

ANNEX 8: PROGRESS WORKS BY MALAYSIA

Part 1: Spiny Lobster Refugia

DEVELOPMENT OF A REFUGIUM MANAGEMENT PLAN FOR THE MUD SPINY LOBSTER (*Panulirus polyphagus*) AT TANJUNG LEMAN, JOHOR

Presented in RSTC6

Samut Prakan

Thailand

4-6 July 2022

Distribution of lobster *Panulirus polyphagus* in Malaysia

- Spiny lobster is a carnivorous predator feeding
- Found in shallow and deep water depend on their stages of life cycle
- Egg & Phyllosoma- offshore
- Juvenile-1-2 years -Inshore
- Adults Offshore 2-3 years
- Area found in Southern part of east Johor coast

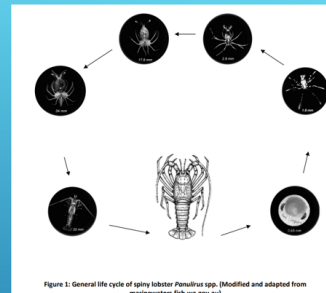


Figure 1: General life cycle of spiny lobster *Panulirus* spp. (Modified and adapted from marinewaters.fish.wa.gov.au)

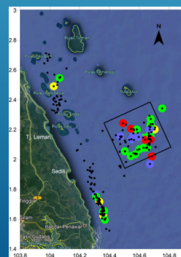


Fig 2c: Main spiny lobster fishing grounds in FT Labuan. Source: Chen & Zakaria, 2018

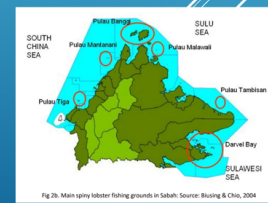


Fig 2b: Main spiny lobster fishing grounds in Sabah. Source: Busing & Chio, 2004

THREATS TO THE LOBSTERS' POPULATION

- ▶ Declining trend since early 2000's had triggered the push towards conserving the lobster population in Malaysia
- ▶ Habitat degradation, illegal fishing activities, and over-fishing are the key drivers that deteriorated the lobster population in the area
- ▶ To deal with this declining resource, recommendations for the implementation of a lobster refugia in Malaysia
- ▶ Present status stock is in overfished area:
 - ▶ F/F_{msy} 1.94
 - ▶ B/B_{msy} 0.3

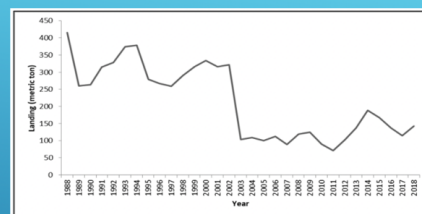


Figure 3: The landing trend of spiny lobsters in the east coast of Peninsular Malaysia during a thirty-year period (1988 – 2018) (Source: Siow et al., 2020)

THE MANAGEMENT STEERING FRAMEWORK

- 35- Series of number in technical report of network meeting and activities has been done
- Latest report on
 - Development of Refugium management plan for the mud spiny lobster at Tanjung Leman
 - Management plan for the tiger prawn refugia at Kuala Baram

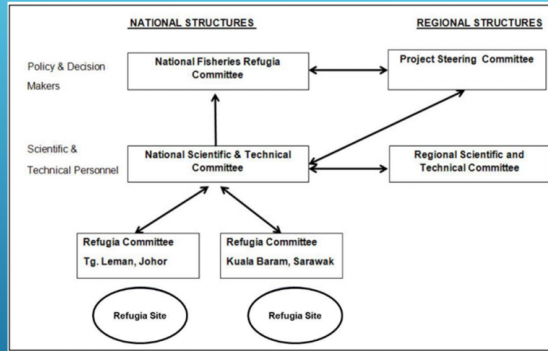
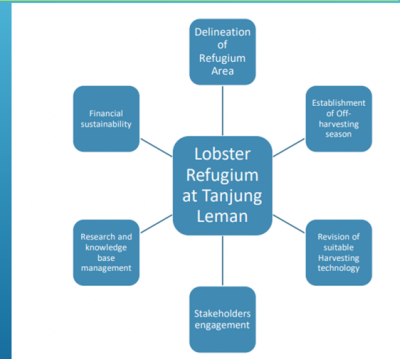


Figure 4: The national and regional coordination mechanism for the execution of Fisheries Refugia in Malaysia (Source: Siow et al., 2020)

STRATEGIES AND COMPONENT OF REFUGIUM PLAN

To achieve the refugium's objectives, the current management plan endorsed the following strategies to address their key concerns highlighted in the publication. Table and Figure elaborated the key strategies that formed the framework for lobster refugium management plan at Tanjung Leman, Johor

Component for the establishment of lobster refugia	Strategies	Related Outputs
OTU/ Targeted species	To elaborate lobsters' biology and reproduction cycle	To identify suitable harvesting technique for sustainable fisheries
Establishment of refugium area	To outline potential migration patterns of the spiny lobster	To delineate critical area to sustain lobster population in the area
	To identify area of potential settlement of the lobster's larvae	
Off-season proposal for lobster refugium	To identify target groups for public awareness and dissemination of information	To collect information for public awareness program
	To identify strategic period for closure of lobster fishing ground in the area	To identify critical period/ time/ spawning in a year for the lobster population
Insufficient scientific data for decision support system	To identify information gaps and method for data collection	To involve fishers in the data collection of sustainable lobster fisheries

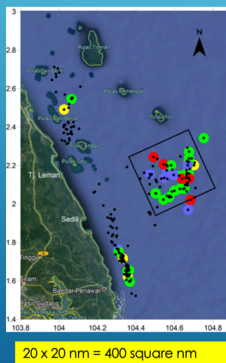


DELINEATION OF LOBSTER REFUGIUM AT TANJUNG LEMAN

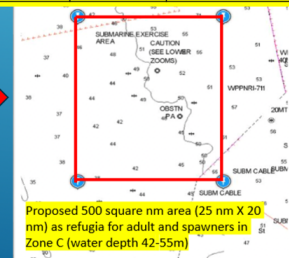
► The proposed delineation based on the current circulation pattern, habitats and critical area for the migration route as well as sensitive area for the lobster- **PROPOSED A SITE WITH MINOR COORDINATE ADJUSTMENT-**

Justification:

1. Since nursery area in Zone A are also a major fishing grounds for traditional fishers, at initial stage to gazette only spawning ground as refugia in Zone C. Next step will be followed by refugia in Zone B and Zone A after some progress of refugia in Zone C.
2. This strategy is to prevent social conflict with traditional fishers in zone A and at the same time the DOFM has more time for public awareness campaign activities to them.
3. The most potential area to be gazetted as first lobster refugia in zone C. This area was located in was suggested from studied earlier in Zone Southern part of Pulau Aur, in Johor waters and have a high concentration of mud spiny lobsters compared to other areas.
4. This area also has a higher density of adult female lobsters including berried females which are ready to release its eggs.
5. New coordinates is good for management and monitoring purposes during enforcement activity by the DOFM officers and for good memories for fishing vessel skippers



Position	Latitude	Longitude
Point 1	N 1° 55.000'	E 104° 30.000'
Point 2	N 2° 20.000'	E 104° 30.000'
Point 3	N 1° 55.000'	E 104° 50.000'
Point 4	N 2° 20.000'	E 104° 50.000'



	<h2 style="text-align: center;">ARTIFICIAL REEFS FOR LOBSTERS</h2> <ul style="list-style-type: none"> ▶ Alternatives to resolve the conflicting issue with in fishes and management is to introduce artificial reefs into the refugium ▶ Artificial reefs for Post-larvae, Juvenile and Sub-adult Lobsters ▶ Artificial Reefs for Adult Lobsters ▶ The artificial reefs can serve two major roles: <ul style="list-style-type: none"> ▶ 1. Establish new habitats for the lobster in the area. These new "artificial" habitats can potentially be the no take zone within the refugium ▶ 2. To deter operation of bottom trawler within the refugium. Bottom trawling has long known to be destructive to the benthic ecosystem. This destructive method should be phased out in stages and replace with a less destructive fishing method 	
	<h2 style="text-align: center;">ESTABLISHMENT OF OFF-HARVESTING SEASONS</h2> <ul style="list-style-type: none"> ▶ The aim of the off-harvesting seasons establishment is to protect this resource during the major spawning period ▶ Defined as the prohibition of any activity regarding fishing of spiny lobster within a certain period. ▶ Already started in 2021- July to Sept. ▶ During the closure, spiny lobster shall not be harvested, possessed, purchased, or sold. 	
	<h2 style="text-align: center;">REVISION OF HARVESTING SIZE AND TECHNOLOGY</h2> <ul style="list-style-type: none"> ▶ The main problems that affect the sustainability of spiny lobster resources are the capture of undersized lobster. ▶ Undersized lobster is captured and accepted for trading to increase profitability ▶ In order to establish guideline for harvesting size and technology, thorough literature related to the size at sexual maturity of spiny lobster and fishing gear in Malaysian coastal waters areas will be accumulated, and a comprehensive literature review will be made to clarify the status of Malaysia spiny lobster and the technical aspect capturing the lobster. ▶ The estimated size at maturity for the spiny lobster at the proposed refugia site-This size could be suggested as minimum CL to catch <ul style="list-style-type: none"> ▶ males was 6.58 cm - 8.18 cm CL ▶ females was 6.75 cm- 7.58 cm (based on CPL). 	

STAKEHOLDERS ENGAGEMENT

- ▶ DOFM has carried out several stakeholder engagements/consultations prior to this project
 - ▶ 2017- Consultation with the artisanal fishermen from East Coast of Johor
 - ▶ 2018-Consultation with the trawlers fishermen from Endau dan Sedili and
 - ▶ 2018-Refugia Project Consultation with various stakeholders
 - ▶ 2018-Consultation with the fishers from Pahang and Johor
 - ▶ 2019-Consultation with the fishers from Pahang and Joho
 - ▶ 2021- Engagement session with trawlers
- ▶ Information Center:
 - ▶ To create public awareness and spread information about the fisheries refugia concept to the public
 - ▶ DOFM has established Refugia Information Center (RIC) at Tanjung Leman Ferry Jetty in November 2017 to promote the concept of fisheries refugia to the public.

FORMULATION OF REFUGIA MANAGEMENT PLAN

- ▶ In preparation of the refugium management for lobster at Tanjung Leman, Johor, the outputs of the six key components as presented in **Strategies and Component of Refugium plan** will be used as the fundamental for the Lobster Refugium Management Plan in Tanjung Leman, Johor
- ▶ The lobster refugium plan, as any other management plans is a dynamic document which should be updated regularly to stay relevant.
- ▶ The management plan will provide guides and key performance indicator for the efficiency of the management in the respective aspect of importance.
- ▶ The key performance indicator will be used as a benchmark for the efficiency of the management plan, which will be review from time to time.
- ▶ The frequency of review shall be based on the efficiency of the plan, as well as changes in the government policy.

Part 2: Gtiger Prawn Refugia

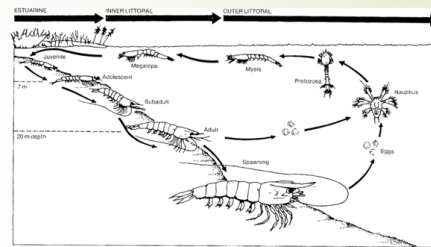


MANAGEMENT PLAN FOR TIGER PRAWN REFUGIA AT KUALA BARAN MIRI SARAWAK

Presented in **RSTC6**
Samut Prakan
Thailand
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Distribution of *P. monodon*

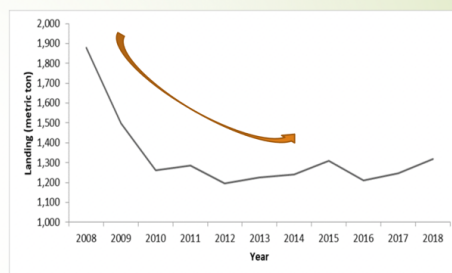
- Ecologically, penaeid shrimps have to go through two major ecosystems: the offshore and the coastal inshore environments in order to complete their life cycle
- Mature penaeids breed in deep water while post-larval and juvenile stages inhabit inland marshes, estuaries, brackish water and mangrove areas, then they migrate back to the sea for maturation and breeding



Life cycle of *P. monodon*

Current threats to tiger prawn population

- P. monodon* has been extensively farmed to meet increasing demand, they were also caught in the wild for production and spawners collection for seed production purposes.
- The high dependency of wild-caught spawners for seed production thus resulted in over-exploitation of the natural population, affecting the sustainability and biodiversity of fishery resources
- The declining number of tiger shrimp landing was reported between from 2008 to 2018 due to unrestricted coastal development.
- The problem of over-exploitation of the tiger prawn resource is aggravated by the deployment of destructive fishing gears such as beam-trawl and mechanized push net in the coastal prawn nursery areas.
- Prawn nursery area in the riverine ecosystem is also affected by deforestation of mangrove area for development and housing



Present status stock is in recovery area:
 $F/F_{msy} 0.99$
 $B/B_{msy} 0.96$

The management steering framework

- 35- Series of number in technical report of network meeting and activities has been done
- Latest report on
 - Development of Refugium management plan for the mud spiny lobster at Tanjung Leman
 - Management plan for the tiger prawn refugia at Kuala Baram

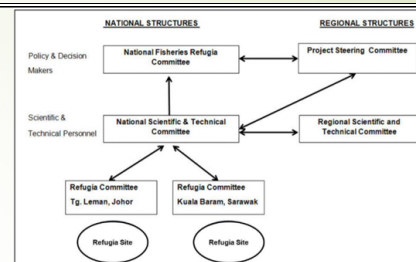


Figure 4: The national and regional coordination mechanism for the execution of Fisheries Refugia in Malaysia (Source: Siow et al., 2020)

Based on the previous engagement session (Department of Fisheries, Malaysia, 2021),

- All stakeholders agreed with the proposal of the tiger prawn refugia establishment.
- August to October will be regulated as the closed season for tiger prawns.
- This regulation is applicable for all trawlers at Zone C7. All fishing activities by the trawlers must operate at 12 nautical miles from the shoreline.
- 2021 will be the first year of the implementation of this regulation
- The department also encourages the fishermen to comply with this regulation voluntarily for this year. In the year 2023, the department will fully enforce these regulations.
- For tiger prawn, specifically for Kuala Baram, the Close season from August to October will be included as an additional clause in the Vessel License and Fishing Equipment for fishermen's Zone C7.

Key components and strategies of tiger prawn refugia establishment

Component for tiger prawn refugia establishment	Strategies	Related outputs
Focused area for refugia establishment	To determine the migration pattern of tiger prawn from larvae to adulthood.	Identify potential area for tiger prawn fishing activity and protect vulnerable populations.
Protection of spawners and seasonal closure	To determine the ovarian maturation stages	Preserve spawners population to allow more natural larvae production.
	To determine the length of tiger prawn at maturity	To protect the harvested species and prevent overfishing.
	To propose off-season for tiger prawn	Yearly scheduled area closed for fishing.
Data acquirment for decision support system	To identify information gaps, insufficient data and method	To allow better data collection method and analysis for sustainable tiger prawn fishing plan.
Stakeholders engagement	To facilitate and validate the proposed management with stakeholders	Ensure an accurate representation of information regarding the program from relevant parties.
		For a smooth collaboration setting.
Developing refugia trust fund	Financial model for effective mix of finance solution	For financial sustainability: lower cost, increase capital flow.

Designated area for refugia

- Fig. 4 showed the location of the proposed tiger prawn refugia site off Kuala Baram (red-dash lines), covering an area of approximately 556 km². (55,600 hectare)
- Adjustment at sea based on having tiger prawn during fishing activities and
- In Mangrove area to protect nursery area of the tiger prawn post-larva and juvenile in the 5 rivers Sg. Pasu, Sg Lutong, Sg. Miri, Sg. Bakam Sg. Sibuti



Table 3: Coordinates of proposed area of tiger prawn refugia site.

Point	Longitude	Latitude
A	N 04° 35.000'	E 114° 04.000'
B	N 4° 39.000'	E 114° 03.000'
C	N 4° 46.000'	E 113° 55.000'
D	N 4° 43.000'	E 113° 49.000'
E	N 4° 24.000'	E 113° 59.000'

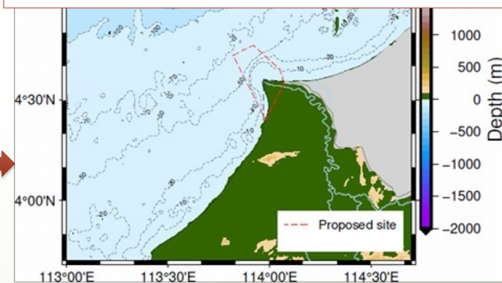


Fig. 4: Proposed tiger prawn refugia site off Kuala Baram.

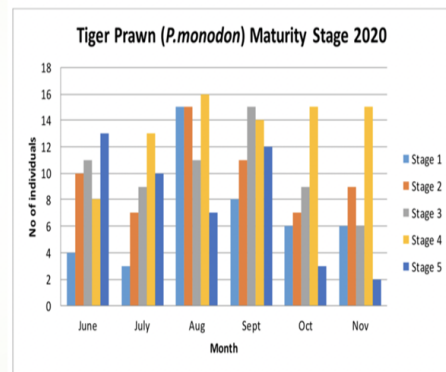
Population preservation and restoration effort

Population preservation and restoration effort

- Mangrove buffer zones** of 50 to 100 m facing open seas and 20 to 50 m along riverbanks should be preserved to protect the nursery area of the tiger prawn post larvae and juvenile
- Stock enhancement program**
 - Whereby prawn fries produced from Kuala Baram spawners in the hatchery are release back into these rivers should be carried out at least twice a year. This is to increase prawn stock in the refugia area as well as the surrounding sea.
 - Stock assessment and biological survey for post larvae and juveniles prawn in the area before and after the release program should also be carried out
- Stock assessment** for the tiger prawn resource in the refugia area is to be carried out once a year to ascertain the success of the demarcation of the area in preserving the stock

Protection of spawners and seasonal closure

- Numerous studies have shown that environmental factors can directly and indirectly affect prawn's life cycles in many ways
- In the worst-case scenario, a change in the environment can cause the recruitment of prawn to collapse
- In Kuala Baram, all sizes of *P. monodon* and all maturation stages, from immature juveniles to mature adults and berried females, are harvested. This scenario is especially dangerous because it will cause the collapse of a population in near future.
- Base research on ovarian maturation stage finding,
 - **Implement closure or other protective measures in August until October to ensure that females are protected during such a high reproductive output period**



Revision of harvest methods and gears

- **Fishing gears and trawling areas**
 - A total of 112 fishers operating drift net, hook & line, trammel net and trawl net (twin out-rigger) are being used at the coastal waters up to 15NM offshore in Miri.
 - The number of licenses by zone: C12-30; C10-1; C7-24 and the rest (57 boats) are traditional operators from zone B and A.
 - With the new regulation of shifting the trawling area to 8NM and above, the areas of less than 5 NM are considered protected from trawling activities where the stations of high concentration of tiger shrimp spawners are in the range of 4.47 – 5.76 NM
- **Harvest strategy- use the Limit Reference Points**
 - The primary strategy would be to introduce measures that would reduce fishing capacity by 50% through limited access and the use of rights-based approaches in small-scale fisheries.

Identification and engagement with stakeholders

- Most of the fishermen involved in the harvest of *P. monodon* are small-scale fishers that operate along the coastal zones and utilize traditional gears, although there are also some fishermen that operate trawlers and purse seine in deeper off coastal zones of more than 5 nautical miles.
- The establishment of a refugia requires the combined effort from various stakeholders.
- Public participation and the active involvement of community players are critical to ensure the successful implementation and sustainability of any refugia management plan
- The latest stakeholders' engagement with other relevant stakeholders, including Miri Port Authority, Sarawak Fishing Vessel Association, Department of Marine Fisheries, Sarawak, Sarawak Forestry Corporation, Miri Fishermen Association, Department of Irrigation and Drainage Branch Miri, and Sarawak Rivers Board was held on 23rd September 2021 and 21st October 2021
- Based on the report, all stakeholders understand the importance of the establishment of *P. monodon* refugia to safeguard the wild *P. monodon* populations at Kuala Baram, Miri, Sarawak.



Summary

- The establishment tiger prawn refugia requires careful and detailed representation of important aspects such as their life-cycle followed the determination of their weight-length relationship, environmental conditions and their harvesting methods and gears.
- The involvements of specific parties; the stakeholders and the government bodies are important for management and financial sustainability throughout the entire refugia plan.
- According to acquired preliminary data and observable anthropogenic impact, more conservation efforts are required to ensure that the population of tiger prawn at the refugia area are not affected.
- Furthermore, financial sustainability research is necessary for a long term establishment of tiger prawn refugia.