Establishment of Marine *Refugia* in Malaysia: Conservation and Protection of Wild Penaeid Shrimp Stock in Baram, Sarawak and Wild Lobster Population in Tanjung Leman, Johor

Mohd Ghazali bin A. Manap
Department of Fisheries Malaysia
Persiaran Perdana, Putrajaya, Malaysia
email: gazalimanap@gmail.com

Abstract

The Department of Fisheries Malaysia (DOFM) has taken initial steps in ensuring that natural resources are not threatened with extinction by introducing the concept of special *refugia* for two commodities, such as the penaeid shrimp and lobster. Tanjung Leman in Johor (Southeast of Peninsula Malaysia) has been identified as special *refugia* for lobster, and Kuala Baram (Northeast of Sarawak State) as special *refugia* for the penaeid shrimp. Since 2006, annual landings of lobster (*Panulirus* spp.) in Johor had been dramatically decreasing below 500 metric tons (MT) from previously recorded which was 2059 MT in 2002. Landings of lobster had dropped particularly in the West Coast of Peninsula Malaysia while landings in the East Coast, such as in Sabah and Sarawak also showed decreasing trend to below 200 MT. For penaeid shrimp (*Penaeus monodon*), capture data mainly from Sabah and Sarawak also showed decreasing pattern from 1948 MT in 2003 to 1226 MT in 2013. The month of March is the highest peak for annual landings of lobster and penaeid shrimp in Malaysia, mostly delivered by trawlers. Harvest of lobster and penaeid shrimp had contributed around 89% and 74%, respectively, to the overall catch landings of the country. Currently, several committees and action groups involving various stakeholders in the two areas were established and plans of action for 2014-2018 serve as written guidelines and references for all stakeholders. The successful implementation of the concept of *refugia* for seasonal conservation of a freshwater fish in Sabah under the program called Tagal System, had been an inspiration of the concerned stakeholders, believing that such success could be replicated in other areas of the country and for other economically-important aquatic species.

Introduction

The concept of *refugia* which is different from protected area, had been legally introduced in Malaysia since 1996 when the DOFM gazetted Fisheries Regulation 1996 (Closed Seasoned to Catch Kerapu Fry) from November to December every year in the State of Kelantan and Terengganu (north-east side of Peninsular Malaysia) for 370 km long stretching beaches. Also in the same year, DOFM gazetted Fisheries Regulations 1996 (Prohibition of Method of Fishing Grouper Fry) allowing only fish traps to catch grouper fry along Malaysian coasts. Catching grouper fry without special permit during the closed season is considered an offence under this regulation. However, enforcing these regulations faced a lot of constraints to the Government in terms of financial resources especially in engaging government personnel to do the patrolling, providing fuel for patrol boats, allocating allowances for concerned staff, among others. In 2000, the Department of Fisheries Sabah introduced one concept that had been rejuvenated from traditional practices called the Tagal System. A traditional concept of co-management, this system involves the local communities in various disciplines to manage certain area for the conservation of native species of fish in wild environment. The aim of Tagal System is to strengthen the smart partnership between government agencies and local communities in protecting, reviving depleted river fish population, and then harvesting such resource in a sustainable manner for the benefit of the local communities.

Tagal System

The concept of symbiosis between local community and authority has been successfully adopted for freshwater fish conservation. The first Tagal System in Malaysia was introduced in the State of Sabah in 2001 to protect 30 natural river fish pools for the river mahsheer (*Tor tombroides*) (Wong, 2012; Said, 2015). Local communities acting as "local policemen" have played important role in controlling the access for fishing in a designated pool declared as a Tagal area. Penalties are imposed by the local leader to those committing any offence in the Tagal area.

Tourists to the Tagal area are allowed to visit and experience swimming with the fish, and conduct feeding activities but at the Green and Yellow Zones only. While the Green Zone is open for other activities including fishing (catch and release method) and fish feeding with permission from the local community, the Yellow Zone is only open for fish feeding but fishing is absolutely prohibited. The Red Zone, usually located at the upstream of a river, is permanently closed and considered as resource conservation pool.

Tagal System in Sabah which started with 30 areas in 2001 had expanded to 487 areas in 2014 and benefited 170,000 local communities in various economic activities. Seventeen districts in the Western State of Sabah comprising 192 rivers have already been involved in Tagal Programs. Success of the Tagal Program is highly dependent on the close collaboration and cooperation between local communities and government authority as demonstrated in **Fig. 1**.

Fig. 1. Partnership between local communities and Department of Fisheries for successful management of Tagal System in the State of Sabah

The roles of local communities in the Tagal System are:

a) to identify suitable sites to be developed as tagal areas;
b) to form a committee for tagal to be headed by a local leader;
c) to monitor and protect the tagal site from illegal poachers, overfishing and pollution;
d) to ensure that only sustainable manner of harvesting is allowed in tagal areas; and
e) to provide updated information on the progress and development of the tagal area to the Department of Fisheries.

The Government Authority (Department of Fisheries) is responsible for:

a) providing technical advice on tagal system to the concerned local community;
b) monitoring the progress of existing tagal system;
c) pursuing direct involvement in relevant R&D activities;
d) conducting study tour for tagal communities;
e) assisting local communities in launching new tagal sites; and
f) promoting agro-tourism.

Rationale for Implementation of Marine *Refugia*

From 2000 to 2014, landings of lobster nationwide sharply decreased from 1140 MT to 217 MT (as reported in the Annual Statistics of DOFM) which could be due to reclassification of data in the Annual Statistics between *Panulirus* spp. and *Thennus orientalis* in 2005. However, the real landings of *Panulirus* spp. are still low in spite of some areas which have already been identified as natural nursery ground for this species. Meanwhile, for the tiger shrimp (*Penaeus monodon*), intensive exploitation of broodstock from wild habitat for mass production in shrimp fry hatcheries also contributed to the decline in landings of this species. From 2000 to 2013, landing patterns for this penaeid shrimp declined from around 1900 MT to 1200 MT. The main gears used by fishers to catch these two species are trawl net and gill net, while March and November are identified as high season for landing of lobster and June to August for the tiger shrimp. Within Peninsular Malaysia, the State of Johore has been identified with the highest landing area for the spiny lobster. Meanwhile, the State of Sarawak are identified with the highest landing for tiger shrimp. Due to the high economic value of these two species which as well as high demand, and based on the principle of conserving while still abundant, these two species were selected as trial for the new Malaysian *refugia* area in Tanjung Leman, Johor and Kuala Baram for spiny lobster and tiger shrimp, respectively (**Fig. 2**). Both areas also experience rapid development and strong competition with other indsutries such as tourism, oil and gas explorations and rubber plantations.

Fig. 2. Locations of Kuala Baram and Tanjung Leman, in Malaysia

Implementation Malaysian Marine *Refugia*

The methodologies adopted for the implementation of *refugia* in Malaysia are based on four main components (Said, 2015), namely:

a) Identification and management of fisheries and critical habitat linkages at two (2) priority fisheries *refugia*
b) Improvement of the management of critical habitats for fish stocks of trans-boundary significance via national actions to strengthen the enabling environment and knowledge-base for *refugia* management
c) Information management and dissemination in support of national-level implementation of the fisheries *refugia* concept
d) National coordination for integrated fish stocks and critical habitat management

Coordination for the implementation of *refugia* in Malaysia involved two structures of management and two levels of national coordination committee (**Fig. 3**). The first is National Structure comprising two levels of coordination committees: first level committee is Policy and Decision Making; and second is Scientific and Technical Committee. Meanwhile, at the refugia sites, second level committee is established involving local stakeholders (communities and authorities) concerned with these two particular sites.

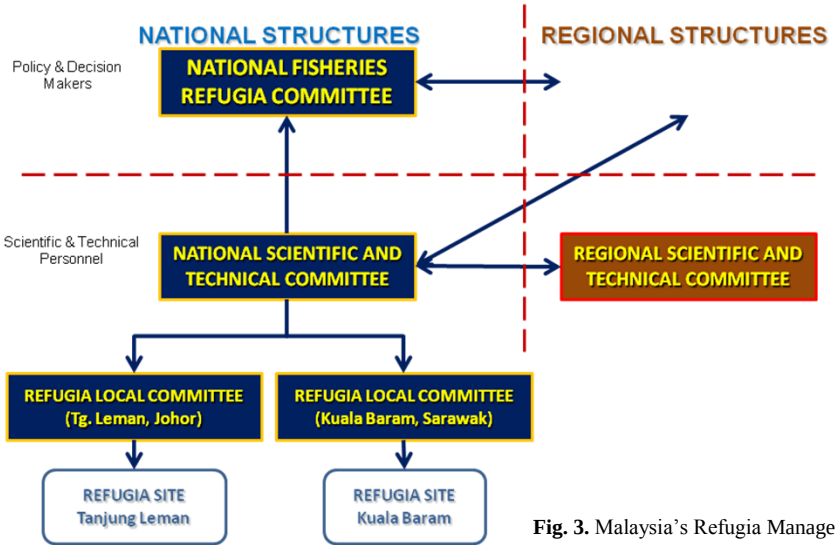

Fig. 3. Malaysia's Refugia Management Structure

The stakeholders involved for each committee are listed below while the detailed memberships in each committee are listed in **Appendix 1**:

a) First Level Committee
   i. Policy and Decision Maker Committee
   ii. Scientific and Technical Committee
b) Second Level Committee
   i. Tanjung Leman Refugia Committee
   ii. Kuala Baram Refugia Committee

Issues and Constraints

Active participation and support from local communities

Local communities hardly give their full cooperation and support to the *refugia* concept, limiting their efforts to catch fish all year round. This concept is already portrayed as a closed area where fishing is permanently prohibited. Furthermore, local fishers who are directly impacted from this partly conservation concept rely on lobster and tiger shrimp for their daily family incomes, seeking substitute incomes through other activities has become necessary to support the daily lives of fishers and their family needs during closed season.

Source of pollution from terrestrial activities

The two refugia sites are exposed and threatened with pollution from terrestrial activities. Tanjung Leman is surrounded with palm oil plantations and two crude palm oil refinery stations. While for Kuala Baram is located in famous oil-rich fields. Palm oil refinery, oil and gas industry and other terrestrial activities are major contributors and agents of pollution in the *refugia* areas. Therefore, the involvement of local authorities responsible for environmental quality is important in order that immediate actions could be taken to control pollution in the *refugia* areas.

Clear boundary

Conflict between fishers within refugia areas and fishers from other areas persist since clear boundaries of the *refugia* areas are not properly marked. Encroachment of fishers from other areas especially during the closed seasons has sparked tension and anguish among local fishers while watching other fishers fishing in *refugia* areas during closed seasons. Local communities are not empowered to arrest any encroachment by illegal fishers in *refugia* areas.

Migratory species

As noted, these two species are short-range migratory species. Lobsters from Tanjung Leman in Johor, Malaysia are known to migrate to adjacent Indonesian islands, while tiger shrimp in Kuala Baram *refugia* freely moved from Malaysia into Brunei Darussalam waters. These behaviors make all efforts in conserving the species and their habitats useless and difficult to measure it successfulness.

Experience from Tagal System

The fish in tagal has lost the ability to find food in natural environment. Most fishes in Tagal areas rely on artificial diets provided by visitors to Tagal areas.

Conclusion and Recommendations

Latest approaches of refugia with full participation of stakeholders, especially local communities are considered new concept in Malaysia. It is still in its initial stages and requires more intensive consultations and discussions on this newly introduced concept to get mutual agreement on management of the *refugia*. Awareness programs on the direct and indirect benefits of having *refugia* in their areas and their crucial roles in local community development would ensure successful adoption of this concept and sustain the continuity of this program. In addition, active participation of local communities in this new concept of *refugia* should be community-centered rather than top-bottom approach, in order to ease burden to the government and authorities concerned in enforcement as well as in controlling, safeguarding, reporting, monitoring and other government related activities.

Mutual agreement between authority and local communities will directly benefit the conservation of resources. The species that would be conserved through the *refugia* concept should be identified with the objective of protecting the scarce marine resources, such as the case of the spiny lobster and tiger shrimp, and raising the status of such species from being threatened to extinction. The bottom point in this concept is conserve will resources are still in abundance.

References

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Appendix 1

National Fisheries Refugia Committee (Policy and Decision Maker)

National Structure	Agency Involved
National Fisheries Refugia Committee ***Resource Management Division, DOFM Putrajaya (Secretariat)***	Department of Fisheries Malaysia (Chairmanship – Director-General of Fisheries Malaysia) Ministry of Agriculture and Agro-based Industry Ministry of Natural Resources and Environment (Biodiversity Division) Ministry of Modernization of Agriculture (MOMA) Sarawak. Economic Planning Unit Sarawak Economic Planning Unit Johor Malaysia Maritime Enforcement Agency (APMM) Royal Police of Malaysia Malaysia Fisheries Development Agency (LKIM) Ministry of Science, Technology and Innovation (MOSTI) Economic Planning Unit, Prime Minister Department Resource Management Division, DOFM. Fisheries Research Institute, DOFM. Resource Proctection Division, DOFM. Extension and Technology Transfer Division, DOFM. Planning and Development Division, DOFM. Legal Advisor Office, DOFM.

National Scientific and Technical Refugia Committee

Technical & Scientific Structure	Agency Involved
National Scientific & Technical Committee ***Fisheries Research Division (Secretariat)***	Fisheries Research Institute (Chairman – Director of Fisheries Research) FRI Batu Maung, Penang FRI Kampong Acheh FRI Bintawa FRI Rantau Abang Dept. Of Marine Park Malaysia Pahang State Fishereis Office Johore State Fisheries Office Sarawak State Marine Fisheries Office Universiti Malaysia Terengganu Universiti Malaysia Sarawak Universiti Malaysia Sabah National University of Malaysia Sarawak State Forestry Department World Wide-fund of Nature for Flora and Fauna (WWF) Malaysia Nature Society
	Johor State National Parks Department Pengerusi Refugia Perikanan Tg. Leman Pengerusi Refugia Perikanan K. Baram

Refugia Local Committee

a. Tanjung Leman Local Refugia Committee

Local Structure	Stakeholder Involved
Tg. Leman Local Refugia Committee, Johor	Mersing District Fisheries Office Rompin District Fisheries Office Mersing Fisherman Association Rompin Fisherman Association Fisheries Development Authority District of Mersing Mersing Land and District Office Local Enforcement Agency Trawler Vessel Owner Associaton Fisheries Ecosystem Community of Tg. Leman Johor State National Park Director

b. Kuala Baram Local Refugia Committee

Local Structure	Stakeholder Involved
Kuala Baram Local Refugia Committee, Sarawak	Sarawak Region 3 Fisheries Office, Miri. Sarawak Fishing Vessel Owner Association, Miri Chapter. District Fisherman Association. Fisheries Development Authority District of Miri. Miri Land and District Office Malaysia Maritime Enforcement Agency (MMEA) Petroleum Nasional (PETRONAS) Fisheries Ecosystem Community of Kuala Baram