



**United Nations
Environment Programme**



**UNEP/GEF South China Sea
Project**



**Global Environment
Facility**

Date: 21st May 2006
Original: English

**MARINE PROTECTED AREAS AND THE CONCEPT OF FISHERIES *REFUGIA*
DEVELOPED BY THE REGIONAL WORKING GROUP ON FISHERIES**

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Prepared as a discussion document for the
FAO Workshop on Marine Protected Areas and Fisheries Management: Review of Issues and
Considerations

Rome, 12th-14th June 2006

INTRODUCTION

The integration of fish habitat considerations and fisheries management is a central theme and challenge in the context of the fishery component of the SCS Project. It represents the merging of two related but, until recently, very distinct management domains. The first being habitat management, which aims to maintain the functional integrity of ecosystems through actions focused on the biophysical attributes of these systems. The second is that of fisheries management, which largely aims to secure sustainable returns from resource use through actions focusing on the relationship between fishing and target species.

Integrating Fisheries and Habitat Management

The integration of fisheries management and habitat management has recently received high-level international recognition, especially during the 2001 Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem when participants approved the *Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem*. The Reykjavik Declaration states that in an effort to reinforce responsible and sustainable fisheries in the marine ecosystems, “we will individually and collectively work on incorporating ecosystem considerations into that management to that aim.” It also requested the FAO to prepare “guidelines for best practices with regard to introducing ecosystem considerations into fisheries management”. The World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa, 2002, considered the Reykjavik Declaration in adopting a political declaration and plan of implementation in relation to capture fisheries. In the WSSD declaration, the Heads of State agreed to “develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive practices ...the integration of marine and coastal areas into key sectors”.

An Ecosystem Approach?

In 2003, FAO released the *Technical Guidelines for Responsible Fisheries* dealing specifically with the ecosystem approach to fisheries (EAF) (see FAO 2003). In a note regarding the preparation of the document, FAO highlights that “at the time of writing (*the guidelines*), there was little practical experience in implementing EAF anywhere in the world”. The background to the document goes on to state that, “these guidelines attempt to translate the requests for an ecosystem approach to fisheries into operational guidelines that can be applied to marine capture fisheries” (FAO 2003: p.4). In brief, the document recognises that, fisheries have the potential to alter the structure, biodiversity and productivity of marine ecosystems, and that ideally, natural resources should not decrease below their level of maximum productivity, the guidelines suggest that ecosystem-based approaches to fisheries should abide by a series of EAF principles.

The EAF principles stress that:

- a. Fisheries should be managed to limit their impact on the ecosystem to the extent possible,
- b. Ecological relationships between harvested, dependent and associated species should be maintained,
- c. Management measures should be compatible across the entire distribution of the resource (across jurisdictions and management plans),
- d. The precautionary approach should be applied because the knowledge on ecosystems is incomplete, and
- e. Governance should ensure both human and ecosystem well-being and equity (FAO 2003: p.15).

The need to mesh the impacts of fishing on the structure and functioning of the ecosystem with the traditional focus on the sustainable yield of target species is clear, but represents perhaps one of the greatest challenges to fisheries management in the Gulf of Thailand and the South China Sea. The removal of biomass from a complex of aquatic species, characterised by a diverse array of predator-prey relationships, obviously leads to ecosystem effects from fishing (Pauly *et al.* 2000: p.697).

Fishing has the potential to alter and degrade ecosystems through a wide range of both direct and indirect effects, especially in coastal waters where impacts from other coastal uses are often present. Fishing has a number of direct effects on marine ecosystems because it is responsible for changes to the population size, size structure and genetic diversity of fished species, as well as the physical disturbance and destruction of habitat (Goni 1998: pp.39-50). These direct effects of fishing may have

many indirect implications for other species and community structure through changes in trophic interactions induced by fishing mortality of fished species.

Translating Policy into Action

The contribution of fishing activities to disturbance and destruction of fisheries habitats, such as coral reefs, seagrass, wetlands (e.g. tidal flats), and mangroves are a key consideration of the fisheries component of the SCS Project, as structural habitat plays an important role in recruitment, prey protection, and sustaining biodiversity. However, the SCS Project recognises that effective management of the effects of fishing will need to ensure that the exploitation of various fished species leaves habitats and ecosystems with their biodiversity and structural integrity maintained, rather than simply demonstrating that fisheries do have impacts on ecosystems and habitats.

Translating policy into action is an ongoing focus of the SCS Project, and essential for meeting the SCS Project objective of establishing a regionally co-ordinated approach to action aimed at reversing environmental degradation trends in the South China Sea and Gulf of Thailand. As such, the fisheries component, led by the Regional Working Group on Fisheries (RWG-F), is developing mechanisms to effect the integration of fisheries and habitat management, as well as establishing examples of best practice in the management of the environmental aspects of regional coastal and marine fisheries.

FISHERIES IN THE SOUTH CHINA SEA AND GULF OF THAILAND

The South China Sea and Gulf of Thailand is a global centre of shallow water marine biological diversity, supporting a significant world fishery of importance to the food security of, and as a source of export income for, Southeast Asian countries. The fisheries sector is significant in the context of domestic food security and nutritional security for the participating countries. Unrefined estimates of capture production value indicate that the contributions of capture fisheries to GDP are more than 2.0 percent in the majority of the countries in the area. However, since the majority of fisheries are small-scale in nature, and land fish in a large number of decentralised landing places for distribution through complex marketing networks at the community level, estimates of the value of capture fisheries production are largely underestimated and do not adequately value the artisanal or subsistence part of the sector.

The total combined capture fisheries production from marine waters of Cambodia, China, Indonesia, Malaysia, Philippines, Thailand, and Vietnam was approximately 27 million tonnes in 2003, equivalent to approximately 40 percent of total global capture fisheries production in that year. It is important to note that these landings were taken from a much wider area than the South China Sea. During 2003, all countries participating in the SCS Project, excluding Cambodia, were in the top 20 capture fishery producing countries, with some experiencing an annual increase in production close to 5.0 percent. Eight of the top ten production species are pelagic fishes.

Landings from the Gulf of Thailand and the South China Sea contribute to approximately 10 percent of reported global fisheries production per annum, although it is considered that greater annual fluctuations in landings will be observed in the future as both areas become increasingly dependent on small pelagic fisheries. This is largely due to the effects of the "fishing down the food chain" that has occurred in both areas. Demersal fisheries in the Gulf of Thailand and South China Sea are fully exploited with evidence showing that the landings of many species are currently declining. Declining fish availability, coupled with over-capacity and the dependence of the small-scale sector on coastal fisheries for income generation has led to the adoption of destructive fishing practices such as blast fishing to maintain short-term incomes and food production. These trends suggest that production from capture fisheries will wane in coming years unless fishing effort (and related over-capacity) is reduced.

Based on present consumption patterns and population growth rates, pressure on coastal fisheries resources is steadily increasing. Despite nutritional requirements and current population growth rates, the countries surrounding the South China Sea are generally net exporters of fishery products. This trade pattern is continuing since the need to generate foreign exchange to buy capital inputs for industrialisation continues to be a higher priority than food security.

Fisheries Management?

The role of fisheries in the economies of the riparian states of the Gulf of Thailand and South China Sea, coupled with the rapid growth of Southeast Asian fisheries during the second half of the 20th century, led to government interest in fisheries management. Fisheries were seen as unmanaged and governments intervened and assembled new structures in fisheries ministries and management agencies. In doing so, they typically removed any management responsibility from the community. The institutions that emerged largely sought to define and subsequently regulate some form of “sustainability limits”, with concepts of control and certainty playing a central role in policy formulation.

This situation relied on the establishment of formal rules, usually defined in fisheries legislation aimed at offsetting problems of overfishing. The common method of regulation has involved limiting access to the fishery combined with the use of input and effort controls aligned with a predetermined competitive limit on a total catch aimed at sustaining maximum yields from fish stocks. However, fisheries managed in this manner have all too frequently been characterised by excess competition among fishers, leading to the combined problems of overcapitalisation and overexploitation. Despite this trend, the management of the majority of fisheries conducted in the Gulf of Thailand continues to rely heavily on input control based approaches.

Community Values, Norms, and Knowledge

New appreciation of the diverse traditions and cultures in the region, the small-scale, coastal and subsistence nature of most fisheries, the dependence of coastal communities on fisheries for food security, the multi-species/fishing method nature of fisheries, and the multi-jurisdictional setting has provided impetus for the development of innovative approaches in moderating the tendency to overexploit Southeast Asian fish resources. One perspective is that overexploitation of fisheries may be a sign of community failure, in that community values, norms, and knowledge are critically important in guiding sustainable fisheries practices and that the erosion of such community arrangements for the management of fisheries may “open the door” to overfishing. In this connection, significant efforts are being made throughout the region to decentralise the responsibility for fisheries management with an aim of establishing co-management approaches to fisheries.

The notion of rights-based approaches to the management of the region’s small coastal fisheries is also gaining ascendancy. Examples of rights-based fisheries management systems are currently being promoted, with a notable case study being the communalisation of fishing rights as developed in the inshore fisheries of Japan, where the use of community based territorial use rights, reinforced by local modes of social regulation based on principles of equity, have been successful in preventing the tendency to overexploitation. However, it has been recognised that putting all small-scale fisheries under a management system is still a relatively new concept in the region and, when existing, it is not likely to be applied (Kato 2004: p.3).

Uncertainty and the Role of Fisheries Habitat

Most existing fisheries management arrangements focus on achieving maximum sustainable exploitation of resources but often fail to address the complexity inherent in fisheries systems. Fisheries systems involve the interrelationships of such dynamics as environmental variability, multi-species interactions and unpredictable effects of fishing on fish stocks. Such complexity not only influences the effectiveness of policy intervention, but also the accuracy of indicators used to assess the effectiveness of such intervention.

It is also now clear that many of the data used in the assessment of fisheries resources and fisheries management measures contain errors, and that many common assessment models grossly simplify fisheries systems (Ludwig *et al* 1993: p.260). It is inevitable that fisheries management will continue to take place in situations where there is irreducible uncertainty due to the massive and difficult information problems associated with describing and understanding most fisheries. This is especially true in the case of the Gulf of Thailand, where fisheries management must balance the interests of multiple jurisdictions, coastal community dependence on fisheries for food security, the problem of overfishing, destructive fishing practices, and the inherently complex nature of the tropical multispecies fisheries in the region.

However, against this background of uncertainty and complexity, is a need to develop robust and workable solutions to fisheries problems in the Gulf of Thailand and South China Sea. It is well recognised that coral reef, seagrass, mangrove and wetland habitats contribute significantly to the productivity of coastal fisheries, and act as refuges for the majority of fished species during critical phases of their lifecycles. Approaches such as decentralisation and rights-based systems to the management of broader fisheries issues must incorporate strategies that aim to foster the dependence of fisheries on coastal and marine habitats. This will require developing mechanisms aimed at minimising fishery impacts on the habitats upon which fisheries depend.

The Regional Working Group on Fisheries Approach

The Fisheries Component of the SCS Project, entitled Over-Exploitation of Fisheries in the Gulf of Thailand, is focusing on the development of a regional system of fisheries *refugia* for capture fisheries management in the South China Sea and Gulf of Thailand. The Regional Working Group has recently prepared Regional Guidelines on the Use of Fisheries *Refugia* in collaboration with the Southeast Asian Fisheries Development Center. The increasing promotion of the use of Marine Protected Areas (MPAs) as fisheries management instruments, and several emerging initiatives at the global level aimed at establishing guidelines for the use of MPAs in fisheries management, have created a need for the Regional Working Group on Fisheries (RWG-F) to clearly define the similarities and differences between MPAs (and other spatial and temporal management tools) and fisheries *refugia*.

AN OVERVIEW OF REGIONAL WORKING GROUP ON FISHERIES DELIBERATIONS REGARDING THE USE OF MARINE PROTECTED AREAS IN SOUTHEAST ASIAN FISHERIES MANAGEMENT

MPAs are being increasingly advocated or conceived as fisheries management instruments. For instance, the Food and Agricultural Organisation of the United Nations (FAO) has recently initiated activities to develop international consensus about actions to be taken at national, regional, and global levels to improve and guide the use of marine protected areas as management and conservation tools for fisheries.

It is inevitable that fisheries ministries/departments in the region will have to become better at working with MPAs/marine reserves/habitat management areas and the environmentally “concerned” groups promoting such initiatives. However, given the high level of coastal community participation in Southeast Asian fisheries, the RWG-F has identified that the key challenge for these organisations will be finding the right conduit for achieving acceptance amongst communities of the purpose of any marine management area.

Are Marine Protected Areas the right conduit for achieving acceptance amongst fishing communities of specific locations used for fisheries and habitat management in Southeast Asia?

The RWG-F is of the opinion that they are not, but considers that it would be unwise to completely dismiss the idea of multiple use marine protected areas and fisheries working well together in the region. The group has reached this position as it feels that, while MPAs are often established under the umbrella of “improving the state of fisheries”, the criteria for the selection of MPA sites typically relate to the achievement of objectives for biodiversity conservation or political gain rather than fisheries management.

Members of the group have also indicated that, in their view, MPAs are widely understood by stakeholders to be areas that are closed to fishing¹. Experience in the region is that completely closing areas to fishing is a difficult if not futile task. For instance, the Philippines have trialed the use of no-take areas in fisheries, or fish sanctuaries², and due to problems with compliance and community

¹ An example that has been noted by the group is the Marine Protected Areas Sustainable Fisheries Programme of the Marine Programme of the IUCN World Commission on Protected Areas. This is focused on the Southeast Asian region and aims to encourage regional action plans for identifying, establishing, and networking no-take ecological reserves and facilitating access to funding for these activities. It also aims to guide fisheries managers in Southeast Asia regarding how to promote and enhance regional and national-level no-take activities to replenish fish stocks and preserve marine biodiversity <<http://www.iucn.org/themes/wcpa/biome/marine/programme.htm>>.

² Section 32 of the Philippines Fisheries Code defines 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.

acceptance are working to redefine the term “fish sanctuary” with an emphasis on sustainable use rather than prohibition. The RWG-F has stressed the importance of focusing on concepts of sustainable use and fishery-critical habitat linkages when communicating with government officials and coastal communities in Southeast Asia about spatial fisheries management tools, since 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 well accepted that initially there was a clear distinction between establishing MPAs for protection of biodiversity and fisheries, but it is felt that this distinction has been recently blurred by MPA advocates presenting general MPA benefits both in terms of biodiversity protection and fisheries. In order to achieve fisheries benefits, the use of MPAs as a fisheries management tool will need to give adequate consideration to the links between specific locations and the life-cycle of important species in the selection of MPA sites.

Are the links between specific locations and the life-cycles of important fish species being given adequate consideration in the selection of sites for inclusion in systems of MPAs that are being promoted in the context of their perceived fisheries benefits?

The RWG-F believes that they are not, and has been working to develop a concept of fisheries *refugia* for use in establishing a:

- System of fisheries management areas (fisheries *refugia*) in the South China Sea and Gulf of Thailand that focuses on the critical links between fish stocks and their habitats.

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

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

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

THE RWG-F APPROACH: THE NATURAL *REFUGIA* CONCEPT AND FISHERIES *REFUGIA*

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

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

During its Sixth Meeting in Sabah, Malaysia, 5th-8th September, 2005, the RWG-F felt uncomfortable associating any of the above *refugia* scenarios with important fishes in the region, largely due to a lack of information about the biology and population dynamics of most species at that time. There was,

however, consideration of the role of *refugia* in fisheries of other regions, with discussion of the example of high recruitment and catches of hake in the Mediterranean during the 1980s despite a complete lack of input/output controls and a high percentage of juvenile fish being caught by inshore trawlers. It was pointed out that it is believed this occurred due to larger spawning fish occupying deeper areas of the continental shelf in *refugia* created by the inefficiency of the fine inshore trawls for large fish, and making a major spawning contribution to the adjacent fishery.

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

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

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

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

Accordingly, the RWG-F is of the opinion that it will be very difficult to base fisheries *refugia* on actual natural *refugia*, and is promoting the use of the RWG-F definition of *refugia* (see Information Box 1) for the identification of fisheries *refugia* to “replace” those lost due to over-exploitation and the destruction of fisheries habitats. There is a common understanding that fisheries *refugia* relate to specific areas of significance to the life cycle of particular species, and that they should be defined in space and time, and serve to protect spawning aggregations, nursery grounds, and migratory routes.

INFORMATION BOX 1

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 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:

- 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.

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

SIMILARITIES AND DIFFERENCES BETWEEN SEASONAL CLOSURES, MARINE PROTECTED AREAS, AND THE CONCEPT OF FISHERIES *REFUGIA* DEVELOPED BY THE RWG-F

As the definition of fisheries *refugia* developed by the RWG-F focuses on sustainable use and clearly states that *refugia* will not be no-use areas, *refugia* cannot be substituted for permanent closures or no-take MPAs and vice versa. *Refugia* can, however, be compared to seasonal closures and multiple-use MPAs.

As outlined above, fisheries *refugia* will be established to maintain natural *refugia* and to create “replacement” *refugia* for those lost due to over-exploitation. In order to enable the countries involved to take some initial steps, the RWG-F definition of *refugia* has been framed broadly. The group has proposed that priority areas for *refugia* are those in which fish spawn and those in which juveniles seek shelter/food, and are initially looking at the identification of candidate *refugia* on this basis (Figure 1). This action is aimed at providing a starting point for a system of fisheries *refugia* in a situation where there is very little information about the location of natural *refugia* for the species they are dealing with (perhaps any species in the region for that matter).

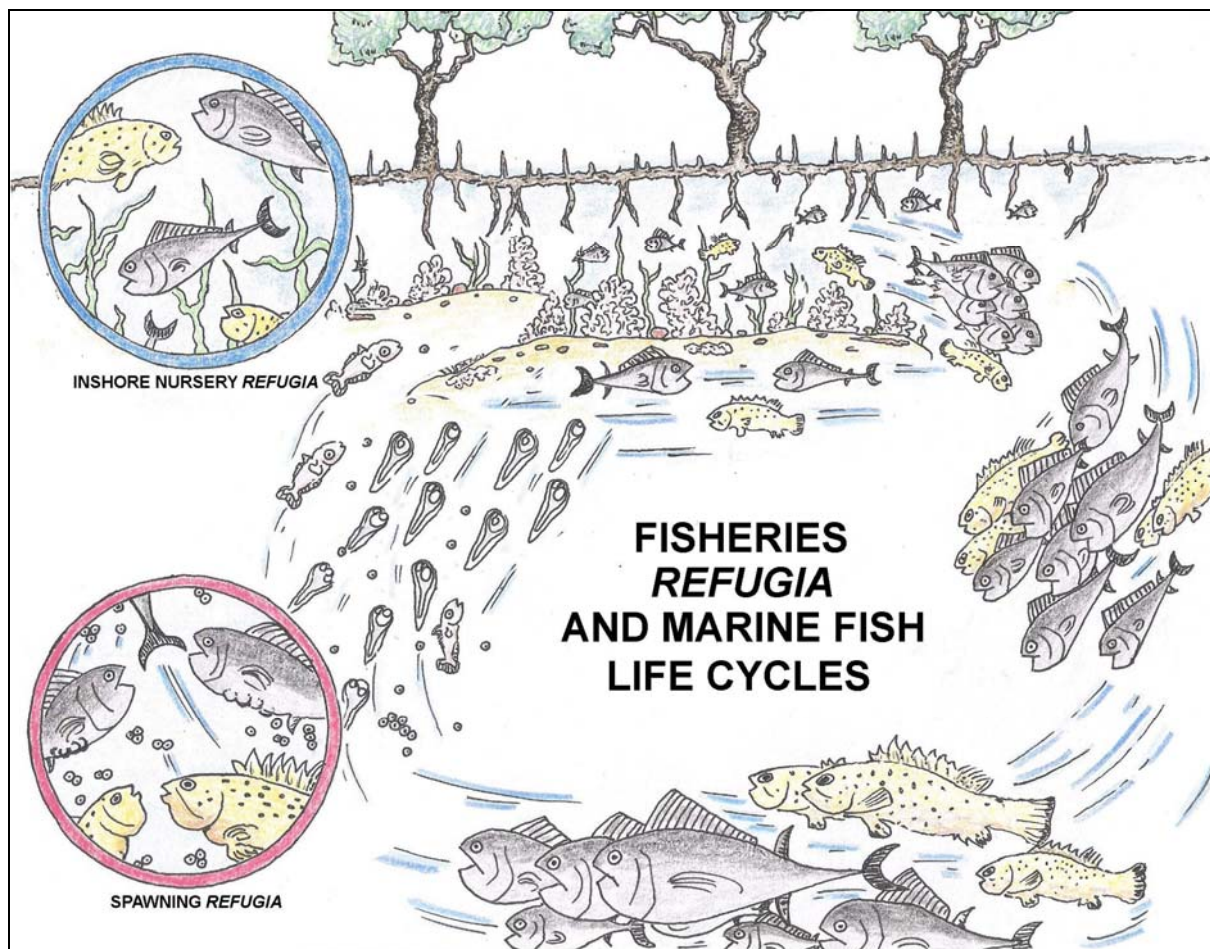


Figure 1 The *refugia* types prioritised by the RWG-F in relation to the generalised life-cycle of demersal marine fishes

In this sense, fisheries *refugia* are very different to the general seasonal closures used in fisheries. Another important difference is based on the fact that the short term area and seasonal closures commonly used in fisheries management (e.g. spot closures and closed seasons) are often implemented in small well-defined areas of fishing grounds. The fisheries *refugia* concept on the other hand, is based on areas of critical importance to the life-cycle of the species. This means that areas located outside the main fishing grounds for a given species, which are critical to the life-cycle for that species, qualify as fisheries *refugia* and can be managed accordingly. 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 species. It may also include interventions to provide habitat protection, for example, 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.

The group understands that individuals taking a “helicopter view” of the definition of *refugia*, and the initial actions of identifying important nursery and spawning areas, may misconstrue that the group is simply identifying areas for a regional system of seasonally managed areas (e.g. spot closures, closed seasons). An important role of the Fisheries Component of the SCS Project is to ensure that when such individuals take a “helicopter view” of this activity, they see a regional initiative working to (a) develop a system of fisheries *refugia*, including “replacement” of lost natural *refugia*, in order to build resilience in regional fisheries, and to (b) provide an institutional mechanism for improved fisheries and habitat management, i.e., management based on fisheries-critical habitat linkages. One aspect of this involves promoting the actions in terms of goals and objectives, rather than a working definition. General goals and objectives for this activity can be split into two categories: (a) resource-related and (b) institutional-related (see Table 1).

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

Consideration of these goals and objectives enables 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 spawning fish or to reduce the levels of fishing effort at times when pre-recruits are migrating to fishing grounds. A question regularly asked of the RWG-F is “do such spot closures and closed seasons qualify as fisheries *refugia*?” The answer to this question is “they do if the site has been selected in terms of achieving one or more of the resource-related objectives of the *refugia* system, and can be managed in the context of institutional-related goals and objectives for the regional system of *refugia*.”

A similar and perhaps more contentious question asked of the RWG-F is “do MPAs qualify as fisheries *refugia* and vice versa?” The simple answer to this question 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, with most aimed at achieving goals and objectives of biodiversity conservation. Similarly, the criteria for the identification of MPA sites usually relate to concepts of representativeness, comprehensiveness, and uniqueness, and a particular MPA cannot qualify as a fisheries *refugium* if the site was selected using these criteria. However, parts of multiple-use MPAs, such as fisheries management zones, may qualify as replacement fisheries *refugium* if:

- Such zones promote the concept of sustainable use rather than prohibition of fishing, and
- The selection of the zone was based on criteria relating to the critical linkage between the area and the life-cycle for which the area is managed.

However, it is essential that consideration be given to the fact that, if the site for a multiple-use MPA was identified using criteria that did not relate to fish life-cycle and critical habitat linkages, any fisheries management zone within that MPA may not be worthy of the research, financial, and management resources required for the development of that site as a fisheries *refugium* if compared to sites that were identified purely on critical habitat linkages. Similarly, poorly designed fisheries management zones within multiple-use MPAs may (a) lead to a loss of community support for spatial approaches to fisheries management, and (b) lead to the re-direction of fishing effort towards areas that are more important in terms of critical habitat linkages. Nevertheless, such zones should not be disregarded and may represent a class of *refugia* for consideration in any regional *refugia* system. Comparisons of the appropriateness of fisheries management zones within MPAs as *refugia* and fisheries *refugia* sites identified purely on the basis of fishery-critical habitat linkages will require the consideration of information relating to fish life-cycle and habitat associations at the fishery level.

A CHECKLIST FOR EVALUATING IF FISHERIES MANAGEMENT AREAS QUALIFY AS FISHERIES *REFUGIA*

The RWG-F has agreed that efforts of the Fisheries Component of the South China Sea Project to identify areas of natural *refugia* and fisheries *refugia*, i.e., replacements for natural *refugia* lost due to over-exploitation and habitat loss, should consider the appropriateness of existing spot closures, closed seasons, and fisheries management zones within multiple-use Marine Protected Areas as potential candidate sites for fisheries *refugia*. During its Seventh Meeting in Bangkok, Thailand from 16-18 May 2006, the RWG-F developed the checklist provided in Information Box 2 for use in evaluating at the regional level if individual spot closures, closed seasons, and fisheries management zones of MPAs qualify as candidate fisheries *refugia*. RWG-F members are currently using this checklist to identify existing fisheries management areas in Cambodia, Indonesia, Malaysia, Philippines, Thailand and Vietnam that may qualify as candidate fisheries *refugia* sites for inclusion in a regional system of fisheries *refugia*. A preliminary list of candidate sites, including managed and currently unmanaged areas that qualify as fisheries *refugia*, will be agreed by the RWG-F during its Eighth Meeting in November 2006.

INFORMATION BOX 2

Checklist for Evaluating if Fisheries Management Areas Qualify as Fisheries *Refugia*

- a. Has the site been selected in terms of achieving one or more of the resource-related objectives of the regional system of fisheries *refugia*?
- b. Can the site be managed in the context of achieving one or more of the institutional goals and objectives for the regional system of fisheries *refugia*?
- c. Does the management of the area focus on the concept of sustainable use rather than the prohibition of fishing?
- d. Will the use of the area as a fisheries *refugium* ensure that any required reduction in fishing effort does not lead to an increase in fishing effort or use of inappropriate fishing gears and practices in areas adjacent to the site that are more critical to the life-cycle of the species for which the *refugium* is managed?
- e. Have the potential benefits and costs to the community of managing the area as a fisheries *refugium* been considered and communicated to fishers?

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