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Regional Inception Workshop for the
SEAFDEC/UNEP/GEF Project:
*"Establishment and Operation of a Regional System of Fisheries Refugia
in the South China Sea and Gulf of Thailand"*

Bangkok, Thailand, 1st – 3rd November 2016

Supporting the Scientific and Technical Needs of the Fisheries *Refugia* Project

1. BACKGROUND

The South China Sea and Gulf of Thailand supports a significant world fishery of importance to the food security of, and as a source of export income for, Southeast Asian countries. Landings from this area contribute to approximately 10 percent of reported global fisheries production per annum, and estimates of the value of capture production indicate that capture fisheries contribute more than 2 percent to total GDP in the majority of countries in the area. The challenge for the Southeast Asian region however, is how to balance the interests of multiple jurisdictions and coastal community dependence on fish stocks for food and income, in the face of problems resulting from over-fishing, destructive fishing practices, incidental capture of endangered species, and the inherently complex nature of tropical multi-species fisheries.

Most coastal and marine fisheries in Southeast Asia are characterised by excess competition among fishermen, and as such suffer from the problems of over-capitalisation and over-exploitation. Demersal fisheries in the South China Sea and Gulf of Thailand have long been considered fully exploited with indications that the landings of many species are declining. As such the region has progressively become more dependent on small pelagic species, and these trends suggest that production from capture fisheries will wane in coming years unless fishing effort and related over-capacity are reduced.

This situation has provided the impetus for the development of innovative approaches to moderate the tendency to over-exploit Southeast Asian fish stocks. In this connection, significant efforts are being made throughout the region by all participating countries, often in collaboration with the Food and Agriculture Organization of the United Nations, the Southeast Asian Fisheries Development Center, and bi-lateral donor agencies to improve the institutional and scientific basis required to achieve the sustainable use of regional fish stocks. Large national and regional fisheries programmes have and continue to be implemented in areas including *inter alia*: fishing capacity; licensing; subsidies; information collection and statistics; indicators; co-management; poverty alleviation; responsible fishing gear and practices; and illegal, unregulated and unreported (IUU) fishing.

The fisheries component of the UNEP/GEF project entitled “*Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*”, focused on transboundary fisheries issues in the South China Sea and Gulf of Thailand, specifically those relating the links between fish stocks and habitats. The key activities of the component were designed to:

- Secure agreement on the nature of joint actions required to address identified problems in the South China Sea and Gulf of Thailand,
- Develop criteria to determine the national, sub-regional and transboundary significance of spawning and nursery areas, and to
- Apply these criteria to determine priorities for management action within the South China Sea and Gulf of Thailand.

It was anticipated that these activities would meet the regional need for joint actions relating to fisheries and environment in the Gulf of Thailand, and result in regional and national plans for the establishment of a system of *refugia* to maintain important transboundary fish stocks. The component was aimed at enabling participating countries to contribute to the achievement of one of the overall objectives of the project, specifically “*Improved integration of fisheries and biodiversity management in the Gulf of Thailand*”. The original project design considered this critical to the achievement of the overall goals of the project as follows:

to create an environment at the regional level, in which collaboration and partnership in addressing environmental problems of the South China Sea, between all stakeholders, and at all levels is fostered and encouraged; and to enhance the capacity of the participating governments to integrate environmental considerations into national development planning.

Additional anticipated outputs included local language educational and public awareness materials on sustainable fisheries and fish stock conservation in the Gulf of Thailand, and a report of field test

results of the effectiveness of a blast fishing detection device as a deterrent against the use of explosives in fishing.

The fisheries component of the project was based on an emerging regional understanding of:

- the critical role that habitats such as mangroves, coral reefs, seagrass, and wetlands play in sustaining fisheries production in the South China Sea and Gulf of Thailand, and
- the need to enhance capacity within national fisheries and environment departments and ministries to develop the partnerships required to improve the integration of fisheries and habitat management.

The component was nested with other project components focusing on habitat degradation and loss, land-based pollution, economic valuation, and legal matters within the broader management framework of the multi-lateral, intergovernmental South China Sea project. National activities were executed by departments or research institutes of government Ministries responsible for fisheries in Cambodia, Indonesia, Malaysia, Philippines, Thailand, and Viet Nam. Government nominated focal points for fisheries from these countries led the execution of regional level activities through the Regional Working Group on Fisheries (RWG-F)..

2. THE WORK OF THE UNEP/GEF REGIONAL WORKING GROUP ON FISHERIES

Eleven meetings of the RWG-F were convened from 2002-2008 and the work of this group benefited from the participation and substantive contributions of 5 regional experts on fisheries, and senior advisors and technical staff of the Southeast Asian Fisheries Development Center (SEAFDEC), the Food and Agriculture Organisation of the United Nations (FAO), the WorldFish Centre, and the International Union for Conservation of Nature (IUCN). The direct linkages and feed-back loops that were established between and among these fisheries experts, and the habitat specialists, pollution scientists, lawyers, and economists involved in the broader project have been acknowledged by International and regional fisheries organisations as having provided the necessary scientific and institutional setting required to address matters relating to improved fisheries habitat management. Reports of these meetings can be accessed online at http://www.unepscs.org/South_China_Sea_Meeting_Reports/#7.

The fisheries component of the project was unique in that it represented the first attempt to develop a regional initiative aimed at the establishment of integrated fisheries and habitat management areas (fisheries *refugia*) in Southeast Asia supported by national habitat action plans (NAPs) and fisheries policies. The close collaboration established between the RWG-F and SEAFDEC ensured that fisheries component activities complemented rather than duplicated work being undertaken as part of larger SEAFDEC and FAO fisheries projects and programmes. Additional sharing of information relating to the work of the RWG-F and that of other national regional projects was facilitated through the regular participation of RWG-F members in regional technical and policy meetings in the areas of fishing capacity reduction, licensing, subsidies, information collection and statistics, indicators, co-management, responsible fishing gear and practices, and illegal, unregulated and unreported (IUU) fishing.

2.1 OUTPUTS AND OUTCOMES

The key substantive outputs associated with the completion of the tasks in the preparatory phase of the fisheries component included:

- Regionally agreed ranked lists of the occurrence and transboundary significance of 58 pelagic and 29 demersal fish species, 15 cephalopods, and 18 crustaceans in the South China Sea and Gulf of Thailand (see **Annex 1**);
- Regionally agreed list of 82 threatened and near threatened species for the South China Sea and Gulf of Thailand;
- National meta-databases and GIS data relating to available information on fish stock status, fish early life history science, role of habitats as fish nursery and spawning areas, and management; and
- National reports on “*Fish Stocks and Habitats of Regional, Global and Transboundary Significance in the South China Sea*” in both English and national languages.

The national reports represent a significant achievement of the project in terms of the compilation of national level information and data relating specifically to the links between fish stocks of transboundary significance and their habitats and management. These reports focused on the analysis of information including *inter alia* the following:

- The fisheries sector, including community dependence,
- Species of regional, global and/or transboundary significance,
- The importance of species in terms of landings, value, status and food security,
- The biology and ecology of the priority species,
- Fishery status and threats,
- Habitats and areas of importance in the maintenance of exploited fish stocks, and
- Current management regimes.

These reports built on the work of the national fisheries committees and RWG-F to reach regional agreement on the transboundary significance of important fish, cephalopod, and crustacean species. The publication of the reports in English facilitated their use at the regional level to evaluate inter-country differences and similarities in approaches to fisheries and habitat management in the participating countries. The activity of compiling and analysing existing information and data also built capacity within the Specialised Executing Agencies to contribute to the operational phase activity to develop a system of *refugia*, including the identification of areas of critical importance to the life-history of important species. The national reports can be accessed online at http://www.unepscs.org/South_China_Sea_National_Reports/.

2.2 ESTABLISHING A REGIONAL SYSTEM OF FISHERIES *REFUGIA*

Given the feed back loops between fish stock and habitat quality on the one hand, and fishing activities and habitats on the other the RWG-F identified the need to develop a regional initiative aimed at improving the effective management of the linkages between fish stocks and habitats. The group agreed that the initiative would need to address the barriers identified above and noted specifically that, the initiative should:

- Improve the understanding amongst stakeholders, including fisher folk, scientists, policy makers, and fisheries managers, of habitat and fishery linkages, as a basis for integrated fisheries and habitat management;
- Build the capacity of fisheries and environment departments and ministries to engage in meaningful dialogue regarding how broader multiple use planning can best contribute to improving the state of fisheries habitat management in areas of the South China Sea and the Gulf of Thailand; and
- Enhance and sustain participation of local fishing communities and the private sector in management interventions for improved fisheries habitat management and biodiversity conservation, through a focus on sustainable use rather than prohibition of fishing.

Development of the Fisheries Refugia Concept

Following a review of existing fisheries and habitat management initiatives in the region, the RWG-F noted that few of these focused on the above objectives and agreed to elaborate a system of fisheries management areas (fisheries *refugia*) in the South China Sea and Gulf of Thailand with a focus on the critical links between fish stocks and their habitats. The longer-term goal of this system would be to build the resilience of Southeast Asian fisheries to the effects of high and increasing levels of fishing effort.

The RWG-F addressed the identified problems by drawing on fisheries management concepts that were easily understood by fishing communities and provincial fisheries officers; and emphasised the sustainable use of fisheries resources and their habitats rather than the prohibition of fishing. The group agreed that the development of a regional initiative should focus on building fishing community support for area-based approaches to fisheries and habitat management, through which fisheries management and biodiversity conservation objectives could be achieved simultaneously. It was agreed that the development of such an initiative was unique in that it would represent the first attempt to develop integrated fisheries and environmental management for regional benefit.

The work of the RWG-F drafted the broad based definition of *refugia* (see Information Box 1) with the assistance of experts from SEAFDEC and FAO. There now exists a common and widespread regional 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 migration routes.

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) was agreed as a reasonable starting point for developing a regional system of *refugia*. It was agreed that information needs would become apparent over time, enabling identification of future areas for research on fish stock life histories, and for the development of a better understanding of the linkage between critical habitats and the life cycles of important pelagic and demersal species of transboundary significance.

In evaluating the factors contributing to the resilience of fish stocks to the effects of high levels of fishing effort, and how spatial fisheries management tools could effectively contribute to enhancing that resilience in Southeast Asian fisheries, the RWG-F has focused initially on the concept of natural *refugia*. Specifically, the group has considered the following “theoretical” types of natural *refugia* and how they may relate to regional fisheries:

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

During its sixth meeting in Sabah, Malaysia the RWG-F recognised the difficulty in linking these *refugia* scenarios with important fish stocks in the region, largely due to limited information about the biology and population dynamics of most species at that time. There was, however, consideration of the role of *refugia* in fisheries in 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 noted that this is believed to have occurred due to larger spawning fish occupying deeper areas of the continental shelf in *refugia* resulting from the inability of the fine inshore trawls to successfully catch fish at that depth. These large fish make a major spawning contribution to the adjacent fishery.

Notwithstanding the lack of readily available regional examples of the role of natural *refugia*, the group agreed that the identification of natural *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 fishing communities; and
- it may be easier to manage these areas with limited research and monitoring, control and surveillance resources than other technical-based measures.

THE RWG-F DEFINITION OF FISHERIES REFUGIA

Fisheries *refugia* in the context of the UNEP/GEF South China Sea Project are defined as:

“Spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical stages of their life cycle, for their sustainable use.”

Fisheries *refugia* should:

NOT be “no take zones”,

Have the objective of sustainable use for the benefit of present and future generations,

Provide for some areas within *refugia* to be permanently closed due to their critical importance [essential contribution] to the life cycle of a species or group of species,

Focus on areas of critical importance in the life cycle of fished species, including spawning, and nursery grounds, or areas of habitat required for the maintenance of brood stock,
 Have different characteristics according to their purposes and the species or species groups for which they are established and within which different management measures will apply,
 Have management plans.

Management measures that may be applied within fisheries *refugia* may be drawn from the following [non-exhaustive] list:

Exclusion of a fishing method (e.g. light luring, purse seine fishing),
 Restricted gears (e.g. mesh size),
 Prohibited gears (e.g. push nets, demersal trawls),
 Vessel size/engine capacity,
 Seasonal closures during critical periods,
 Seasonal restrictions (e.g. use of specific gear that may trap larvae),
 Limited access and use of rights-based approaches in small-scale fisheries.

Identification of Fisheries Refugia: Critical Spawning and Nursery Areas

The Sixth Meeting of the RWG-F 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 fishermen catch adults of the same species offshore. In circumstances 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 agreed 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.

In considering the work of the RWG-F, the Regional Scientific and Technical Committee (RSTC) 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, the RSTC recommended that the RWG-F should: review known spawning areas for pelagic and invertebrate species, with the aim of evaluating these sites as candidate spawning *refugia*; and, evaluate each of the project's habitat demonstration sites as potential juvenile/pre-recruit *refugia* for significant demersal species.

During the seventh meeting of the RWG-F a preliminary inventory of known spawning areas in the Gulf of Thailand for significant pelagic, demersal, and invertebrate species was prepared and the group agreed to compile information on critical spawning and nursery areas for important fish species during the inter-sessional period and to: identify which of the UNEP/GEF South China Sea Project's Habitat Demonstration Sites are critical inshore nursery *refugia* for important demersal species; identify locations in the South China Sea and Gulf of Thailand that are utilised by important pelagic species for spawning; and to evaluate which existing fisheries management areas might qualify as fisheries *refugia*.

The compilation of this information was considered during the eighth meeting of the RWG-F and the information sources reviewed included:

- 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.

This information was used to list and characterise known fish spawning and nursery areas in the Gulf of Thailand and the South China Sea (see **Annex 2**). The RWG-F reviewed the list of sites in relation to: information on the distribution and abundance of fish eggs and larvae in the South China Sea during the post northeast monsoon periods from 1996-1999 (see **Annex 3**); and the outcomes of country consultations on the identification of fisheries *refugia*. The group agreed on 14 priority sites for inclusion in an initial system of fisheries *refugia*, and an additional 9 sites for which additional information is required prior to their inclusion in the system.

2.3 IMPROVING THE SCIENTIFIC BASIS FOR THE IDENTIFICATION OF FISHERIES REFUGIA

As noted above a constraining factor in the further development of a regional system of fisheries *refugia* is the scarcity of information relating to the early-life history of the majority of significant transboundary species in the South China Sea and Gulf of Thailand. In this connection, the development of a collaborative programme of technical consultations, working group meetings, and training workshops, aimed at improving the scientific basis for the identification of fisheries *refugia* was agreed between the RWG-F and SEAFDEC during 2006.

This resulted in a comprehensive review of past and ongoing fish early-life history research work, and the compilation of information on known spawning and nursery areas for important fish species in the Gulf of Thailand and South China Sea. It was identified that past research activities conducted in the 1970s and 1980s 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. The RWG-F agreed that there are some limitations in the use of this research for the identification of spawning *refugia*, including reported ecosystem changes in the Gulf of Thailand over recent decades.

The group discussed that information and data collected through research activities initiated by SEAFDEC in the mid 1990s would provide a more accurate and temporally relevant information base for use in identifying current spawning and nursery areas. These research activities involved cruises 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); and in Vietnamese Waters (58 stations). Larval fish sampling was undertaken at 249 stations using bongo nets in the period of the post-northeast monsoon (April-May) from 1996-1999.

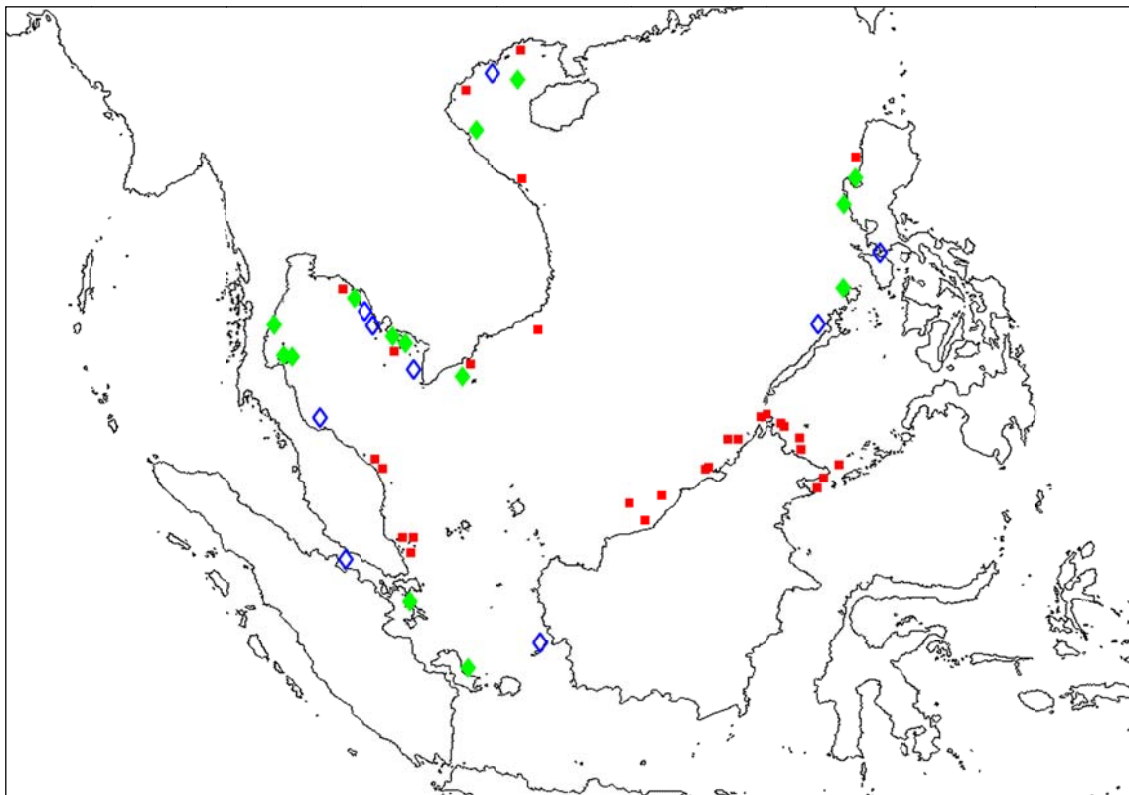


Figure 2 Location of: known spawning and nursery areas of transboundary demersal fish species [▪]; initial sites selected for inclusion in the regional system of *refugia* [◆]; sites of high priority for inclusion in the regional system once the initial set are established [◇].

It was noted that 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. Consequently the results of larval fish surveys conducted by SEAFDEC during the post northeast monsoon (April-May) may assist in developing a better understanding of spawning (sources) and nursery (sinks) locations for important species. Drawing on this data the group worked with SEAFDEC scientists to map the distribution and abundance of the larvae of important demersal and pelagic fish species in the South China Sea during the post northeast monsoon periods from 1996-1999, an example of which is provided in Figure 3.

2.4 CAPACITY BUILDING FOR THE OPERATION OF A REGIONAL SYSTEM OF FISHERIES *REFUGIA*

The UNEP/GEF Regional Working Group on Fisheries (RWG-F) identified during its seventh and eighth meetings that a key constraint in the future development of the regional system of fisheries *refugia* is a shortage of information regarding fish life-cycle and critical habitat linkages in Southeast Asia. SEAFDEC has been working to fill this information gap by including larval and juvenile fish surveys as part of their regular fisheries research cruises, however, the region has faced difficulties in the processing of samples due to limited expertise in national fisheries departments.

In this connection a joint UNEP/GEF South China Sea Project – SEAFDEC Regional Training Workshop on Larval Fish Identification and Fish Early Life History Science was convened at the SEAFDEC Training Department from 16th-31st May 2007 to assist in filling this information gap. Specifically the course aimed to build regional capacity in the processing and identification of larval fish samples collected during regular research cruises of SEAFDEC's Fisheries Research Vessel. This was supported by an Advanced Regional Training Workshop on Larval Fish Identification (25th May-14th June 2008) aimed at providing participants from the first larval fish training event with an opportunity to work in the SEAFDEC's fisheries laboratories with expert ichthyologists to practice the identification of economically important fish species to the family and species levels. Participants were

also trained to draw and stain larval specimens and these are being used for the production of a regional guide on the identification of the larvae of coastal and marine larval fish of Southeast Asia. Additional outputs and outcomes from these training events include: a detailed laboratory guide to the identification of eggs and larvae of marine fish in Southeast Asia; the formal establishment of a “*Network of Southeast Asian Larval Fish Scientists*” within the framework of SEAFDEC; and a database of fish egg and larvae distribution in the South China Sea and Gulf of Thailand (2004-2006).

In addition to the larval fish identification training initiative, the RWG-F also identified the need to build capacity of middle to senior level fisheries managers for the establishment and management of fisheries *refugia* in the South China Sea and Gulf of Thailand. In this connection a joint UNEP/GEF South China Sea Project – SEAFDEC Regional Training Workshop on the Establishment and Management of Fisheries *Refugia* was convened at the SEAFDEC Training Department from 28th October – 10th November 2007 and was participated in by 25 individuals from all participating countries. The workshop was supported by 8 resource persons, including: Dr. Yasuhisa Kato; Mr. Somsak Chullasorn; Mr. Bundit Chokesanguan; Dr. Theo Ebberts; Dr. Supaporn Anuchiracheeva; Mr. Pirochana Saikiang; Dr. Thamasak Yeemin; and Mr. Christopher Paterson.

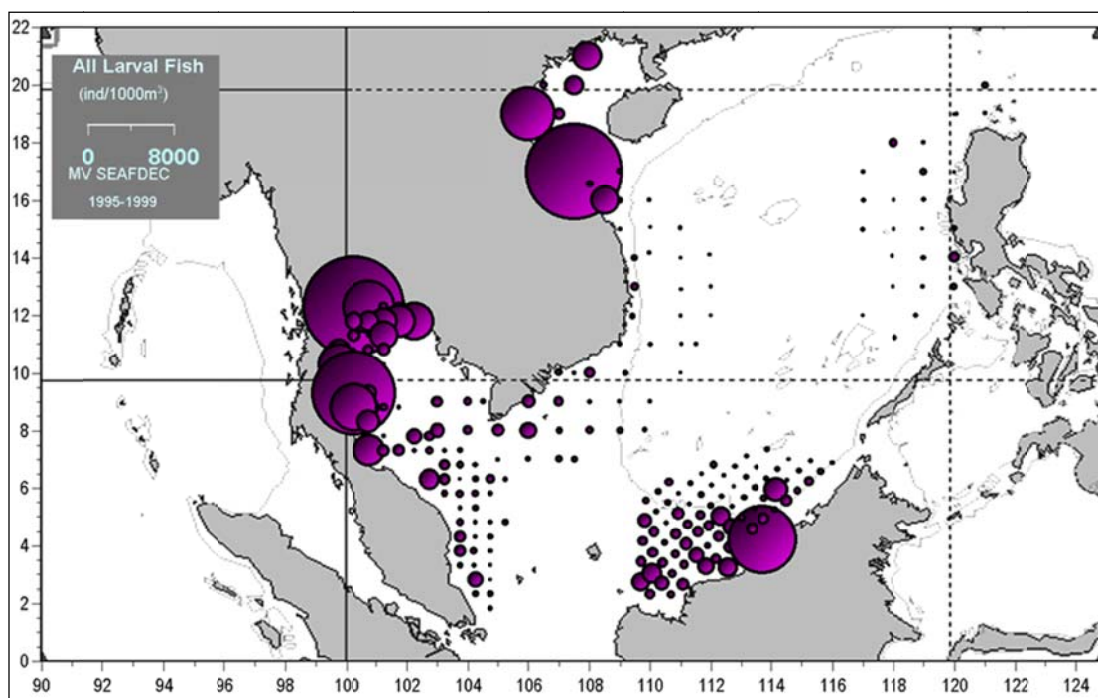


Figure 3 The distribution and relative abundance of fish larvae in the Gulf of Thailand and South China Sea during the post northeast monsoon period (1996-1999) (all larvae combined)

3. MEETING THE SCIENCE AND TECHNICAL NEEDS OF ESTABLISHING AND OPERATING A REGIONAL SYSTEM OF FISHERIES REFUGIA

National and site-level activities

Key science activities for the SEAFDEC/UNEP/GEF Fisheries Refugia Project include development and update of national fisheries databases for use in preparing annual syntheses of new and additional information and data relating to the status of stocks of priority fish, crustacean and mollusc species for dissemination at national and regional levels. Important elements of these syntheses reports are assessments of biomass trends, recruitment and fish size derived from abundance surveys, as well as volume and value of landings by fishing area and fishing gear used. To build on foundational fish early life history science capacity, developed through the UNEP/GEF South China Sea project, participating countries plan to establish and populate national databases of fish egg and larvae distribution and abundance. Individual country plans include actions to develop combined national Geographical Information Systems (GIS) on fisheries and marine biodiversity featuring information on locations and

management status of coastal habitats, fisheries *refugia*, MPAs, and critical habitats for threatened and endangered species. It is envisaged that these national GIS databases will be used in the preparation of annual syntheses of new and additional data relating to the science and management of fish life-cycle and critical habitat linkages.

The development of fisheries and habitat data collection programmes at *refugia* sites are included in this component of national activities. Initial planned steps include compilation of information sources into site characterisations focusing on quality and expanse of habitats, trends in annual production and value of harvests, the number and type of fishing vessels and gear used in the area and village/community level socio-economic information. Site level survey programmes will include regular collection of information and data on: the number and types of fishing vessels operating in the *refugia* area; the species and size selectivity of the principal fishing gear used; gonadosomatic index and size frequency of priority species utilising the area; the role of fisheries *refugia* in the production (and economic value) of priority fish, crustacean, and molluscs; and usage of *refugia* by threatened and endangered marine species. A provisional site characterisation form is included in this document as **Annex 4**. Stakeholder consultations aimed at obtaining the support of fishing families and fish buyers in community-based information and data collection are also included.

Community-based *refugia* management plans are anticipated outputs of this component of national plans. Proposed supporting activities include consultative processes to facilitate agreement among stakeholders on the boundaries of fisheries *refugia*, identification of key threats to *refugia* sites, recording of fishing community views regarding appropriate fisheries and habitat management measures, and eliciting stakeholder inputs to management plan review. *Refugia* management plans will provide rules *inter alia* on operating requirements for the use of particular classes of fishing vessels or fishing gear within *refugia*, procedures for adjusting management measures over time, and mechanisms for enforcement. Specific direction is given to drafting of regulations and ordinances required in support of plan implementation. All countries have identified the need for management plans to contain community education and awareness programmes, mainly with a focus on participatory activities to monitor the status of fish habitats within the *refugia*, collect lost and abandoned fishing gear, and develop responsible fishing practices at the community level. Several countries, namely Viet Nam and Philippines, extended this to include the development of collaborative observer programmes among community volunteers and national and provincial fisheries enforcement agencies to detect illegal and destructive fishing activities in fisheries *refugia* and adjacent areas of sensitive habitats. An important first step in this process will involve agreeing protocols for delineating boundaries of *refugia* sites. Annex 5 contains a questionnaire for the compilation of country-specific information regarding national and community-based protocols for delineating the boundaries of coastal and marine management areas such as fisheries *refugia*. Similarly, **Annex 6** presents a provisional process for a causal chain/diagnostic analysis approach to the identification of threats to fish stock and critical habitat linkages

Regional level activities

Regional Information and Data Management. Specific actions are planned to support countries through the development of protocols for delineating the boundaries of critical habitat areas that act as fisheries *refugia* and the regional compilation of information and data into a regional GIS on the distribution of coastal habitats, fisheries *refugia*, locations of marine protected areas and fisheries management zones, as well as fish egg and larvae distribution and abundance. The development of a modelling system, linking known sources and sinks of fish larvae to ocean circulation patterns and nutrient/chlorophyll concentrations in the South China Sea and Gulf of Thailand, was also given priority as a means of improving regional understanding of fish early life history and links to critical habitats.

Targeted Demonstration Activities. Actions to support and guide National Fisheries Departments in establishing coastal fisheries management systems in priority fisheries *refugia* are planned. Building on experiences with the habitat demonstration site approach developed by the UNEP/GEF South China Sea project, sites will be selected to identify and trial approaches to reducing the effects of trawl and push net fishing on seagrass habitat, as well as to test the use of fishing gear and practices that reduce the capture of juveniles, pre-recruits and fish in spawning condition.

Capacity Development. Development of human resource capacity for the identification and management of fisheries refugia and improving information management and dissemination represented the second core group of regional supporting activities. Annual regional training workshops on fisheries refugia management, larval fish identification and fish early life history science, development of a regional Information and Education Campaigns (IEC) for small-scale fishing communities on the critical links between fish stocks and their habitats and the preparation of guidelines on how to empower communities to enforce agreed management rules in fisheries refugia form priority SAP actions. It was agreed that this activity component would support the development of indicators to monitor the effectiveness of coastal fisheries management systems established in priority fisheries refugia. A regional programme for the compilation of standardised fisheries statistics for use in identifying and managing fisheries refugia would be developed to support monitoring and evaluation.

ANNEX 1

Lists of Pelagic and Demersal Fish Species, Cephalopods, and Crustaceans of Transboundary Significance

The Regional Working Group on Fisheries (RWG-F) developed a list of pelagic and demersal fish species, cephalopods, and crustaceans of transboundary significance during its second meeting in October 2002. In considering the species which the development of a regional system of fisheries *refugia* should focus, the RWG-F revised these lists during their eighth meeting convened on Phu Quoc Island, Viet Nam from 10th-13th July 2007. The revised lists are included in this Annex as Tables 1-4.

Table 1 Occurrence and Ranking of the Transboundary Significance of pelagic fish species in the South China and Gulf of Thailand.

Table 1a Species to be considered during the initial review.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thailand	Viet Nam	Cambodia	Indonesia	Philippines	Cambodia	Indonesia	Philippines	Thailand	Viet Nam	Expert	Average
Narrow-barred Spanish mackerel	<i>Scomberomorus commerson</i>	X	X	X	X	X	5	5	5	5	3	4.5	4.58
Indian mackerel	<i>Rastrelliger kannagurta</i>	X	X	X	X	X	4	5	5	5	2	4.5	4.25
Frigate tuna	<i>Auxis thazard</i>	X	X	X	X	X	3	4	5	5	4	4.5	4.25
Indo-Pacific king mackerel	<i>Scomberomorus guttatus</i>	X	X	X	X	X	5	4	5	4	3	4	4.17
Short mackerel	<i>Rastrelliger brachysoma</i>	X	X	X	X	X	3	5	5	4	3	4.5	4.08
Sardinellas	<i>Sardinella spp</i>	X	X	X	X	X	4	3	4	5	3	4	3.83
Kawakawa	<i>Euthynnus affinis</i>	X	X	?	X	X		5	5	5	3	4.5	3.75
Japanese scad	<i>Decapterus maruadsi</i>	X	X	X		X	2	0	5	5	4	4.5	3.42
Longtail tuna	<i>Thunnus tonggol</i>	X	X	?	X	X		3	5	5	2	5	3.33
Anchovies	<i>Stolephorus, Encrasicholina</i>	X	X	X	X	X	4	3	4	3	3	3	3.33
Shortfin scad	<i>Decapterus macrosoma</i>	X	X	?	X	X		3	5	5	2	4	3.17
Bigeye scad	<i>Selar crumenophthalmus</i>	X	X	X	X	X	2	4	4	4	1	4	3.17
Bullet tuna	<i>Auxis rochei</i>	X	X	X		X	3	2	5	3	2	3	3.00
Yellowfin tuna	<i>Thunnus albacares</i>		X		X	X		0	5		5		1.67
Indian scad	<i>Decapterus russelli</i>	X		?	X	X		4	4	3		3.5	2.42

Table 1b The following species were not considered of to merit consideration during the initial phase.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thai	Viet	Cam	Indo	Phil	Cam	Ind	Phil	Thai	Viet	Exp	Average
Torpedo scad	<i>Megalaspis cordyla</i>	X	X	X	X	X	2	3	5	3	1	3.5	2.92
Yellow-stripe scad	<i>Selaroides leptolepis</i>	X	X	X	X	X	2	3	4	3	3	2.5	2.92
Yellowtail scad	<i>Atule mate</i>	X	X	X	X	X	2	3	4	4	1	3	2.83
Talang queenfish	<i>Scomberoides commersonianus</i>	X	X	X	X	X	4	3	4	2	1	3	2.83
Redbelly yellowtail fusilier	<i>Caesio cuning</i>	X		X	X	X	5	4	4	1		3	2.83
Indo-Pacific sailfish	<i>Istiophorus platypterus</i>	X	X		X	X		4	5	1	3	3.5	2.75
Double-spotted queenfish	<i>Scomberoides lysan</i>	X	X	X	X	X	4	2	4	2	1	3	2.67
Dorab wolf herring	<i>Chirocentrus dorab</i>	X	X	X	X	X	2	4	3	2	2	3	2.67
Whale shark	<i>Rhincodon typus</i>	X	X	X	X	X	3	2	4	1	2	3.5	2.58
Blacktip shark	<i>Carcharhinus limbatus</i>	X		X	X	X	3	3	4	2		3	2.50
Bamboo shark	<i>Chiloscyllium spp</i>	X	X	X	X	X	4	1	4	1	2	3	2.50
Scalloped hammerhead shark	<i>Sphyrna lewini</i>	X	X	X	X	X	3	3	4		2	3	2.50
Common dolphin fish	<i>Coryphaena hippurus</i>	X	X		X	X		3	5	1	3	2.5	2.42
Swordfish	<i>Xiphias gladius</i>	X	X	X		X	2	0	5	1	3	3.5	2.42
Skipjack tuna	<i>Katsuwonus pelamis</i>		X	?	X	X		5	5		4		2.33
Trevallies	<i>Caranx spp</i>	X	X	X	X	X	2	4		3	2	3	2.33
Spottail shark	<i>Carcharhinus sorrah</i>	X	X	X	X	X	3	2	2	1	3	3	2.33
Shrimp scad	<i>Alepes djedaba</i>	X	X	X	X	X	2	2	4	2	1	2.5	2.25
Indo-Pacific blue marlin	<i>Makaira mazara</i>	X	X			X		0	5	1	3	3.5	2.08
Black marlin	<i>Makaira indica</i>	X	X			X		0	5	1	3	3.5	2.08
Blacktip reef shark	<i>Carcharhinus melanopterus</i>	X			X	X		3	4	2		3	2.00
Chacunda gizzaard shad	<i>Anodontostoma chacunda</i>	X		X	X	X	3	2	3	1		2	1.83
Atlatic blue marlin	<i>Makaira nigricans</i>	X				X		0	5	1		3.5	1.58
Spotted sardinella	<i>Amblygaster sirm</i>	X		?	X	X		4		2		2.5	1.42
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>				X	X		4	4				1.33
Thintail thresher shark	<i>Alopias vulpinus</i>		X		X	X		2	4		2		1.33
Whitecheek shark	<i>Carcharhinus dussumieri</i>	X	X					2		1	1	3	1.17
Pelagic thresher shark	<i>Alopias pelagicus</i>		X		X	X		2	4		1		1.17

Note: Though it was decided that these species would not be considered in the initial review of species of transboundary significance, some of them, including the whale shark, are included in the list of threatened and near threatened species in Annex 5 of UNEP/GEF/SCS/RWG-F.9/2.

Table 1c Species of uncertain occurrence, importance and/or difficulty of identification which are included within aggregates in Tables 1a and 1b.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thai	Viet	Cam	Indo	Phil	Cam	Ind	Phil	Thai	Viet	Exp	Average
Shorthead anchovy	<i>Encrasicholina heteroloba</i>	X		X			4	2		3		4	2.17
Commerson's anchovy	<i>Stolephorus commersoni</i>	X	X	X	X	X	3	4	4	1	4	2	3.00
Devi's anchovy	<i>Encrasicholina devisi</i>	X			X	?		1		3		3.5	1.25
Indian anchovy	<i>Stolephorus indicus</i>	X	X	X	X	X	4	3	4	3	3	3	3.33
Island mackerel	<i>Rastrelliger faughni</i>	X				X		1		2		2.5	0.92
Streaked seerfish	<i>Scomberomorus lineolatus</i>	X						1		4		3	1.33
Barred queenfish	<i>Scomberoides tala</i>	X				X		1		2		2.5	0.92
Buccaneer anchovy	<i>Encrasicholina punctifer</i>	X						1		3		4	1.33
Smooth hammerhead shark	<i>Sphyrna zygaena</i>				X			3					0.50
Whitefin wolf herring	<i>Chirocentrus nudus</i>	X						2		1		2.5	0.92
Flying fish	<i>Cypselurus spp</i>	X				X		1	4	1	2	2.5	1.75
Goldstripe sardinella	<i>Sardinella gibbosa</i>	X	X	X	X	X	4	3	4	5	3	4	3.83
Deepbody sardinella	<i>Sardinella brachysoma</i>			X	X	X	4	3	4				1.83
Fringescale sardinella	<i>Sardinella fimbriata</i>	X	X	X	X	X	4	3	4	3	1	2.5	2.92
White sardinella	<i>Sardinella albella</i>	X				X		2	3	2		2.5	1.58

Table 2 Occurrence and Ranking of the Transboundary Significance of demersal fish species in the South China and Gulf of Thailand.

Table 2a Species to be considered during the initial review.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thai	Viet	Cam	Indo	Phil	Cam	Ind	Phil	Thai	Viet	Exp	Average
Greasy grouper	<i>Epinephelus tauvina</i>	X	X	X	X	X	5	4	4	2	5	3	3.83
Mangrove red snapper	<i>Lutjanus argentimaculatus</i>	X	X	X	X	X	5	3	4	2	4	3.5	3.58
Malabar blood snapper	<i>Lutjanus malabaricus</i>	X	X	X	X	X	5	5	4	2	2	3.5	3.58
Malabar grouper	<i>Epinephelus malabaricus</i>	X	X	X	X	X	5	4	4	2	3	3.5	3.58
Threadfin breams	<i>Nemipterus spp</i>			X	X	X	4	4	2	4	3	3.5	3.42
Leopard coral grouper	<i>Plectropomus leopardus</i>	X	X	X	X	X	4	4	4	2	2	3	3.17
Lizardfish	<i>Saurida spp</i>	X	X	X	X	X	4	3	2	3	3	3.5	3.08
Brownstripe red snapper	<i>Lutjanus vitta</i>	X	X	X	X	X	5	3	4	2	1	3	3.00
Sixbar grouper	<i>Epinephelus sexfasciatus</i>	X	X	X	X	X	5	2	4	2	2	3	3.00
Purple-spotted bigeye	<i>Priacanthus tayenus</i>	X	X	X	X	X	3	3	3	3	2	3.5	2.92
Largehead hairtail	<i>Trichiurus lepturus</i>	X	X	X	X	X	2	3	2	2	2	3	2.33

Table 2b The following species were not considered of sufficiently high transboundary importance to merit consideration during the initial phase.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thai	Viet	Cam	Indo	Phil	Cam	Ind	Phil	Thai	Viet	Exp	Average
Red bigeye	<i>Priacanthus macracanthus</i>	X	X	X	X	X	3	3	3	2	3	3.5	2.92
Duskytail grouper	<i>Epinephelus bleekeri</i>	X	X	X	?	X	4	1	4	2	3	2.5	2.75
Humphead snapper	<i>Lutjanus sanguineus</i>	X	X	X	X	X	5	4		1	3	3	2.67
Emperor red snapper	<i>Lutjanus sebae</i>		X	X	X	X	5	4	4		2		2.50
Sharptooth jobfish	<i>Pristipomoides typus</i>		X	X	X	X	5	3	4		3		2.50
Croakers	<i>Johnius, Pennahia & Otolithes spp</i>	X	X	X	X	X	2	3	2	2	2	3	2.33
Bigeye snapper	<i>Lutjanus lutjanus</i>	X		X		X	5	3		3		3	2.33
Crimson jobfish	<i>Pristipomoides filamentosus</i>		X	X	X	X	5	3	4		2		2.33
Spotted coral grouper	<i>Plectropomus maculatus</i>	X		X	X	X	3	3	4	1		3	2.33
Spotted eagle ray	<i>Aetobatus narinari</i>	X		X	X	X	2	4	4	1		2.5	2.25
Brown-marbled grouper	<i>Epinephelus fuscoguttatus</i>		X	X	X	X	4	2	4		3		2.17
Giant manta ray	<i>Manta birostris</i>		X	X		X	2	3	5		1		1.83
Blue-spotted stingray	<i>Dasyatis kuhlii</i>	X	X		X	X		2	4	1	1	2.5	1.75
Skate	<i>Raja spp</i>	X	X	?	X	X		2	4	1	1	2.5	1.75
Squartail coral grouper	<i>Plectropomus aereolatus</i>	X				X		2	4	1		3	1.67
Snapper species	<i>Lutjanus species for live fish trade</i>	X							5	2			1.17
Hong Kong grouper	<i>Epinephelus akaara</i>		X					0			4		0.67
Blue-spotted ribbontail ray	<i>Taeniura lymma</i>	X				X		0		1		2	0.50

Table 3 Occurrence and Ranking of the Transboundary Significance of cephalopod species in the South China and Gulf of Thailand.

Table 3a Species to be considered during the initial review.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thai	Viet	Cam	Indo	Phil	Cam	Ind	Phil	Thai	Viet	Exp	Average
Needle cuttlefish	<i>Sepia aculeata</i>	X	X	X	X	X	4	3	3	3	5	3.5	3.58
Indian squid	<i>Uroteuthis (photololigo) duvauceli</i>	X	X	X		X	4	0	3	3	3	3.5	2.75
Swordtip squid	<i>Uroteuthis (photololigo) edulis</i>		X	X	X	X	4	4	3		5		2.67
Bigfin reef squid	<i>Sepioteuthis lessoniana</i>	X	X		X	X		2	3	3	3	4	2.50
Mitre squid	<i>Uroteuthis (photololigo) chinensis</i>	X	X			X		0	3	4	4	3.5	2.42
Pharaoh cuttlefish	<i>Sepia pharaonis</i>	X	X			X			3	2	4	3.5	2.08
Curvespine cuttlefish	<i>Sepia recurvirostra</i>	X	X			X			3	2	3	3	1.83
Octopus	<i>Octopus spp.</i>		X	X	X	X	4	3			4		1.83
Kisslip cuttlefish	<i>Sepia lycidas</i>	X	X			X			3	1	4	2.5	1.75
squid	<i>Loligo sumatrensis ?</i>	X			X	X		1	3	3		3	1.67

Table 3b The following species were not considered of sufficiently high transboundary importance to merit consideration during the initial phase.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thai	Viet	Cam	Indo	Phil	Cam	Ind	Phil	Thai	Viet	Exp	Average
Spineless cuttlefish	<i>Sepiella inermis</i>	X				X			3	2		2.5	1.25
Octopus	<i>Octopus membranaceus</i>	X	X							2	3	2.5	1.25
Shortclub cuttlefish	<i>Sepia brevimana</i>	X				X			3	1		2.5	1.08
Octopus	<i>Octopus aegina</i>			X			4						0.67
Octopus	<i>Octopus macropus</i>			X			4						0.67

Table 4 Occurrence and Ranking of the Transboundary Significance of crustacean species in the South China and Gulf of Thailand.

Table 4a Species to be considered during the initial review.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thai	Viet	Cam	Indo	Phil	Cam	Ind	Phil	Thai	Viet	Exp	Average
Scalloped spiny lobster	<i>Panulirus homarus</i>	X	X	X	X	X	5	4	5	1	4	2.5	3.58
Banana prawn	<i>Penaeus merguensis</i>	X	X	X	X	X	3	5	3	3	3	4	3.50
Giant tiger prawn	<i>Penaeus monodon</i>	X	X	X	X	X	3	4	3	2	5	4	3.50
Rock lobster	<i>Panulirus ornatus</i>	X	X	X	X	X	5	2	5	1	5	2.5	3.42
Longlegged spiny lobster	<i>Panulirus longipes</i>	X	X	X	X	X	5	3	5	1	3	2.5	3.25
Painted rock lobster	<i>Panulirus versicolor</i>	X	X	X	X	X	5	2	5	1	2	2.5	2.92
Green tiger prawn	<i>Penaeus semisulcatus</i>	X	X	X	X	X	3	3	3	3	2	3	2.83
Pronghorn spiny lobster	<i>Panulirus penicillatus</i>	X	X	X	X	X	5	1	5	1	2	2.5	2.75
Slipper lobster	<i>Thenus orientalis</i>	X	X	X	X	X	5	4		1	3	3.5	2.75
Jinga shrimp	<i>Metapenaeus affinis</i>	X	X	X	X	X	3	2	3	2	3	3	2.67
Greasyback shrimp	<i>Metapenaeus ensis</i>	X	X		X	X		2	3	2	4	3	2.33

Table 4b The following species were not considered of sufficiently high transboundary importance to merit consideration during the initial phase.

Common name	Species	Occurrence					Ranking of transboundary significance						
		Thai	Viet	Cam	Indo	Phil	Cam	Ind	Phil	Thai	Viet	Exp	Average
Western king prawn	<i>Penaeus latisulcatus</i>	X	X		X	?		3	3		2	3.5	1.92
Kuruma shrimp	<i>Penaeus japonicus</i>		X	X		X	3	0	3		3		1.50
Indian white shrimp	<i>Penaeus indicus</i>		X		X	X		2	3		2		1.17
Shrimp	<i>Metapenaeus conjunctus</i>	X				?		0	3	1		2.5	1.08
Bird shrimp	<i>Metapenaeus lysianassa</i>	X				?		0	3	1		2.5	1.08
Witch prawn	<i>Penaeus canaliculatus</i>			X		?	3	0	3				1.00
Pink prawn	<i>Metapenaeus intermedius</i>	X						0		1		2.5	0.58

ANNEX 2

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

Introduction

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 be used to identify known fish spawning and nursery areas in the Gulf of Thailand and the South China Sea. Members formed country-based sessional working groups to prepare country summaries of known critical spawning and nursery areas in their respective countries. These sessional working groups collated information regarding:

- Approximate geographical location of the site;
- Species known to utilise the site;
- Known usage of the site (i.e. as spawning and/or nursery area)
- Time of year that the site is utilised as a spawning or nursery area; and
- The information source.

This information was compiled and included in Annex 4 of the Report of the Eighth Meeting. This information, as well as information and data regarding: distribution and abundance of larval fish in the South China Sea during the post northeast monsoon periods from 1996-1999; and the outcomes of country consultations on the identification of fisheries *refugia* in each of the participating countries were used to identify a suite of sites for inclusion in a preliminary system of fisheries *refugia* in the South China Sea and Gulf of Thailand.

Deliberations of the Ninth Meeting of the Regional Working Group on Fisheries

It was agreed during the ninth meeting of the RWG-F that members should review in detail document UNEP/GEF/SCS/RWG-F.9/8, “*Review of Information regarding known Spawning and Nursery Areas and the Establishment of Pilot Fisheries Refugia Sites in the South China Sea and Gulf of Thailand*”, and update information for each known spawning and nursery area and add new sites to the list as appropriate. The revised lists of known spawning and nursery areas for economically important fish species in the South China Sea and Gulf of Thailand are included in Tables 1-6 of this Annex.

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 ^o 24'13"N – 107 ^o 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 ^o 59'05"N – 106 ^o 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 ^o 31'36"N – 108 ^o 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 ^o 57'08"N – 108 ^o 1'13"E	Banded grouper (<i>Epinephelus amblycephalus</i>) Blacktip grouper (<i>Epinephelus fasciatus</i>) Painted lobster (<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 ^o 47'44"N – 106 ^o 33'38"E	Threadfin breams (<i>Nemipterus</i> spp.) (n) Lizardfish (<i>Saurida</i> spp.) (n) Bigeye snapper (<i>Lutjanus lineolatus</i>) (n) Onespot snapper (<i>Lutjanus monostigma</i>) (n) Indian goatfish (<i>Parupeneus indicus</i>) (n) Brushtooth lizardfish (<i>Saurida undosquamis</i>) (n) Monocle bream (<i>Scolopsis lineate</i>) (n) Asymmetrical goatfish (<i>Upeneus asymmetricus</i>) (n) Freckled goatfish (<i>Upeneus tragula</i>) (n)	• • • • • • • • •		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	National Seagrass Report

					species.	
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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>)	•	•
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
Ilocos Coast		Caranx	•	•	February-April	NFRDI
		Nemipterids	•	•	May-June	NFRDI
		Siganids	•	•	February-March	NFRDI
		Gobies	•	•		NFRDI
		Tunas	•	•		NFRDI
		Groupers	•	•		NFRDI
		Sardines	•	•		NFRDI
		Anchovies	•	•		NFRDI
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
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

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		
		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	
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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>)	•		Unknown	
		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>Pomadasys hasta</i>)	•		Unknown	
		Wrasse (<i>Halichoeres kallochroma</i>)	•		All year	
		Harrowed Sole (<i>Strabozebrians cancellatus</i>)	•		All year	
		Streaked spinefoot (<i>Siganus javus</i>)	•		All year	
		Swimming crab (<i>Portunus pelagicus</i>)	•			
		<i>Penaeus</i> spp.	•			
		Tiger shrimp (<i>Penaeus monodon</i>)	•			
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 3

Fish Egg and Larvae Surveys in the South China Sea and Gulf of Thailand (2004-2006)

Introduction

A total of 249 larval fish samplings were conducted using bongo nets aboard M.V. SEAFDEC 1 during the post-northeast monsoon (April-May) from 1996-1999. The results of this work were presented by Dr. Somboon Siriraksophon of SEAFDEC during the Eighth Meeting of the Regional Working Group on Fisheries (RWG-F), and have been subsequently revised by SEAFDEC's Dr. Yoshinobu Konishi. The key findings of this work include:

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 trevallies (*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 (*Stolephorus* 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.

Deliberations of the Eighth Meeting of the Regional Working Group on Fisheries

The Eighth Meeting of the RWG-F noted while the results of SEAFDEC's 1996-1999 surveys provides some insight into the distribution and abundance of larvae during the post-monsoon period (April-May), there is in a need for surveys during other periods of the year to better reflect seasonal differences in the spawning dynamics of many species. In this connection, it was noted that SEAFDEC have been utilising M.V. SEAFDEC 2 for the conduct of fisheries resources assessment surveys in the South China Sea and Gulf of Thailand since 2004, and that larval fish have been and continue to be sampled using a bongo net at survey sites.

Deliberations of the Ninth Meeting of the Regional Working Group on Fisheries

In considering the outcomes of the UNEP/GEF–SEAFDEC “*Regional Training Workshop on Larval Fish Identification and Fish Early Life History Science*”, it was noted by the RWG-F that participants in this workshop should form national larval fish identification teams with responsibility for the processing of samples collected during cruises of M.V. SEAFDEC 2.

The need for the development of regional and national plans for the processing of larval fish samples and the compilation and management of related data was subsequently discussed by members of the RWG-F and staff of SEAFDEC. It was suggested that members of the Regional Working Group on Fisheries, in collaboration with National level staff responsible for the planning of M.V. SEAFDEC 2 cruises in National waters, could play an important role in the development of such plans.

It was agreed that the National Echo Seminars on Larval Fish Identification should be used to bring fisheries focal points, training workshop participants, representatives of national research institutes, and SEAFDEC's technical focal points together in order to develop national programmes to process the larval fish samples collected as past of past and on-going larval fish surveys conducted using M.V. SEAFDEC 2. It was agreed further that the national workshops should work towards the development of an inventory of the existing larval fish samples in each country, and determine the who, when, and where of sample processing. It was noted that special attention should be paid to ensuring the efficient and safe storage of data collected for sharing at the regional level.

There was a lengthy discussion regarding whether all fish, crustacean, and cephalopod larvae in the samples collected should be processed, or whether attention should be directed at a specific component of the zooplankton sampled. It was agreed that the work of the group should be directed at the processing of fish larvae and that specific emphasis should be place on the species of transboundary significance identified in Annex 1 above.

ANNEX 4

PROVISIONAL SITE CHARACTERISATION TEMPLATE FOR BASELINE SETTING

Indonesia

F1: General landing statistic by administrative unit: Bangka

		Recent,	2010	2000	1990	1980
All Species	Catch (ton/y)					
	Value (IDR ²)					

Top 10 landing fisheries or invertebrates

1 st	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
2 nd	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
3 rd	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
4 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
5 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
6 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
7 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
8 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
9 th	Common name ¹ :					
	Catch (ton/y)					

		Recent,	2010	2000	1990	1980
	Value (IDR ²)					
10 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					

- Note:
1. Select from common name list in annex 1
 2. Value (IDR) = Value at the actual year (IDR)

Indonesia

F1: General landing statistic by administrative unit: Belitung

		Recent,	2010	2000	1990	1980
All Species	Catch (ton/y)					
	Value (IDR ²)					

Top 10 landing fisheries or invertebrates

1 st	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
2 nd	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
3 rd	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
4 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
5 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
6 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
7 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
8 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
9 th	Common name ¹ :					
	Catch (ton/y)					

		Recent,	2010	2000	1990	1980
	Value (IDR ²)					
10 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					

- Note:
1. Select from common name list in annex 1
 2. Value (IDR) = Value at the actual year (IDR)

Indonesia

F1: General landing statistic by administrative unit: Riau Kepulauan

		Recent,	2010	2000	1990	1980
All Species	Catch (ton/y)					
	Value (IDR ²)					

Top 10 landing fisheries or invertebrates

1 st	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
2 nd	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
3 rd	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
4 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
5 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
6 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
7 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
8 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
9 th	Common name ¹ :					
	Catch (ton/y)					

		Recent,	2010	2000	1990	1980
	Value (IDR ²)					
10 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					

- Note:
1. Select from common name list in annex 1
 2. Value (IDR) = Value at the actual year (IDR)

Indonesia

F2: General landing statistic by fishery ports or landing site:

Port/Landing site name.....

The geographical coordinates (latitude and longitude) of the approximate centre of the fishery ports or landing site, expressed in degrees and minutes.

Latitude..... Longitude.....

		Recent,	2010	2000	1990	1980
All Species	Catch (ton/y)					
	Value (IDR ²)					

Top 10 landing common

1 st	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
2 nd	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
3 rd	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
4 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
5 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
6 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
7 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
8 th	Common name:					
	Catch (ton/y)					
	Value (IDR ²)					

		Recent, ...	2010	2000	1990	1980
9 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					
10 th	Common name ¹ :					
	Catch (ton/y)					
	Value (IDR ²)					

- Note:
1. Select from common name list in annex 1
 2. Value (IDR) = Value at the actual year (IDR)

(Please reproduce this table for more ports)

Indonesia

F3: Fishing effort as number of fishing days per year by gear by administrative unit: Bangka

	Recent,	2010	2000	1990	1980
Surrounding net					
Seine net					
Trawl					
Lift net					
Falling net					
Gill net					
Trap					
Hook & Line					
Scoop net					
Drive-in-net					
Dredges					
Miscellaneous gear					

Indonesia**F3: Fishing effort as number of fishing days per year by gear by administrative unit: Belitung**

	Recent,	2010	2000	1990	1980
Surrounding net					
Seine net					
Trawl					
Lift net					
Falling net					
Gill net					
Trap					
Hook & Line					
Scoop net					
Drive-in-net					
Dredges					
Miscellaneous gear					

Indonesia**F3: Fishing effort as number of fishing days per year by gear by administrative unit: Riau Kepulauan**

	Recent,	2010	2000	1990	1980
Surrounding net					
Seine net					
Trawl					
Lift net					
Falling net					
Gill net					
Trap					
Hook & Line					
Scoop net					
Drive-in-net					
Dredges					
Miscellaneous gear					

Indonesia

F4: Fishing effort as number of boats per year by gear by administrative unit: Bangka

	Recent,	2010	2000	1990	1980
Surrounding net					
Seine net					
Trawl					
Lift net					
Falling net					
Gill net					
Trap					
Hook & Line					
Scoop net					
Drive-in-net					
Dredges					
Miscellaneous gear					

Indonesia**F4: Fishing effort as number of boats per year by gear by administrative unit: Belitung**

	Recent,	2010	2000	1990	1980
Surrounding net					
Seine net					
Trawl					
Lift net					
Falling net					
Gill net					
Trap					
Hook & Line					
Scoop net					
Drive-in-net					
Dredges					
Miscellaneous gear					

Indonesia

F4: Fishing effort as number of boats per year by gear by administrative unit: Riau Kepulauan

	Recent,	2010	2000	1990	1980
Surrounding net					
Seine net					
Trawl					
Lift net					
Falling net					
Gill net					
Trap					
Hook & Line					
Scoop net					
Drive-in-net					
Dredges					
Miscellaneous gear					

Indonesia

F5: Fishing effort as number of fishing days per year by gear by Port/Landing site name.....

The geographical coordinates (latitude and longitude) of the approximate centre of the fishery ports or landing site, expressed in degrees and minutes.

Latitude..... Longitude.....

	Recent,	2010	2000	1990	1980
Surrounding net					
Seine net					
Trawl					
Lift net					
Falling net					
Gill net					
Trap					
Hook & Line					
Scoop net					
Drive-in-net					
Dredges					
Miscellaneous gear					

(Please reproduce this table for more ports)

Indonesia

F6: Fishing effort as number of boats per year by gear by Port/Landing site name.....

The geographical coordinates (latitude and longitude) of the approximate centre of the fishery ports or landing site, expressed in degrees and minutes.

Latitude..... Longitude.....

	Recent,	2010	2000	1990	1980
Surrounding net					
Seine net					
Trawl					
Lift net					
Falling net					
Gill net					
Trap					
Hook & Line					
Scoop net					
Drive-in-net					
Dredges					
Miscellaneous gear					

(Please reproduce this table for more ports)

Indonesia**F7: Importance of the fisheries sector in terms of employment & dependence by administrative unit: Bangka**

		Year
Number of fishermen		
Number of fishing household members		
Number of fish processing plants or factories		
Number of employees in fish processing industry		
Estimate proportion fishery product consumed locally	<input type="checkbox"/> <10 <input type="checkbox"/> 10-50 <input type="checkbox"/> >90	

(Please round-up number to the nearest 1,000)

Indonesia**F7: Importance of the fisheries sector in terms of employment & dependence by administrative unit: Belitung**

		Year
Number of fishermen		
Number of fishing household members		
Number of fish processing plants or factories		
Number of employees in fish processing industry		
Estimate proportion fishery product consumed locally	<input type="checkbox"/> <10 <input type="checkbox"/> 10-50 <input type="checkbox"/> >90	

(Please round-up number to the nearest 1,000)

Indonesia**F7: Importance of the fisheries sector in terms of employment & dependence by administrative unit:
Riau Kepulauan**

		Year
Number of fishermen		
Number of fishing household members		
Number of fish processing plants or factories		
Number of employees in fish processing industry		
Estimate proportion fishery product consumed locally	<input type="checkbox"/> <10 <input type="checkbox"/> 10-50 <input type="checkbox"/> >90	

(Please round-up number to the nearest 1,000)

Indonesia

F8: Top ten species of regional, global and/or transboundary significance

Species and/or common name Number 1.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 2.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 3.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 4.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 5.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 6.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 7.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 8.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 9.....

Fish Type

IUCN status

(http://www.redlist.org/info/categories_criteria.html)

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify
- None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

Future (next decade)

- | | |
|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Declining in spawning or nursing grounds | <input type="checkbox"/> Declining in spawning or nursing grounds |
| <input type="checkbox"/> Over fishing | <input type="checkbox"/> Over fishing |
| <input type="checkbox"/> Destructive fishing practices | <input type="checkbox"/> Destructive fishing practices |
| <input type="checkbox"/> Alien species/disease | <input type="checkbox"/> Alien species/disease |
| <input type="checkbox"/> Pollution | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> Climate change | <input type="checkbox"/> Climate change |
| <input type="checkbox"/> Natural disasters | <input type="checkbox"/> Natural disasters |
| <input type="checkbox"/> Population fragmentation | <input type="checkbox"/> Population fragmentation |
| <input type="checkbox"/> Unknown | <input type="checkbox"/> Unknown |
| <input type="checkbox"/> Other (1), specify | <input type="checkbox"/> Other (1), specify |
| <input type="checkbox"/> Other (2), specify | <input type="checkbox"/> Other (2), specify |

Species and/or common name Number 10.....

Fish Type

IUCN status

http://www.redlist.org/info/categories_criteria.html

- Large pelagic fishes
- Small pelagic fish species
- Demersal fish species
- Commercially exploited invertebrates
- Other, specify

- Extinct (EX)
- Extinct in the wild (EW)
- Critically endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Lower risk (LR)
- Data Deficient (DD)
- Not evaluated (NE)

Special concerns

- Endemic
- Other (1), specify
- Other (2), specify

None

Status of population

Year	CPUE	Stock Size	MSY
	Unit	Unit	Unit
Recent,			
2010			
2000			
1990			
1980			

Major threats to the species (please select upto 3 most important threats)

Present

- Declining in spawning or nursing grounds
- Over fishing
- Destructive fishing practices
- Alien species/disease
- Pollution
- Climate change
- Natural disasters
- Population fragmentation
- Unknown
- Other (1), specify
- Other (2), specify

Future (next decade)

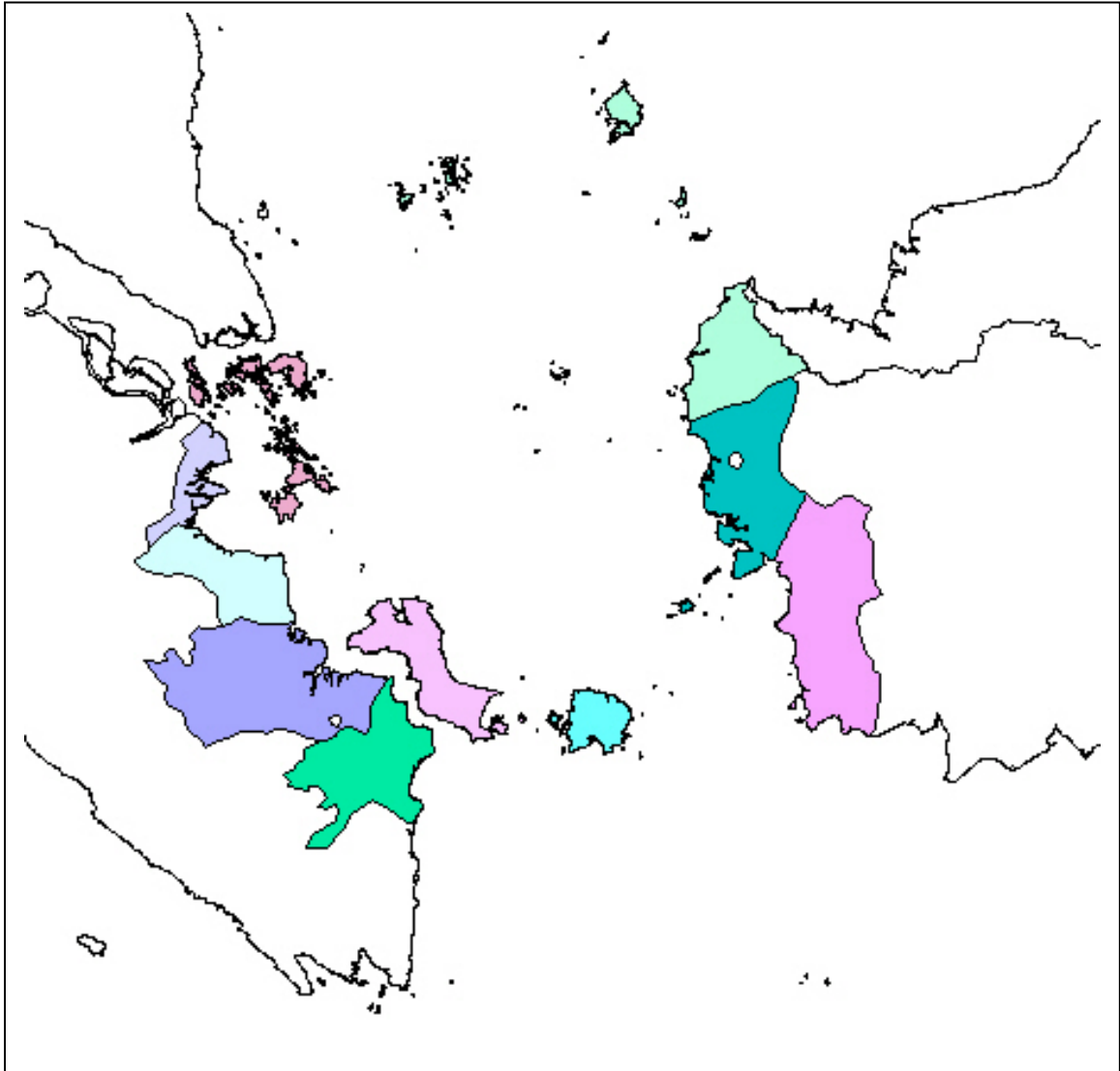
- Declining in spawning or nursing grounds
- Over fishing
- Destructive fishing practices
- Alien species/disease
- Pollution
- Climate change
- Natural disasters
- Population fragmentation
- Unknown
- Other (1), specify
- Other (2), specify

Indonesia

F9: Areas of importance in the maintenance of exploited fish stocks

Instruction

1. Locate as many areas that are important for maintaining of exploited stocks and indicate their names in the map. (you may substitute this map by any other maps or GIS as appropriate.)
2. For each area in the map provide information in each Table F9.



F10: Name of area

The geographical coordinates (latitude and longitude) of the approximate centre of the fishery area expressed in degrees and minutes.

Latitude..... Longitude.....

(Please reproduce this page for more area)

	Common name ¹ and/or species of top 5 fishes that use this area for:			
	Spawning grounds	Nursing areas	Feeding grounds	Fishing grounds
1 st				
2 nd				
3 rd				
4 th				
5 th				

Threats to this area

Present

Destructive harvestation

- Explosive fishing Bottom trawl
- Plant/animal removal
- Other (1), specify
- Other (2), specify

Pollution

- Sediment Oil
- Heavy metals Organic pollutants
- Eutrophication Salinity change
- Thermal Pesticides
- Other (1), specify
- Other (2), specify

Natural disaster

- Storm Volcano Flood
- Land subsidance Drought
- Fire
- Other (1), specify
- Other (2), specify

Future (next decade)

Destructive harvestation

- Explosive fishing Bottom trawl
- Plant/animal removal
- Other (1), specify
- Other (2), specify

Pollution

- Sediment Oil
- Heavy metals Organic pollutants
- Eutrophication Salinity change
- Thermal Pesticides
- Other (1), specify
- Other (2), specify

Natural disaster

- Storm Volcano Flood
- Land subsidance Drought
- Fire
- Other (1), specify
- Other (2), specify

Global changes

- Thermal
- Sea level rise
- Other (1), specify
- Other (2), specify

Coastal development

- Land fill Dredging Tourism
- Coastal erosion
- Other (1), specify
- Other (2), specify

Upland development

- Changing discharge and runoff
- Other (1), specify
- Other (2), specify

Global changes

- Thermal
- Sea level rise
- Other (1), specify
- Other (2), specify

Coastal development

- Land fill Dredging Tourism
- Coastal erosion
- Other (1), specify
- Other (2), specify

Upland development

- Changing discharge and runoff
- Other (1), specify
- Other (2), specify

F11: Sources of data (Please add more pages if necessary)

Please provide reference to data given

1.
.....
2.
.....
3.
.....
4.
.....
5.
.....

Name of data providers

1. Name.....
Address
Tel: Fax: E-mail:.....
2. Name.....
Address
Tel: Fax: E-mail:.....
3. Name.....
Address
Tel: Fax: E-mail:.....
4. Name.....
Address
Tel: Fax: E-mail:.....

ANNEX 5

Questionnaire to Initiate the Compilation of Updated Information on National and Community-Based Protocols for Delineating the Boundaries of Coastal and Marine Management Areas such as Fisheries *Refugia*

Question	Response
1. Do you have a policy and/or law in your country governing procedures for establishing fisheries <i>refugia</i> ?	<p>Please indicate yes or no:</p> <p>If yes, please list name of policy and law:</p> <p>If no, please list name of policy(ies) and law(s) used to establish other fisheries management areas:</p>
2. Do any of the policies or laws listed above define protocols for delineating the boundaries of fisheries <i>refugia</i> or fisheries management areas?	<p>If yes, do these protocols require:</p> <p>(a) the use of scientific information and data relating to the essential role the site in the life-cycle of fisheries resources in the area? Yes/No?</p> <p>(b) involvement of the community and/or resource users in establishing boundaries for fisheries <i>refugia</i> or fisheries management areas? Yes/No?</p> <p>(c) consideration of the actual threats to fish stocks or fish habitats at the location in which the management area (fisheries <i>refugia</i> or other) will be established? Yes/No?</p> <p>(d) an assessment of the socio-economic impacts of the management measures, including possible transboundary implications, to be applied within fisheries <i>refugia</i> or other areas? Yes/No?</p> <p>If you answered yes to any of the above, please provide a short explanatory note here:</p>
3. Are there other community-based, traditional fisheries management measures that need to be considered in establishing fisheries <i>refugia</i> in your country?	<p>Please indicate yes or no:</p> <p>If yes, does the community-based approach define procedures for delineating boundaries of management areas?</p> <p>Does the community-based approach utilise a consultative approach to the assessment of the actual threats to fish stocks or fish habitats at the location in which the management area will be established?</p>
4. Once boundaries for a fisheries <i>refugia</i> are delineated, what steps are involved in having the area designated as a fisheries <i>refugia</i> ?	<p>Please describe the steps here, including both the formal legal and community-based requirements:</p>

ANNEX 6

**Framework Process for Baseline Setting and Identifying Priorities for Intervention
at Fisheries Refugia Sites**

Framework process for baseline setting and identifying priorities for intervention at fishery refugia sites	
1. Identification of issues and problems with fish stock and coastal habitat linkages	<ul style="list-style-type: none"> • Identify compromises of, and threats to, aquatic uses, resources and amenities, associated hazards to human health and legitimate uses of the aquatic environment, as well as associated limitations on traditional and cultural activities • Scientifically evaluate the aquatic environmental issues and problems (e.g., types and volume/magnitude of pollutants entering the system; rates of loss of coastal habitats/ecosystems; changes in species composition and catch per unit effort in fisheries; increases in sedimentation and algal density)
2. Quantification of the compromises to fish stock and coastal habitat linkages	<ul style="list-style-type: none"> • Conduct social and economic evaluation of the aquatic environmental issues and problems (e.g., economic costs of environmental impacts; social costs of the issues such as adverse effects on human health and welfare).
3. Initial prioritization of problems	<ul style="list-style-type: none"> • Based on the system description, identify and quantify compromises (steps one to three above) and threats, and produce an initial prioritization of the compromises, hazards and limitations to legitimate uses and activities
4. Identification and characterization of immediate, secondary, and higher level causes of the degradation of fish stock and critical habitat linkages (" <i>causal chain analysis</i> ")	<ul style="list-style-type: none"> • Determine and describe the immediate causes of identified issues • Determine and describe of the secondary causes of identified issues • Determine and describe the tertiary...to penultimate causes of identified issues
5. Identification and characterization of ultimate (root) causes of the degradation of fish stock and critical habitat linkages	<ul style="list-style-type: none"> • Determine and describe the ultimate/root causes of identified issues
6. Identification and characterization of options for intervention	<ul style="list-style-type: none"> • Identify and then describe options for intervention, with emphasis on potential interventions at the most fundamental levels of cause (however, potential options at all levels should be characterized where possible)
7. Analysis of options for intervention	<ul style="list-style-type: none"> • Examine options for intervention for commonalities and crosstalk/conflicts • Establish criteria for net benefit analyses of options
8. Determination of comparative net benefit of options for intervention	<ul style="list-style-type: none"> • Establish costs of intervention, potential benefits of intervention (preferably in monetary terms) taking account of feedback loops/conflicts to determine the most effective options for intervention
9. Identification of priority options for intervention	<ul style="list-style-type: none"> • Identify, characterize and specify any conditions that should be imposed upon priority options for intervention based on the magnitude of their net benefit and ability to resolve/ameliorate multiple issues