

# Fisheries *Refugia* and Marine Protected Areas: Can they help sustain the contribution of fisheries towards food security in Southeast Asia?

John C. Pernetta, Christopher J. Paterson and Somboon Siriraksophon

Originally prepared for the SEAFDEC Regional Advisory Committee for Fisheries Management in Southeast Asia (RAC) in support of the continuing activities of the regional fisheries *refugia* initiative, this article compares and contrasts the concepts of fisheries *refugia* and marine protected areas. Specifically, the potential benefits to fisheries associated with the use of both management tools in the Southeast Asian region, are also evaluated.

Fish stocks in the South China Sea and Gulf of Thailand are subject to high levels of fishing effort, such that stocks of most economically important species are considered to be fully fished or overexploited. The increasing global demand for fisheries products and the dependence of coastal communities on fish for food and income result in continued increase in fishing effort, which led to “fishing down the marine food chain” and the growing dependence on small pelagic stocks due to the decline in demersal species. It is the declining fishery resources that drove the fishers to use destructive fishing methods in order to maintain fish catch and increase incomes in the short-term. Many reports have suggested that the trends of production from capture fisheries would decline over the coming years unless total fishing effort and capacity are reduced. However, an obvious problem in the reduction of fishing capacity continues to persist since most fisheries in the Southeast Asian region are small-scale with the majority of the fishers being highly dependent on fisheries for income, food and well-being (Paterson *et al.*, 2006).

Moreover, while actions aimed at reducing the rate of loss of coastal habitats that are significant to fisheries have been implemented by the countries bordering the South China Sea, the decadal rates of loss of such habitats reported by UNEP (2007) remain high, *e.g.* seagrass beds (30%), mangroves (16%), and coral reefs (16%). The increasing levels of fishing effort coupled with continued decline in the total area of habitats critical to the life cycles of most aquatic species, have therefore raised serious concerns for the long-term sustainability of small-scale fisheries in the region.

With fish production being intrinsically linked to the quality and expanse of habitats, and recognizing the heightened dependence of coastal communities on fish

for food and income, emphasis over the past decade has been placed on the need to improve the integration of fish habitat considerations and fisheries management. As a matter of fact, the need for integrated fisheries and habitat management received high-level international recognition during the 2001 Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem and the 2002 World Summit on Sustainable Development. Additionally, such need had also been emphasized in the FAO Technical Guidelines for Responsible Fisheries (FAO, 1995) dealing specifically with the ecosystem approach to fisheries, and the Regional Guidelines for Responsible Fisheries in Southeast Asia (SEAFDEC, 2003 and 2006). The dilemma for the fisheries and environment sectors is that conservation of habitat does not necessarily result in increased fish stocks while lowering the fishing effort does not necessarily result in improved habitat conditions. Given the complexity of the key threats to fish stocks, fish habitats, and associated biodiversity in Southeast Asia, it is becoming increasingly important for fisheries and environment departments in the region to ensure that adequate cross sectoral consultation and coordination are in place, particularly in terms of the identification and designation of priority areas for fisheries and habitat management.

## Marine Protected Areas

The term Marine Protected Area (MPA) is widely used around the world and consequently its meaning in any one country or region may be quite different from that of the others. There are many terms related to MPA, *i.e.* SPA (Specially Protected Area), SCA (Special Conservation Area), MCZ (Marine Conservation Zones - a type of MPA in English waters), MR (Marine Reserve), MP (Marine Park), NTZ (No Take Zone) or closed area in fisheries management, or ASCC (Area of Special Conservation Concern). Each of these terms has specific types of restrictions associated with them as defined by the laws of the countries concerned. In the international arena, there has been the development of a comparable plethora of concepts including “Particularly Sensitive Sea Areas” and Special Areas. For example, the World Summit on Sustainable Development in 2002 called for “*the establishment of marine protected areas consistent with international laws and based on scientific information, including representative networks by 2012*”, while the

Durban Action Plan developed in 2003, called for regional actions and targets to establish a network of protected areas by 2010 within the jurisdiction of regional environmental protocols. This Action Plan recommended the establishment of protected areas for 20 to 30% of the world's oceans by the goal date of 2012.

On the other hand, the Convention on Biological Diversity recommended that nations should set up marine parks that are controlled by a national central organization before integrating them into regional systems. In this connection, Decision VII/28 of the UN laid out the following deadlines:

- By 2006: complete area system gap analysis at national and regional levels.
- By 2008: take action to address the under-represented marine ecosystems in existing national and regional systems of protected areas, taking into account marine ecosystems beyond areas of national jurisdiction in accordance with applicable international laws.
- By 2009: designate the protected areas identified through the gap analysis.
- By 2012: complete the establishment of comprehensive and ecologically representative national and regional systems of Marine Protected Areas.

Later, the UN also endorsed Decision VII/15 in 2006 that called for *“Effective conservation of 10% of each of the world’s ecological regions by 2010”*.

A common point of concern is over terminology. What exactly is a Marine Protected Area? One general definition indicated that it is a marine area that meets the definition of a “Protected Area” as initially defined by the World Conservation Union (IUCN, International Union for the Conservation of Nature) (**Box 1**).

Therefore, the term “Marine Protected Area” can cover generically any area that meets the IUCN’s definition, regardless of shape, size, purposes and management approaches. Due to the diverse terminology and confusion surrounding the term MPA, the World Conservation Monitoring Centre produced in 1994 a table of six categories of MPAs that was endorsed in 2004 by the United Nations Framework Convention on Climate Change (**Box 2**).

Hence, these definitions and their implicit purposes suggest that the over-riding goal of MPAs is to protect and maintain biological diversity and the ecosystem processes that result in the provision of ecological services and the dynamic stability of natural systems. The emphasis of all these definitions is on “protection” rather than “sustainable use” which is unfortunate in the light of the emphasis on sustainable use as indicated in the outcomes of the World Summit on Sustainable Development in 2002. Another

**Box 1: Definitions of Marine Protected Area**

The International Union for the Conservation of Nature or IUCN defined MPA as: *A clearly defined geographical space, recognized, dedicated, and managed, through legal or effective means, to achieve the long-term conservation of nature with associated ecosystem service and cultural value.*

The Convention on Biological Diversity, meanwhile, has adopted a slightly different definition of MPA as: *A geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives.*

Both of these definitions require that the site must be set aside principally for conservation in order to be designated a Marine Protected Area. More specifically, the World Conservation Union also went further and defined a **Marine Protected Area** as: *Any area of intertidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all enclosed environment.*

The Convention on Biological Diversity attempted to solve the definitional problems of a marine protected area that include adjacent land by defining the broader term of **“Marine and Coastal Protected Area”** (MCPA, for short) as being: *Any defined area within or adjacent to the marine environment, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by legislation or other effective means, including customs, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings.*

**Box 2: MPA Categories of the World Conservation Monitoring Centre**

Category	Created mainly for:
I	Scientific purposes or as a strict nature reserve; wilderness protection
II	Ecosystem protection and recreation (often National Park)
III	Conservation of specific natural features (often National Monument)
IV	Conservation through close management and monitoring of species
V	Landscape/seascape conservation and recreation (no protection assigned)
VI	Sustainable use of natural ecosystem

further difficulty could arise if most fishing communities and local fisheries officers continue to widely understand MPAs as areas that are closed to fishing. In addressing this concern, the Marine Protected Areas Sustainable Fisheries Programme of the Marine Programme of the IUCN World Commission on Protected Areas was developed. Focusing on the Southeast Asian region, the Programme aims to encourage the establishment of regional action plans for identifying, establishing, and networking no-take

ecological reserves and facilitating access to funding for these activities.

Additionally, the Programme also serves as guide for fisheries managers in Southeast Asia on the promotion and enhancing of regional and national-level no-take activities to replenish fish stocks, and preservation of marine biodiversity<sup>1</sup>. Experience in the region suggests that attempting to completely close areas to fishing is not only difficult but is a futile task. The Philippines for example, attempted to promote the use of no-take areas in fisheries or fish sanctuaries. However, due to problems with compliance and community acceptance in a number of areas, the term “fish sanctuary” had to be redefined putting emphasis on sustainable use rather than on prohibition. Section 32 of the Philippine Fisheries Code therefore defined a fish sanctuary as “*a protected water area where fish are able to spawn, feed and grow undisturbed and where fishing and other activities are absolutely prohibited*”. This example presents the importance of focusing on the concepts of sustainable use and fishery-critical habitat linkages in communicating with government officials and coastal communities in Southeast Asia about spatial fisheries management tools, because these are more easily understood at the fishery level than the science of no-take areas and the concept of biodiversity and its conservation.

It is also worth noting that in the 1960s and 70s, there was a clear distinction between establishing marine parks and protected areas for the protection of biodiversity and establishing fisheries management areas to protect fish stocks. This distinction became blurred recently when the benefits of MPAs were presented both in terms of biodiversity protection and potential enhanced fish catch outside the MPAs. This was complicated further when an objective review of the various MPA definitions suggested that the entire Exclusive Economic Zones (EEZs) of Southeast Asian countries are technically MPAs, because fishing in the EEZs is restricted through conventional and long-standing fisheries management measures.

## Benefits of MPAs to Fisheries

In order to achieve the maximum benefits, selection of areas as MPAs must give adequate consideration to the links between specific locations and the life-cycle of important species. Currently, these linkages are not given adequate consideration in the selection of sites for MPA systems, despite the promotion of these systems on the basis of their purported benefits. It is unfortunate that the establishment of MPAs always emphasize on the benefits to the fisheries

of such areas. In reality, traditionally established MPAs are frequently associated with increased abundance, biomass and sizes of both focal and other species **within the no-take areas of an MPA**. It is debatable however, whether such systems as currently designed, actually result in any economic benefits from increased fish capture outside the area. At least in the short-term, the reverse tends to be the case, because the catch per unit of effort declines due to the increased effort of the fishers who had been displaced due to the establishment of the MPA.

In addition, it has been recognized that the establishment of an MPA can enhance catch per unit effort (CPUE) in adjacent areas through the export of juveniles and adults (Yamasaki and Kawahara, 1990; Russ and Alcalal, 1996; Roberts *et al.*, 2001). However, regional examples of increased abundance and catch of fish adjacent to MPAs following their establishment, are few and far between. The Nha Trang Marine Reserve in Vietnam, for example has shown little evidence of benefits either to fish stocks or to fishing communities outside the protected area. While it is indisputable that biomass in strictly enforced no-take MPAs may increase over time, but with limited information available it may be unwise to anticipate increased production across the entire geographic range of the fisheries as a result of the establishment of such areas. It is important to note that in effect, the displaced fishers may intensify their fishing efforts in areas adjacent to the MPAs following their establishment, and that this often results in a decline in the CPUE.

Hilburn *et al.* (2006) noted that MPA establishment is expected to increase yields when fishing effort cannot be controlled and stocks would otherwise be overfished but is unlikely to improve yields in lightly fished fisheries, and reduce inter-annual variability in catch in the face of stochastic events such as recruitment failure and make fisheries less sensitive to uncertainty in fishing mortalities. However, the effect of MPAs on enhanced yields could be a reflection of the movement of adult fish species that have high rates of movement and require greater reserve areas than those with low rates of movement. Conversely, species with low rates of movement rarely move outside the reserve and consequently the MPA cannot contribute to increased fisheries catch.

Hilburn *et al.* (2006) also attempted to demonstrate by modelling the effect of an MPA which is designated either within a regulated, single species fishery with a defined Total Allowable Catch (TAC) based on Maximum Sustainable Yield (MSY), the outcome of which was a decrease in catch. The results of the modelling showed that in a poorly regulated fishery where the stock is over-harvested

<sup>1</sup> <http://www.iucn.org/themes/wcpa/biome/marine/programme.htm>

and heading towards extinction, the establishment of an MPA can result in increased fish abundance and catch.

However, in such cases **the catch and abundance will be much lower than in a well regulated fishery** where harvest level is maintained at MSY. If an MPA is established within a well regulated fishery then the overall effects will be a slightly lower catch and lower abundance. Such outcomes suggest that simply establishing an MPA without consideration of the ecology and population characteristics, particularly the adult dispersal rates of the target species, is likely to be ineffective in enhancing the fish catch. Consequently, in small-scale fisheries such as those targeting the demersal stocks of the Southeast Asian waters, the establishment of MPAs is unlikely to receive support from the fishing communities.

### Natural Refugia and Fisheries Refugia

Pauly (1997) suggested that even very low rates of fishing mortality may be unsustainable in long-lived demersal stocks unless a sizable fraction of the spawning adults are made completely inaccessible to fishing activities owing to some natural refuge (underwater canyons, large boulders, etc.). Such contention was based on the fact that many

demersal species in temperate waters and large predators on coral reefs are long-lived with natural mortalities of 0.1-0.2 year<sup>-1</sup>, implying that sustainable fishing could not extract more than about 10% of the stock biomass per year. However, he also explained that such exploitation rates quickly remove the accumulations of large and old females that are the source of most eggs and subsequent recruitment to stocks of long-lived fishes. In addition, he also suggested that the relationship between fish size and fecundity is highly non-linear with large females being far more fecund than an equivalent weight of small individuals. As an example, he cited the case of the red snapper (*Lutjanus campechanus*) in which a single female (61 cm and 12.5 kg) contained the same number of eggs (9,300,000) as 212 females (42 cm and 1.1 kg each).

As fishing technology has developed and the size of fishing fleets has increased, the extent of natural *refugia* for fish stocks has declined, particularly in Southeast Asia where destructive fishing practices such as trawling and push netting have seriously disturbed large areas of soft bottom habitats. On the other hand, the degradation and loss of coastal habitats such as mangrove forests, as a consequence of coastal infrastructure development, have dramatically reduced the expanse of habitats that have important nursery functions for commercial and subsistence species.



Provincial fisheries and border army officers working at-sea with fishers and staff of Kien Giang's Department of Environment to map fisheries *refugia* at the Phu Quoc Archipelago in Viet Nam (Photo by Christopher Paterson)



Surveying distributions of fisheries habitats off the coast of Ham Ninh Commune, Phu Quoc Archipelago (Photo by Christopher Paterson)

#### Box 3: Definition of Fisheries Refugia

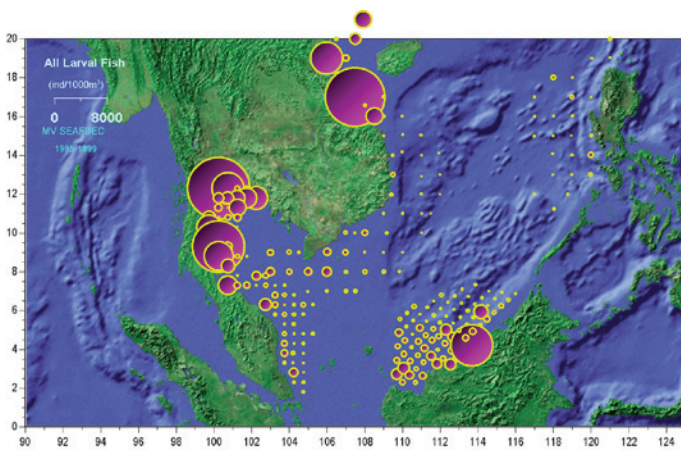
*"Spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical stages of their life cycle, for their sustainable use."*

Thus, fisheries *refugia* should:

- not be simply "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 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 broodstock
- 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 of classical fisheries management actions:

- 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 of fish life cycles
- seasonal restrictions (e.g. use of specific gear that may trap larvae)
- limited access and use of rights-based approaches in small-scale fisheries



Distribution and abundance of fish larvae (all species combined) in the South China Sea and Gulf of Thailand during the post-northeast monsoon periods from 1996 to 2000 (Illustration by Dr. Somboon Siriraksophon)

Against this background of widespread over-exploitation of fish stocks in the Gulf of Thailand and South China Sea as well as the lack of sound empirical evidence for the value of MPAs in enhancing fish stocks and catch in the region, the UNEP/GEF project on “*Reversing environmental degradation trends in the South China Sea and Gulf of Thailand*” through the Regional Working Group on Fisheries (RWG-F) developed the initial concept of fisheries *refugia* (Box 3). Over the period from 2002 to 2008 in collaboration with SEAFDEC and its Member Countries, the Project refined this concept and further developed a framework for the establishment and operation of a regional system of fisheries *refugia*, targeting priority transboundary, demersal fish and non-finfish resources (UNEP, 2007).

This concept focuses on sustainable use and clearly states that *refugia* will not simply be no-use areas, *refugia* cannot be substituted for permanent closures or no-take MPAs and *vice versa*. The concept of fisheries *refugia* is based on recognition of the fact that specific habitats and areas are of critical importance to different stages of the life-cycle of each species. This means that areas located outside fishing grounds for a given species, which are critical to



Fishing community consultation on the identification and establishment of fisheries *refugia* at Masinloc in the Philippines (Photo by Mr. Noel Barut)

the life-cycle for that species, might need to be managed as fisheries *refugia*. Such management for example, may include interventions aimed at reducing the impacts of the incidental capture of juveniles of a given species by another fishery operating in areas critical as inshore nursery *refugia* for that particular species.

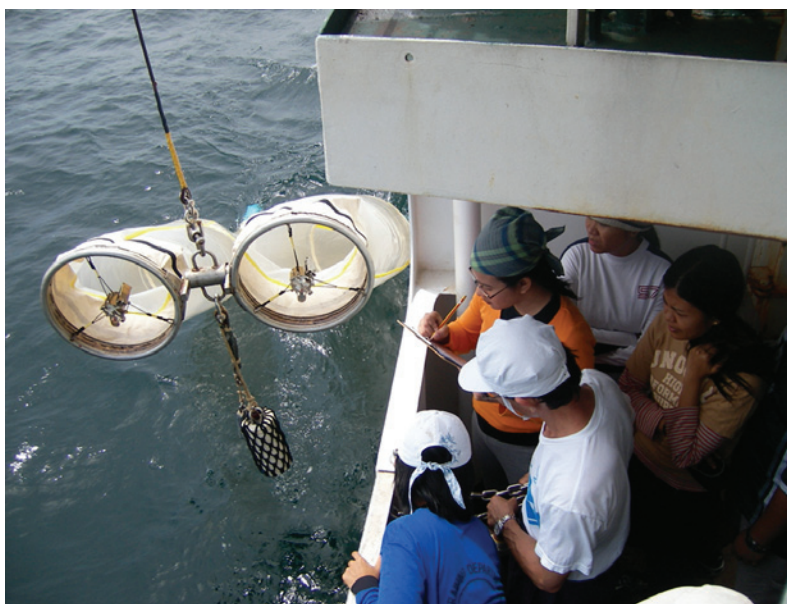
Such management could also include interventions to provide habitat protection, to ensure that areas important for egg deposition are not disturbed, and/or to safeguard habitats that provide protection for juveniles from predators, such as mangroves and seagrass beds. In developing the framework for a regional system of fisheries *refugia* in the South China Sea and Gulf of Thailand, the RWG-F recognized the need for two separate but related sets of goals and objectives as shown in Table 1. The first is related to the resource (fish stock) itself and the second to the institutional framework under which management is brought about.

Overall, the resource related goal is to enhance the resilience of regional fish stocks to the effects of fishing. Meanwhile, the institutional goal is to integrate fisheries and habitat management at the national level, a task which is formidable given the past history of interaction between fisheries and environmental managers in most countries in the region. The former is generally focussed on the individual stocks and management of fishing effort on a sectoral basis while the latter is on biological diversity and ecosystem protection to the exclusion of sustainable use.

Consideration of these goals and objectives would enable one to evaluate whether or not areas subject to seasonal closures and fisheries management zones within multiple-use MPAs can be classified as fisheries *refugia* and form part of a regional *refugia* system. For instance, short term closures (or spot closures) are often implemented to redirect fishing effort from areas containing concentrations of juvenile fish or specific age classes of fish. Similarly, closed seasons are often implemented to safeguard the spawning fish or reduce the levels of fishing effort at times when pre-recruits are migrating to the fishing grounds. Such actions would form part of the suite of available management actions that could be used within a designated *refugia* management regime but the designated area or “place” (Pauly, 1997) is the *refugia* itself.

## Discussions and Conclusion

The similarities and differences between MPAs and fisheries *refugia* (Table 2) are worthwhile considering. In the case of MPAs, the objectives are often broadly focussed at the ecosystem level rather than on species of importance to local fisheries, while the sites are selected on the basis of biodiversity criteria rather than on their significance to the

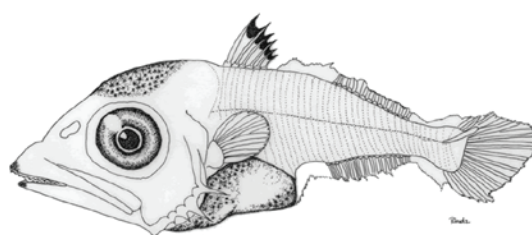
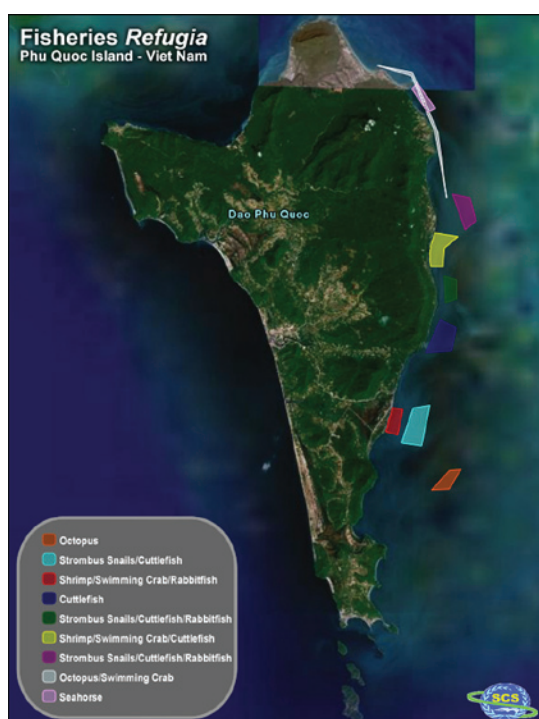


Above: Larval specimen of *Scomberoides* spp. collected from the South China Sea as part of the fisheries *refugia* training program (Photo by Dr. Yoshinobu Konishi)

Left: Staff of national fisheries departments participating in at-sea training on the conduct of fish egg and larvae surveys in the upper Gulf of Thailand in May 2007 (Photo by SEAFDEC Training Department)

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

Resource-Related Goal - Increased Resilience of Regional Fish Stocks to the Effects of Fishing	Institutional-Related Goal - Fisheries and Habitat Management Conducted in an Integrated Manner
<p><b>Longer-Term Objectives</b></p> <ul style="list-style-type: none"> <li>• Increased average size of important species</li> <li>• Increased egg production of important species</li> <li>• Increased recruitment of important species</li> <li>• Increased biomass of important fish species</li> </ul>	<p><b>Longer-Term Objectives</b></p> <ul style="list-style-type: none"> <li>• Community-based management of fisheries <i>refugia</i> for integrated fisheries and habitat management</li> <li>• National and regional level commitments for integrated fisheries and ecosystem management</li> <li>• Appropriately represented fisheries agenda in broader multiple-use marine planning initiatives</li> </ul>
<p><b>Shorter-Term Objectives</b></p> <ul style="list-style-type: none"> <li>• Safeguarding of natural <i>refugia</i></li> <li>• Reduced capture of juveniles and pre-recruits of important species in critical fisheries habitats</li> <li>• Reduced targeting and capture of important species when forming spawning aggregations</li> <li>• Reduced targeting and capture of migrating fish</li> </ul>	<p><b>Shorter-Term Objectives</b></p> <ul style="list-style-type: none"> <li>• Community-based management of fisheries <i>refugia</i> for fisheries management</li> <li>• Understanding among fishing communities of critical habitats and fish life-cycle linkages</li> <li>• Enhanced capacity of fisheries departments/ministries to engage in meaningful dialogue with the environment sector</li> </ul>



Above: Larval specimen of yellowfin tuna (*Thunnus albacares*) from the South China Sea (Drawn by a participant in the fisheries *refugia* training program)

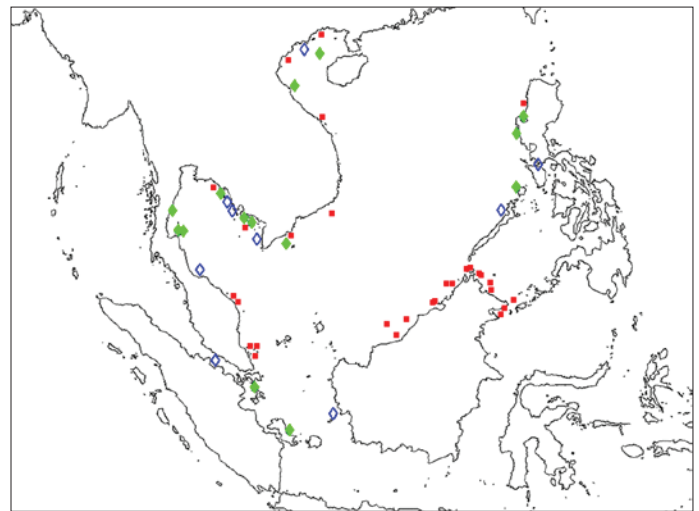
Left: Spawning/nursery areas for rabbitfish and various invertebrate species of subsistence and commercial importance in the seagrass beds of Phu Quoc Island, Viet Nam (Photo by Christopher Paterson)

life cycle of the species concerned. Similarly, the focus on protection rather than sustainable use has made the MPAs generally less acceptable than *refugia* at the level of the primary stakeholders (fisherfolk and local government officers).

In the Southeast Asian region, since the focus of fisheries *refugia* is on the benefits to fisheries rather than the benefits to biological diversity, this has resulted in a wide acceptance of establishing such areas. Subsequently, the guidelines for the establishment of fisheries *refugia* as part of the ASEAN-SEAFDEC Regional Guidelines for Responsible Fisheries in the Southeast Asian Region (SEAFDEC, 2006), have been accepted inter-governmentally. More particularly, the concept of *refugia* has been used successfully to assist the Philippines in resolving long running fisheries conflicts in the Visayan Sea. It has also been used to facilitate the cross-sectorial co-ordination required between the environment and fisheries sectors at both the provincial and local levels, to integrate fisheries and habitat management at the Phu Quoc Archipelago in Viet Nam (UNEP, 2008).

A question that often arises would be on whether “MPAs qualify as fisheries *refugia*”. A simple answer is no, especially if the MPA promotes the no-take concept in relation to fisheries. MPAs are implemented to limit human activity throughout a designated area of the ocean, which are mostly aimed at achieving the goals and objectives of biodiversity conservation. The criteria for the identification of MPA sites usually relate to concepts of representativeness, comprehensiveness, and uniqueness. Thus, a particular MPA cannot qualify as a fisheries *refugia* if the site has been selected using these criteria. Parts of multiple-use MPAs, such as fisheries management zones, may however, qualify as a fisheries *refugia* if such zones promote the concept of sustainable use rather than prohibition of fishing, and selection of the zone had been based on criteria relating to the critical linkage between the area/habitat and the life-cycle of the species for which the area is managed.

However, if the site for a multiple-use MPA had been identified using criteria that did not relate to fish life-cycle and critical habitat linkages, then it is unlikely that the



Location of: known spawning and nursery areas of transboundary 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 [◇] (Illustration by Christopher Paterson).

MPA will result in definite benefits to the fisheries sector. Similarly, poorly designed fisheries management zones within multiple-use MPAs may lead to loss of community support for spatial approaches to fisheries management, as well as to the re-direction of fishing effort towards areas that are more important in terms of critical habitat linkages and consequently have a reverse effect to the one which it has been intended for. Another question which could arise is whether “Marine Protected Areas could be the right conduit for achieving acceptance among fishing communities with specific locations used for fisheries and habitat management in Southeast Asia”.

The immediate response is also no considering that it would be unwise to completely dismiss the idea of multiple-use of marine protected areas and fisheries working well together in the region. Specifically, although MPAs are often established under the umbrella of “improving the state of fisheries”, the

**Table 2.** Comparison between the objectives, benefits, site selection criteria, use and acceptability of traditional MPAs and fisheries *refugia*

	Marine Protected Areas	Fisheries <i>Refugia</i>
Strategic Objectives	Protection of biodiversity Tourism Increased fish production	Improved management of fish stock and habitat links Increased resilience of stocks
Purported Fisheries Benefits	Enhanced stock in MPA leads to bigger catches outside	Safeguarding fish in places and at times critical to their life-cycle will reduce growth and recruitment over-fishing
Site Selection Criteria	Species diversity/richness Uniqueness of the site Site’s representativeness	Importance to the life-cycle of economically important spp. Likelihood to improve stocks
Use Status	Strict protection-multiple use (typically no-take fisheries zones in SCS)	Based on sustainable use rather than prohibition of fishing
Acceptability to communities	Concern that costs outweigh benefits Enforcement is costly	Objectives and scientific basis well accepted by fishing communities and local officials

#### Box 4: Goals of the development of regional system of fisheries *refugia*

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

criteria for the selection of MPA sites is typically related to the achievement of objectives for biodiversity conservation or political gain rather than fisheries management. In this regard, the RWG-F developed a regional system of fisheries *refugia* (Box 4). The RWG-F comprised representatives from the capture fisheries and research divisions of the Departments of Fisheries of Cambodia, Indonesia, Malaysia, Philippines, Thailand and Viet Nam, together with regional experts and members from the SCS Project Co-ordinating Unit, FAO and SEAFDEC with periodic participation of representatives from IUCN.

Empirical evidence of an overall increase in fishery benefits following the establishment of an MPA is still controversial since increased catches frequently do not compensate for the decreasing expanse of fishing grounds. In addition, MPA models have shown that, the effects on fisheries yield are highly dependent on a number of factors, *i.e.* dispersal in the larval, juvenile and adult stages; configuration of the reserve; and status of the fishery. In conclusion, it appears that traditional marine protected areas are unlikely to enhance fish stocks and catch since they are directed towards achieving other wider objectives and their selection rarely

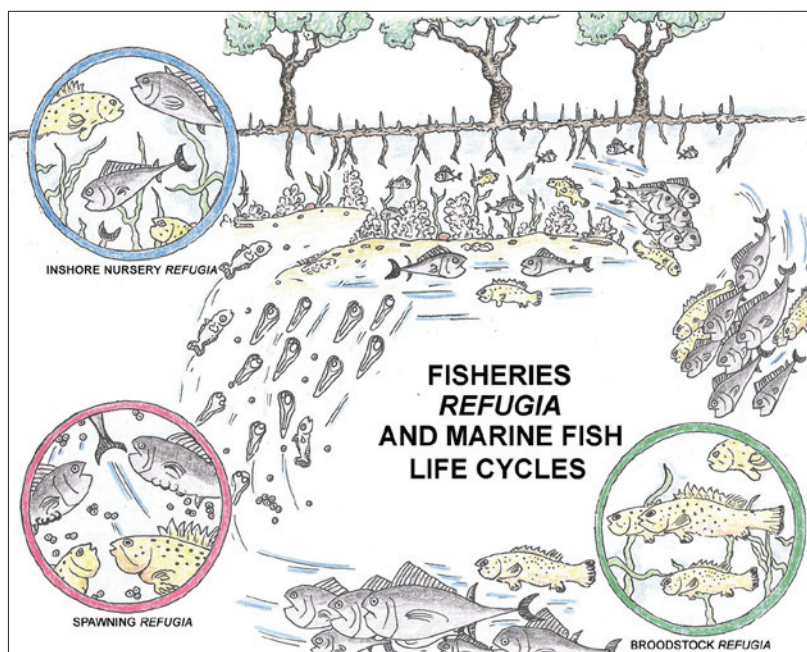
takes into consideration the life history and population dynamics of fishery species. Since the fisheries *refugia* concept has been developed to redress this imbalance, such approaches may potentially bring greater benefits to the fisheries sector.

## Acknowledgements

The development of the concept of fisheries *refugia* was a targeted outcome of the fisheries component of the UNEP/GEF Project on Reversing environmental degradation trends in the South China Sea and the Gulf of Thailand. This project including the activities relating to the development of the fisheries *refugia* concept, was financially supported by the Global Environment Facility (GEF) and co-financed by the governments of the participating countries, namely: Cambodia, China, Indonesia, Malaysia, Philippines, Thailand and Viet Nam, although China did not participate in the fisheries and coral reef components of the UNEP/GEF South China Sea Project. The development of the concept owes much to the intellectual inputs of the government representatives and regional fisheries experts who participated in the annual meetings of the Regional Working Group on Fisheries between 2002 and 2008, together with the staff of the South China Sea Project Co-ordinating Unit, SEAFDEC, the FAO Regional Office for Asia and the Pacific, and IUCN.

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<http://www.iucn.org/themes/wcpa/biome/marine/programme.htm>



The *refugia* types prioritized by the RWG-F in relation to the generalized life cycle of demersal marine fishes



[http://www.unepscs.org/South\\_China\\_Sea\\_Knowledge/Lessons\\_Learned/SCS\\_Lessons\\_Learned.html](http://www.unepscs.org/South_China_Sea_Knowledge/Lessons_Learned/SCS_Lessons_Learned.html)

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### About the Authors

**Mr. John C. Pernetta**, now a free-lance fisheries management consultant and ecologist, was the former Director of the UNEP/GEF Project on Reversing Environmental Degradation Trends in the South China Sea and the Gulf of Thailand. After his retirement from the Project, he continues to provide technical assistance to the SEAFDEC Regional Advisory Committee for Fisheries Management in Southeast Asia (RAC).

**Mr. Christopher J. Paterson** is currently working with the Pacific Islands Applied Geoscience Commission (SOPAC) on the implementation of a UNDP/UNEP/GEF project in the Pacific. He was also part of the Project Coordinating Unit for the Project on Reversing Environmental Degradation Trends in the South China Sea and the Gulf of Thailand.

**Dr. Somboon Siriraksophon** is the Policy and Program Coordinator of SEAFDEC based at the SEAFDEC Secretariat in Bangkok, Thailand.



## Enhancing Safety at Sea for Small-scale Fishing Boats in Southeast Asia

*Bundit Chokesanguan, Sutee Rajruchithong and Worawit Wanchana*

The Southeast Asian Fisheries Development Center (SEAFDEC) has been implementing activities on Safety at Sea for small-scale fishing boats in conjunction with the global Code of Conduct for Responsible Fisheries (CCRF) which prescribed that: (8.1.5) "*States should ensure that health and safety standards are adopted for everyone employed in fishing operations. Such standards should not be less than the minimum requirements of relevant international agreements on conditions of work and services*". Taking into consideration such article of the CCRF, the Regional Guidelines for Responsible Fishing Operations in Southeast Asia (SEAFDEC, 2000) specifically stipulated that: (8.1.5 (1)) "*since the minimum requirement in relevant international agreements including SOLAS and IMO is only applicable to vessels larger than 24 m LOA, and considering that majority of the fishing boats in the region is smaller than this size, States should be encouraged to elaborate special safety standards and policies with emphasis on smaller boats. The FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels (1980) may be used as reference.*" In addition, the Regional Guidelines also indicated that: (8.1.5 (2)) "*Regional organizations including SEAFDEC should support the States to urgently formulate such standards for smaller fishing vessels in the region.*"

Thus, activities on Safety at Sea targeting the Southeast Asian region had been conducted as part of the project on Responsible Fishing Technology and Practices implemented by SEAFDEC Training Department (SEAFDEC/TD) and