travel to the Philippines' demonstration sites in July was constrained by the prevalence of typhoons. Dr. Son invited the Working Group to Viet Nam for the meeting, and suggested that since he planned to facilitate the establishment of a fisheries *refugia* site in the proximity of Phu Quoc Island, he would like to host the meeting there. He noted and the meeting agreed that travel to Phu Quoc is convenient for all members.

12.4 Following some discussion regarding the suitability of other habitat demonstration sites in Viet Nam, it was agreed that the Ninth Meeting would be convened on Phu Quoc Island from 10th-13th July to provide an opportunity for the group to observe efforts of the Ministry of Fisheries Viet Nam to establish a pilot fisheries *refugia* site in the area.

13. ANY OTHER BUSINESS

13.1 Members of the RWG-F were invited to raise any other matters that needed to be considered by the RWG-F. Dr. Worawit informed the meeting that he had held discussions with Ms. Thu of the Ministry of Fisheries Viet Nam regarding the translation of the SEAFDEC – UNEP/GEF Guidelines on the Use of Fisheries *Refugia* for Sustainable Capture Fisheries Management in Southeast Asia into Vietnamese.

13.2 Dr. Son expressed his hope that consideration could be given to the revision of the budgets for the Specialized Executing Agencies for the Fisheries Component to ensure that adequate funds were available to support any necessary stakeholder consultations. Mr. Paterson noted that he would discuss this matter with the Project Director upon his return to Bangkok.

14. ADOPTION OF THE REPORT OF THE MEETING

14.1 The Rapporteur, Mr. Noel Barut presented the draft report of the meeting, prepared by the Secretary during the meeting. The draft report was considered, amended and adopted as it appears in this document.

15. CLOSURE OF THE MEETING

15.1 The Chairperson, Dr. Son invited participants to make any closing remarks. Ms. Chee thanked the members of the Project Co-ordinating Unit for their efforts in organising the meeting, and expressed her appreciation to UNEP/GEF for inviting the Department of Fisheries, Malaysia to participate in the meeting. Dr. Son, on behalf of Mr. Parlin who was required to return to Jakarta early for personal reasons, expressed his thanks to the PCU for organising the meeting. Dr. Son also thanked the PCU and colleagues from SEAFDEC for attending the meeting, and Mr. Parlin for hosting the meeting. Dr. Son noted again that he looked forward to seeing everyone again in Viet Nam for the Ninth Meeting of the RWG-F.

ANNEX 1**List of Participants****Focal Points****Cambodia**

Mr. Ek Heng, Vice Chief
Fisheries Domain and Extension Office Fisheries
Administration
Ministry of Agriculture, Forestry and Fisheries
186 Norodom Blvd.,
P.O. Box 582
Phnom Penh, Cambodia

Tel/Fax:(855 23) 215470
Mobile: (855 12) 404353
E-mail: heng_at@yahoo.com;
ekheng80@hotmail.com

Malaysia

Ms. Chee Phaik Ean, Senior Research Officer
Head of Aquatic Ecosystem Section
Fisheries Research Institute
11960 Batu Maung
Penang, Malaysia

Tel: (60 4) 626 5824; 626 3925
Fax: (60 4) 626 2210
E-mail: chee@fri.gov.my
phaikEAN@hotmail.com

Thailand

Mr. Pirochana Saikliang, Senior Fishery Biologist
Chumporn Marine Fisheries Research and
Development Center
408 Moo 8, Paknum Sub-district,
Muang District, Chumporn 86120
Thailand

Tel/Fax:(66 77) 522 006; 522 007
Mobile: (66 81) 843 9887
E-mail: pirochas@fisheries.go.th

Indonesia

Mr. Parlin Tambunan, Director of Fisheries
Resources, Directorate General of Capture
Fisheries
Jln. Harsono RM No.3, Gd. B, Lt VI
Ragunan – Pasar Minggu
Jakarta Selatan,
Indonesia

Tel/Fax:(62 21) 781 1672
Mobile: (62 81) 698 1032
E-mail: dfrmdgf@indosat.net.id;
dgcstat@indosat.net.id

Philippines

Mr. Noel Barut
National Fisheries Research and Development
Institute, Department of Agriculture
940 Kayumanggi, Press Building I
Quezon Avenue, Quezon City, Philippines

Tel: (63 2) 373 7451
Fax: (63 2) 372 5063
Mobile: (63) 917 8385701
E-mail: noel_barut@hotmail.com

Viet Nam

Dr. Dao Manh Son, Vice Director
Research Institute for Marine Fisheries
170 Le Lai Street
Haiphong City
Viet Nam

Tel: (84 31) 837 898; 836 135
Fax: (84 31) 836 812
Mobile: (84 91) 332 9782
E-mail: daoson@hn.vnn.vn

Regional Experts

Mr. Somsak Chullasorn
45, Soi Wattana Niwet 4,
Sutisan Rd., Huay Kwang
Bangkok 10320, Thailand

Tel: (66 2) 277 5015
Fax: (66 2) 693 1828
Mobile: (66 89) 686 5016
E-mail: papasomsak@hotmail.com

Prof. Nygiel B. Armada, Senior Fisheries
Management Specialist
FISH Project, 5th Floor, CIFIC Tower,
North Reclamation Area,
6000 Cebu City, Philippines

Tel: (63 32) 232 1821
Fax: (63 32) 232 1825
E-mail: nbarmada@mozcom.com

Observers

Dr. Yasuhisa Kato, Special Advisor
SEAFDEC Secretariat
Suraswadi Building,
Kasetsart University Campus
P.O. Box 1046 Kasetsart Post Office
Bangkok 10903, Thailand

Tel: (66 2) 940 6335; 940 6326
Fax: (66 2) 940 6336
Mobile: (66 81) 825 5636
E-mail: kato@seafdec.org

Dr. Somboon Siriraksophon, Head of Capture
Fishery Technology Division
SEAFDEC Training Department,
P.O. Box 97, Phrasamutchedi,
Samutprakarn 10290, Thailand

Tel: (66 2) 425 6140
Fax: (66 2) 425 6110
Mobile: (66 88) 9477 9968
E-mail: somboon@seafdec.org

Dr. Joopool Sanguansin, Senior Expert on
Fisheries Ecology, Department of Fisheries
Kasetklang, Chatuchak,
Bangkok 10900 Thailand

Tel: (66 2) 940 6527
Fax: (66 2) 562 0571
Mobile: (66 88) 070 6463
E-mail: joompols@fisheries.go.th

Dr. Worawit Wanchana, Project Officer
SEAFDEC Secretariat
Suraswadi Building,
Kasetsart University Campus
P.O. Box 1046 Kasetsart Post Office
Bangkok 10903, Thailand

Tel: (66 2) 940 6326
Fax: (66 2) 940 6336
Mobile: (66 89) 488 9644
E-mail: worawit@seafdec.org

Mrs. Nguyen Giang Thu
Official – Department of Science and Technology
Ministry of Fisheries
10-12 Nguyen Cong Hoan Street
Hanoi, Viet Nam

Tel/Fax:(844) 7714147
Mobile: (84) 912 516891
E-mail: giangthu@mofi.gov.vn
giangthu@gmail.com

Project Coordinating Unit Member

Mr. Christopher Paterson, Expert – Fisheries
UNEP/GEF Project Co-ordinating Unit
United Nations Environment Programme
2nd Floor, Block B, United Nations Building,
Rajdamnern Nok Avenue,
Bangkok 10200 Thailand

Tel: (66 2) 288 1116
Fax: (66 2) 288 1094
E-mail: patersonc@un.org

Project Co-ordinating Unit

Mr. Reynaldo Molina, Intern
UNEP/GEF Project Co-ordinating Unit
United Nations Environment Programme
2nd Floor, Block B, United Nations Building,
Rajdamnern Nok Avenue,
Bangkok 10200 Thailand

Tel: (66 2) 288 2606
Fax: (66 2) 288 1094
E-mail: molinar@un.org

Ms. Saranya Rojananuangnit, Team Assistant
UNEP/GEF Project Co-ordinating Unit
United Nations Environment Programme
2nd Floor, Block B, United Nations Building,
Rajdamnern Nok Avenue,
Bangkok 10200 Thailand

Tel: (66 2) 288 2608
Fax: (66 2) 288 1094
E-mail: rojananuangnit@un.org

ANNEX 2

List of Documents

Discussion documents

UNEP/GEF/SCS/RWG-F.8/1	Agenda.
UNEP/GEF/SCS/RWG-F.8/2	Annotated Agenda.
UNEP/GEF/SCS/RWG-F.8/3	Report of the Meeting.
UNEP/GEF/SCS/RWG-F.8/4	Current Status of Budgets and Reports from the Specialised Executing Agencies in the Participating Countries.
UNEP/GEF/SCS/RWG-F.8/5	Review of Information Collated by the Fisheries and Habitat Components of the South China Sea Project on Specific Locations Important to the Life-Cycles of Significant Fish Species.
UNEP/GEF/SCS/RWG-F.8/6	Review of Past and On-Going Research Relating to the Distribution and Abundance of Eggs and Larval Fish in the Gulf of Thailand and South China Sea.
UNEP/GEF/SCS/RWG-F.8/7	Developing a Regional Strategy and National Plans for a System of Fisheries <i>Refugia</i> in the South China Sea and Gulf of Thailand.
UNEP/GEF/SCS/RWG-F.8/8	Preparation of Guidelines for Improving the Integration of Fisheries and Habitat Management in Relation to the Demonstration Sites.
UNEP/GEF/SCS/RWG-F.8/9	Regional Working Group for the Fisheries Component Inputs to the Regional Strategic Action Programme.
UNEP/GEF/SCS/RWG-F.8/10	Status of the UNEP/GEF South China Sea Project Website, Online Tools, and Activities to Promote the Fisheries Component of the Project.
UNEP/GEF/SCS/RWG-F.8/11	Work Plan for the Regional Working Group on Fisheries for 2007-2008.

Information documents

UNEP/GEF/SCS/RWG-F.8/Inf.1	List of Participants.
UNEP/GEF/SCS/RWG-F.8/Inf.2	List of Documents.
UNEP/GEF/SCS/RWG-F.8/Inf.3	Programme.

The following documents are supplied in hard-copy and are available on the Project Website:

UNEP/GEF/SCS/RTF-E.4/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Fourth Meeting of the Regional Task Force on Economic Valuation UNEP/GEF/SCS/ RTF-E.4/3.
UNEP/GEF/SCS/RTF-L.4/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Fourth Meeting of the Regional Task Force on Legal Matters UNEP/GEF/SCS/RTF-L.4/3.
UNEP/GEF/SCS/RTF-E.5/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Fifth Meeting of the Regional Task Force on Economic Valuation. UNEP/GEF/SCS/ RTF-E.5/3.

UNEP/GEF/SCS/RTF-L.5/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Fifth Meeting of the Regional Task Force on Legal Matters. UNEP/GEF/SCS/RTF-L.5/3.
UNEP/GEF/SCS/RWG-CR.7/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Seventh Meeting of the Regional Working Group on Coral Reefs. UNEP/GEF/SCS/RWG-CR.7/3.
UNEP/GEF/SCS/RWG-F.7/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Seventh Meeting of the Regional Working Group on Fisheries. UNEP/GEF/SCS/RWG-F.7/3.
UNEP/GEF/SCS/RWG-LbP.7/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Seventh Meeting of the Regional Working Group on Land-Based Pollution. UNEP/GEF/SCS/RWG-LbP.7/3
UNEP/GEF/SCS/RWG-M.7/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Seventh Meeting of the Regional Working Group for the Mangrove Sub-component. UNEP/GEF/SCS/RWG-M.7/3.
UNEP/GEF/SCS/RWG-SG.7/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Seventh Meeting of the Regional Working Group for the Seagrass Sub-component. UNEP/GEF/SCS/RWG-SG.7/3.
UNEP/GEF/SCS/RWG-W.7/3	Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. Report of the Seventh Meeting of the Regional Working Group on Wetlands UNEP/GEF/SCS/RWG-W.7/3.

Documents received during the Eighth RWG-F Meeting, Belitung, Indonesia

Indonesia	<p>Six Monthly Progress Report (<i>January 2006-June 2006</i>)</p> <p>Six Monthly Project Expenditure (<i>January to June 2006</i>)</p> <p>Cash Advance Request (<i>ending 31 December 2006</i>)</p> <p>Summary of the National Fishery Committee Meeting South China Sea Project in Indonesia (Phase II), Bogor, 9-10 June 2006</p> <p>Contract Agreement for Administrative Assistant UNEP/GEF SCS Fisheries Project of Indonesia (<i>Ratnawati</i>)</p> <p>Work Order and Working Agreement (<i>Khaerul Jaelani</i>)</p> <p>Work Order and Working Agreement (<i>Mrs. Elva Wirda</i>)</p>
Philippines	<p>Six Monthly Project Expenditure (<i>January 2002 to December 2007</i>)</p> <p>Cash Advance Request (<i>ending 31 December 2006</i>)</p> <p>Operation Budget for Fisheries Specialized Executing Agency - Philippines</p>
Thailand	<p>National Report for Fisheries in Thailand (<i>hard copy; 2 copies for PCU</i>)</p> <p>National Report for Fisheries in Thailand (<i>electronic copy</i>)</p>

ANNEX 3

Agenda

1. **OPENING OF THE MEETING**
 - 1.1 Welcome Address on behalf of UNEP
 - 1.2 Introduction of Participants
2. **ORGANISATION OF THE MEETING**
 - 2.1 Election of Officers
 - 2.2 Documentation and Administrative Arrangements
 - 2.3 Organisation of Work
3. **ADOPTION OF THE MEETING AGENDA**
4. **STATUS OF THE ADMINISTRATIVE REPORTS FOR 2005 AND 1ST HALF 2006: PROGRESS REPORTS; EXPENDITURE REPORTS; AND AUDIT REPORTS**
5. **DEVELOPMENT OF A LIST OF CANDIDATE FISHERIES REFUGIA SITES IN THE SOUTH CHINA SEA AND GULF OF THAILAND**
 - 5.1 Review of Information Collated by the Fisheries and Habitat Components of the South China Sea Project on Specific Locations Critical to the Life-Cycles of Significant Fish Species
 - 5.2 Past and On-Going Research Relating to the Distribution and Abundance of Larval and Juvenile Fish in the Gulf of Thailand and South China Sea
 - 5.3 Outcomes of Country Consultations on the Identification of Fisheries *Refugia* Sites
6. **MATTERS RELATING TO THE ESTABLISHMENT OF A REGIONAL SYSTEM OF FISHERIES REFUGIA IN THE GULF OF THAILAND AND THE SOUTH CHINA SEA**
 - 6.1 Preparation of a Draft Regional Strategy and National Plans for a Regional System of Fisheries *Refugia*
 - 6.2 Establishment of an Online Information and Mapping System in Support of a Regional System of Fisheries *Refugia*
 - 6.3 Strengthening Collaboration with SEAFDEC for Development of a Regional System of Fisheries *Refugia*
7. **DEVELOPMENT OF GUIDELINES FOR IMPROVING THE INTEGRATION OF FISHERIES AND HABITAT MANAGEMENT IN RELATION TO THE DEMONSTRATION SITES**
8. **FINALISATION OF FISHERIES COMPONENT INPUTS TO THE REGIONAL STRATEGIC ACTION PROGRAMME**
9. **UPDATE OF THE REGIONAL GIS DATABASE AND META-DATABASE AND EFFICIENT USE OF THE PROJECT WEBSITE**
10. **CONSIDERATION OF THE PROPOSED SOUTH CHINA SEA PROJECT TRAINING ACTIVITIES REGARDING THE FISHERIES COMPONENT**
11. **REVISION OF THE WORKPLAN AND ACTIVITIES FOR THE REGIONAL WORKING GROUP ON FISHERIES**
12. **DATE AND PLACE OF THE NINTH MEETING OF THE REGIONAL WORKING GROUP ON FISHERIES**
13. **ANY OTHER BUSINESS**
14. **ADOPTION OF THE REPORT OF THE MEETING**
15. **CLOSURE OF THE MEETING**

ANNEX 4

Critical Spawning and Nursery Areas for Important Fish Species in the Gulf of Thailand and South China Sea

BACKGROUND

The activity of establishing a regional system of fisheries *refugia* in the Gulf of Thailand and the South China Sea is based upon the emerging understanding of the importance of natural *refugia* in sustaining fisheries. Fish stocks in the Gulf of Thailand and South China Sea are subjected to high levels of fishing effort, such that stocks of most economically important species are considered fully fished or over-fished. Maintenance of natural *refugia*, or creation of *refugia* in cases where natural *refugia* no longer exist due to over-fishing or habitat loss, should be important priorities for the management of fisheries in Southeast Asia. These areas may act as effective buffers against uncertainty and recruitment failure, of which the latter is especially relevant in terms of food security.

SIXTH MEETING OF THE REGIONAL WORKING GROUP ON FISHERIES

The Sixth Meeting of the Regional Working Group on Fisheries (RWG-F) (5th-8th September 2005) noted that most fish populations are vulnerable to the impacts of over-fishing in areas and at times where there are high abundances of (a) stock in spawning condition, (b) juveniles and pre-recruits, or (c) pre-recruits migrating to fishing grounds. It was highlighted that the impacts of over-fishing are intensified in instances where small-scale fishers and commercial fishers share the same stock, often leading to disputes of the relative impacts of each group.

The Working Group agreed that this situation is characteristic of the over-fishing problem in many marine fisheries in the Gulf of Thailand and the South China Sea. Juveniles and pre-recruits are often caught in inshore areas by small-scale fishers, while commercial fishers catch adults of the same species offshore. It was highlighted that in situations such as this, high levels of fishing effort in inshore waters may drive growth over-fishing, while the same circumstances in offshore areas may cause recruitment over-fishing of the same stock. It was identified that the use of inshore nursery *refugia* to protect fish during the juvenile and pre-recruit phases of their life-cycle can assist in the prevention of growth over-fishing. Whereas spawning *refugia* may assist in the prevention of recruitment over-fishing.

SIXTH MEETING OF THE REGIONAL SCIENTIFIC AND TECHNICAL COMMITTEE

The Sixth Meeting of the Regional Scientific and Committee (RSTC) (8th-10th December 2005) considered document UNEP/GEF/SCS/RSTC.6/7 "*Identification of Fisheries Refugia in the Gulf of Thailand*". It was noted that fisheries *refugia* have often been used as a fisheries management tool when more conventional techniques, such as effort or gear restrictions, have failed to achieve desired management objectives, particularly in regions where fisheries are subject to intense and unmanageable fishing pressure, such as in the Gulf of Thailand. In other cases, fisheries *refugia* have been used to separate potentially conflicting uses of coastal waters and their limited resources. However, the effectiveness of fisheries *refugia* will likely depend on an appropriate consideration of known critical spawning and nursery areas in the selection of sites. In this connection, it was discussed that the RWG-F should take the following two-track approach to the identification of fisheries *refugia*:

1. Review known spawning areas for pelagic and invertebrate species, with the aim of evaluating these sites as candidate spawning *refugia*.
2. Evaluate each of the project's habitat demonstration sites as potential juvenile/pre-recruit *refugia* for significant demersal species.

SEVENTH MEETING OF THE REGIONAL WORKING GROUP ON FISHERIES

During its Seventh Meeting in Bangkok, Thailand (16-18 May 2006) the RWG-F considered a preliminary inventory of known spawning areas in the Gulf of Thailand for significant pelagic, demersal, and invertebrate species. To assist in developing a more comprehensive basis for the development of a list of critical spawning and nursery areas for important fish species, the RWG-F agreed to compile information during the inter-sessional period on:

- The UNEP/GEF South China Sea Project's Habitat Demonstration Sites that are critical inshore nursery *refugia* for important demersal species,
- Locations in the South China Sea and Gulf of Thailand that are utilised by important pelagic species for spawning, and
- Fisheries management areas that may qualify as candidate sites of fisheries *refugia*.

EIGHTH MEETING OF THE REGIONAL WORKING GROUPS ON FISHERIES

The Eighth Meeting of the RWG-F considered document UNEP/GEF/SCS/RWG-F.8/5 "*Information Collated by the Fisheries and Habitat Components of the South China Sea Project on Sites Important to the Life-Cycles of Significant Fish Species*". This document contained a review of all information collated by the fisheries and habitat components of the South China Sea Project on fish-habitat linkages. The sources of this information include:

- National Reports on Fisheries,
- National Reports on Coral Reefs, Seagrass, Mangroves, and Wetlands,
- Habitat Site Characterisations,
- Habitat Demonstration Site Project Documents,
- The South China Sea Online Meta-Database, and
- Information Contributed Directly by Fisheries and Habitat Focal Points.

The Eighth Meeting agreed that this information should to identify known fish spawning and nursery areas in the Gulf of Thailand and the South China Sea. It was further agreed that members would form country-based sessional working groups to prepare country summaries of known critical spawning and nursery areas in their respective countries.

Table 1 Known Critical Spawning and Nursery Areas for Significant Fish Species in Viet Nam.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Use of the Site		Time of Year	Information Sources
			Nursery	Spawning		
Haiphong – Nam Dinh, including Xuan Thuy National Park	19°50' – 20°40' N 106°05' – 106°45' E	Bensasi goatfish (<i>Upeneus bensasi</i>) Goldband goatfish (<i>Upeneus moluccensis</i>) Golden threadfin bream (<i>Nemipterus virgatus</i>) Slender threadfin bream (<i>Nemipterus metopias</i>) Japanese scad (<i>Decapterus maruadsi</i>) Sardine (<i>Sardinella jussieu</i>) <i>Ilisha</i> (<i>Ilisha increase</i>) Crimson snapper (<i>Lutjanus erythropterus</i>) Grouper (<i>Epinephelus</i> spp.) Squid (<i>Loligo</i> spp.) Cuttlefish (<i>Sepia</i> spp.) Asiatic hard clam (<i>Meretrix meretrix</i>) Karuma prawn (<i>Penaeus japonicus</i>)	•	•	Multiple species utilise the site as a critical spawning area from April – July. Need to identify time of spawning for significant species The site is utilised year round as a nursery habitat, mostly by demersal species	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries
Bach Long Vi Island near Hai Phong	19°40' – 20°15' N 107°20' – 107°55' E	Goldband goatfish (<i>Upeneus moluccensis</i>) Golden threadfin bream (<i>Nemipterus virgatus</i>) Japanese scad (<i>Decapterus maruadsi</i>) Threadfin porgy (<i>Evynnis cardinalis</i>) Crimson snapper (<i>Lutjanus erythropterus</i>) Grouper (<i>Epinephelus</i> spp.) Abalone (<i>Haliotis diversicolor</i>) Sea cucumber (<i>Holothuria</i> spp.) Sea urchin (<i>Tripneustes gratilla</i>) Squid (<i>Loligo</i> spp.)	•	•	Multiple species utilise the site as a critical spawning area from April – July. Need to identify time of spawning for significant species The site is utilised year round as a nursery habitat, mostly by demersal species	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries
Hon La – Hon Nom Islands in Quang Binh Province	17°40' – 18°00' N 106°25' – 106°38'	Painted lobster (<i>Panulirus ornatus</i>) Chinese spiny lobster (<i>Panulirus stimpsoni</i>) Crimson snapper (<i>Lutjanus erythropterus</i>) Hong Kong grouper (<i>Epinephelus akaara</i>) Groupers (<i>Epinephelus</i> spp.) Orange-spotted spinefoot (<i>Siganus guttatus</i>) Sea cucumber (<i>Holothuria</i> spp.)	•		The site is utilised year round as a nursery habitat by <i>Panulirus</i> spp., <i>Lutjanus</i> spp., <i>Epinephelus</i> spp., and <i>Siganus guttatus</i>	Draft National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries
Phu Quoc Island	09°50' – 10°25' N 103°50' – 104°15' E	Japanese scad (<i>Decapterus maruadsi</i>) Short mackerel (<i>Rastrelliger brachysoma</i>) Spanish mackerel (<i>Scomberomorus commersoni</i>) Orange-spotted spinefoot (<i>Siganus guttatus</i>) Tropical snappers (<i>Lutjanus</i> spp.) Groupers (<i>Epinephelus</i> spp.) Sea cucumbers (<i>Holothuria</i> spp., <i>Tripneustes gratilla</i>) Banana Prawn (<i>Penaeus merguensis</i>) Pearl oyster (<i>Pinctada maxima</i>) Squid (<i>Loligo</i> spp.) Cuttlefish (<i>Sepia tigris</i>)	•	•	Multiple species utilise the site as a critical spawning area. Need to identify time of spawning for significant species. The site is utilised year round as a nursery habitat, mostly by demersal species.	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries

Table 1 cont. Known Critical Spawning and Nursery Areas for Significant Fish Species in Viet Nam.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Use of the Site		Time of Year	Information Sources
			Nursery	Spawning		
		Sea urchin (<i>Tripneustes gratilla</i>) Threadfin breams (<i>Nemipterus</i> spp.) Moray eel (<i>Gymnothorax undulates</i>) Bigeye snapper (<i>Lutjanus lineolatus</i>) Onespot snapper (<i>Lutjanus monostigma</i>) Indian goatfish (<i>Parupeneus indicus</i>) Double whiptail (<i>Pentapodus emeryii</i>) Striped whiptail (<i>Pentapodus vitta</i>) Brushtooth lizardfish (<i>Saurida undosquamis</i>) Monocle bream (<i>Scolopsis lineate</i>) Asymmetrical goatfish (<i>Upeneus asymmetricus</i>) Freckled goatfish (<i>Upeneus tragula</i>) Blue swimming crab (<i>Portunus pelagicus</i>)				
Binh Thuan Province to Con Dao Island in southern Viet Nam	08°28' – 10°15' N 106°25' – 107°40' E	Frigate tuna (<i>Auxis thazard</i>) Skipjack tuna (<i>Katsuwonus pelamis</i>) Japanese scad (<i>Decapterus maruadsi</i>) Indian mackerel (<i>Rastrelliger kanagurta</i>) Spanish mackerel (<i>Scomberomorus commersoni</i>) Tunas (<i>Thunnus</i> spp.) Anchovies (<i>Stolephorus</i> spp.) Red bigeye (<i>Priacanthus macracanthus</i>) Brushtooth lizardfish (<i>Saurida undosquamis</i>) Crimson snapper (<i>Lutjanus erythropterus</i>) Cobia (<i>Rachycentron canadum</i>) Squid (<i>Loligo</i> spp.) Cuttlefish (<i>Sepia</i> spp.)	•	•	Critical spawning area for <i>Scomberomorus commersoni</i> <i>Stolephorus</i> sp. from December to February. Need to identify time of spawning for significant species The site is utilised year round as a nursery habitat, mostly by demersal species	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries National Reports on Coral Reefs and Seagrass Coral Reef and Seagrass Habitat Site Characterisations
Hon Chuoi to Phu Quoc Island	08°30' – 10°00' N 103°32' – 104°28' E	Anchovies (<i>Stolephorus</i> spp.) Short mackerel (<i>Rastrelliger brachysoma</i>) Skipjack tuna (<i>Katsuwonus pelamis</i>) Japanese scad (<i>Decapterus maruadsi</i>) Doublespotted queenfish (<i>Chorinemus lysan</i>) Goldstripe sardinella (<i>Sardinella gibossa</i>) Hairtail (<i>Trichiurus haumella</i>) Cobia (<i>Rachycentron canadum</i>) Frigate tuna (<i>Auxis thazard</i>) Threadfin breams (<i>Nemipterus</i> spp.) Lizardfish (<i>Saurida</i> sp.) Moray (<i>Gymnothorax undulates</i>) Brushtooth lizardfish (<i>Saurida undosquamis</i>) Asymmetrical goatfish (<i>Upeneus asymmetricus</i>) Squid (<i>Loligo</i> spp.) Cuttlefish (<i>Sepia</i> spp.)	•	•	Multiple species utilise the site as a critical spawning area from April – July. Need to identify time of spawning for significant species The site is utilised year round as a nursery habitat, mostly by demersal species	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries National Reports on Coral Reefs and Seagrass Coral Reef and Seagrass Habitat Site Characterisations

Table 1 cont. Known Critical Spawning and Nursery Areas for Significant Fish Species in Viet Nam.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Use of the Site		Time of Year	Information Sources
			Nursery	Spawning		
Co To to Ha Mai Island	21°24'13"N – 107°48'01"E	Golden threadfin bream (<i>Nemipterus virgatus</i>) Japaneses scad (<i>Decapterus maruadsi</i>) Threadfin porgy (<i>Evynnis cardinalis</i>) Crimson snapper (<i>Lutjanus erythropterus</i>) Groupers (<i>Epinephelus</i> spp.)	•	•	Multiple species utilise the site as a critical spawning area from April – June. Need to identify time of spawning for significant species The site is utilised year round as a nursery habitat, mostly by demersal species	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries National Reports on Coral Reefs and Seagrass Coral Reef and Seagrass Habitat Site Characterisations
Ninh Co to Lach Ghep Estuary	19°59'05"N – 106°1'35"E	Japanese scad (<i>Decapterus maruadsi</i>) Sardine (<i>Sardinella jussieu</i>) Ilisha (<i>Ilisha increase</i>) Crimson snapper (<i>Lutjanus erythropterus</i>) Groupers (<i>Epinephelus</i> spp.) Squid (<i>Loligo</i> spp.) Cuttlefish (<i>Sepia</i> spp.)	•		The site is utilised year round as a nursery habitat, mostly by demersal species	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries National Reports on Coral Reefs and Seagrass Coral Reef and Seagrass Habitat Site Characterisations
Cu Lao Thu (Phu Qui)	10°31'36"N – 108°56'40"	Threadfin breams (<i>Nemipterus</i> spp.) Lizardfish (<i>Saurida</i> spp.) Indian goatfish (<i>Parupeneus indicus</i>) Brushtooth lizardfish (<i>Saurida undosquamis</i>) Monocle bream (<i>Scolopsis lineate</i>) Asymmetrical goatfish (<i>Upeneus asymmetricus</i>) Freckled goatfish (<i>Upeneus tragula</i>)	•	•	Multiple species utilise the site as a critical spawning area from April – September. Need to identify time of spawning for significant species. The site is utilised year round as a nursery habitat, mostly by demersal species.	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries National Reports on Coral Reefs and Seagrass Coral Reef and Seagrass Habitat Site Characterisations
Cu Lao Cham	15°57'08"N – 108°1'13"E	Banded grouper (<i>Epinephelus amblycephalus</i>) Blacktip grouper (<i>Epinephelus fasciatus</i>) Tropical snapper (<i>Panulirus ornatus</i>)	•	•	Multiple species utilise the site as a critical spawning area. Need to identify time of spawning for significant species. The site is utilised year round as a nursery habitat, mostly by demersal species.	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries National Reports on Coral Reefs and Seagrass Coral Reef and Seagrass Habitat Site Characterisations
Cua Dai (1 of 9 Mekong River mouths in Viet Nam)	9°47'44"N – 106°33'38"E	Threadfin breams (<i>Nemipterus</i> spp.) Lizardfish (<i>Saurida</i> spp.) Bigeye snapper (<i>Lutjanus lineolatus</i>) Onespot snapper (<i>Lutjanus monostigma</i>) Indian goatfish (<i>Parupeneus indicus</i>) Brushtooth lizardfish (<i>Saurida undosquamis</i>) Monocle bream (<i>Scolopsis lineate</i>) Asymmetrical goatfish (<i>Upeneus asymmetricus</i>) Freckled goatfish (<i>Upeneus tragula</i>)	•	•	Multiple species utilise the site as a critical spawning area. Need to identify time of spawning for significant species. The site is utilised year round as a nursery habitat, mostly by demersal species.	National Report on Fisheries Dr. Dao Manh Son, Fisheries Focal Point, and researchers of Research Institute for Marine Fisheries National Reports on Coral Reefs and Seagrass Coral Reef and Seagrass Habitat Site Characterisations

Table 2 Known Critical Spawning and Nursery Areas for Significant Fish Species in Thailand.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Usage of the Site		Time of Year	Information Sources
			Nursery	Spawning		
Koh Chang Strait and Trat Bay, Trat Province	12°09'42"N - 102°15'00"E	<i>Indo-Pacific mackerel (Rastrelliger neglectus)</i>	•	•	Nursery: December-January Spawning: June-August and December-February	Sinanant (in press)
		Spanish mackerel (<i>Scomberomorus commersoni</i>)		•	February-March and July-September	Chullasorn (1978), Supongpun and Chayakul (1980)
		Tunas (<i>Thunnus</i> spp.)		•	January-March and May-July	Chuenpun (1996)
		Kawakawa (<i>Euthynnus affinis</i>)		•	January-March and May-July	Chuenpun (1996)
		Torpedo scad (<i>Megalaspis cordyla</i>)	•		December-January	Chuenpakdee (2002)
		Yellowtail scad (<i>Atule mate</i>)		•	March-April	Dr. Joompol Sanguansin
		Yellowstripe scad (<i>Selaroides leptolepis</i>)		•	March and July-September	Dr. Joompol Sanguansin
		Sardines (<i>Sardinella</i> spp.)		•	June-August	Munprasit (1996)
		Anchovies (<i>Encrasicholina</i> spp., <i>Stolephorus</i> spp.)		•	March-April and July-September	Dr. Joompol Sanguansin
		Threadfin breems (<i>Nemipterus</i> spp.)		•	May-June	Singhagraiwan (1996)
		Lizardfish (<i>Saurida</i> spp.)		•	May-July	Singhagraiwan (1993)
		Cuttlefish (<i>Sepia</i> spp.)		•	May-August	Chotiyaputta (1989)
		Penaeid shrimps (<i>Penaeus</i> spp.)		•	January-June and August-December	Roongratri (1980, 1990 and 1992)
		Chumphon Group (Prachuap Khiri Khan, Chumphon and Surat Thani Province)	Northern border: From low-water mark to 12°12'49"N – 105°50'46"E Southern border: From low-water mark to 8°52'50"N - 105°50'46"E	<i>Indo-Pacific Mackerel (Rastrelliger neglectus)</i>		•
Indian mackerel (<i>Rastrelliger</i> sp.)				•	February-May and June-September	National Fisheries Report
Tunas (<i>Thunnus</i> spp.)				•	January-March and May-July	National Fisheries Report
Kawakawa (<i>Euthynnus affinis</i>)				•	January-March and May-July	National Fisheries Report
Yellowtail scad (<i>Atule mate</i>)				•	March-April	National Fisheries Report
Yellowstripe scad (<i>Selaroides leptolepis</i>)				•	March and July-September	National Fisheries Report
Sardines (<i>Sardinella</i> spp.)				•	March-April and July-September	National Fisheries Report
Anchovies (<i>Encrasicholina</i> spp., <i>Stolephorus</i> spp.)				•	December-January and April-September	National Fisheries Report
Threadfin breems (<i>Nemipterus</i> spp.)				•	January-April and June-September	National Fisheries Report
Khung Krabane Bay Seagrass Areas Samui Island Pha Ngan Island Pattani Bay				50 economically important demersal and pelagic species	•	
		36 economically important demersal and pelagic species	•		All year	National Seagrass Report
		23 economically important demersal and pelagic species	•		All year	National Seagrass Report
		103 economically important demersal and pelagic species	•	•	All year. Need to determine spawning time for significant species.	National Seagrass Report

Table 3 Known Critical Spawning and Nursery Areas for Significant Fish Species in the Philippines.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Usage of the Site		Time of Year	Information Sources
			Nursery	Spawning		
Lingayen Gulf	16°12'42" – 120°08'17"	Threadfin bream (<i>Nemipterus</i> spp.)	•	•		Fisheries and habitat reports
		Mangrove red snapper (<i>Lutjanus argentimaculatus</i>)	•			Fisheries and habitat reports
		Brownstripe red snapper (<i>Lutjanus vitta</i>)	•			Fisheries and habitat reports
		Leopard coralgroupers (<i>Plectropomus leopardus</i>)	•	•		Fisheries and habitat reports
		White-spotted spinefoot (<i>Siganus canaliculatus</i>) (Rabbitfish)	•	•		Fisheries and habitat reports
		Mottled spinefoot (<i>Siganus fuscescens</i>) (Rabbitfish)	•	•		Fisheries and habitat reports
		Sixbar grouper (<i>Epinephelus sexfasciatus</i>)	•	•		Fisheries and habitat reports
		Greasy grouper (<i>Epinephelus tauvina</i>)	•	•		Fisheries and habitat reports
		Frigate tuna (<i>Auxis thazard</i>)	•			Fisheries and habitat reports
		Bullet tuna (<i>Auxis rocheii</i>)	•			Fisheries and habitat reports
		Spanish mackerel (<i>Scomberomorus commersoni</i>)	•			Fisheries and habitat reports
		Short mackerel (<i>Rastrelliger brachysoma</i>)	•			Fisheries and habitat reports
Masinloc	15°48'-15°59'N 119°89'-119°97'E	Skipjack tuna (<i>Katsuwonus pelamis</i>)	•	•		Fisheries and habitat reports
		Yellowfin tuna (<i>Thunnus albacares</i>)	•	•		Fisheries and habitat reports
		Bigeye tuna (<i>Thunnus obesus</i>)	•	•		Fisheries and habitat reports
		Round scads (<i>Decapterus</i> spp.)	•	•		Fisheries and habitat reports
		Frigate tuna (<i>Auxis thazard</i>)	•	•		Fisheries and habitat reports
		Bullet tuna (<i>Auxis rocheii</i>)	•	•		Fisheries and habitat reports
		Sardines (<i>Sardinella</i> spp.)	•			Fisheries and habitat reports
Batangas Coast	13°39'N – 120°44'E	Frigate tuna (<i>Auxis thazard</i>)	•	•		Fisheries report
		Bullet tuna (<i>Auxis rocheii</i>)	•	•		Fisheries report
		Sardines (<i>Sardinella</i> spp.)	•			Fisheries report
		<i>Rastrelliger kanagurta</i> (Indian mackerel)	•			Fisheries report
		<i>Rastrelliger brachysoma</i> (Short mackerel)	•			Fisheries report

Table 3 cont. Known Critical Spawning and Nursery Areas for Significant Fish Species in the Philippines.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Usage of the Site		Time of Year	Information Sources
			Nursery	Spawning		
Calamianes	12°00'49"N – 120°05'10"	Torpedo scad (<i>Megalaspis cordyla</i>)	•			FISH Project report
		<i>Spatelloides gracilis</i>	•	•		FISH Project report
		Yellowtail scad (<i>Atule mate</i>)	•			FISH Project report
		Bigeye scad (<i>Selar crumenophthalmus</i>)	•			FISH Project report
		Indian mackerel (<i>Rastrelliger kanagurta</i>)	•			FISH Project report
		Sapanish mackerel (<i>Scomberomorus commersoni</i>)	•			FISH Project report
		Oxeye scad (<i>Selar boops</i>)	•			FISH Project report
		Leopard coralgroupier (<i>Plectropomus leopardus</i>)	•	•		FISH Project report
		White-spotted spinefoot (<i>Siganus canaliculatus</i>) (Rabbitfish)	•	•		FISH Project report
		Frigate tuna (<i>Auxis thazard</i>)	•			Fisheries report
		Bullet tuna (<i>Auxis rocheii</i>)	•			Fisheries report
		Blue swimming crab (<i>Portunus pelagicus</i>)	•	•		FISH Project report
Malampaya Sound	11°01'N – 119°17'E	Indian anchovy (<i>Stolephorus indicus</i>)	•			Habitat report
		Commerson's anchovy (<i>Stolephorus commersonii</i>)	•			Habitat report
		Common ponyfish (<i>Leiognathus equulus</i>)	•	•		ADB RETA
		Blue swimming crab (<i>Portunus pelagicus</i>)	•	•		Habitat report
		Banana Prawn (<i>Penaeus merguensis</i>)	•	•		Habitat report

Table 4 Known Critical Spawning and Nursery Areas for Significant Fish Species in Malaysia.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Usage of the Site		Time of Year	Information Sources
			Nursery	Spawning		
Seagrass Sites	02°44' – 104°12'	Multiple demersal and pelagic species	•		All year	Ms. Chee Phaik Ean
	02°4'30" – 104°22'35"	Multiple demersal and pelagic species	•		All year	
	03°11'45" – 112°43'	Multiple demersal and pelagic species	•		All year	
	05°21'15" – 115°12'	Multiple demersal and pelagic species	•		All year	
	06°13'19" – 116°05'	Multiple demersal and pelagic species	•		All year	
	07°16'47" – 116°48'	Multiple demersal and pelagic species	•		All year	
	07°14'05" – 117°20'	Multiple demersal and pelagic species	•		All year	
	05°45' – 118°2'30"	Multiple demersal and pelagic species	•		All year	
	04°46' – 118°58'	Multiple demersal and pelagic species	•		All year	
Coral Reef Sites	04°31' – 118°41'	Multiple demersal and pelagic species	•		All year	
	05°36' – 119°30'	Multiple demersal and pelagic species	•		All year	
	06°10'37" – 118°02'	Multiple demersal and pelagic species	•		All year	
	07°18' – 117°19'	Multiple demersal and pelagic species	•		All year	
	07°26' – 116°44'	Multiple demersal and pelagic species	•		All year	
	06°14' – 115°35'	Multiple demersal and pelagic species	•		All year	
	05°21'55" – 115°11'	Multiple demersal and pelagic species	•		All year	
	04°11'33" – 113°14'	Multiple demersal and pelagic species	•		All year	
	03°49' – 112°06'48"	Multiple demersal and pelagic species	•		All year	
	02°46' – 104°09'	Multiple demersal and pelagic species	•		All year	
	05°44' – 103°01'46"	Multiple demersal and pelagic species	•		All year	
05°54' – 102°42'	Multiple demersal and pelagic species	•		All year		

Table 5 Known Critical Spawning and Nursery Areas for Significant Fish Species in Indonesia.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Usage of the Site		Time of Year	Information Sources
			Nursery	Spawning		
Riau Province Coast and Riau Island	1N, 104-105E	Demersal finfish and small pelagic fish	•	•	Juveniles of demersal species utilise the area year round. Exact spawning times unknown.	National Fisheries Report (Sumino and Widodo, 2003)
West Kalimantan Waters	2N-2S, 108E	Demersal finfish and small pelagic fish		•	Exact spawning times unknown.	National Fisheries Report (Sumino and Widodo, 2003)
West Kalimantan Waters (South China Sea)	5N-3S, 107-109E	Small pelagic	•	•	Juveniles of demersal species utilise the area year round. Exact spawning times unknown.	National Fisheries Report (Haryati, 2003)
Eastern coast of North Sumatra (North Sumatra Province)	1N, 104-105E	Multiple demersal and pelagic species	•	•	Juveniles of demersal species utilise the area year round. Exact spawning times unknown.	Dr. Parlin Tambunan
Bangka Belitung Waters	2°44'N – 107°11'E	Multiple demersal and pelagic species	•	•	Juveniles of demersal species utilise the area year round. Exact spawning times unknown.	Dr. Parlin Tambunan
East Bintan Seagrass Demonstration Site		Monocle bream (<i>Scolopsis xenochrous</i>)	•		Year round	National Seagrass Report
		Dory snapper (<i>Lutjanus fulviflamma</i>)	•		Year round	
		John's snapper (<i>Lutjanus johni</i>)	•		Year round	
		Thumbprint emperor (<i>Lethrinus harak</i>)	•		Unkown	
		Pink ear emperor (<i>Lethrinus lentjan</i>)	•		Year round	
		Freckled goatfish (<i>Upeneus tragula</i>)	•		Year round	
		Yellowstriped goatfish (<i>Upeneus vittatus</i>)	•		Year round	
		Orange-dotted tuskfish (<i>Choerodon anchorago</i>)	•		Year round	
		Freckled goatfish (<i>Upeneus tragula</i>)	•		Unknown	
		Yellowstriped goatfish (<i>Upeneus vittatus</i>)	•		Year round	
	Orange-dotted tuskfish (<i>Choerodon anchorago</i>)	•		Unknown		

Table 6 Known Critical Spawning and Nursery Areas for Significant Fish Species in Cambodia.

Site Name	Geographic Location	Species Known to Utilise the Site	Known Usage of the Site		Time of Year	Information Sources
			Nursery	Spawning		
Kampot Seagrass Demonstration Site	10°27 – 10°36 N 103°54 – 104°17 E	Greasy grouper (<i>Epinephelus tauvina</i>)	•		All year	Mr. Ouk Vibol
		Mangrove red snapper (<i>Lutjanus argentimaculatus</i>)	•		All year	
		Malabar grouper (<i>Epinephelus malabaricus</i>)	•		All year	
		Threadfin bream (<i>Nemipterus</i> spp.)	•		All year	
		Leopard coral grouper (<i>Plectropomus leopardus</i>)	•		All year	
		Lizardfish (<i>Saurida</i> spp.)	•		All year	
		Brownstripe red snapper (<i>Lutjanus vitta</i>)	•		All year	
		Sixbar Grouper (<i>Epinephelus sexfasciatus</i>)	•		Unknown	
		Golden spotted spinefoot (<i>Siganus guttatus</i>)	•		All year	
		Whitespotted spinefoot (<i>Siganus canaliculatus</i>)	•		All year	
		Bluespot grey mullet (<i>Valamugil seheli</i>)	•		Unknown	
		Humpback grouper (<i>Cromileptes altivelis</i>)	•		All year	
		Long fin grouper (<i>Epinephelus quoyanus</i>)	•		All year	
		Orange spotted grouper (<i>Epinephelus coioides</i>)	•		All year	
		Backtip grouper (<i>Epinephelus faciatus</i>)	•		All year	
		Lined silver grunt (<i>Pomadourus hasta</i>)	•		Unknown	
		Wrasse (<i>Halichoeres kallochroma</i>)	•		All year	
		Harrowed Sole (<i>Strabozebrans cancellatus</i>)	•		All year	
		Streaked spinefoot (<i>Siganus javus</i>)	•		All year	
Cambodian waters	Exact locations unknown	Yellowtail scad (<i>Atule mate</i>)		•	May	National Fisheries Report
		Yellowstripe scad (<i>Selaroides leptolepis</i>)		•	February – April	
		Torpedo scad (<i>Megalaspis cordyla</i>)		•	September – December February – April	
		Japanese scad (<i>Decapterus maruadsi</i>)		•	September – December	
		Spanish mackerel (<i>Scomberomorus commersoni</i>)			January – March	
		Cavalla (<i>Alectis kalla</i>)		•	May – June	
		Trevally (<i>Alectis indicus</i>)		•	May – June	
		Doublespotted queenfish (<i>Scomberoides lysan</i>)		•	February – April	

ANNEX 5

Distribution and Abundance of Fish Larvae in the Gulf of Thailand and South China Sea

BACKGROUND

In evaluating the factors contributing to the resilience of fisheries to the resource-related effects of high levels of fishing effort, and how spatial fisheries management tools could effectively contribute to building resilience in Southeast Asian fisheries, the Regional Working Group on Fisheries (RWG-F) has focused on the natural *refugia* concept in fisheries. Specifically, the group has considered the following “theoretical” natural *refugia* types and how they may relate to regional fisheries:

- *Refugia* related to depth stratification of the population or the selectivity of fishing gear causing parts of the population to have a very low probability of capture,
- Migrations to spawning area *refugia* located outside of the fishing grounds, and
- A *refugia* scenario where part of the population is located in the fishing ground, with another part of the population occupying areas that are not fished and providing a source of new recruits to the fished area.

Sixth Meeting of the Regional Working Group on Fisheries

During its Sixth Meeting in Sabah, Malaysia, 5th - 8th September, 2005, the RWG-F felt uncomfortable associating any of the above *refugia* scenarios with important fishes in the region, largely due to a lack of information about the biology and population dynamics of most species at that time. There was, however, consideration of the role of *refugia* in fisheries of other regions, with discussion of the example of high recruitment and catches of hake in the Mediterranean during the 1980s despite a complete lack of input/output controls and a high percentage of juvenile fish being caught by inshore trawlers. It was pointed out that it is believed this occurred due to larger spawning fish occupying deeper areas of the continental shelf in *refugia* created by the inefficiency of the fine inshore trawls for large fish, and making a major spawning contribution to the adjacent fishery.

Regardless of the lack of readily available regional examples of the role of natural *refugia*, the group agreed that the identification of such *refugia* should be the focus of efforts to establish management areas for regional fisheries as:

- It is “*refugia*” that most likely contribute to the resilience of fisheries to the effects of fishing,
- The concept is likely to be more easily understood by fishers and align closely with the traditional knowledge of fishers, and
- It may be easier to manage these areas with limited research and monitoring, control and surveillance resources than other technical-based measures.

Problems Identifying Natural *Refugia* in the Gulf of Thailand and South China Sea

Several members of the group have highlighted that they find it difficult to believe that many of the above-mentioned natural *refugia* remain in areas such as the Gulf of Thailand, especially considering the:

- Multi-gear/sector/jurisdiction nature of fisheries,
- The combined problems of over-exploitation and community dependence on fisheries,
- Reported ecosystem effects of fishing, and the
- Large scale fisheries habitat losses associated with the development of shrimp farming activities.

Accordingly, the RWG-F is of the opinion that it will be very difficult to base fisheries *refugia* on actual natural *refugia*, and is promoting the use of the RWG-F definition of *refugia* for the identification of fisheries *refugia* to “replace” those lost due to over-exploitation and the destruction of fisheries habitats. There is a common understanding that fisheries *refugia* relate to specific areas of significance to the life cycle of particular species, and that they should be defined in space and time, and serve to protect spawning aggregations, nursery grounds, and migratory routes.

Since it is not possible at this stage to describe any natural *refugia* for important species, the group believes that the action of establishing *areas where management measures are applied to sustain important species during critical stages of their life cycle* (e.g. nursery areas, spawning areas, migratory routes) is a reasonable starting point for a system of *refugia* and that the region should proceed on this basis. The group has indicated that they feel information needs will become apparent over time, enabling identification of future areas for research and the development of a better understanding of critical habitat-life cycle linkages.

Sixth Meeting of the Regional Scientific and Technical Committee

The Sixth Meeting of the Regional Scientific and Technical Committee in December 2005 recommended that the RWG-F focus part of its efforts on reviewing known spawning areas for pelagic and invertebrate species, with the aim of evaluating these sites as candidate spawning *refugia*. It was noted that by the RSTC that information regarding the spatial dynamics of pelagic fish and invertebrate populations, oceanographic features, fish behaviour, and fishing effort dynamics should be used to determine the optimum locations and sizes of spawning *refugia* in the Gulf of Thailand and South China Sea.

Joint South China Sea Project – SEAFDEC Meeting on Identification of Fish Spawning Areas

The development of a collaborative programme of technical consultations, working group meetings, and training workshops, aimed at strengthening efforts to establish a regional system of fisheries *refugia*, was discussed between the South China Sea Project and SEAFDEC during August 2006. In this connection it was agreed that it would be beneficial to convene a brief working meeting between representatives of the RWG-F and SEAFDEC's Special Advisor and Research Scientist on the identification of fish spawning *refugia*. It was further agreed that the meeting would provide the RWG-F and SEAFDEC with an opportunity to develop a programme of work to (a) review past and ongoing fish early-life history research work, and (b) compile information on known spawning and nursery areas for significant fish species in the Gulf of Thailand and South China Sea.

This meeting was subsequently convened at the SEAFDEC Secretariat Office in Bangkok, Thailand on 25th September 2006. Dr. Yasuhisa Kato and Dr. Somboon Siriraksophon of SEAFDEC, and Christopher Paterson, the PCU Fisheries Expert, Khun Somsak Chullasorn, the Regional Fisheries Expert, and Khun Pirochana Saikliang, Fisheries Focal Point for Thailand participated in the meeting. The meeting discussed past research activities conducted in the 1970s and 1980s that had largely focused on the identification of spawning areas and migratory routes for Indo-Pacific Mackerel (*Rastrelliger neglectus*), round scads (*Decapterus* spp.), anchovy, and neritic tunas. It was noted and agreed that much of this information had been compiled in the Thai National Fisheries Report and is summarised in Annex 2 of document UNEP/GEF/SCS/RWG-F.8/5 "*Information Collated by the Fisheries and Habitat Components of the South China Sea Project on Specific Locations Important to the Life-Cycles of Significant Fish Species*".

RECENT INFORMATION REGARDING THE DISTRIBUTION AND ABUNDANCE OF FISH LARVAE IN THE GULF OF THAILAND AND SOUTH CHINA SEA

Some limitations in the use of abovementioned research for the identification of spawning *refugia* were noted during the course of the meeting, including reported ecosystem changes in the Gulf of Thailand over recent decades, and the fact that most data had been collected as part of short-term research activities. In this connection it was identified that data collected through ongoing research activities initiated by SEAFDEC in the late 1990s may provide a more recent and accurate information base for use in identify spawning and nursery areas.

SEAFDEC conducted a series of Marine Fisheries Resources Surveys from 1996-1999 in the Gulf of Thailand and South China Sea. These activities were part of the SEAFDEC Interdepartmental Collaborative Research Programme, and were implemented by the SEAFDEC Marine Fisheries Resources Development and Management Department, and the SEAFDEC Training Department, in cooperation with national fisheries departments and research institutes.

The main surveys of interest to the task of identifying fish spawning areas in the Gulf of Thailand and South China Sea were conducted using the SEAFDEC Research Vessel M.V. SEAFDEC in the following areas:

- Gulf of Thailand and East Coast of Peninsular Malaysia (81 stations)
- West Coast of Sabah, Sarawak, and Brunei Darussalam (79 stations)
- West Coast of Luzon, Philippines (31 stations)
- Vietnamese Waters (58 stations)

The surveys focused on the collation of important fisheries-related information including the distribution and abundance of key resources, the fisheries biology of significant species, the primary production of coastal oceans (including distribution and abundance of phytoplankton), fisheries oceanographic information, and other environmental information. The information and data collected during the surveys was subsequently analysed and presented during a series of regional technical seminars convened from 1997-2000.

A total of 249 larval fish samplings were conducted using bongo nets in the period of the post-northeast monsoon (April-May) from 1996-1999. Information collected from fishing communities, processors, and past research suggests that many economically important species in the Gulf of Thailand and South China Sea spawn during the period from January to March each year. As such, it was agreed during the 25th September meeting that the results of past and ongoing larval fish surveys conducted by SEAFDEC during the post northeast monsoon may assist the RWG-F in developing a better understanding of spawning (*sources*) and nursery (*sinks*) locations for important species.

In this connection, Dr. Somboon of SEAFDEC delivered a presentation during the Eighth Meeting of the RWG-F on the distribution and abundance of larval fish in the South China Sea and Gulf of Thailand during the post northeast monsoon periods from 1996-1999. Species based maps of the distribution and abundance of the larvae of important pelagic and demersal fish species were developed and are presented below. The key conclusions from Dr. Somboon's presentation included:

1. There were four (4) main areas with high larval fish abundances (>6,000 individuals per m³). These were the upper Gulf of Thailand, Thailand (Lat 12.30N Long 100.25-100.75E), the east coast of Samui Island, Thailand (Lat 9.30N, Long 100.25E), the Miri Coastal Area of Sarawak, Malaysia (Lat 4.30N, Long 114.00E), and the Quang Tri Coastal Area of Viet Nam (Lat 15.00N, Long 107.00E).
2. The larvae of four (4) groups of species were highly abundant in the upper Gulf of Thailand. These were the anchovies (*Stolephorus* spp.) (≈2,000 individuals per 1000m³), the jacks and trevallys (*Caranx* spp.) (≈1,000 individuals per 1000m³), the scads (*Decapterus* spp.) (≈500 per 1000m³), and the Yellowstipe scad (*Selaroides leptolepis*) (≈500 per 1000m³).
3. Nearly all *Sardinella* larvae (*Sardinella* spp.) were concentrated off the east coast of Thailand's Samui Island and the transboundary area between Thailand's Narathiwat Province and Kota Baru in Malaysia.
4. The larvae of mackerels (*Rastrelliger* spp.) were observed to be most abundant adjacent to Samui Island. Larvae of this group were less observed in lower abundances in the southern Gulf of Tonkin in Viet Nam's Quang Tri Province and at the Mekong River mouth in Viet Nam.
5. The larvae of Spanish mackerel (*Scomberomorus* spp.) were shown to be most abundant at the lower end of the Gulf of Tonkin and adjacent to Con Dao Island in Viet Nam.
6. The abundances of most tuna larvae were very low, except for *Euthynnus affinis* which were highly abundant in the Gulf of Tonkin, Viet Nam. The high abundance areas for *E. affinis* were located in the immediate vicinity of underwater sea mounts near the entrance to the Gulf of Tonkin.
7. In terms of demersal species, the upper Gulf of Thailand appeared to be important for the larvae of most economically important species.

8. There were three main sites utilised by fish larvae of important species: (1) Gulf of Tonkin, Viet Nam (*Euthynnus affinis*, *Scomberomorus* spp., *Rastrelliger* spp.), (2) Upper Gulf of Thailand (*Stolophorus* spp., *Decapterus* spp., and *Caranx* spp.), and (3) Samui Island (*Rastrelliger* spp., *Sardinella* spp., and *Nemipterus* spp.).
9. Very few larvae of any important fish species were observed along the east coast of Peninsular Malaysia. The member participating in the meeting on behalf of the Malaysian Department of Fisheries has noted that larvae of very few economically important species are known to utilise this area. Similarly, the larvae observed in areas the Malaysian States of Sarawak and Sabah were of less important genera from the family *Gobiidae* and *Monacanthus* spp. (Pipefish).
10. The linking of an oceanographic circulation model for the South China Sea to the distribution and abundance of fish larvae would assist the Working Group in developing a better understanding of the sources and sinks of fish larvae for economically important species.
11. Surveys conducted during the 1970s identified high relative abundances of scad (*Decapterus* spp.) larvae in the central Gulf of Thailand. The 1996-1999 surveys identified high relative abundances of scads in the upper Gulf of Thailand, whereas very few larvae of this group were observed in the central Gulf. Recent maps of the central Gulf of Thailand show that the areas utilised by the scads during the 1970s have been subjected to large-scale development in support of the oil and gas industry.

MAPS OF THE DISTRIBUTION AND ABUNDANCE OF LARVAL FISH IN THE GULF OF THAILAND AND SOUTH CHINA SEA DURING THE POST NORTHEAST MONSOON PERIODS FROM 1996-1999

All Larval Fish Combined

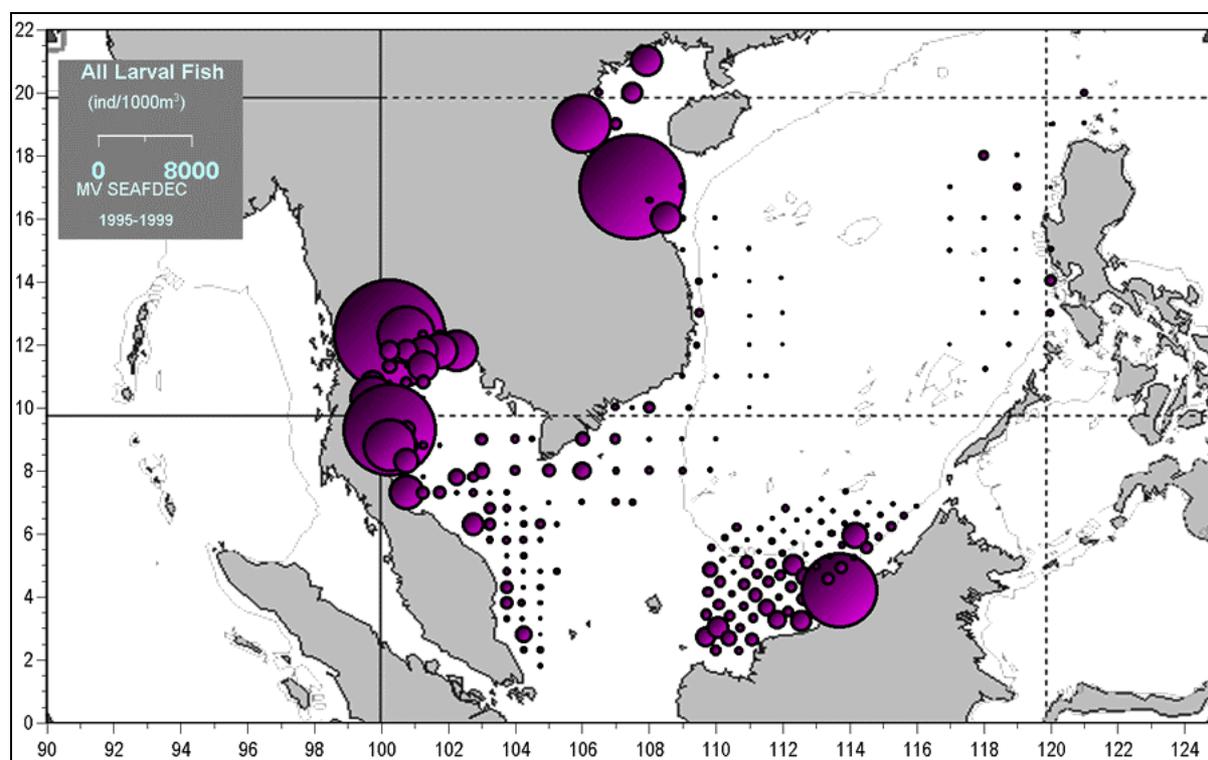


Figure 1 The distribution and relative abundance of fish larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999) (all larvae combined).

Pelagic Fish Species

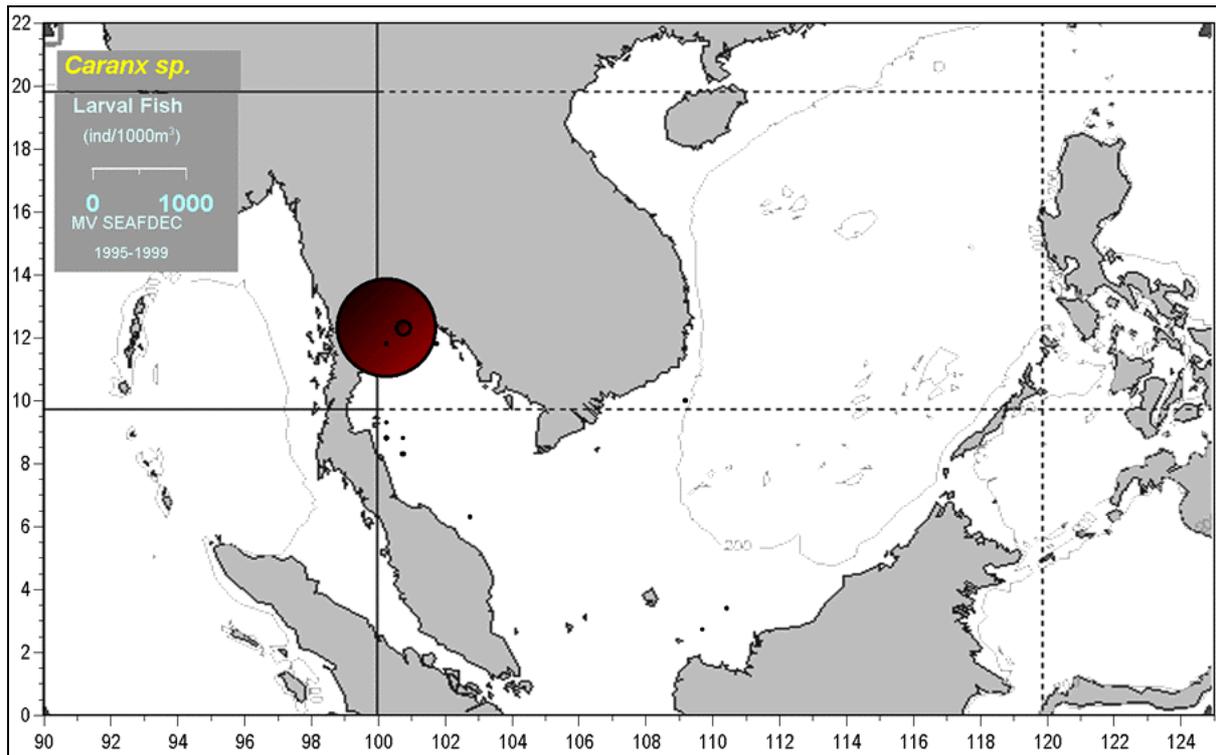


Figure 2 The distribution and relative abundance of fish larvae of jack and trevally (*Caranx* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

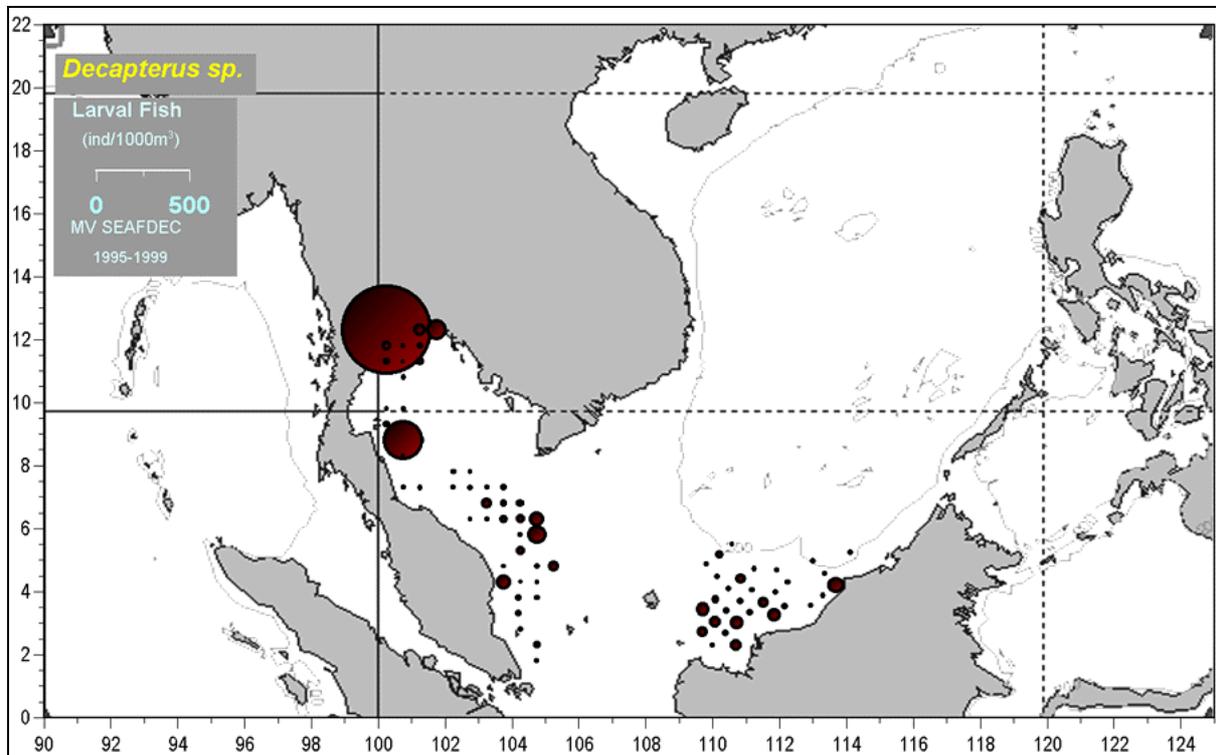


Figure 3 The distribution and relative abundance of scad (*Decapterus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

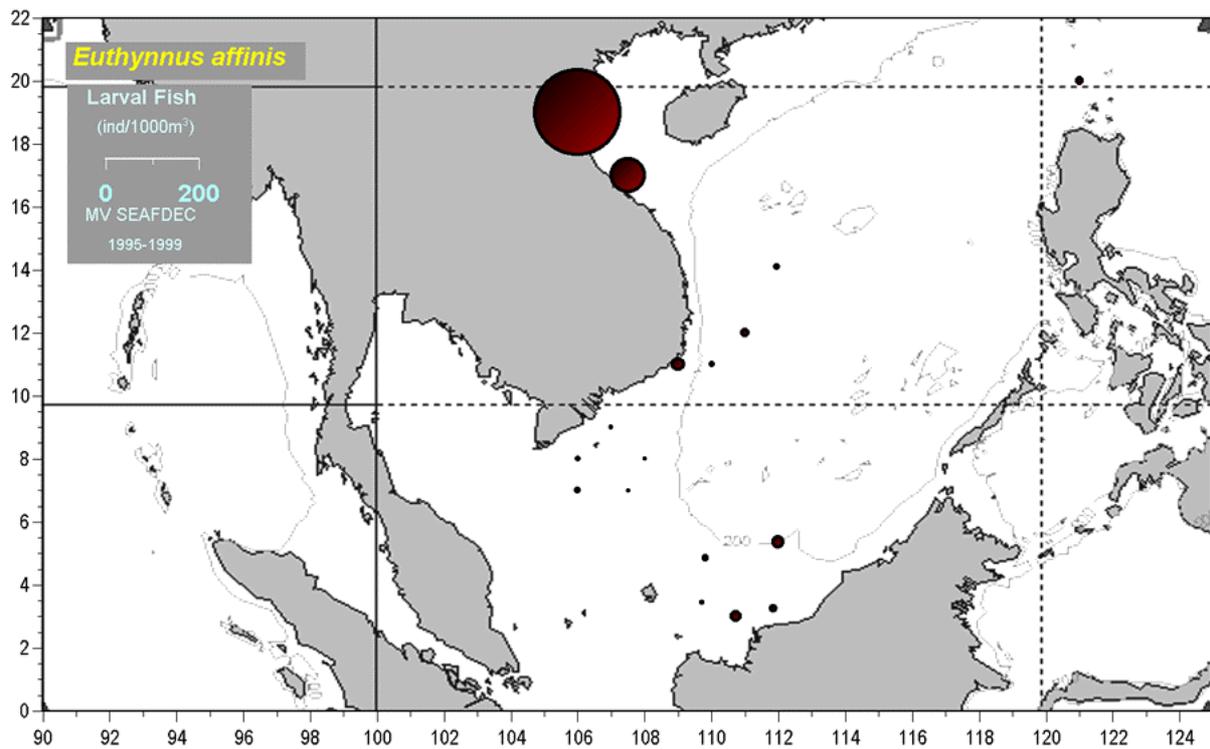


Figure 4 The distribution and relative abundance of kawakawa (*Euthynnus affinis*) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

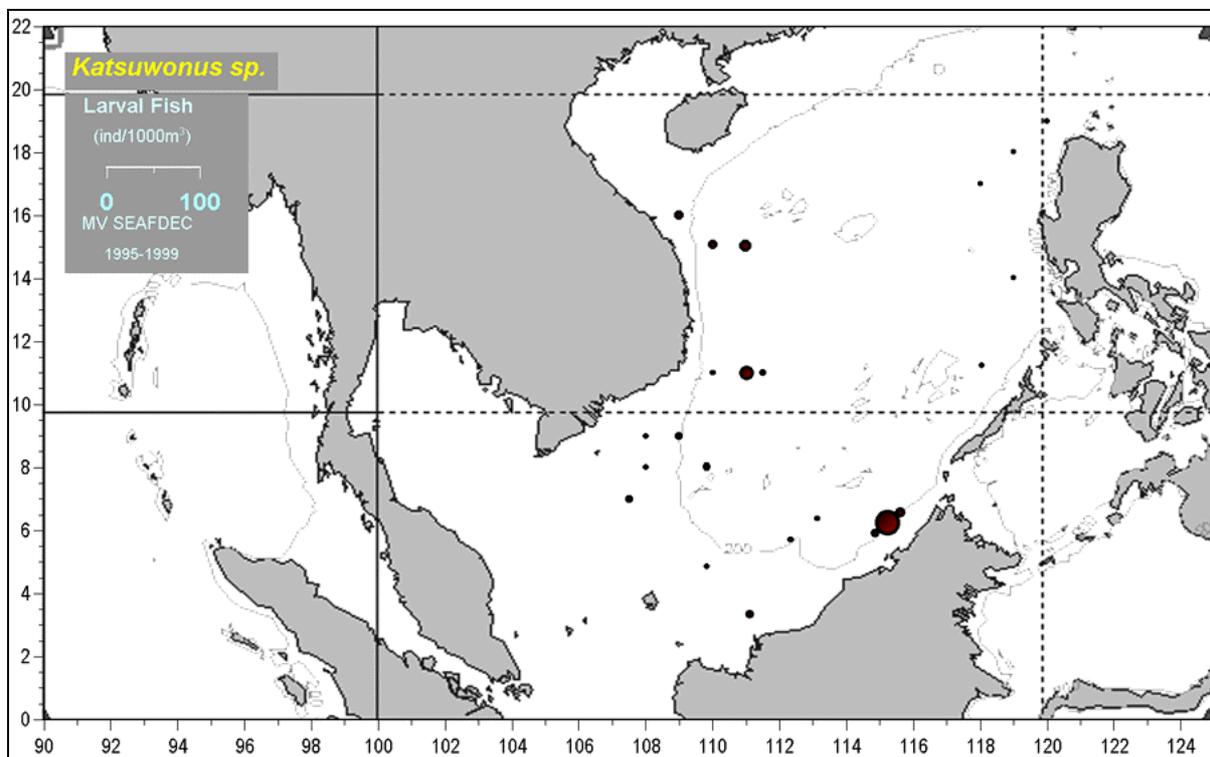


Figure 5 The distribution and relative abundance of skipjack tuna (*Katsuwonus pelamis*) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

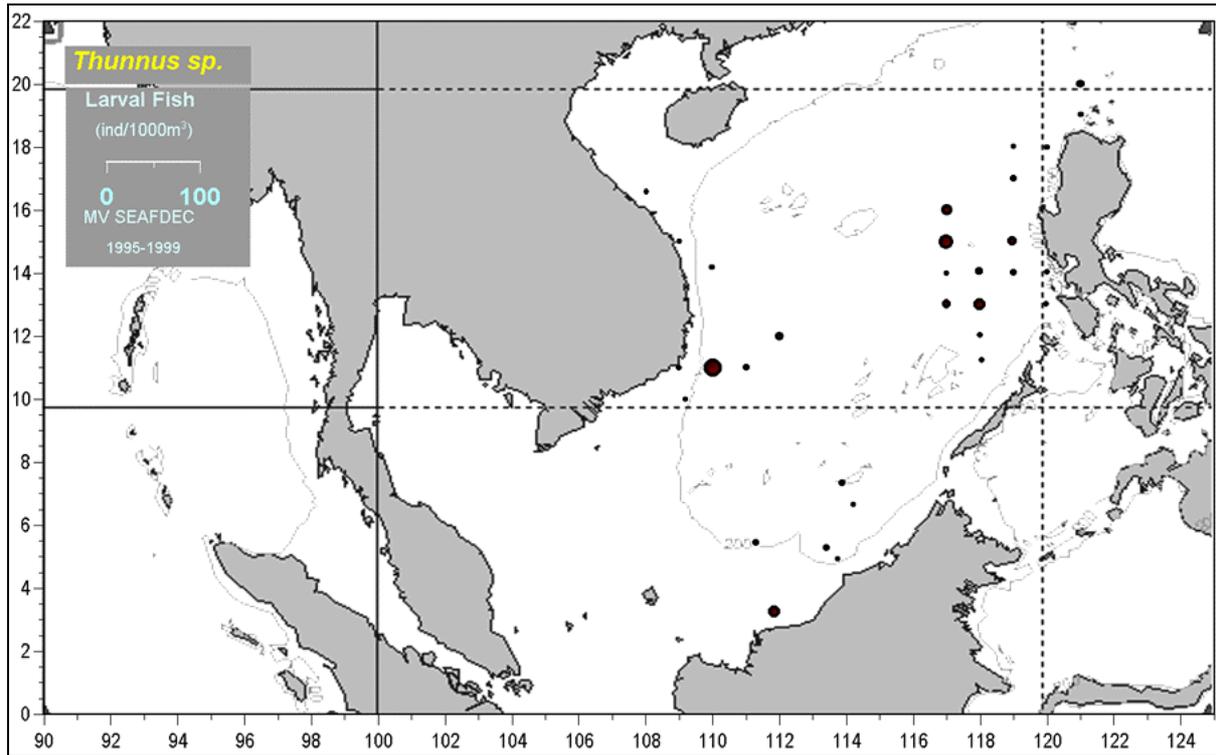


Figure 6 The distribution and relative abundance of tuna (*Thunnus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

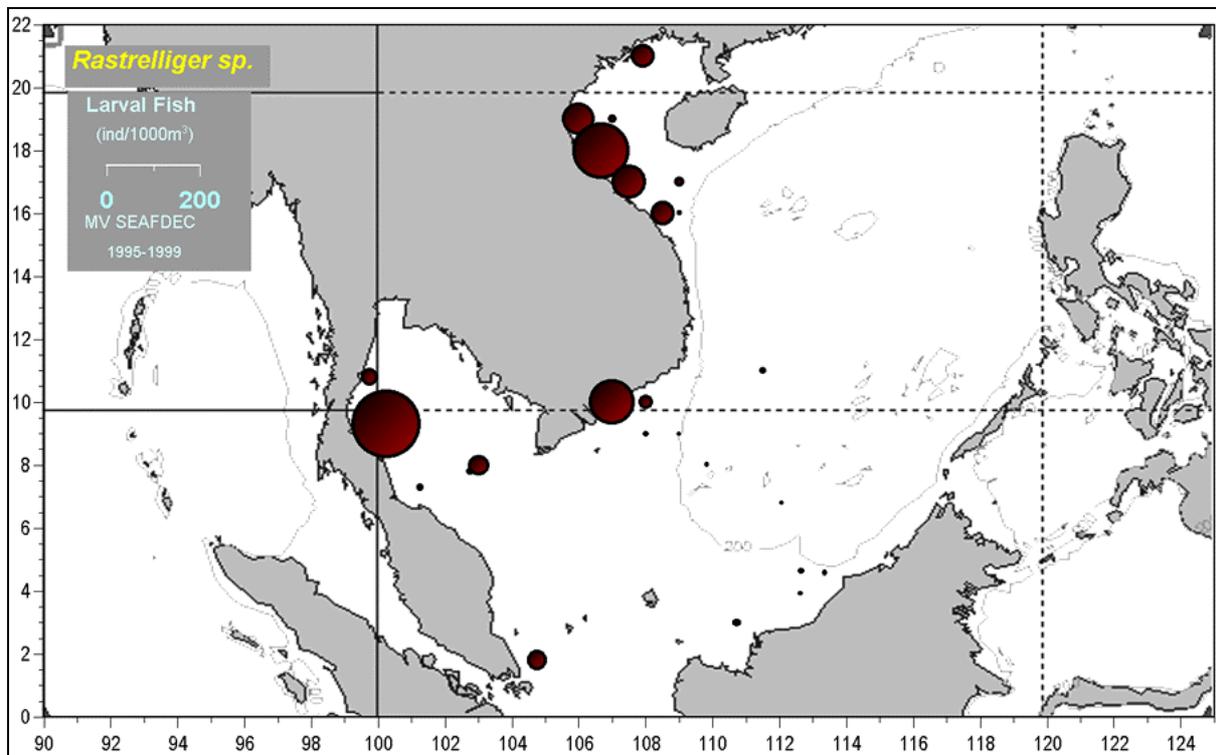


Figure 7 The distribution and relative abundance of mackerel (*Rastrelliger* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

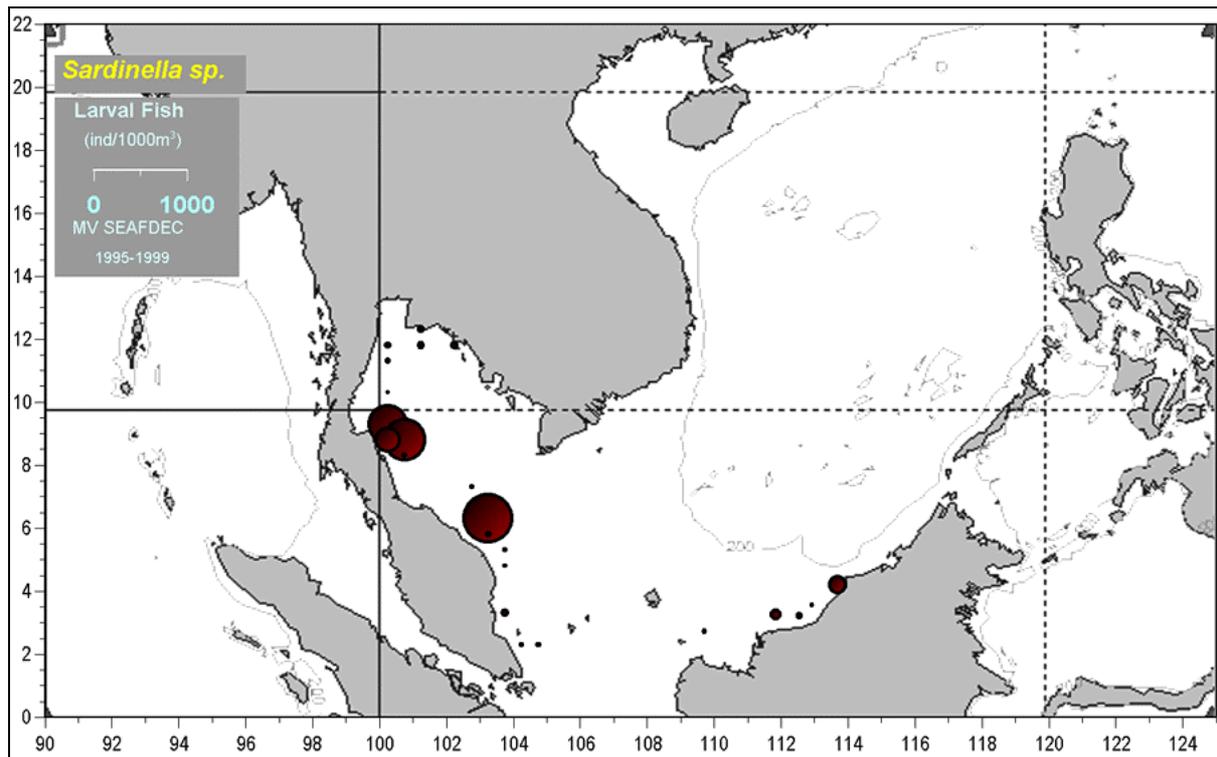


Figure 8 The distribution and relative abundance of sardinella (*Sardinella* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

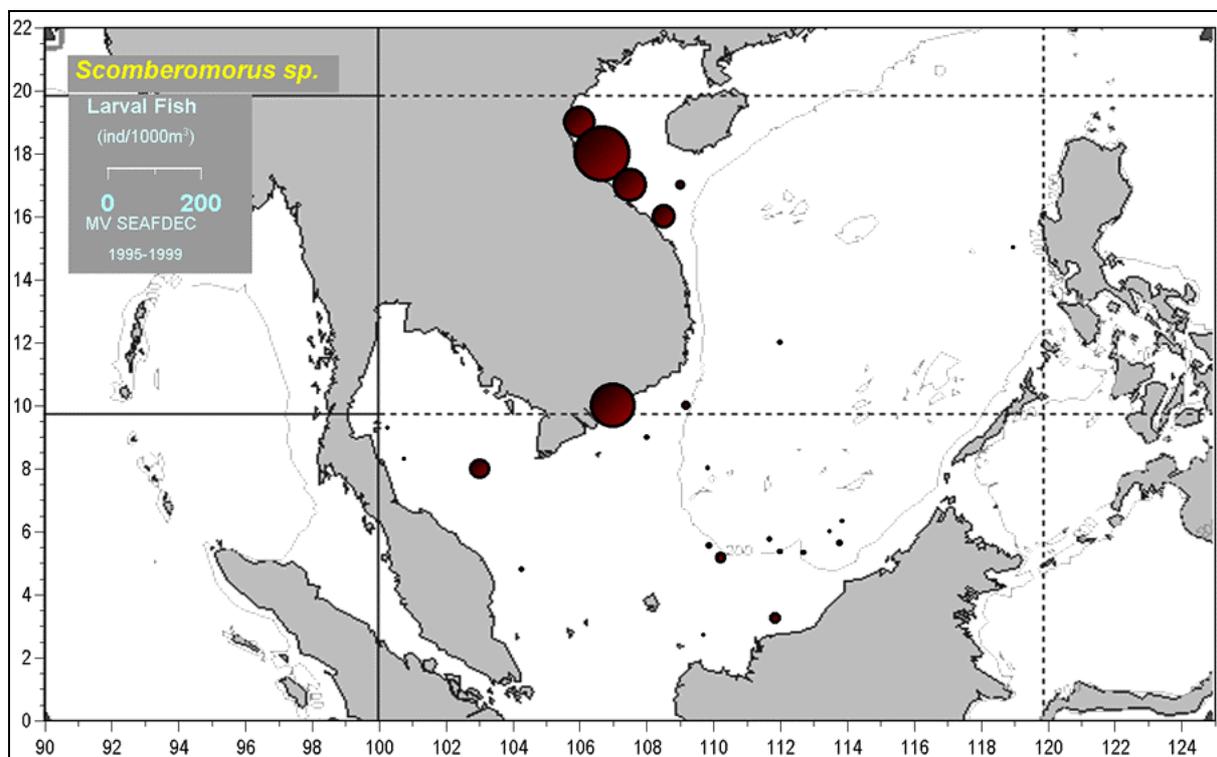


Figure 9 The distribution and relative abundance of Spanish mackerel (*Scomberomorus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

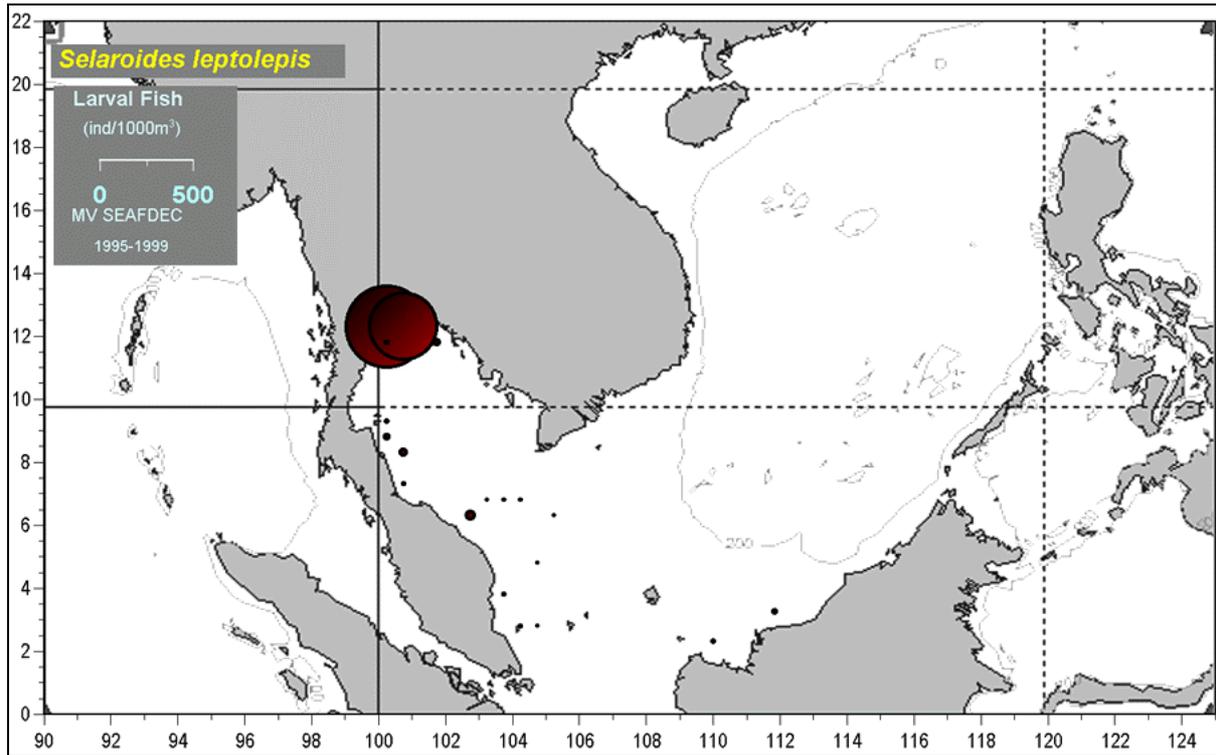


Figure 10 The distribution and relative abundance of yellowstripe scad (*Sardinella* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

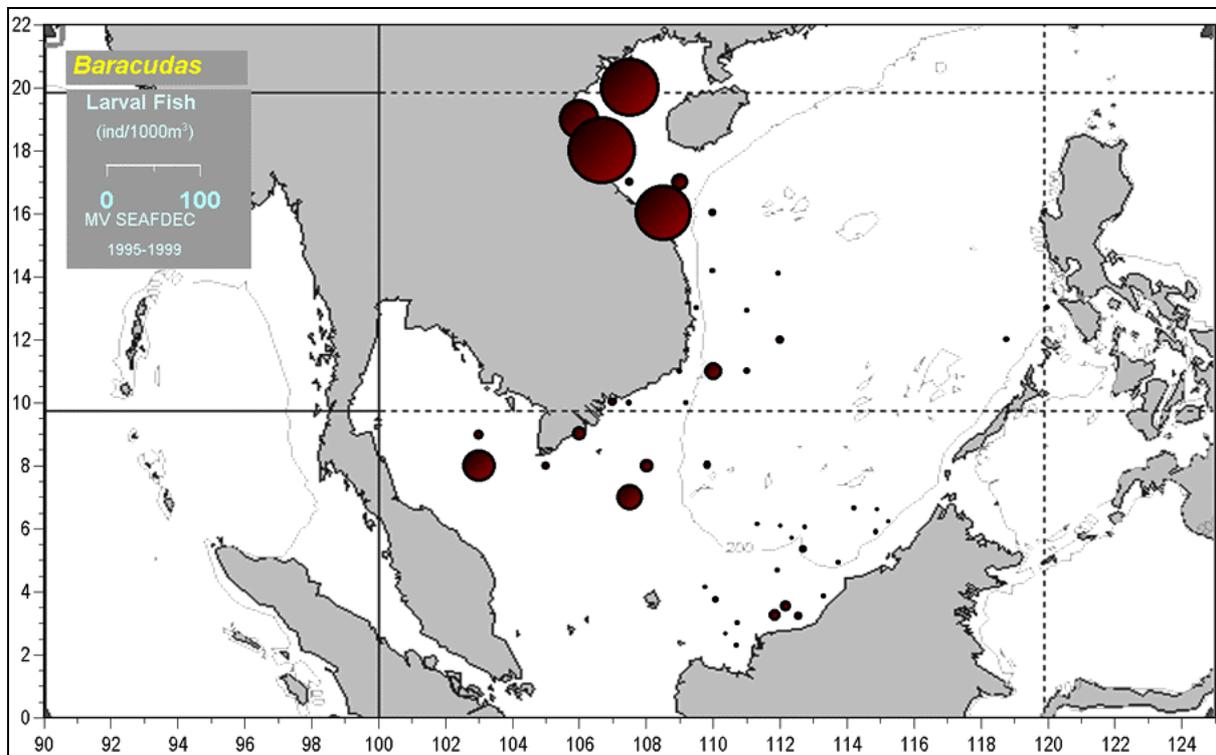


Figure 11 The distribution and relative abundance of baracuda (*Sphyraena* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

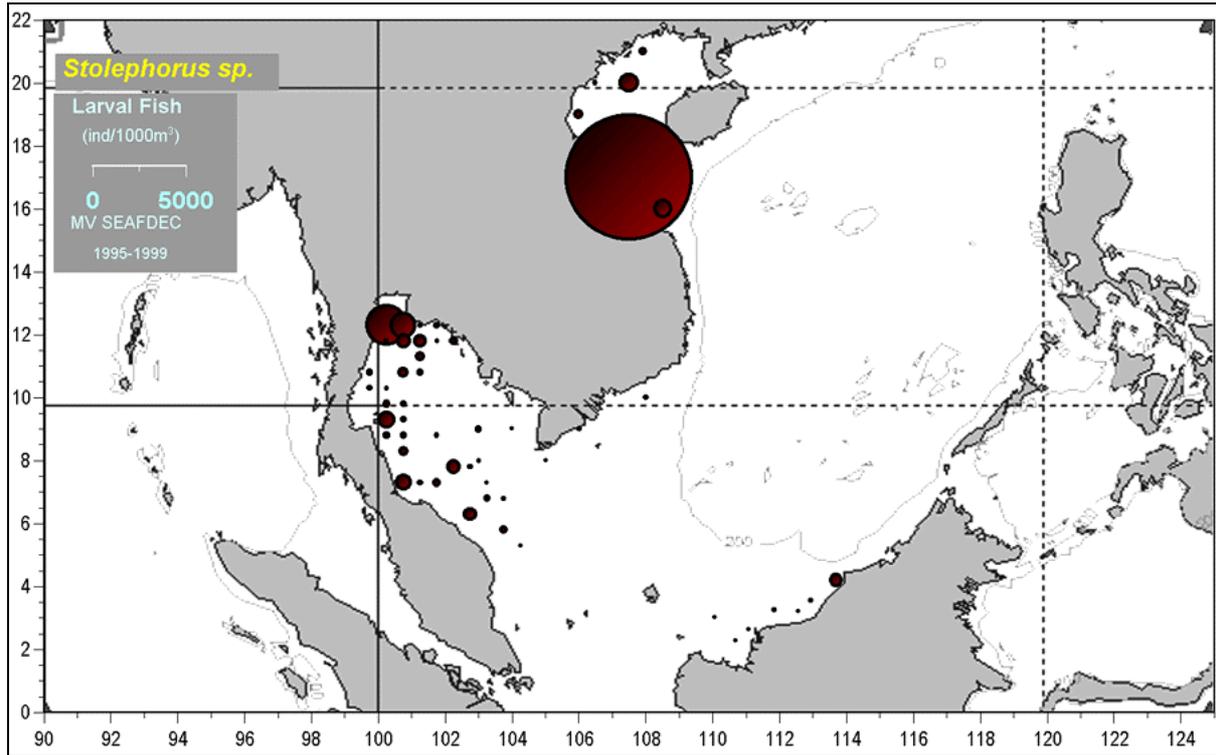


Figure 12 The distribution and relative abundance of anchovy (*Stolephorus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

Demersal Fish Species

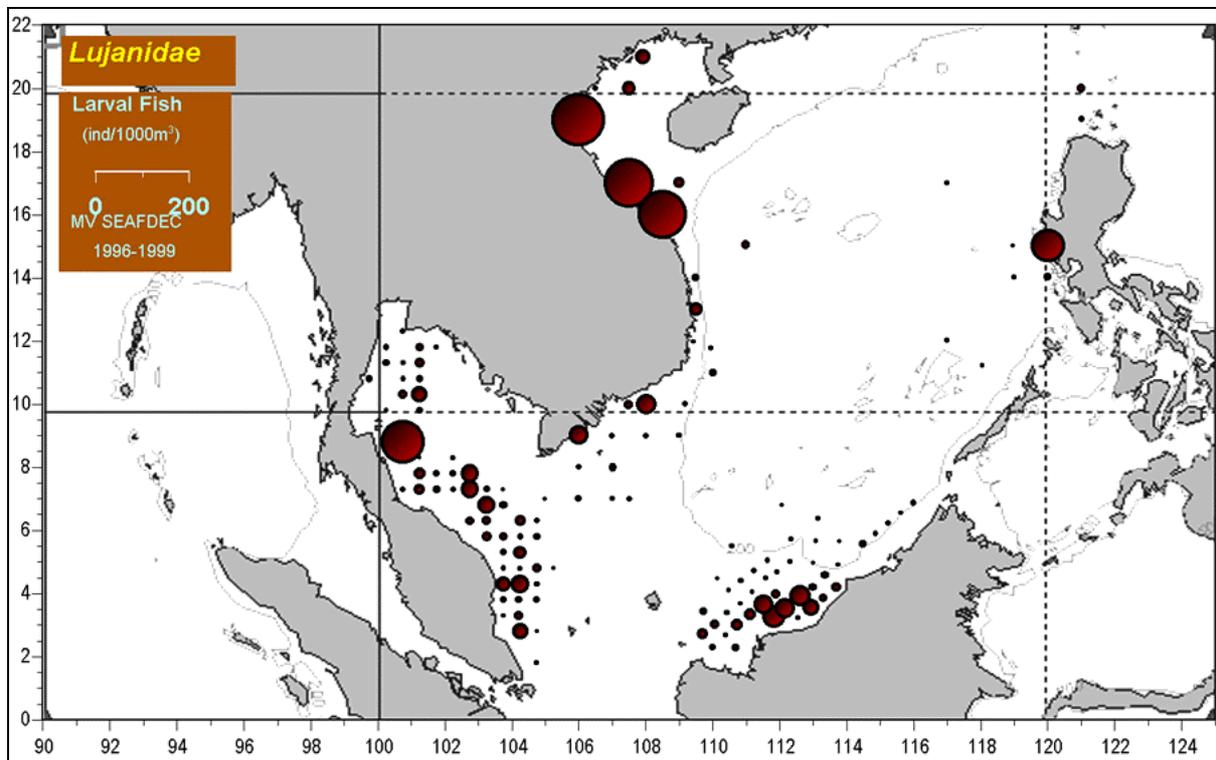


Figure 13 The distribution and relative abundance of tropical snapper (*Lutjanus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

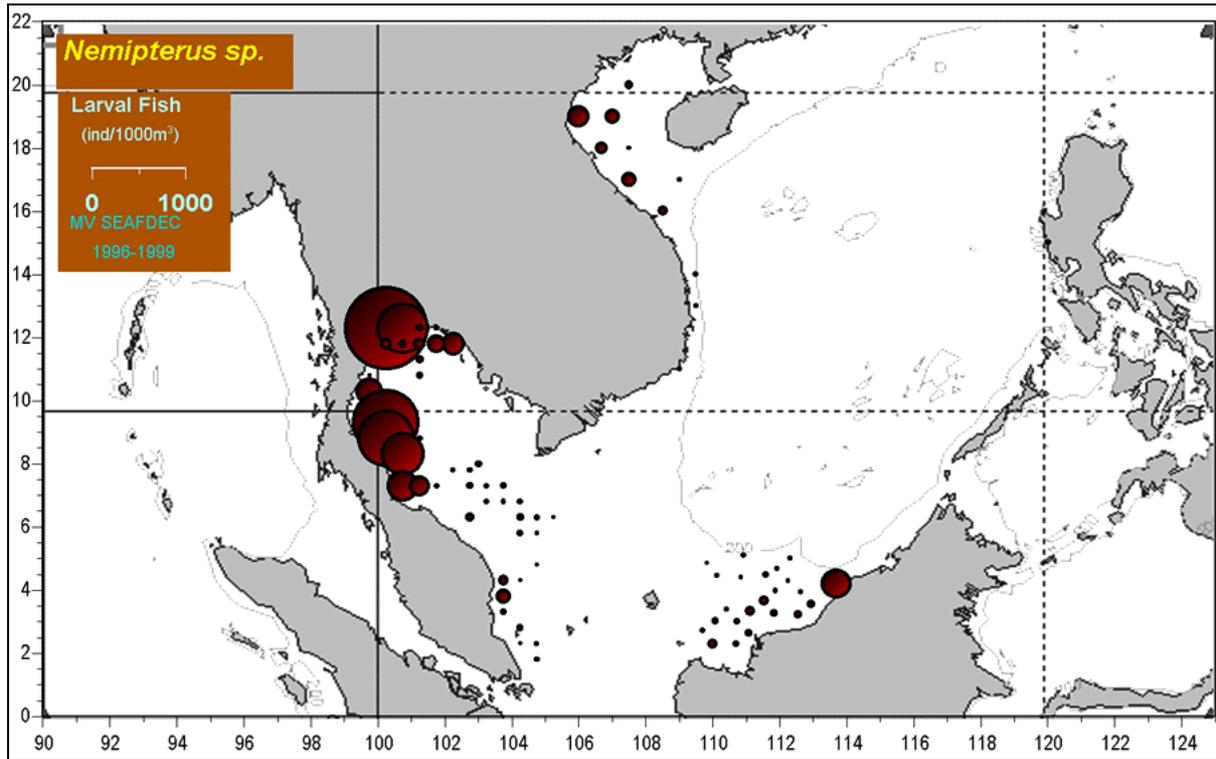


Figure 14 The distribution and relative abundance of threadfin bream (*Nemipterus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

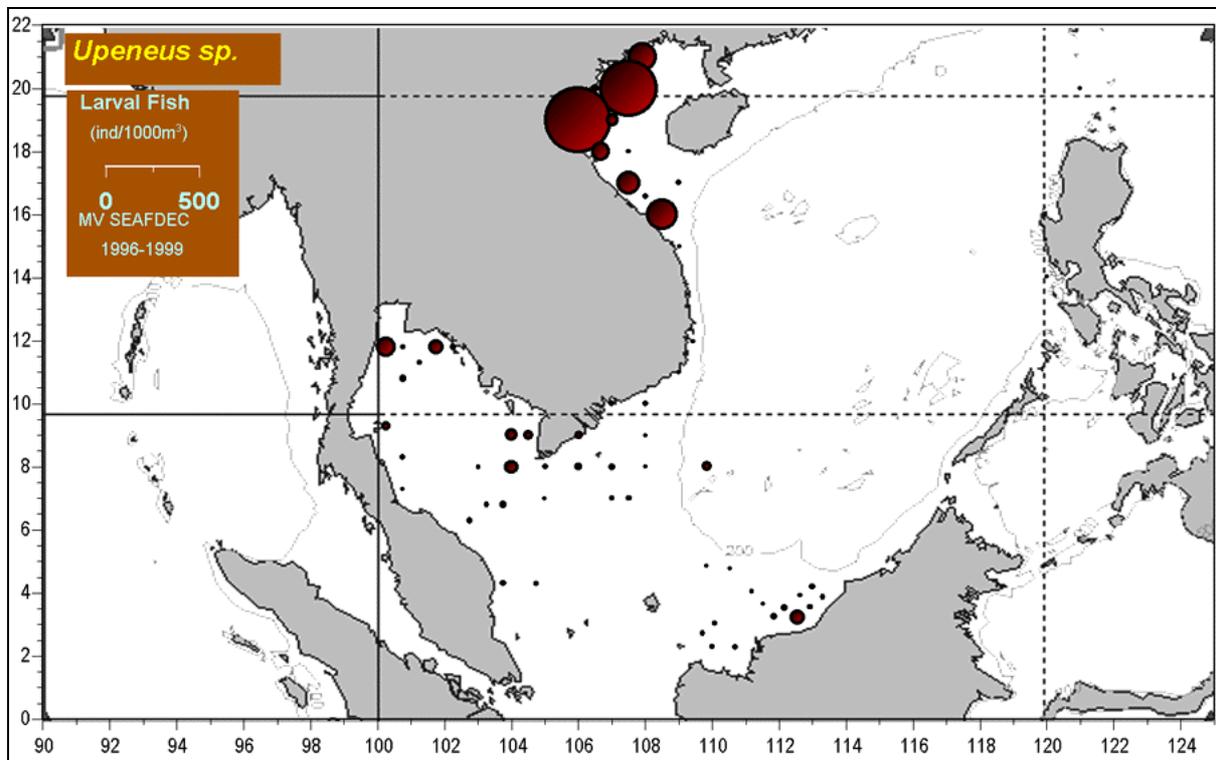


Figure 15 The distribution and relative abundance of goatfish (*Upeneus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

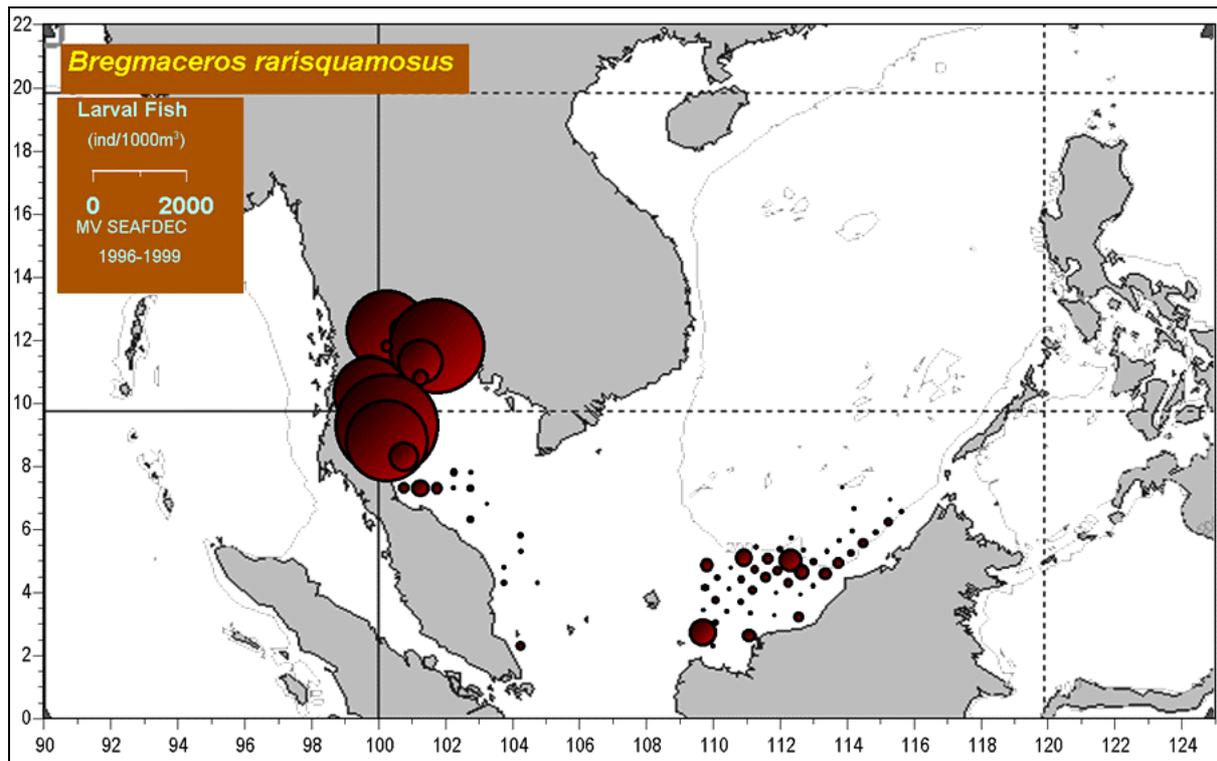


Figure 16 The distribution and relative abundance of big-eye cod (*Bregmaceros rarisquamosus*) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

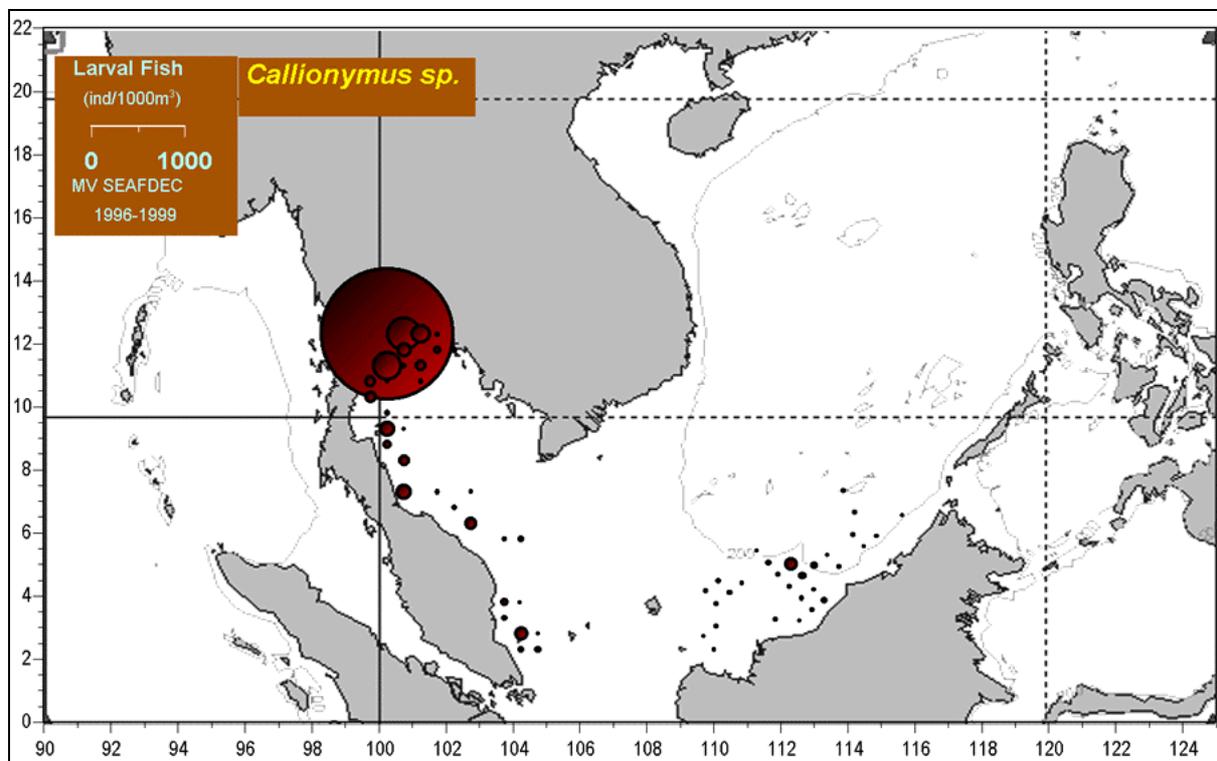


Figure 17 The distribution and relative abundance of *Callionymus* spp. larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

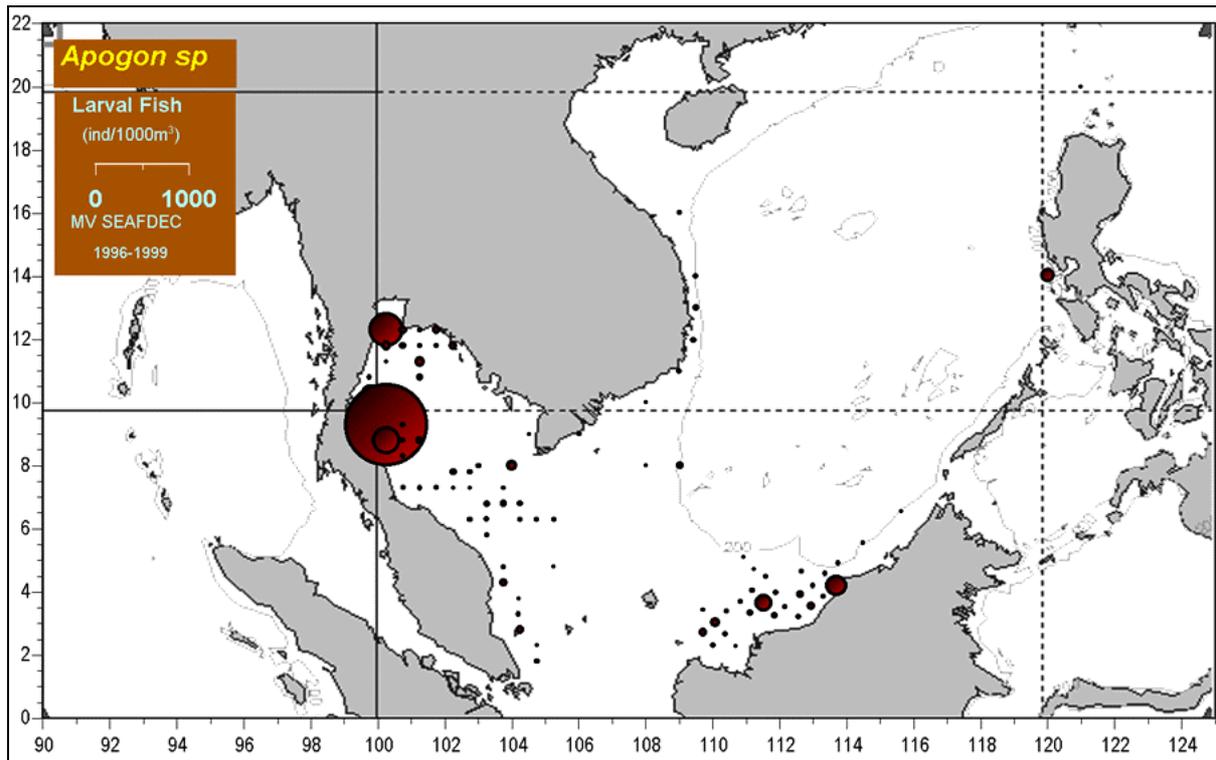


Figure 18 The distribution and relative abundance of cardinalfish (*Apogon* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

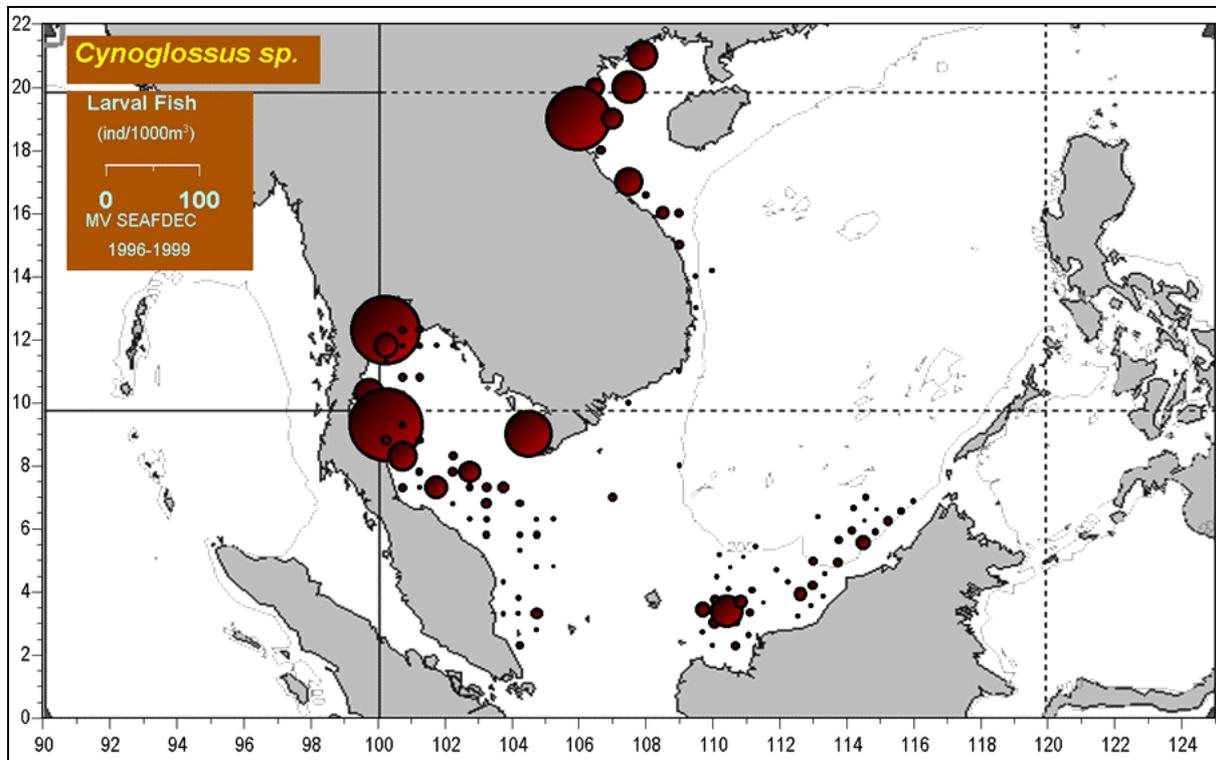


Figure 19 The distribution and relative abundance of tonguesole (*Cynoglossus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

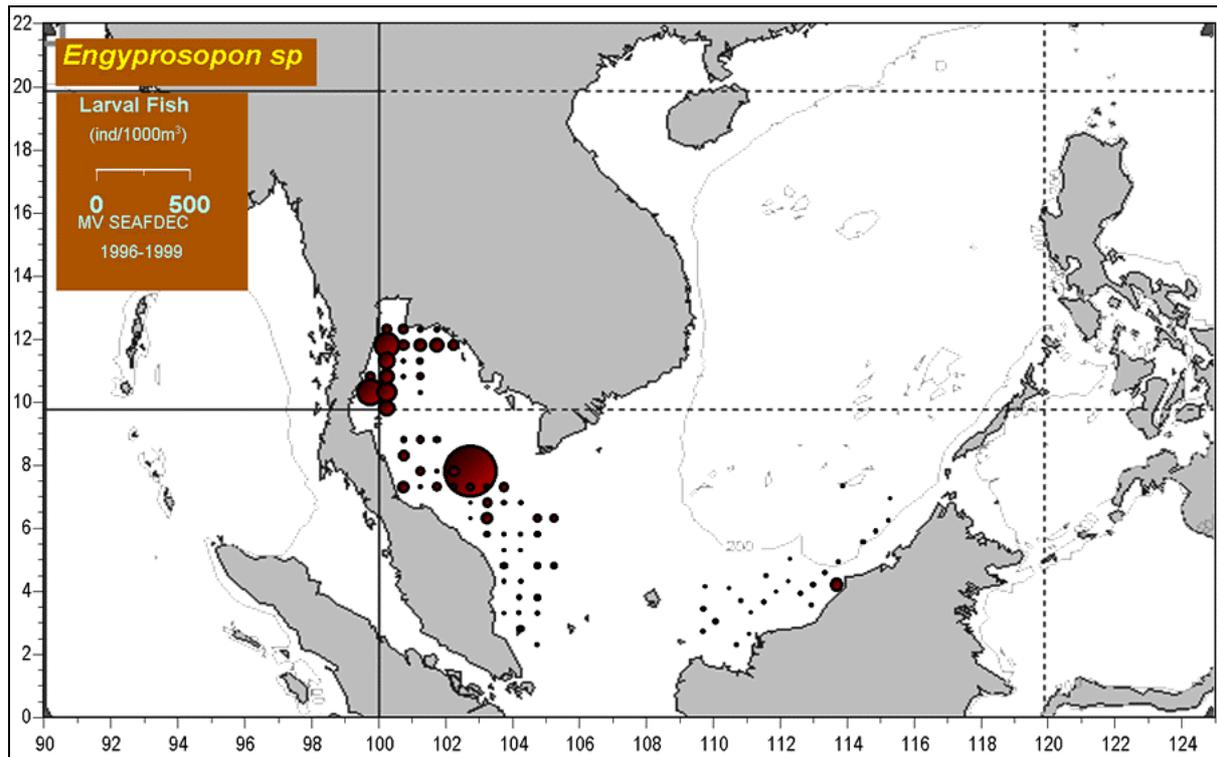


Figure 20 The distribution and relative abundance of flounder (*Engyprosopon spp.*) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

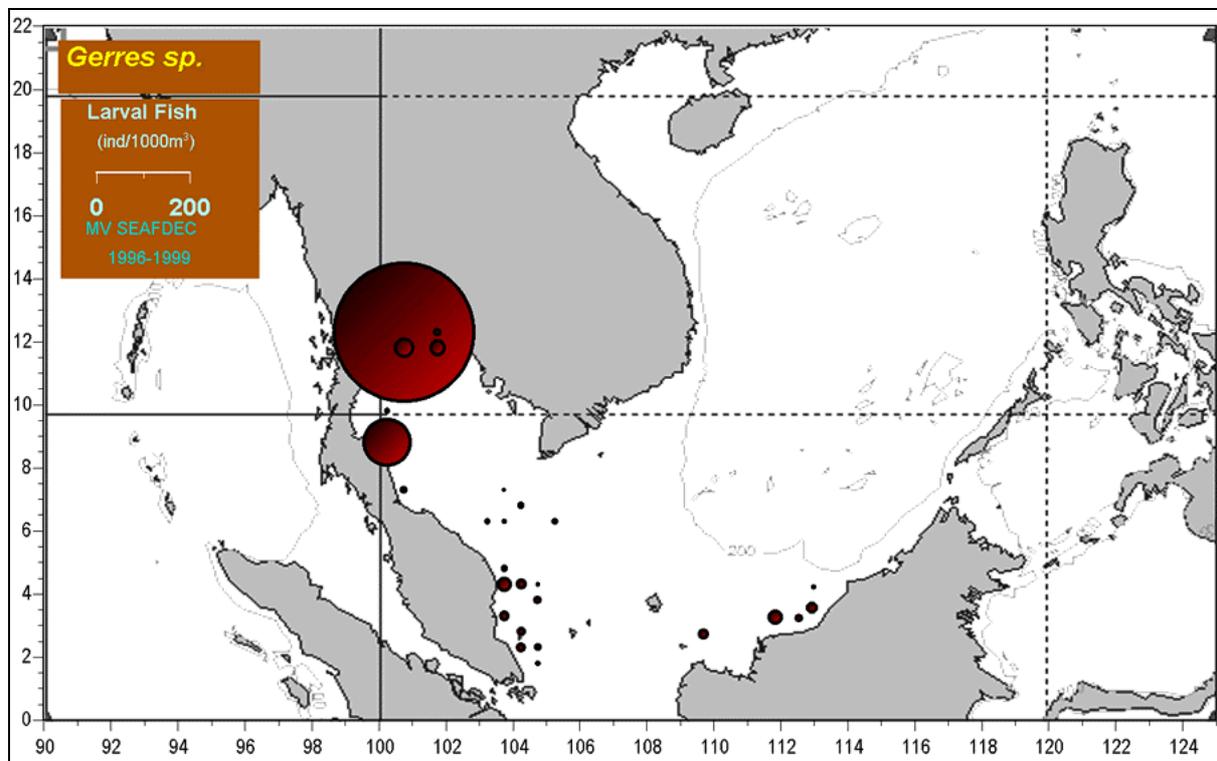


Figure 21 The distribution and relative abundance of silver biddy (*Gerres spp.*) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

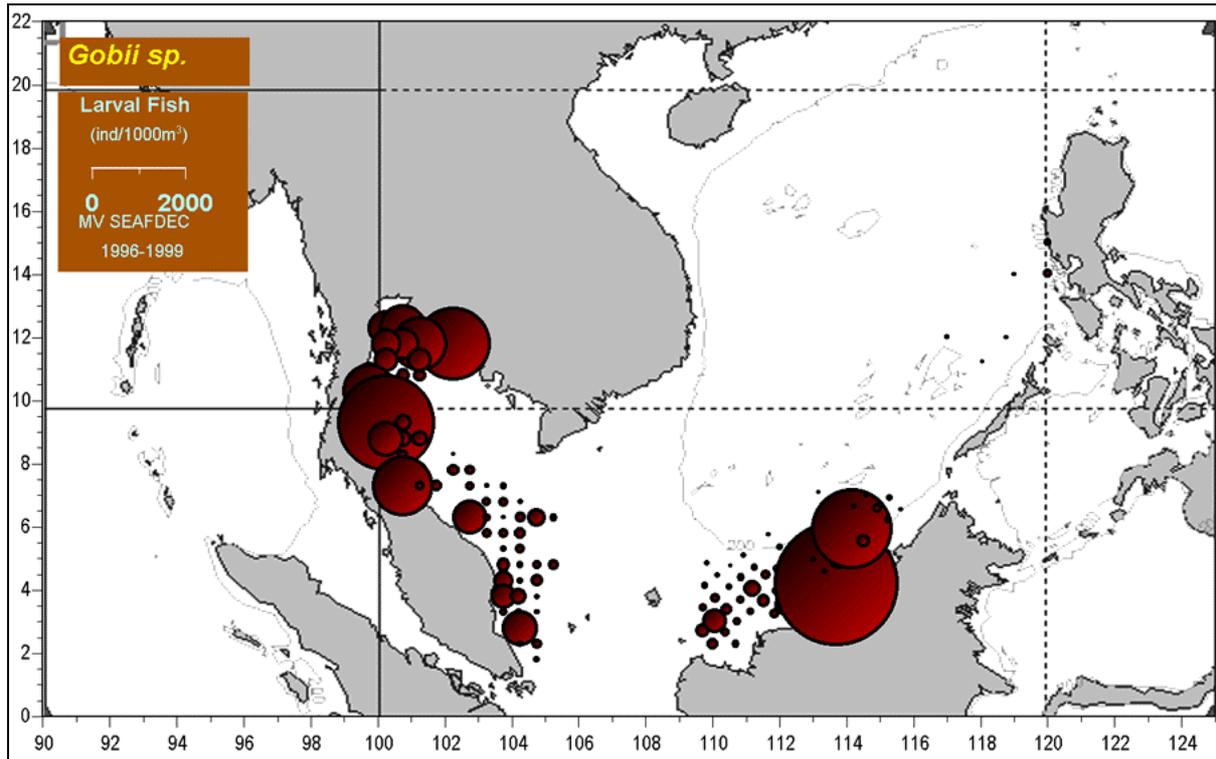


Figure 22 The distribution and relative abundance of Gobiidae larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

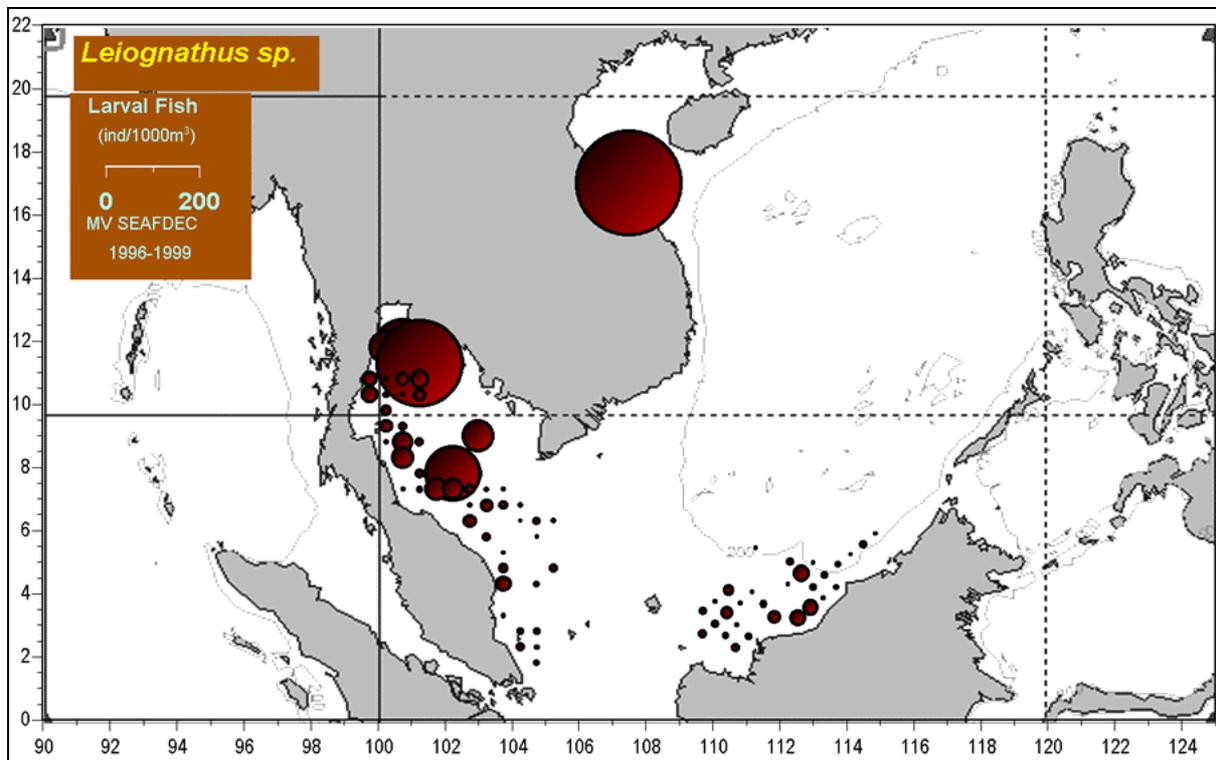


Figure 23 The distribution and relative abundance of ponyfish (*Leiognathus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

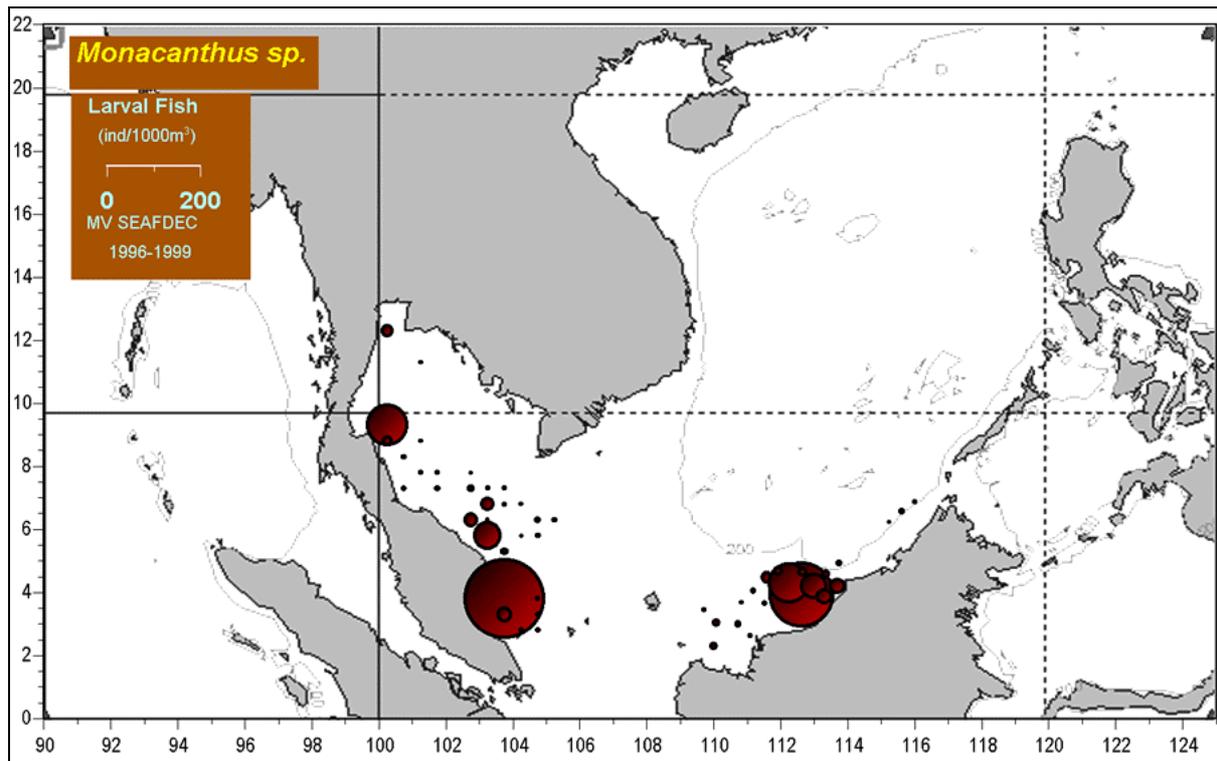


Figure 24 The distribution and relative abundance of filefish (*Monacanthus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

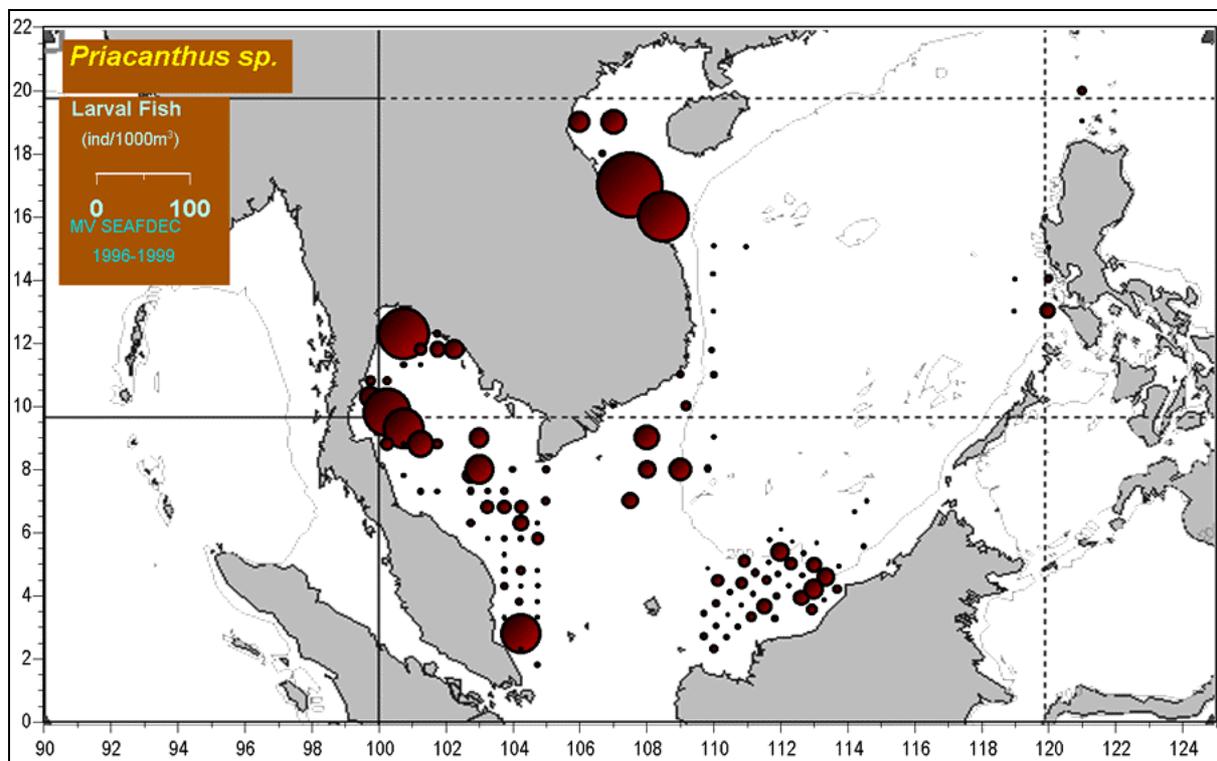


Figure 25 The distribution and relative abundance of bullseye (*Priacanthus* spp.) larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

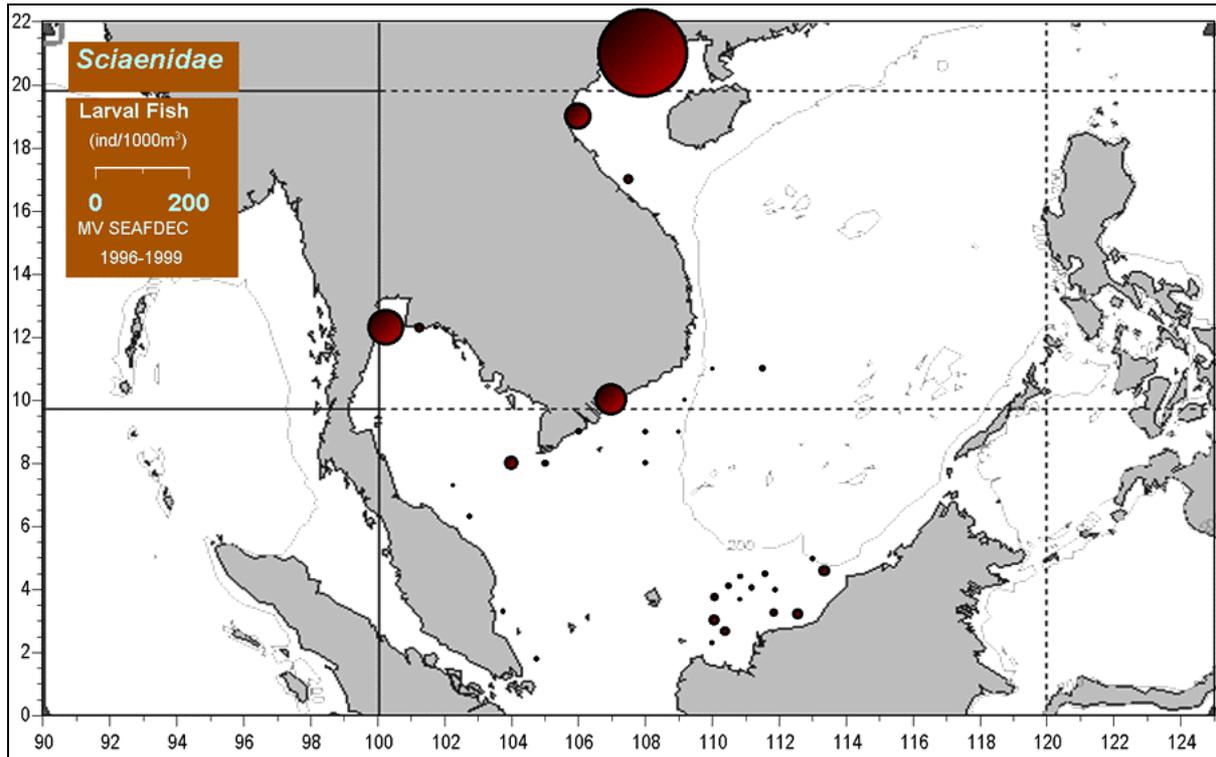


Figure 26 The distribution and relative abundance of *Sciaenidae* spp. larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

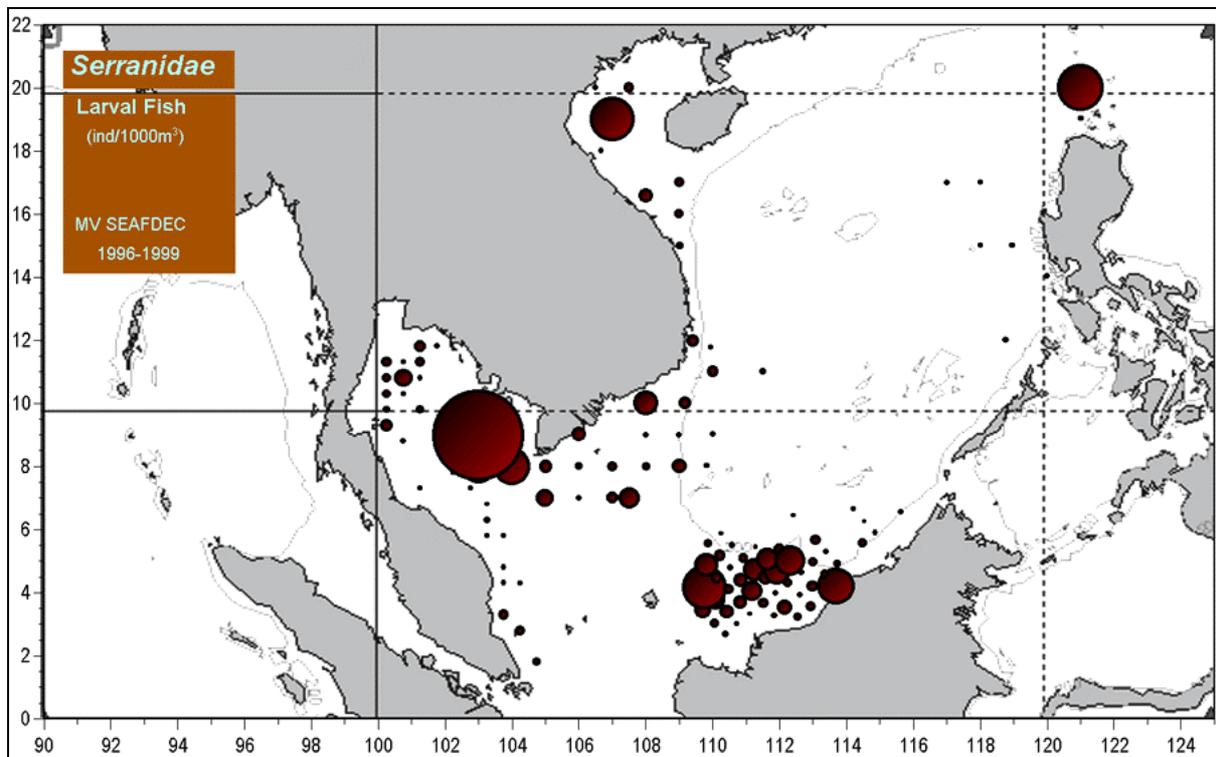


Figure 27 The distribution and relative abundance of *Serranidae* larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

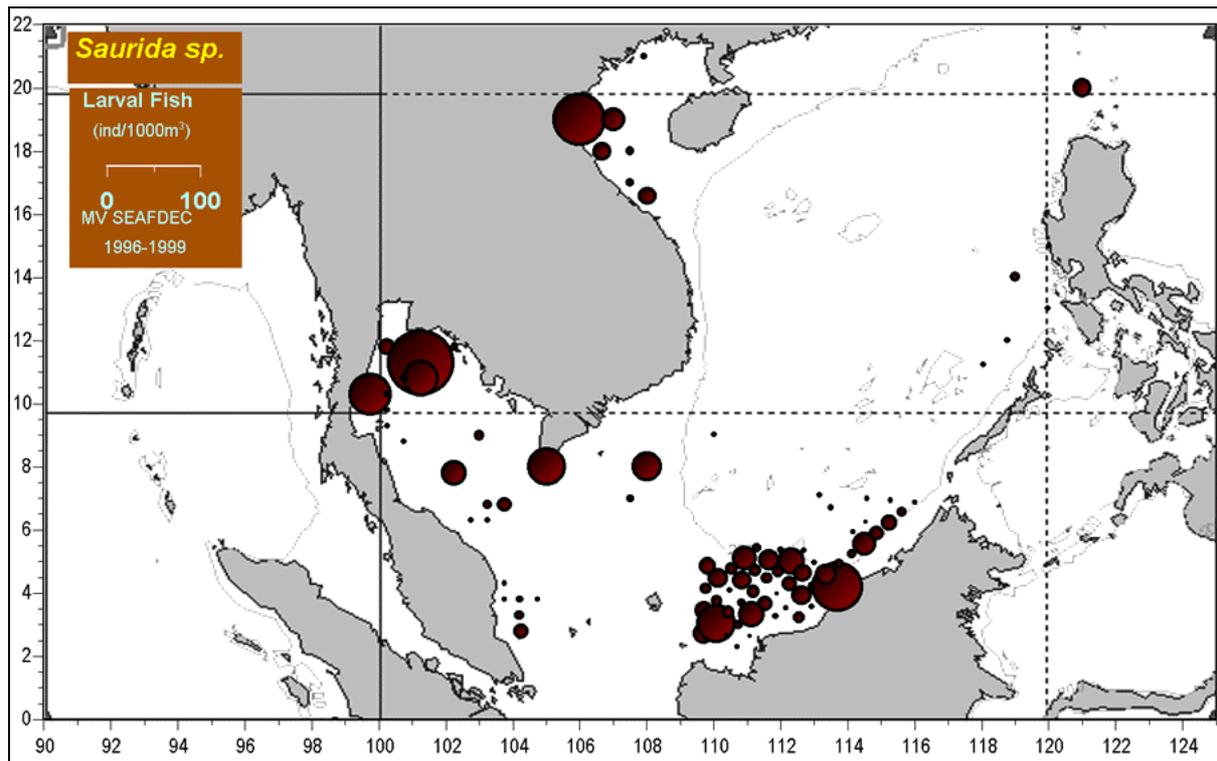


Figure 28 The distribution and relative abundance of *Saurida* spp. larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

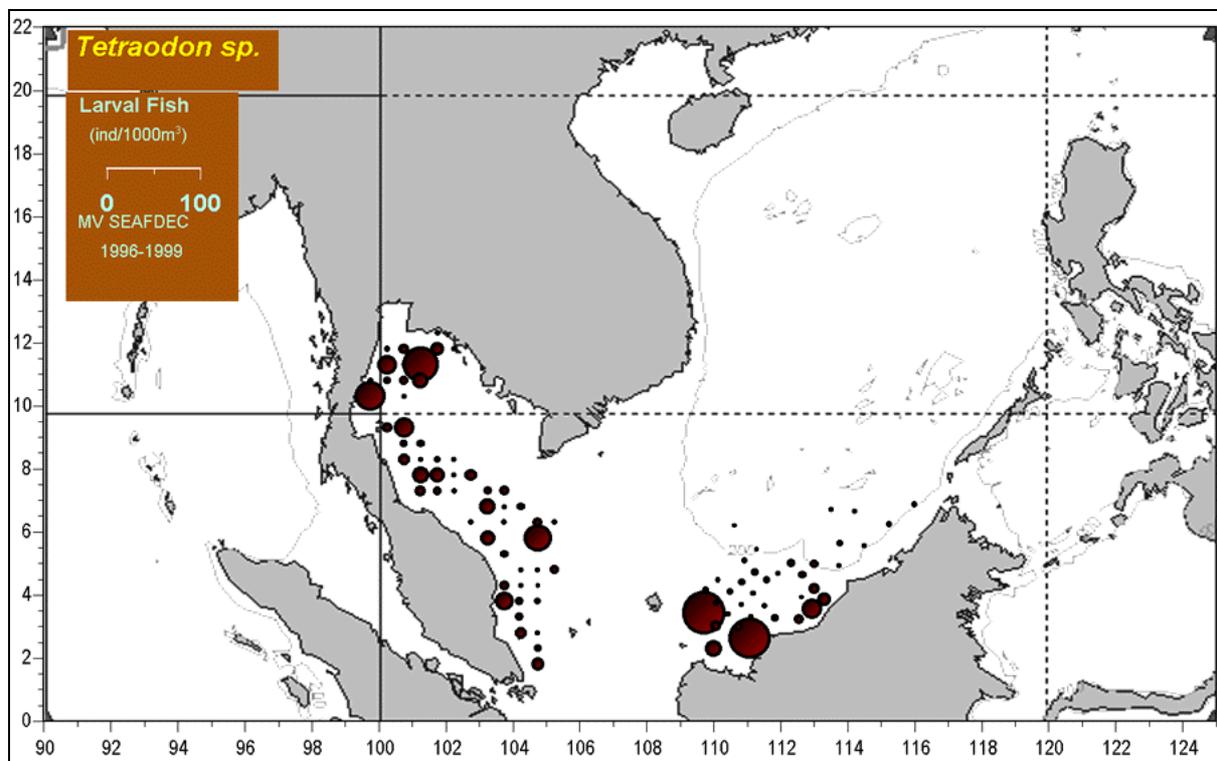


Figure 29 The distribution and relative abundance of *Tetraodon* spp. larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999).

Annex 6

Sites for Inclusion in an Initial Regional System of Fisheries *Refugia*

BACKGROUND

The Eighth Meeting of the Regional Working Group on Fisheries considered 3 main information sources to assist in the identification of specific locations in the Gulf of Thailand and South China Sea for inclusion in an initial regional system of fisheries *refugia*. These sources were as follows:

Information Source 1

Document UNEP/GEF/SCS/RWG-F.8/5 “*Information Collated by the Fisheries and Habitat Components of the South China Sea Project on Sites Important to the Life-Cycles of Significant Fish Species*”. This document contained a review of all information collated by the fisheries and habitat components of the South China Sea Project on fish-habitat linkages. The sources of information used for this review include:

- National Reports on Fisheries,
- National Reports on Coral Reefs, Seagrass, Mangroves, and Wetlands,
- Habitat Site Characterisations,
- Habitat Demonstration Site Project Documents,
- The South China Sea Online Meta-Database, and
- Information Contributed Directly by Fisheries and Habitat Focal Points.

The meeting used this review to develop country-based tables of critical spawning and nursery areas for important species in the Gulf of Thailand and South China Sea. These tables are attached to the Report of the Meeting in Annex 4 “*Spawning and Nursery Areas for Important Fish Species in the Gulf of Thailand and South China Sea*”.

Information Source 2

Dr. Somboon Siriraksophon of the Southeast Asian Fisheries Development Centre (SEAFDEC) delivered a presentation during the meeting on the distribution and abundance of larval fish in the South China Sea during the post northeast monsoon periods from 1996-1999. Species based maps of the distribution and abundance of larvae of important species were prepared and attached to the meeting report as Annex 5 “*Distribution and Abundance of Fish Larvae in the Gulf of Thailand and South China Sea*”.

Information Source 3

Fisheries Focal Points and observers from SEAFDEC were invited to deliver presentations to the meeting on the outcomes of stakeholder consultations on the identification of fisheries *refugia* in their respective countries. Focal Points were further invited to comment on any challenges or lessons learned to date in the identification and establishment of fisheries *refugia* sites.

The meeting reviewed each of these information sources and compared areas of high fish larvae abundance with the country tables of known spawning and nursery areas. It was identified that most areas with high abundances of fish larvae were located within the spawning and nursery areas identified and summarised in Annex 5. On this basis the group agreed that the country tables of known spawning and nursery areas provided a suitable starting point for the development of a list of fisheries *refugia* sites. Focal points then developed a list of fisheries *refugia* sites for initial inclusion in a regional system of fisheries *refugia*. These sites were plotted on country maps and included in this Annex as Figures 1-5.

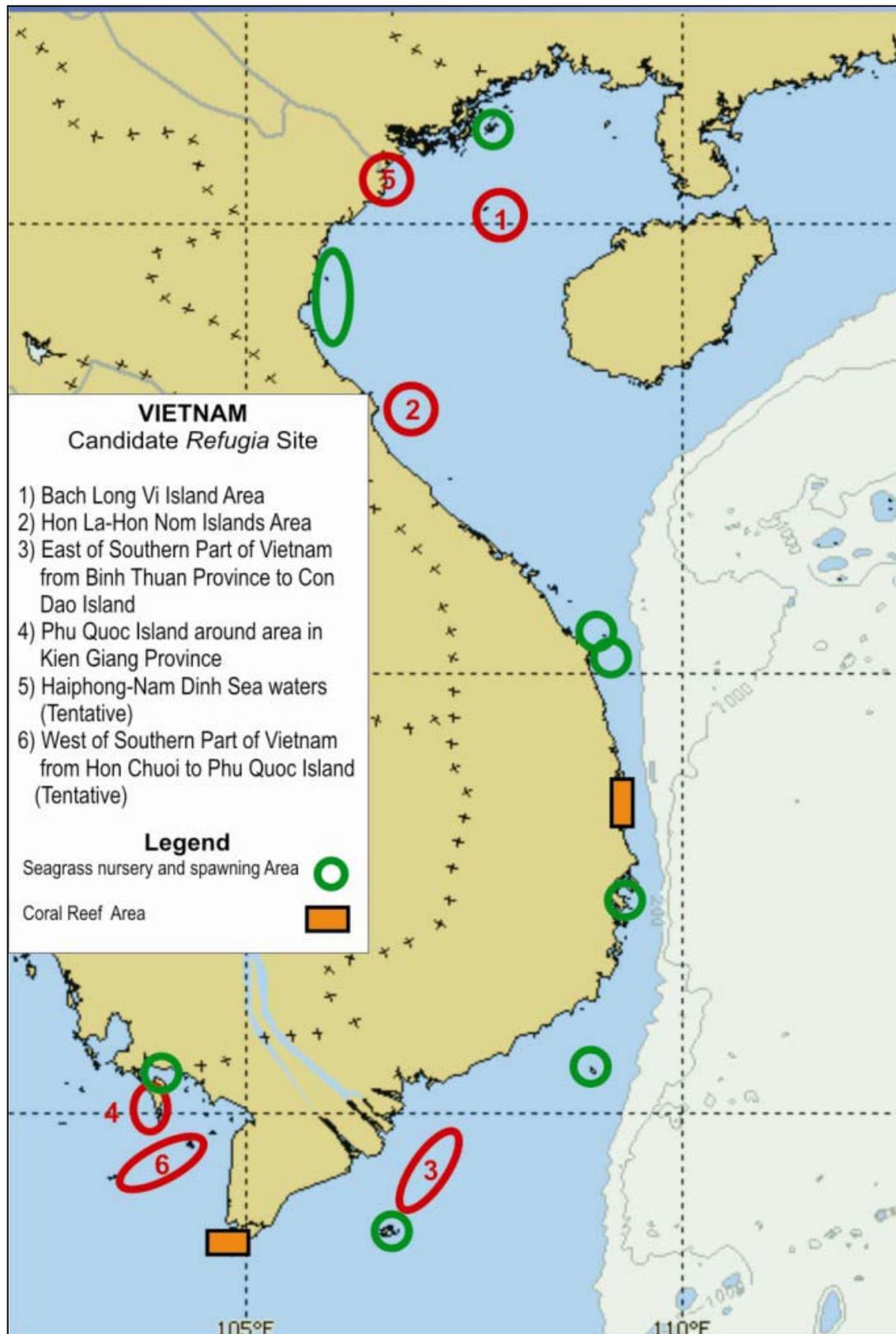


Figure 1 Sites selected in Vietnam for inclusion in an initial system of fisheries *refugia*.

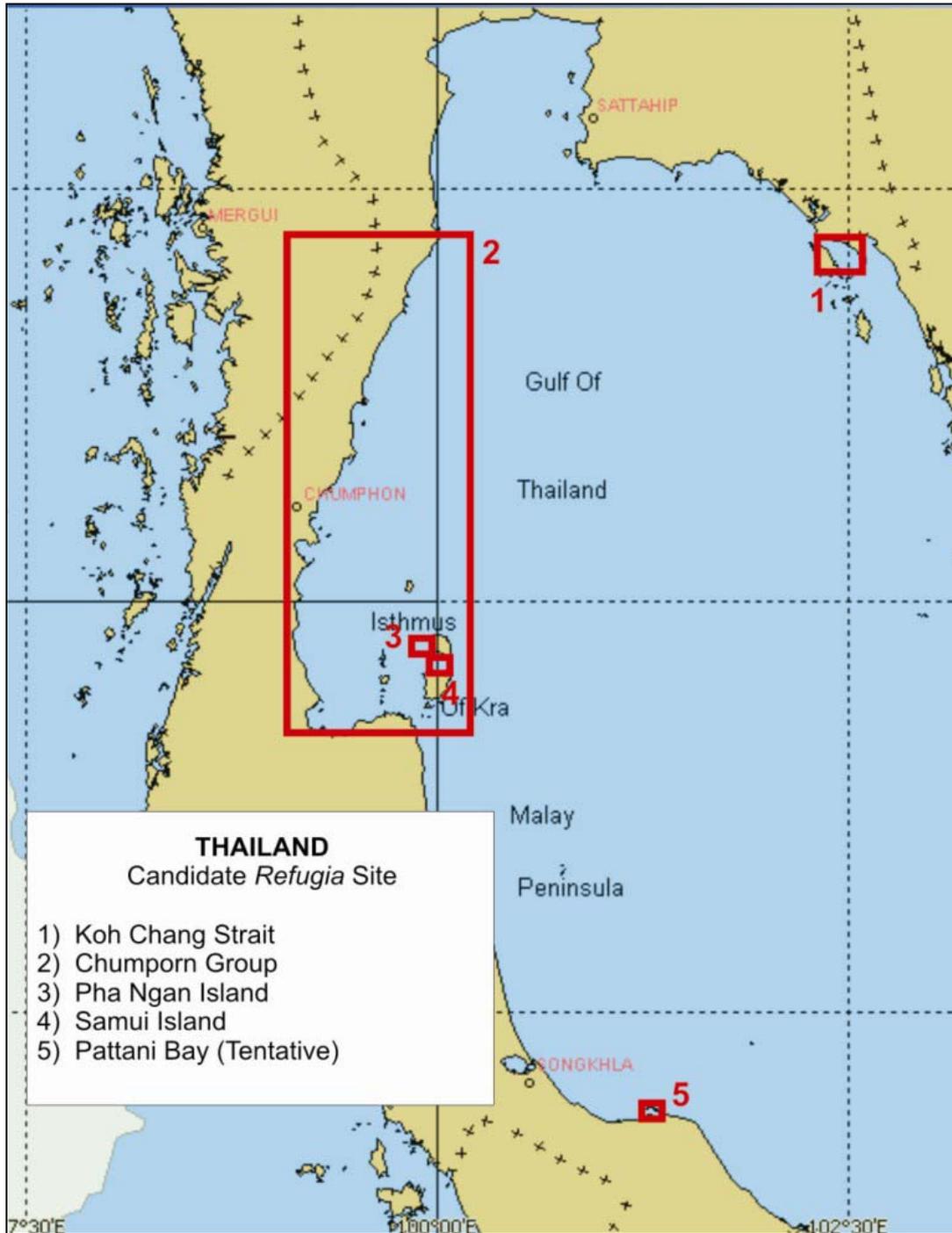


Figure 2 Sites selected in Thailand for inclusion in an initial system of fisheries *refugia*.



Figure 3 Sites selected in the Philippines for inclusion in an initial system of fisheries *refugia*.

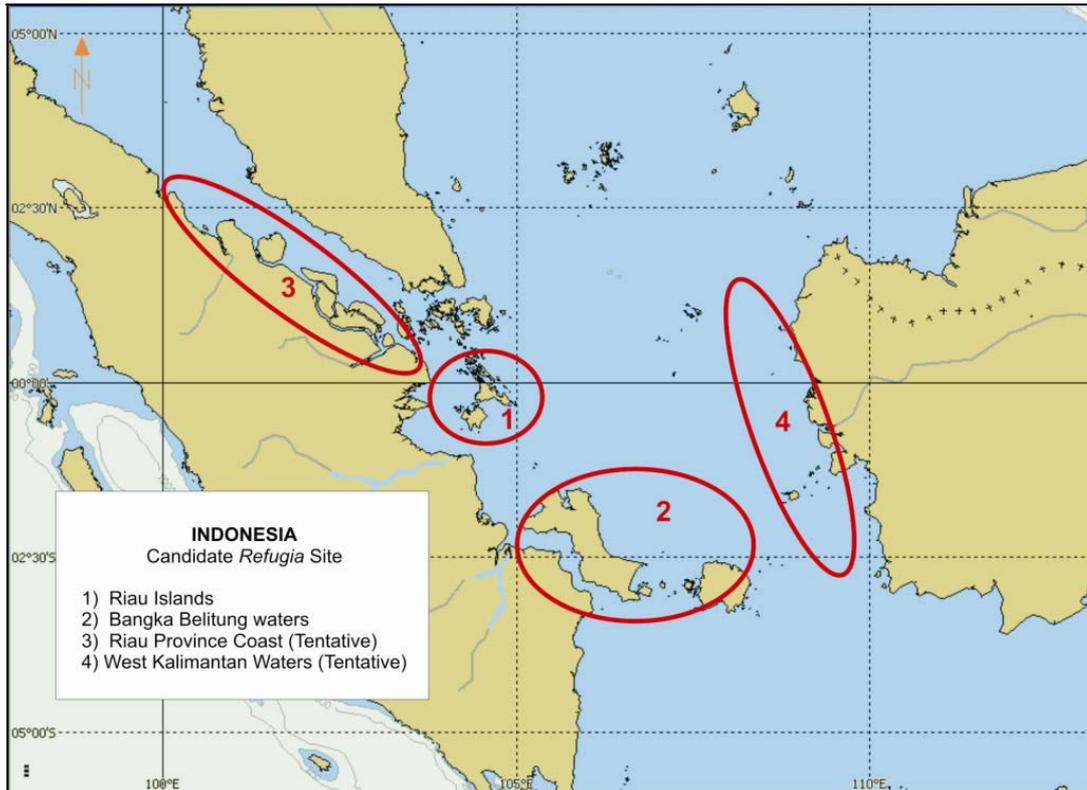


Figure 4 Sites selected in Indonesia for inclusion in an initial system of fisheries *refugia*.

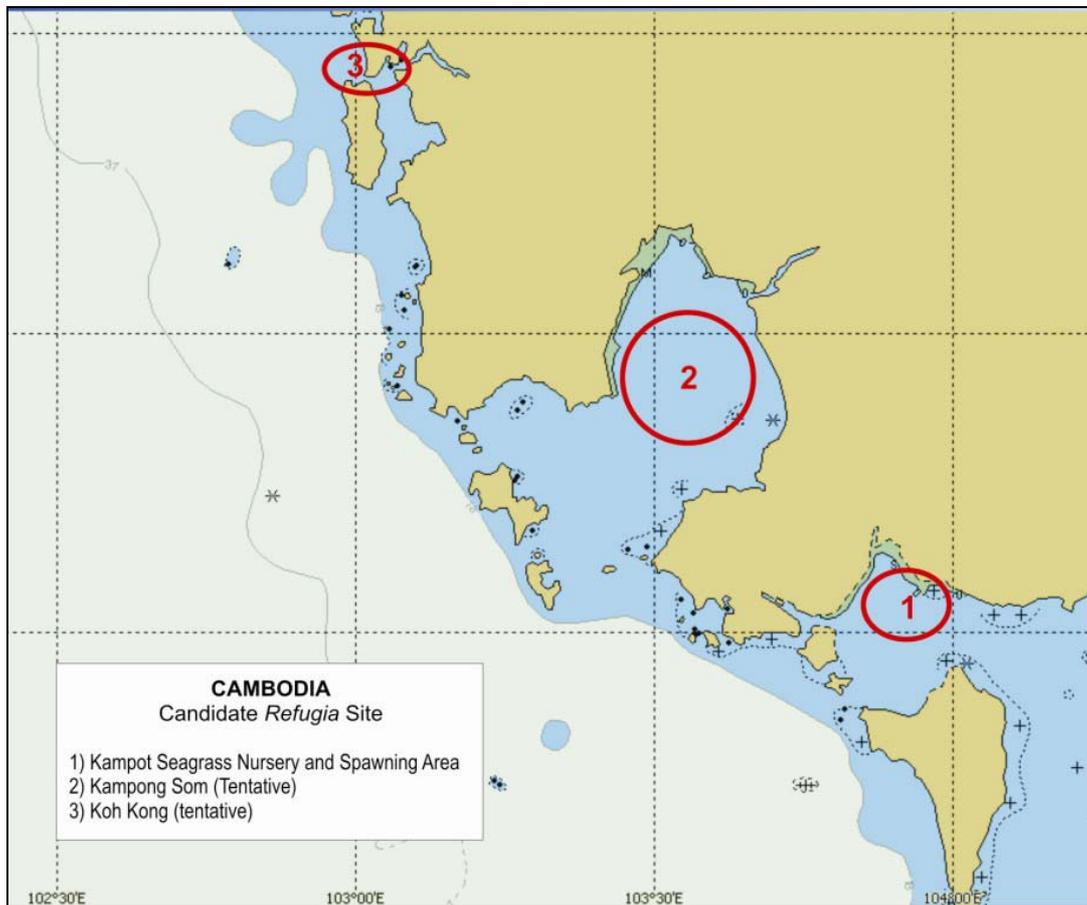


Figure 5 Sites selected in Cambodia for inclusion in an initial system of fisheries *refugia*.

ANNEX 7

Regional and National Plans for a System of Fisheries *Refugia*

BACKGROUND

In order to enable the participating countries to take some initial steps to establish *refugia* sites, the RWG-F definition of *refugia* has been framed broadly. The group has proposed that priority areas for *refugia* are those in which fish spawn and seek shelter/food, and have selected sites for inclusion in an initial system of fisheries *refugia* on this basis.

The group understands that individuals taking a “helicopter view” of the definition of *refugia*, and the initial actions of identifying important nursery and spawning areas, may misconstrue that the group is simply identifying areas for a regional system of seasonally managed areas (e.g. spot closures, closed seasons). An important role of the Fisheries Component of the SCS Project is to ensure that when such individuals take a “helicopter view” of this activity, they see a regional initiative working to (a) develop a system of fisheries *refugia*, including “replacement” of lost natural *refugia*, in order to build resilience in regional fisheries, and to (b) provide an institutional mechanism for improved fisheries and habitat management, i.e., management based on fisheries-critical habitat linkages.

In terms of developing a Regional Fisheries *Refugia* Strategy it will be important to define specific resource and institutional related goals and objectives for the *refugia* system. Some preliminary (a) resource-related and (b) institutional-related goals and objectives for the *refugia* system were considered by the Eighth Meeting of the RWG-F (Table 1).

Table 1 Preliminary Goals and objectives for a regional system of fisheries *refugia*.

Resource-Related Goal – Increased Resilience of Regional Fish Stocks to the Effects of Fishing	Institutional-Related Goal – Fisheries and Habitat Management Conducted in an Integrated Manner
<p>Longer-Term Objectives Increased average size of important species Increased egg production of important species Increased recruitment of important species Increased biomass of important fish species</p>	<p>Longer-Term Objectives Community-based management of fisheries <i>refugia</i> for integrated fisheries and habitat management National and regional level commitments for integrated fisheries and ecosystem management Appropriately represented fisheries agenda in broader multiple use marine planning initiatives</p>
<p>Shorter-Term Objectives Safeguarding of natural <i>refugia</i> Reduced capture of juveniles and pre-recruits of important species in critical fisheries habitats Reduced targeting and capture of important species when forming spawning aggregations Reduced targeting and capture of migrating fish</p>	<p>Shorter-Term Objectives Community-based management of fisheries <i>refugia</i> for fisheries management Understanding amongst fishing communities of critical habitat and fish life-cycle linkages Enhanced capacity of fisheries departments/ministries to engage in meaningful dialogue with the environment sector</p>

Specific Resource-Related Objectives, Performance Assessment Criteria, and Means for Verifying the Performance of a Regional System of Fisheries *Refugia*

A Regional Fisheries *Refugia* Strategy should define specific criteria for use in measuring the effectiveness of the system of *refugia*. These criteria, and associated information regarding how performance will be measured, can be used to frame realistic and workable targets for the system of *refugia*. A preliminary set of performance assessment criteria, and means of verification, for the resource-related objectives of a regional system of fisheries *refugia* were considered by the Eighth Meeting of the RWG-F (Table 2).

Table 2 A preliminary set of performance assessment criteria and means of verification for the resource-related objectives of a regional system of fisheries *refugia*.

Resource-Related Objectives	Performance Assessment Criteria	Means of Verification
Longer-Term Objectives		
1. Biomass of commercially important fish (pelagic and demersal) and invertebrate species in the Gulf of Thailand and South China Sea maintained	Biomass trend (multi-year average annual percentage rate of change)	Results of abundance surveys employing relative abundance (CPUE), swept area, acoustic, or egg production methods
2. Increased average size of commercially important fish (pelagic and demersal) and invertebrate species caught in the Gulf of Thailand and South China Sea	Average fish size relative to historical average	Results of size-frequency analyses of fish landed at key landing places and in markets
3. Increased egg production of commercially important fish and invertebrate species in the Gulf of Thailand and South China Sea	Abundance of eggs and larvae of commercially important species in key spawning areas relative to historical average	Results of surveys of egg and larval fish density in key spawning areas
4. Increased recruitment of commercially important fish and invertebrate species to fisheries the Gulf of Thailand and South China Sea	Year class strength relative to historical average	Results of abundance surveys employing relative abundance (CPUE) or swept area methods
Shorter-Term Objectives		
1. Reduced capture of juveniles and pre-recruits of commercially important fish (pelagic and demersal) and invertebrate species, as well as endangered species, in critical fisheries habitats of the Gulf of Thailand and South China Sea	Abundance of juveniles in fishery <i>refugia</i> areas a) Fishing effort dynamics in fishery <i>refugia</i> areas b) Selectivity of fishing operations conducted within juvenile <i>refugia</i> c) Frequency of inappropriate fishing operations in fishery <i>refugia</i> areas d) Volume and size composition of commercially important fish (pelagic and demersal) and invertebrate species landed and traded in main markets	a) Results of fishery dependent and independent surveys b) Interviews of fishers, fishing communities, and traders c) Results of studies of species and size composition conducted within <i>refugia</i> d) Observations/reports of illegal or destructive fishing in fishery <i>refugia</i> areas e) Results of studies of the volume and size of fish landed at main landing places and traded in main market
2. Reduced targeting and capture of commercially important fish (pelagic and demersal) and invertebrate species in spawning condition, and when forming spawning aggregations, in the Gulf of Thailand and South China Sea	a) Fishing effort dynamics in fishery <i>refugia</i> areas b) Selectivity of fishing operations conducted within spawning <i>refugia</i> c) Gonosomatic index (GSI) of commercially important fish (pelagic and demersal) and invertebrate species landed and traded in main markets d) Abundance of eggs and larvae of commercially important species in key spawning areas	a) Interviews of fishers, fishing communities, and traders b) Results of studies of species and size composition of landings during known spawning seasons c) Results of studies of the gonosomatic condition of commercially important species landed and traded in main markets d) Results of surveys of egg and larval fish density in key spawning areas
3. System of fisheries <i>refugia</i> , including both juvenile and spawning <i>refugia</i> , which provides for: (a) networks of fisheries <i>refugia</i> across the geographical ranges of individual species, (b) networks of fisheries <i>refugia</i> that include both juvenile and spawning <i>refugia</i> , (c) fisheries management consistent with the RGRFSEA	Total number/size of juvenile <i>refugia</i> and spawning <i>refugia</i> : (a) Number of species for which a network of fisheries <i>refugia</i> has been developed across its geographical range (b) Number of fisheries <i>refugia</i> networks that include multiple <i>refugia</i> types (c) Number of fisheries <i>refugia</i> for which management systems have been developed	The number and size of fisheries <i>refugia</i> as defined in <i>refugia</i> management plans adopted by national governments (a) Description of the species – specific linkages between <i>refugia</i> in management plans for each <i>refugia</i> in a geographical range based network (b) Description of the life-cycle – specific linkages between <i>refugia</i> in management plans for each <i>refugia</i> in a life-cycle based network (c) Adoption of <i>refugia</i> management plans

Specific Institutional-Related Objectives, Performance Assessment Criteria, and Means for Verifying the Performance of a Regional System of Fisheries *Refugia*

A preliminary set of performance assessment criteria for the institutional-related objectives of a regional system of fisheries *refugia* were also considered by the RWG-F (Table 3).

Table 3 A preliminary set of performance assessment criteria and means of verification for the institutional-related objectives of a regional system of fisheries *refugia*.

Institutional-Related Objectives	Performance Assessment Criteria	Means of Verification
1. Integration of fish life-cycle considerations in fisheries and habitat management in the Gulf of Thailand and South China Sea	Preparation and publication of a management plan for a regional system of fisheries <i>refugia</i> .	Adoption by appropriate regional fora of a management plan for a regional system of fisheries <i>refugia</i> . Management plan to include: a) goals, objectives, target reference points, indicators, and performance measures for each <i>refugia</i> (and <i>refugia</i> network in the system) b) system for reporting on results of analysis of data collected in support of the regional <i>refugia</i> system c) criteria for the identification of new <i>refugia</i> d) research priorities and national commitments of support to the conduct of fisheries research
2. National level commitments to integrate the fisheries <i>refugia</i> concept into fisheries and habitat management	Preparation and publication of National Plans of Action for the Development of the Regional System of Fisheries <i>Refugia</i>	Adoption of plans of action by appropriate Government Ministries.
3. Regionally agreed fisheries <i>refugia</i> science programme, which details: a) Objectives b) Decision-support inputs c) Strategic research partnerships/resourcing d) Research activities	Preparation and publication of a fisheries <i>refugia</i> science programme	Adoption of the programme at a regional expert consultation and then representatives of five SEAFDEC member countries
4. Regionally agreed framework of criteria, target reference points, indicators, and performance measures for identifying and evaluating the performance of <i>refugia</i> that, aim to: (a) reduce the capture of juveniles and pre-recruits of commercially important fish, and endangered species, in critical fisheries habitats (b) reduce the targeting and capture of commercially important fish in spawning condition, and when forming spawning aggregations (c) contribute to the development of species-specific networks of <i>refugia</i> across (i) the geographical range, and (ii) the life-cycle, of individual species.	Preparation of a framework of criteria, target reference points, indicators, and performance measures for identifying and evaluating the performance of fisheries <i>refugia</i>	Adoption of the framework at a regional expert consultation
5. Regional agreement on standardised methodology for the identification and evaluation of important: (a) juvenile <i>refugia</i> (b) spawning <i>refugia</i> , and (c) <i>refugia</i> that can assist in building geographical range and life-cycle based networks of <i>refugia</i>	Preparation and publication of standards for <i>refugia</i> identification and evaluation methods relating to data collection and storage, and analysis	Adoption by appropriate intergovernmental fora of regional standards
6. Regionally agreed guidelines on the use of the fisheries <i>refugia</i> concept in fisheries management.	Regional agreement on guidelines for the use of the fisheries <i>refugia</i> concept	Adoption by appropriate intergovernmental fora of regional guidelines

DELIBERATIONS OF THE EIGHTH MEETING OF THE REGIONAL WORKING GROUP ON FISHERIES

The Working Group identified that the development of a regional strategy is constrained at this stage by a lack of baseline information and experience in the establishment and management of *refugia* sites. It was discussed that regional management initiatives are difficult to implement in Southeast Asia due to differences in fisheries management systems between countries. In this connection, the meeting agreed that a pilot site approach to the establishment of some initial *refugia* may enable the identification of the practical challenges and other issues that a regional strategy would need to consider.

The meeting agreed to establish one fisheries *refugia* pilot site in each country and prepare a draft of a detailed plan for the implementation of activities at that site by 30th June 2007. To assist focal points in guiding the establishment of a fisheries site the following step-by-step guide and work plan was proposed by the working group, the work-plan has been incorporated into the overall plan in Annex 10

PROPOSED GUIDE FOR THE ESTABLISHMENT OF PILOT FISHERIES *REFUGIA* SITES

- 1. Identify Pilot Fisheries *Refugia* Site**
 - Identify goal for the fisheries *refugia* area
 - Identify specific objective(s) for the management of the *refugia* site
 - Gather secondary data and information relating to the pilot site
- 2. Conduct community/stakeholder consultation**
 - Identify stakeholders/participants (e.g. Local and Provincial Government Bodies, Academe, Government Agencies, Law enforcement bodies, fisherfolk organisations)
 - Involve National Fisheries Committee Members

Activities during the consultation

 - Introduce the project, activities, objectives, expected output, etc.
 - Introduce the concept of fisheries *refugia*, procedures for identifying and establishing fisheries *refugia* sites
 - Discuss the difference/similarities between MPAs and the fisheries *refugia* concept
 - Discuss the possible effects on fishing communities once a fisheries *refugia* is established
 - Ensure that all the participants in the consultation have clear understanding of the *refugia* concept
 - Encourage the participants to ask questions about the *refugia* concept
- 3. Involve fishers and fishing communities in the process of identifying and agreeing boundaries of the pilot site**
 - In this manner you will feel (a) if they understood the concept and (b) their acceptance and willingness to support the establishment of a fisheries *refugia* site in their area
 - Conduct national training seminars
- 4. Select sites that have support from local and provincial government officials and bodies**
 - This will ensure the success of the project and assist in establishing similar sites within the administrative boundaries of the local government area
 - Seek assistance and support from local government officials who work well with the community
- 5. Clearly define the roles of all stakeholders and solicit their support and cooperation**
- 6. Collection and provision of data and information**
- 7. Determine the boundaries of the fisheries *refugia* site, resource attributes, etc.**
- 8. Conduct small workshops or community meetings to initiate the formulation of a management plans (including financial plan) for the site**
- 9. Liaise regularly with local fishing community leaders**
- 10. Draft a Fisheries *Refugia* Management Plan for the site**
 - Goal
 - Objectives
 - Justification of objectives
 - Stakeholder identification
 - Targets, strategies and activities to be implemented at the site
 - Timeframes for activities/actions
 - Prioritisation of activities/actions
 - Indicators to measure success of fisheries *refugia* plan
 - Costs of action
 - Institutional and other responsibilities, partnerships
 - Monitoring, evaluation and review of plan

ANNEX 8

Developing a National Programme of Activities for the Implementation for the Fisheries Component of the Revised Strategic Action Programme

BACKGROUND

The Regional Working Group on Fisheries (RWG-F) is currently collaborating with the Southeast Asian Fisheries Development Center (SEAFDEC) to:

- Establish a system of fisheries *refugia* in the South China Sea and Gulf of Thailand that focuses on the critical links between fish stocks and their habitats.

The general longer-term objectives of this activity are to:

- Build the resilience of Southeast Asian fisheries to the effects of high and increasing levels of fishing effort,
- Improve the understanding amongst stakeholders, including fisher folk, scientists, policy-makers, and fisheries managers, of ecosystem and fishery linkages, as a basis for integrated fisheries and ecosystem/habitat management,
- Build the capacity of fisheries departments/ministries to engage in meaningful dialogue with the environment sector regarding how broader multiple use planning (in whatever form) can best contribute to improving the state of fisheries in areas of the South China Sea and the Gulf of Thailand.

This initiative is considered important regionally because of the potential fisheries benefits associated with effective fisheries and habitat management at the local level. It is likely that the role of such approaches to fisheries management will become more important in the region, especially in the light of the continuing importance of fisheries to food security, nutritional security, and maintenance of livelihoods. Such approaches may also assist in curbing the effects of trends in regional fisheries relating to over-capacity and over-exploitation, the use of destructive fishing gear and practices, habitat destruction and pollution, and illegal fishing.

Revised Strategic Action Programme Targets

During the Sixth Meeting of the RWG-F convened in Kudat, Malaysia (5th-8th September 2006), the RWG-F revised and updated the fisheries component targets for the regional Strategic Action Programme in order to better reflect efforts to improve the use of fisheries *refugia* for sustainable capture fisheries management. These revised targets are as follows:

Targets¹

- By 2012 to have established a regional system of *refugia* for the management of priority, transboundary, fish stocks and endangered species.
- By 2012 to have prepared and implemented fisheries management systems in the identified *refugia* based on, and consistent with, the ASEAN SEAFDEC Regional Guidelines for Responsible Fisheries in Southeast Asia.

During discussion at the Sixth Meeting it was noted that neither of the above targets are "hard" in a quantitative sense since they did not enumerate how many *refugia* involving what size of area were to be included in the system. It was noted that this was difficult at the present time since the actual areas of the *refugia* both in terms of location and extent had not been defined. It was agreed therefore that these targets would be reviewed in the light of the subsequent development of the strategy for development of the regional system of *refugia*.

Revised Regional and National Level Activities

The Regional Scientific and Technical Committee (RSTC) recommended during its Sixth Meeting in Batam, Indonesia (10th-13th December 2006) that the RWG-F should evaluate the wording of all proposed regional and national activities in relation to the revised goals and targets. The Seventh Meeting of the RWG-F (16th-18th May 2006) subsequently considered the wording of the national and regional level activities, they were amended and the list was expanded as follows:

¹ Extracted from document UNEP/GEF/SCS/RWG-F.6/3.

Regional Level Activities²

- Review the compatibility of existing national policy frameworks against existing international/regional instruments (with emphasis on the ASEAN SEAFDEC Regional Guidelines for Responsible Fisheries in Southeast Asia). This should lead to identification of gaps and directions for improvement of the national policy frameworks to harmonize them with international/regional instruments.
- Designate fish *refugia* in addition to, or in conjunction with managed coastal habitat areas. These *refugia* should be developed by fisheries related agencies to promote their impacts on rehabilitating resources and in achieving the objectives of fisheries management. Build Information and Education Campaign (IEC) and alternative livelihood programs as necessary for affected fishing communities. Draw lessons from these activities/experiences to define protocols for establishment of a wider system of *refugia* for fisheries management purposes.
- Identify fish stocks or areas requiring bilateral, multilateral, and regional management collaboration.
- Identify regionally important areas requiring special protection and appropriate fishing technology to reduce impacts on endangered/threatened species (e.g. marine turtles, dugong) in the region.
- Identify, develop and establish joint fisheries management frameworks between and among neighbouring countries utilising shared stock through dialogues and consultations.
- Develop criteria for selection of marine habitats and areas (*refugia*) critical to the maintenance of regionally important fish stocks, particularly those of transboundary importance.
- Identify and prioritise specific areas for future management and protection and develop regional and national action plans to develop a regional system of *refugia* for maintenance of regionally important fish stock.
- In collaboration with other relevant institutions promote the standardisation of fisheries related statistics and information exchange.

National Level Activities (the activities should be consistent with related activities proposed at the regional level)³

- Evaluate the effectiveness of fisheries management systems.
- Evaluate the status and trends of fisheries resources in relation to catch efforts and availability of resources in defined areas.
- Reduce the use of fishing gear and practices that damage ecologically sensitive areas with the long term aim of removing and replacing them with more environmentally acceptable fishing gear and practices.
- Review compliance with international and regional fisheries agreements and guidelines.
- Promote the application of the Regional Guidelines for Responsible Fisheries in Southeast Asia through workshops, awareness building, translation into national languages and education of people.
- Develop educational and public awareness materials on sustainable fishery practices.
- Implement programmes to provide information on sustainable fishery practices among small and artisanal fishing communities, and commercial fisheries operators as appropriate.
- Train technical fisheries staff in the identification of fish eggs and larvae.
- Design and establish a programme for identifying important spawning and nursery areas.
- Establish *refugia* in areas identified as critical habitats for the life cycle of fisheries resources.
- Establish in selected *refugia* sound management systems, which can be tested to determine if they are leading to sustainable exploitation of resources and reduction of conflicts between groups of fishermen.

Developing a National Programme of Activities for SAP Implementation

It was agreed during the Seventh Meeting of the RWG-F that each member would develop a national programme of specific costed activities that would implement to broad national level activities proposed for inclusion in the SAP. Preliminary programmes for four participating countries are outlined in Tables 1- 4 of this document.

² Extracted from document UNEP/GEF/SCS/RWG-F.4/3.

³ Extracted from document UNEP/GEF/SCS/RWG-F.4/3.

Table 1 Vietnam's National Programme of Activities for the Implementation of the Regional Strategic Action Programme Proposed during the Eighth Meeting of the Regional Working Group on Fisheries.

Activities	Location	Timeframe	Responsible Organisation(s)	Costs (USD)
Restoration and development of aquatic resources, conservation of rare and valuable endangered species	Nationwide	2007-2015	Research Institute for Marine Fisheries (RIMF)	5,100,000
Development of model of fishing alternation in inshore water	Several coastal provinces (North and South)	2008-2012	Department of cooperative and private economics	1,800,000
Planning and development and management of MPAs, inland protection areas, closure areas and limited use areas	Nationwide	2007-2015	National directorate for aquatic exploitation and protection (NADAREP)	7,200,000
Development of model of community based management of fisheries resources	Several coastal provinces	2007-2010	Vietnam Institute of Fisheries Economics and Planning (VIFEP)	700,000
Development and management of database on fisheries resources and aquatic habitats	Nationwide	2008-2015	Fisheries Informatic Center (FICEN)	1,600,000
Development and implementation National Plan of information dissemination on fisheries protection and development	Nationwide	2007-2015	NADAREP	1,700,000
Establishing National Fisheries <i>Refugia</i>				
<i>Pilot site selection</i>	South of Vietnam	11/06	MoFi and Provincial Government	4000
<i>Community and stakeholder consultation for promoting the refugia concept</i>	South of Vietnam	2/07	MoFi, Provincial Government, Community, and Stakeholders	4000
<i>Collection of required information for Action research</i>	South of Vietnam	3-4/07	RIMF	1000
<i>Community and stakeholder consultation for identifying activities in the refugia</i>	South of Vietnam	5/07	MoFi, Provincial Government, Community, and Stakeholders	4000
<i>Promote the application of the RG for responsible F.</i>	Nationwide	4-6/07	MoFi and RIMF	1000
<i>Development educational and public awareness materials on sustainable fisheries practices</i>	Nationwide	8-10/07	NADAREP and RIMF	2000
				18,116,000

Table 2 Thailand's National Programme of Activities for the Implementation of the Regional Strategic Action Programme Proposed during the Eighth Meeting of the Regional Working Group on Fisheries.

Activities	Location	Timeframe	Responsible Organisation(s)	Costs (USD)
Evaluate the Effectiveness of Fisheries Management Systems	Prachuap Khiri Khan, Chumporn and Surat Thani Fisheries <i>Refugia</i>	2007-2012	Department of Fisheries, Thailand	270,000
	Koh Chang Strait	2007-2012	Department of Fisheries, Thailand	135,000
Evaluate the Status and Trends of Fisheries Resources in Relation to Catch Efforts and Availability of Resources in Defined Areas	Prachuap Khiri Khan, Chumporn and Surat Thani Fisheries <i>Refugia</i>	2007-2012	CMDEC/Department of Fisheries, Thailand	330,000
	Koh Chang Strait	2007-2012	EMDEC/ Department of Fisheries, Thailand	200,000
Reduce the Use of Fishing Gear and Practices that Damage Ecologically Sensitive Areas with the Long-Term Aim of Removing and Replacing them with more Environmentally Acceptable Fishing Gear and Practices	Koh Chang Strait	2010-2011	Trat Provincial Government	
Promote the Application of the Regional Guidelines for Responsible Fisheries in Southeast Asia through Workshops, Awareness Building, translation in National Languages	Prachuap Khiri Khan, Chumporn and Surat Thani Fisheries <i>Refugia</i>	2008-2010	Department of Fisheries, Thailand	
	Koh Chang Strait	2008-2012	Department of Fisheries, Thailand	
Develop education and awareness materials on sustainable fishing practices	Prachuap Khiri Khan, Chumporn and Surat Thani Fisheries <i>Refugia</i>	2008-2012	SMDEC/Department of Fisheries, Thailand	
Distribute materials developed to the local community, schools and education institute	Prachuap Khiri Khan, Chumporn and Surat Thani Fisheries <i>Refugia</i>	(a) 2007-2012 (b) 2007-2012	(a) National Fisheries Focal Point (b) Technology Transfer and Extension Bureau, Department of Fisheries	
Train technical fisheries staff in the identification of fish eggs and larvae to assist in the identification of fisheries <i>refugia</i> sites	CMDEC/Department of Fisheries, Thailand	2007	CMDEC/Department of Fisheries, Thailand	26,000
Design and establish a programme for identifying important spawning and nursery areas	Gulf of Thailand	2007-2012	Department of Fisheries, Thailand	800,000
Establish <i>refugia</i> in areas identified as critical habitats for the life-cycles of the species	Prachuap Khiri Khan, Chumporn and Surat Thani Fisheries <i>Refugia</i>	2007-2012	Department of Fisheries, Thailand	
	Koh Chang Strait	2007-2012	Department of Fisheries, Thailand	
Establish in selected <i>refugia</i> sound management systems, which can be tested to determine if they are leading to sustainable exploitation of resources and reduction of conflicts between groups of fishers	Prachuap Khiri Khan, Chumporn and Surat Thani Fisheries <i>Refugia</i>	2007-2012	Department of Fisheries, Thailand	270,000
				2,031,000

Table 3 Philippines' National Programme of Activities for the Implementation of the Regional Strategic Action Programme Proposed during the Eighth Meeting of the Regional Working Group on Fisheries.

Activities	Location	Timeframe	Responsible Organisation(s)	Costs (USD)
Evaluate the effectiveness of fisheries management systems				
Evaluate the status and trends of fisheries resources in relation to catch efforts and availability of resources in defined areas				
<ul style="list-style-type: none"> Consolidate data collected by the National Stock Assessment Program (NSAP) for priority fishing grounds to determine number of licenses to be issued 	Lingayen Gulf, Ilocos Coast, Bataan/Zambales Coast	Jan 2007 to Dec 2010	BFAR, NFRDI, NSAP-1, NSAP-3	20,000
Reduce the use of fishing gear and practices that damage ecologically sensitive areas with the long term aim of removing and replacing them with more environmentally acceptable fishing gear and practices				
<ul style="list-style-type: none"> Monitor catch and effort of allowed fine meshed fishing gears to support issuance of Fisheries Administrative Order (FAO) for the rationalization of their use 	Lingayen Gulf	Jan 2007 to Dec 2008	BFAR, NFRDI, NSAP-1	30,000
<ul style="list-style-type: none"> Development of FAO and public consultation on the proper fishing gear configuration for small pelagics and large pelagics 	National Office	Jan 2007 to Dec 2007	BFAR, NFRDI,	3,000
Review compliance with international and regional fisheries agreements and guidelines				
<ul style="list-style-type: none"> Development of mechanisms for compliance 	National Office	Jan 2007 to Dec 2007	BFAR, NFRDI,	1,000
<ul style="list-style-type: none"> Public awareness campaign on international and regional fisheries agreements and guidelines 	National Office	Jan 2007 to Dec 2010	BFAR, NFRDI, Academe	10,000
Promote the application of the Regional Guidelines for Responsible Fisheries in Southeast Asia through workshops, awareness building, translation into national languages and education of people				
Develop educational and public awareness materials on sustainable fishery practices				
<ul style="list-style-type: none"> Adopt and modify IEC materials developed by externally funded projects and print for distribution 	National Office	Jan 2007 to Dec 2012	BFAR, NFRDI, other institutions	5,000
<ul style="list-style-type: none"> Development of new IEC materials to specifically focus on fish <i>refugia</i> 	National Office	Jan 2007 to Dec 2012	BFAR, NFRDI, other institutions	50,000

Table 3 cont. Philippines' National Programme of Activities for the Implementation of the Regional Strategic Action Programme Proposed during the Eighth Meeting of the Regional Working Group on Fisheries.

Activities	Location	Timeframe	Responsible Organisation(s)	Costs (USD)
Implement programmes to provide information on sustainable fishery practices among small and artisanal fishing communities, and commercial fisheries operators as appropriate				
Train technical fisheries staff in the identification of fish eggs and larvae	UNEP, SEAFDEC	2007	BFAR, NFRDI, academe	
Design and establish a programme for identifying important spawning and nursery areas				
<ul style="list-style-type: none"> Develop and implement national programme on systematic collection of information to determine spawning seasons and nursery areas of commercially important fish species. 	Lingayen Gulf	Jul 2007 to Jun 2009	BFAR, NFRDI, BFAR-1, academe	30,000
<ul style="list-style-type: none"> Staff development programme to support systematic collection and analysis of information to determine spawning seasons and nursery areas 	Lingayen Gulf	Jul 2007 to Jun 2009	BFAR, NFRDI, BFAR-1, academe	10,000
Establish <i>refugia</i> in areas identified as critical habitats for the life cycle of fisheries resources				
<ul style="list-style-type: none"> Identification of pilot site(s) or fishing community(ies) 	Masinloc, Busuanga, Bolinao	Nov 2006 to Dec 2006	BFAR, NFRDI, BFAR-1,3,4b	3,000
<ul style="list-style-type: none"> Drafting of habitat and fisheries and socio economic profile for the pilot site 	Masinloc, Busuanga, Bolinao	Nov 2006 to March 2007	BFAR, NFRDI, BFAR-1,3,4b	3,000
<ul style="list-style-type: none"> Identification of additional <i>refugia</i> sites 		Jan 2007 to Dec 2007	BFAR, NFRDI	2,000
<ul style="list-style-type: none"> Community and stakeholder consultations for promoting the <i>refugia</i> concept 		Jan 2007 to Dec 2007	BFAR, NFRDI	8,000
<ul style="list-style-type: none"> Drafting of habitat and fisheries and socio economic profile for the additional <i>refugia</i> 		Jul 2007 to Dec 2007	BFAR, NFRDI	3,000
Establish in selected <i>refugia</i> sound management systems, which can be tested to determine if they are leading to sustainable exploitation of resources and reduction of conflicts between groups of fishermen				
<ul style="list-style-type: none"> Collection of required information for pilot area 	Masinloc, Busuanga, Bolinao	Nov 2006 to Dec 2007	BFAR, NFRDI, BFAR-1,3,4b	30,000
<ul style="list-style-type: none"> Community and stakeholder consultations for identifying activities in the pilot <i>refugia</i> 	Masinloc, Busuanga, Bolinao	Nov 2006 to Apr 2007	BFAR, NFRDI, BFAR-1,3,4b	16,000
<ul style="list-style-type: none"> Preparation of detailed plan for the implementation of activities in pilot <i>refugia</i> 	Masinloc, Busuanga, Bolinao	Nov 2006 to Jun 2007	BFAR, NFRDI, BFAR-1,3,4b	10,000

Table 3 cont. Philippines' National Programme of Activities for the Implementation of the Regional Strategic Action Programme Proposed during the Eighth Meeting of the Regional Working Group on Fisheries.

Activities	Location	Timeframe	Responsible Organisation(s)	Costs (USD)
• Enforcing fisheries management measures in the pilot <i>refugia</i>	Masinloc, Busuanga, Bolinao	Nov 2006 to Sep 2007	BFAR, NFRDI, BFAR-1,3,4b	5,000
• Collection of required information for other selected <i>refugia</i> sites		Jun 2007 to Dec 2010	BFAR, NFRDI	40,000
• Community and stakeholder consultations for identifying activities in additional <i>refugia</i> sites		Jun 2007 to Dec 2010	BFAR, NFRDI	20,000
• Preparation of detailed plan for the implementation of activities in additional <i>refugia</i> sites		Jan 2008 to Jun 2009	BFAR, NFRDI	15,000
• Enforcing fisheries management measures in additional <i>refugia</i> sites		Jan 2008 to Dec 2012	BFAR, NFRDI	10,000

Table 4 Cambodia's National Programme of Activities for the Implementation of the Regional Strategic Action Programme Proposed during the Eighth Meeting of the Regional Working Group on Fisheries.

Activities	Locations	Timeframe	Responsible Organisation(s)	Costs (USD)
Evaluate the effectiveness of fisheries management system Disseminations new laws to fishers and awareness campaigns	Along coastline (Kampot, Koh Kong, Sihanoukville and Kep City)	2007 - 2012	Fisheries administration	
Resource and Socio-economic surveys	Kampot, Sihanoukville, Koh Kong	2007-2012	Fisheries administration	
Reduction of fishing gear and practices Awareness campaign on destructive fishing practices	Kampot, Sihanoukville, Koh Kong, Kep City	2007	Fisheries administration and local fisheries authority	
Conduct awareness programme to promote sustainable fishery practices to artisanal and commercial fishery operators	Kampot	2007-2008	Fisheries administration and local fisheries authority	
Fisheries <i>Refugia</i> Activities				
Establish fisheries <i>refugia</i>	Kampot	2007-2008	Fisheries administration and local fisheries authority	
Training of trainers				
Training of stakeholders				
Consultation workshops/workshop/seminars				
Implementation of pilot project on <i>refugia</i>				
Project management				
Monitoring and evaluation of pilot <i>refugia</i> site, improvement of plan				
Review of fisheries <i>refugia</i> plan and improvement of plan				
Establishment of <i>refugia</i> in other areas, monitoring, review and improvement of fisheries <i>refugia</i> plan				

ANNEX 9

Preliminary Syllabus for the Training Course on Larval Fish Identification and Early Life-History Science

BACKGROUND

SEAFDEC are currently utilising M.V. SEAFDEC 2 for the conduct of fisheries resources assessment surveys. A total of 20 cruises have been conducted using this vessel since 2004, and larval fish have been and continue to be sampled using a bongo net at all survey sites. M.V. SEAFDEC 2 has recently conducted work in the Gulf of Thailand, including Cambodian waters, waters adjacent to West Kalimantan Province in Indonesia, the Sulu Sea in the Philippines, and the east coast of Viet Nam. Larval fish samples collected during these cruises will form a critical part in any future development of a regional system of fisheries *refugia*.

To date very few of these larval fish samples have been processed due to a shortage of technical expertise in the participating countries regarding the sorting and identification of larval fish. In recognition of this the Regional Scientific and Technical Committee approved a regional training course and national "echo" seminars on larval fish identification and early-life history science as part of the SCS Training Programme. It is aimed that these training activities will result in the establishment of fish larvae identification teams in each country with the responsibility for the processing of samples collected during M.V. SEAFDEC 2 cruises. The initial desired content for this course includes:

- Methods for larval fish sampling and surveys,
- Methods for identifying larval and juvenile fish,
- Preparation of larval fish identification sheets/manuals for key species,
- Building national-level capacity for the processing of larval fish samples and the identification of larval fish, and
- Standardising the methodology for fish early life history research in Southeast Asia.

Discussions during the Seventh Meeting of the Regional Working Group on Fisheries

The Seventh Meeting of the Regional Working Group on Fisheries (RWG-F) reviewed the training programme as developed by the RSTC and made comment regarding appropriate course participants, possible implementing entities, and how materials developed by the RWG-F could be utilised in training activities. It was agreed that depending on each country's individual needs, the training should be targeted at technical personnel in specialised executing agencies or research institutions. It was further agreed that where possible, preference should be given to junior scientists in the fisheries departments with responsibility for larval identification.

It was also agreed during the Seventh Meeting that the training should be linked with the national programmes of SEAFDEC cruises that involved the collection of eggs and larvae, and that a key output of the activity should be egg and larval fish identification sheets for use in laboratories and at sea. In terms of identification of possible implementing entities, the group was unanimous in agreeing that the Southeast Asian Fisheries Development Center was the most qualified and well equipped organisation in the region to act as an Executing Agency for the conduct of the course.

Discussions during the Eighth Meeting of the Regional Working Group on Fisheries

An important task for the Eighth Meeting of the RWG-F was to provide feedback and advice to SEAFDEC regarding the implementation of this training course. Dr. Somboon of SEAFDEC noted that he had prepared a draft syllabus for the training course, prepared an inventory and costing of all required materials, and had made contact with several experts, including SEAFDEC's larval fish expert, Dr. Konishi, regarding their interest in acting as course instructors. The draft syllabus was presented by Dr. Somboon and amended as it appears below:

PRELIMINARY SYLLABUS FOR THE TRAINING COURSE ON LARVAL FISH IDENTIFICATION AND EARLY LIFE-HISTORY SCIENCE

1 Introduction to Ichthyoplankton (2 days)

- Use of ichthyoplankton (fish eggs and larvae) surveys for fisheries resources research
- Case studies (examples of how fish larvae information can be used to guide management)
- Morphology of fish (squid) eggs, larvae, and juveniles
- General morphology of eggs
- Developmental stages of eggs
- General morphology of larvae (juvenile)
- Developmental stages of larvae (juvenile)

2 Sampling gears (1 days)

- Various types of gears
- Net properties
- Conducting ichthyoplankton surveys using a bongo net, small-scale fishing gears
- Design and implementation of a larval fish survey plan

3 Fishing/Research Vessel Based Training Activities (3 days)

- Calibration of flow meter
- Net towing procedures and towing data record
- Preservation of sampled planktons
- Labelling of sample containers
- Recording supplementary environmental and oceanographic data: water temperature, salinity and current

4 Laboratory Based Training Activities (3 days)

- Sorting of eggs, larvae and juveniles
- Identification (counts and measurements) of sorted eggs, larvae and juveniles
- Bottling, storing and crating of identified samples
- Data summarisation and standardisation
- GIS based mapping of egg and larval distribution

5 Core Competences to be Evaluated (1 day)

- Sorting of eggs and larvae
- Identification of eggs and larvae

Conduct of National “Echo” Seminars

It was agreed during the meeting that the activities of the National “Echo” Seminar component of the training course should be conducted in relation to the implementation of pilot fisheries *refugia* site activities. It was further suggested that, where possible, commonly used small-scale fishing gears should be used when demonstrating the collection of fish larvae in areas of the pilot fisheries *refugia* sites. This recommendation was based on the group’s recognition of the need to involve local fishing communities in the establishment and monitoring of the fisheries *refugia* site.

ANNEX 10

Work Plan and Timetable for the Regional Working Group on Fisheries 2007

BACKGROUND

The work plan and timetable as approved during the Seventh Meeting of the RWG-F was considered and revised during the course of the Eighth Meeting of the Regional Working Group on Fisheries to take into agreements relating to:

- The establishment and development of pilot fisheries *refugia* sites in the participating countries,
- The implementation of South China Sea Project Training Activities relating to the establishment of a regional system of fisheries *refugia*,
- Preparation of Guidelines on Managing the Effects of Fishing in the Habitat Demonstration Sites, and
- Development of the Fisheries *Refugia* Information Portal.

Table 1 places the tasks of the group into clear and easily understood task areas. The task completion dates are aimed at ensuring that the necessary outputs from the national and regional levels are available for consideration at the ninth meeting.

Table 2 presents the schedule of meetings for 2007.

Table 1 cont. Work Plan and Time Table for the Regional Working Group on Fisheries.

Quarter Month	2007											
	1			2			3			4		
	J	F	M	A	M	J	J	A	S	O	N	D
REGIONAL ACTIVITIES												
REGIONAL COMMUNICATION AND INFORMATION EXCHANGE												
Provide regular input to monthly update on fisheries activities												
Submit package of awareness raising materials for <i>refugia</i> information portal												
Promote the fisheries <i>refugia</i> information portal in regional and national fora												
Contribute country level information relating to (a) fish early-life history science, (b) the use of area-based approaches to fisheries management, and (c) the management of fisheries <i>refugia</i> for inclusion in the <i>refugia</i> information portal												
Participate in e-fora discussions as appropriate												
GUIDELINES ON MANAGING THE EFFECTS OF FISHING												
Focal Points and Experts to provide management case studies to CP	X (1/1)											
CP to compile case studies for circulation amongst members of the RWG-F	X (26/1)											
Review case studies and comment on desired content for the guidelines		X (24/2)										
CP to draft guidelines for circulation amongst members of the RWG-F					X (31/5)							
Comment on draft guidelines and provide any additional information required						X (22/6)						
REGIONAL SYSTEM OF FISHERIES REFUGIA												
Community and stakeholder consultations for promoting the <i>refugia</i> concept												
Identify pilot site(s) or fishing community(ies)	X (1/1)											
Draft habitat, fisheries and socio economic profile for the pilot site			X (31/3)									
Trainers training in the identification of fish larvae and national seminars				X (30/4)								
Collection of required information for the design of activities at the pilot fisheries <i>refugia</i> site (Action Research ⁴)												
Community and stakeholder consultations for identifying activities in the <i>refugia</i>												
Preparation of detailed plan for the implementation of activities at the <i>refugia</i> site (initial draft)						X (22/6)						
Preparation of detailed plan for the implementation of activities (final draft)								X (30/9)				
Develop enabling mechanisms in support of fisheries management measures in the <i>refugia</i>												
Implement fisheries management measures in the <i>refugia</i>												
FISHERIES REFUGIA TRAINING ACTIVITIES												
Nominate suitable participants for establishing and training on establishing <i>refugia</i> and larval fish identification												
Provide inputs to Implementing Agencies and Host Organisations for National Seminars as required												

⁴ Research done by managers together with the community/stakeholders to solve a specific problem or to introduce management interventions.

Table 2 Schedule of Meetings for 2007. (RWG = Regional Working Group; -M = Mangroves; -CR = Coral Reefs; -SG = Seagrass; -W = Wetlands; -F= Fisheries; LbP = Land-based Pollution; RTF-E = Regional Task Force on Economic Valuation; RTF-L = Regional Task Force on Legal Matters) (H = United Nations Holidays) (RSTC = Regional Scientific and Technical Committee; RSTC-SC = RSTC Sub-Committee; PSC = Project Steering Committee).

	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M						
January		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
		H																					RTF-E-6													
February					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
																						Chinese NY														
March					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
April	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						
						H							H								RWG-M-8			Joint Mtg. PKWS-Trat												
May			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
								RWG-W-8										RTF-L-6					RWG-SG-8													
June					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
							RWG-CR-8																													
July	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					
							RWG-F-9																													
August				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
							RWG-LbP-8							H																						
September						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
																							Ramadan													
October		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
					Ramadan																															
November				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
December						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
										H																				H						