



**Establishment and Operation of a Regional System of Fisheries Refugia in  
the South China Sea and Gulf of Thailand**

**POLICY BRIEF**

**FISHERIES REFUGIA FOR SQUID MANAGEMENT  
IN BANGKA-BELITUNG**

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# POLICY BRIEF

FISHERIES REFUGIA FOR SQUIDS MANAGEMENT IN BANGKA-BELITUNG



## Executive Summary

Squid has been known as a strategic fisheries commodity in Bangka Belitung Province. Nevertheless, environmental degradation and fishing pressure have been identified as the main threats to squid resource sustainability. To overcome these issues, the squid fisheries refugia may be implemented to regulate the fishing activity (open-close fishing area and season) and habitat rehabilitation. The recommended habitat for squid refugia was 229.721,48 ha and the rehabilitation area was 51.751,86 ha.

## Introduction

Bangka Belitung Province, one of the squid landing centers in Indonesia, whose known as a fisheries area which able to produce export-grade quality in the world fisheries trade. Thus, the squid was considered to become the leading fisheries commodity in Bangka Belitung Province. Squid production from this Province recorded during 2015-2019 achieved 388,48 – 1,203 tons/year (637,68 tons in annual average) and was valued at 1,42-5,27 million USD (2,68 million USD in annual average) (Bangka Belitung Province Export-Import Statistic Report, 2015-2019).

Ecologically, Bangka Belitung waters play an important role in squid resource sustainability in Indonesia's Fisheries Management Area (IFMA) 711, especially as a habitat for squid spawning, egg-laying, and nursery. The squid was susceptible to intensive fishing pressure, aquatic environment change, and degradation. Those factors were caused by the presence of tin mining activities on the coastline along Bangka Belitung Province.

The existence of overlapping functions and utilization of coastal areas is an issue for the sustainability of squid resources in Bangka waters. Strategic management by considering the important role of squid resources and its habitat was essentially required to overcome the issues.

Fisheries refugia are defined as 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 (UNEP, 2007). In the fisheries refugia concept, it was used an approach that involves areas management, which has been scientifically proven for having an important ecological role in the squid life cycle, to promote resource sustainability. Those areas were managed by implemented regulations, e.g., area protection and fishing regulation. This study proposes the implementation of squid fisheries management in Bangka waters by using a fishery refugia approach to maintain its sustainability.

## Squids, an important fisheries commodity in Bangka Belitung Province

The potency of squid fishing from IFMA 711 achieved 32.369 tons which were known top three squid production in Indonesia after Java Seas and Malacca strait (IMMAF decree No 19/2020). The exploitation rate of squid in IFMA 711 is categorized as fully-exploited. This condition required proper management by considering a precautionary approach. Squid production in Bangka Belitung Province has been recorded to have fluctuated, annually.

Squid production during the last ten years (2010-2020) showed a declining trend from 2011 to 2017. Nevertheless, a production increase was also observed from 2018 to 2019, significantly, followed by a slight decline in 2020 squid production (Figure 1). Interestingly, significant squid production increased in 2018-2019 but was not followed by incensement of squid abundance indices in Bangka Belitung waters.

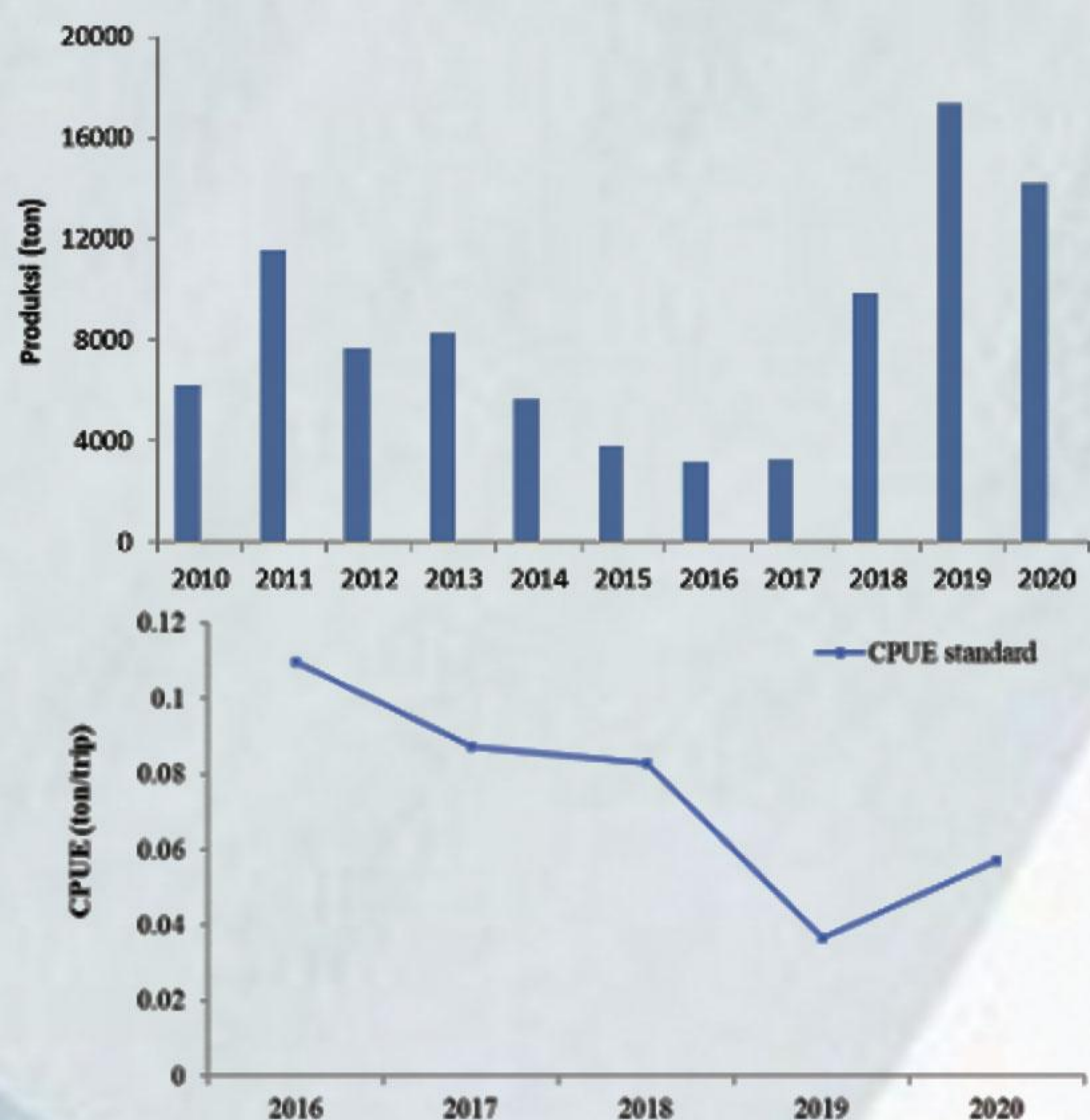


Figure 1. Squid production and catch per efforts unit (CPUE) in Bangka Belitung Province

Squid fishing was conducted throughout the year by implementing several fishing gears, i.e., squid jigging and lift net. The peak of the spawning season was from April-June and October-November (Figure 2). Squid species landed in Bangka waters were dominated by Mitre squid (*Uroteuthis chinensis*) and a minor catch of Bigfin squid (*Sepioteuthis lessoniana*) (Figure 3). All those squids were matured and mostly ripe when captured. This was due to the fishermen targeting ripe squids which were required for squid egg-chips industrial production.

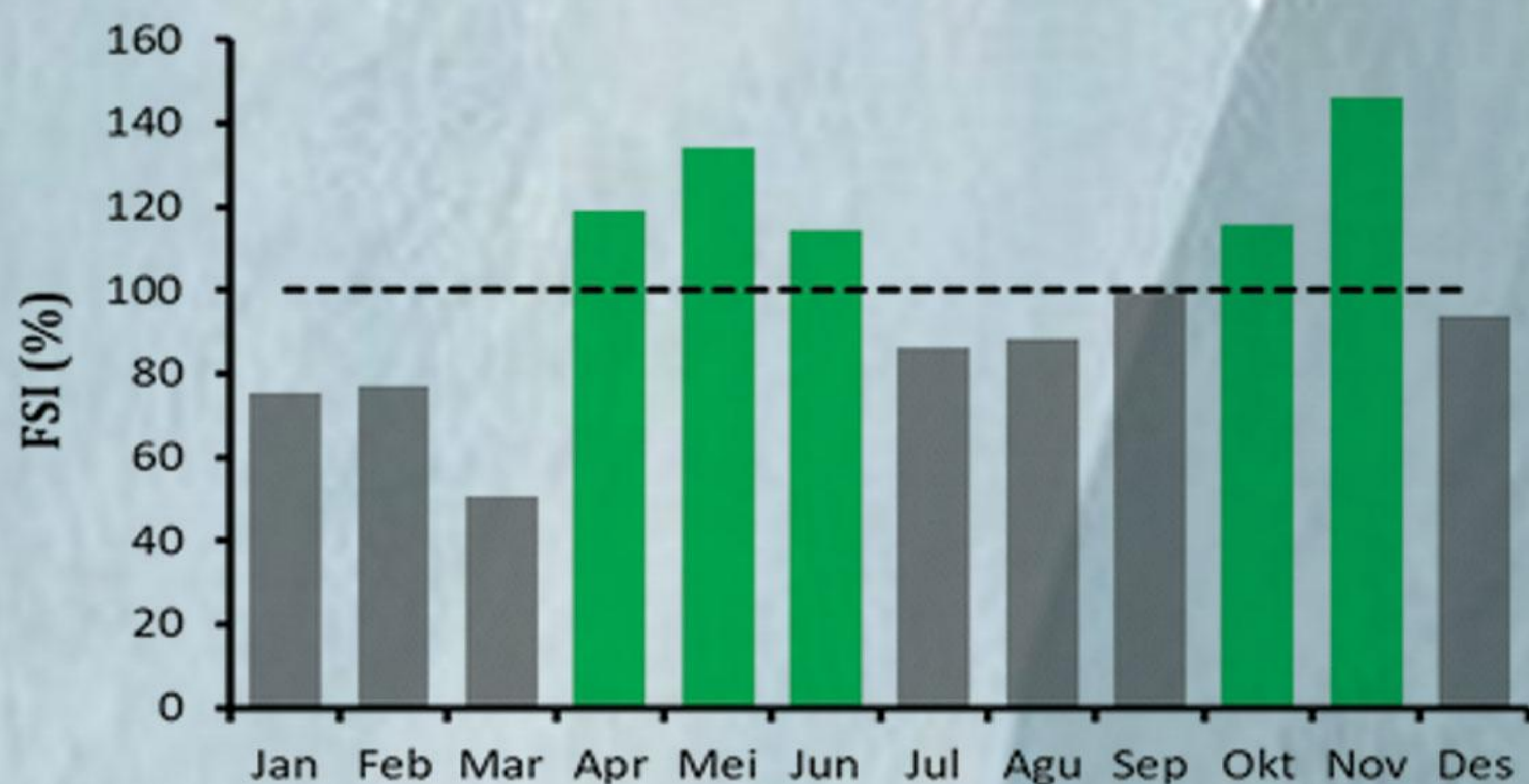
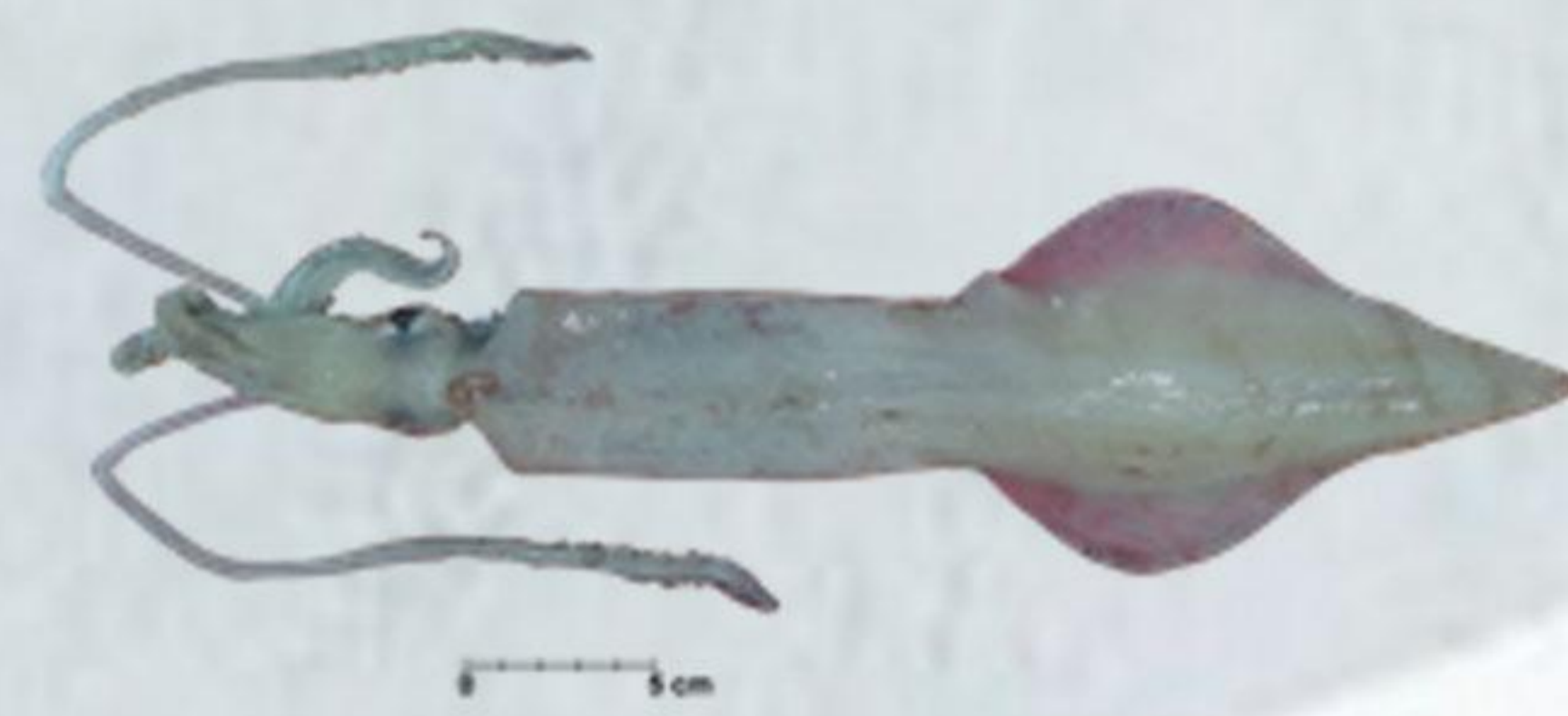


Figure 2. Squid fishing season indices



*Uroteuthis (L.) chinensis*



*Sepioteuthis lessoniana*

Figure 3. Squid species from Bangka Belitung Waters

Squid exploitation in Karimata strait (Bangka Belitung Province and its adjacent area) was mostly fished by fishermen from Java Island and was to be landed in Jakarta and Cirebon (West Java Province). Squid fishermen in Bangka Island mostly fish squid only in the coastal area of Bangka Island and Karimata strait water (Figure 4).

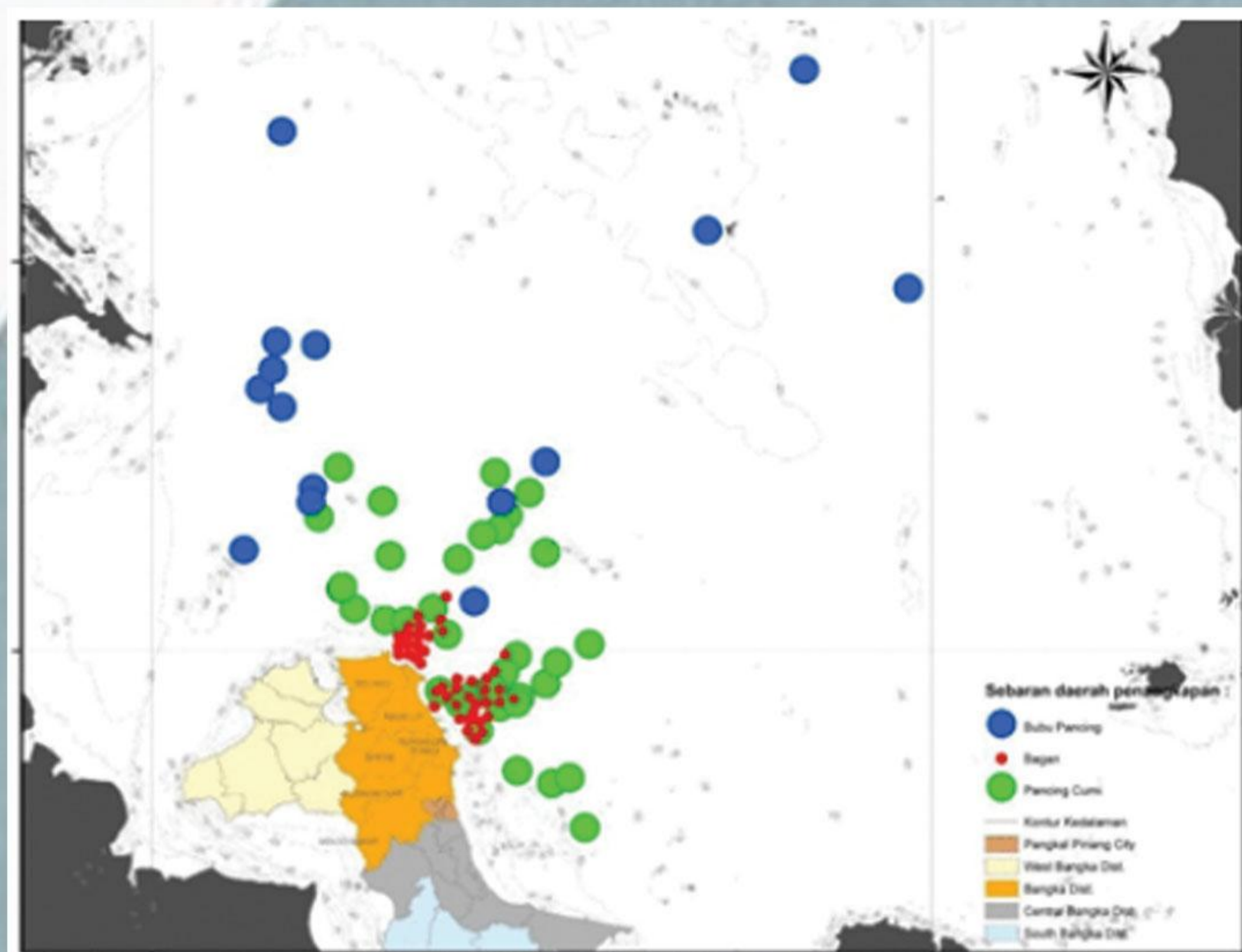


Figure 4. Squid fishing ground in Bangka Island.

## The coastal ecosystem of Bangka Belitung is a critical habitat for squid

In general, squids could be found in shallow water, close to the coastline, around seagrass or coral reefs ecosystem which has 700 m in depth, approximately (Jareb & Roper, 2010). Preferential spawning habitat for squid was also known to have ecologically functioned coral reefs and sea grass ecosystems belonging to low turbidity. This ecosystem condition was essential habitat for the squid's life cycle.

Seagrass and coral reef ecosystem potency in Bangka Belitung waters was 11.646,9 ha and 17.744,85 ha, respectively. Both ecosystems provided huge potency in establishing ecological function as essential habitat for squid and provided squid resource stock for both local stock in Bangka Island and squid stock in IFMA 711.

Today, the seabed of Bangka Belitung coast was facing tin mining activities. This mining activity triggered lower seawater visibility by the input of a large amount of sediment. Recently, seawater visibility on Bangka Island was 50% of its average depth. This showed us that seawater visibility in Bangka waters was relatively low. In addition, lower visibility and high sedimentation rate were also promoting a direct impact on the squid habitat essential for squid spawning and egg-laying.

## Delineation of critical habitat for squid resources

Based on scientific consideration, An area of 1.529.097,93 ha, consisting of 1.212.572,60 ha of spawning area and 316.525,33 of egg-laying area, was recommended as potential Fisheries Refugia areas for squid. The proposed spawning area consisted of four sub-area, i.e., Tuing water (261.451,12 ha), Dua island (247.125,06 ha), Karang Sembilan (253.085,07 ha), and Karang Timah (250.911,35 ha). The proposed egg-laying area covered 4 miles of coastal waters from the western to the northern side of Bangka island, coastal water of Bangka, coastal water of Pangkal Pinang, and coastal water of Bangka Tengah (184.420,92 ha), Kelapa Island (46.294,32 ha), Dua Timur Island (1.764,22 ha), Dua Barat Island (713,43 ha), northern water of Dua Island (963,87 ha), Karang Jagur (1.790,10ha), Karang Mejan (713,43 ha), Karang Sembilan (18.042,16 ha) and Semujur Island water and Gusung Asem (61.811,88 ha) (Figure 5).

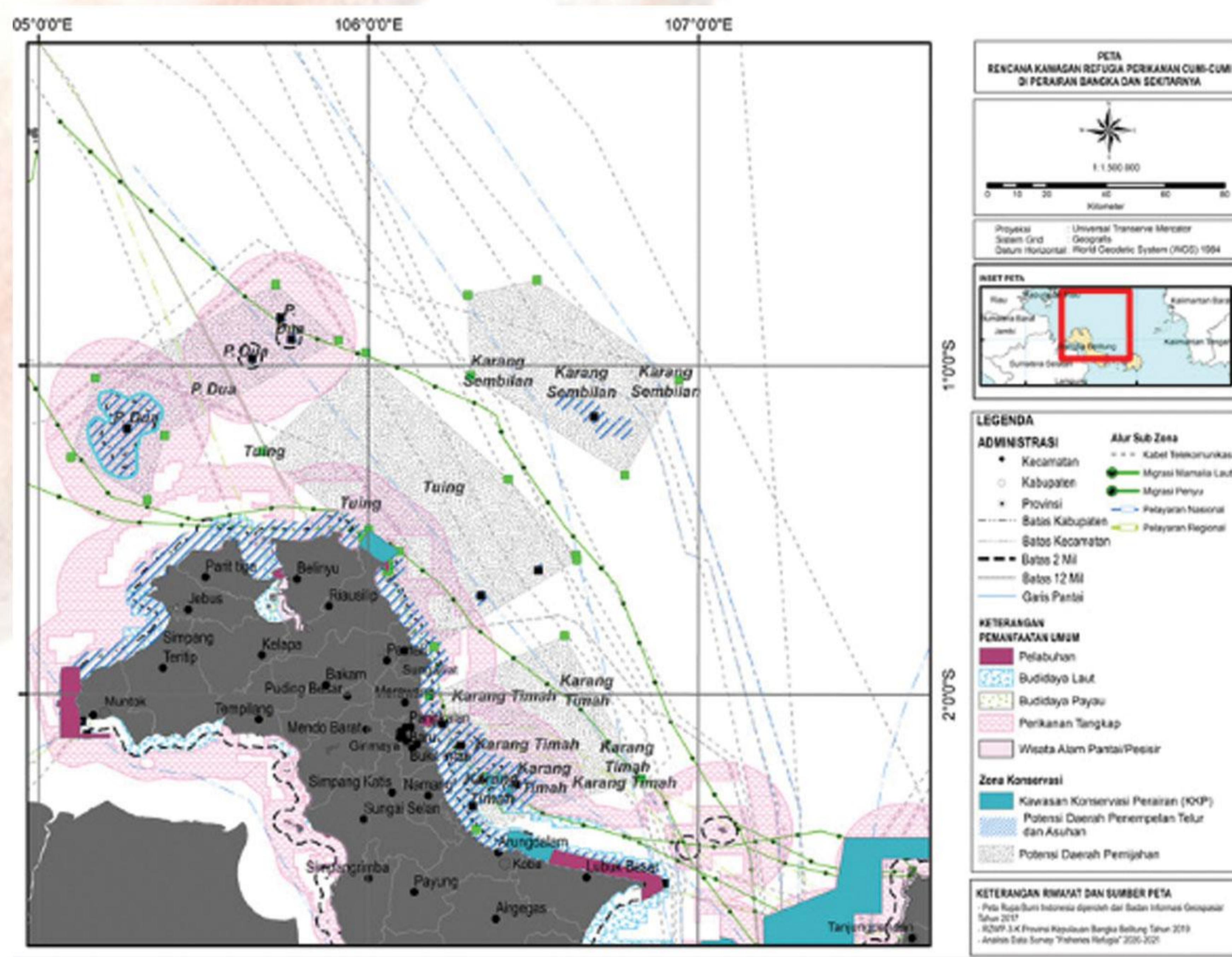


Figure 5. Potential area recommended for squid fisheries refugia in Bangka Belitung Province.

Furthermore, from those potential squid fisheries refugia areas, a single cluster of priority areas was proposed as squid refugia covering 157.668,35 ha consisting of 148.087,08 ha of spawning area and 9.581,27 ha of nursery area (Figure 6).

The regional arrangement showed that most of the coastal area included in the regional zoning plan around Bangka Island has become mining areas. Therefore, stakeholders' consultation is essentially required to build agreements between established economic activity and the future of squid resources sustainability in Bangka waters.

To protect matured squid, the closed squid fishing season should be implemented between April to June and October to November. In addition, to protect the squid juveniles which were susceptible to the lift net operation, a lift net operational area management could be implemented by relocating the lift net outside the nursery area.

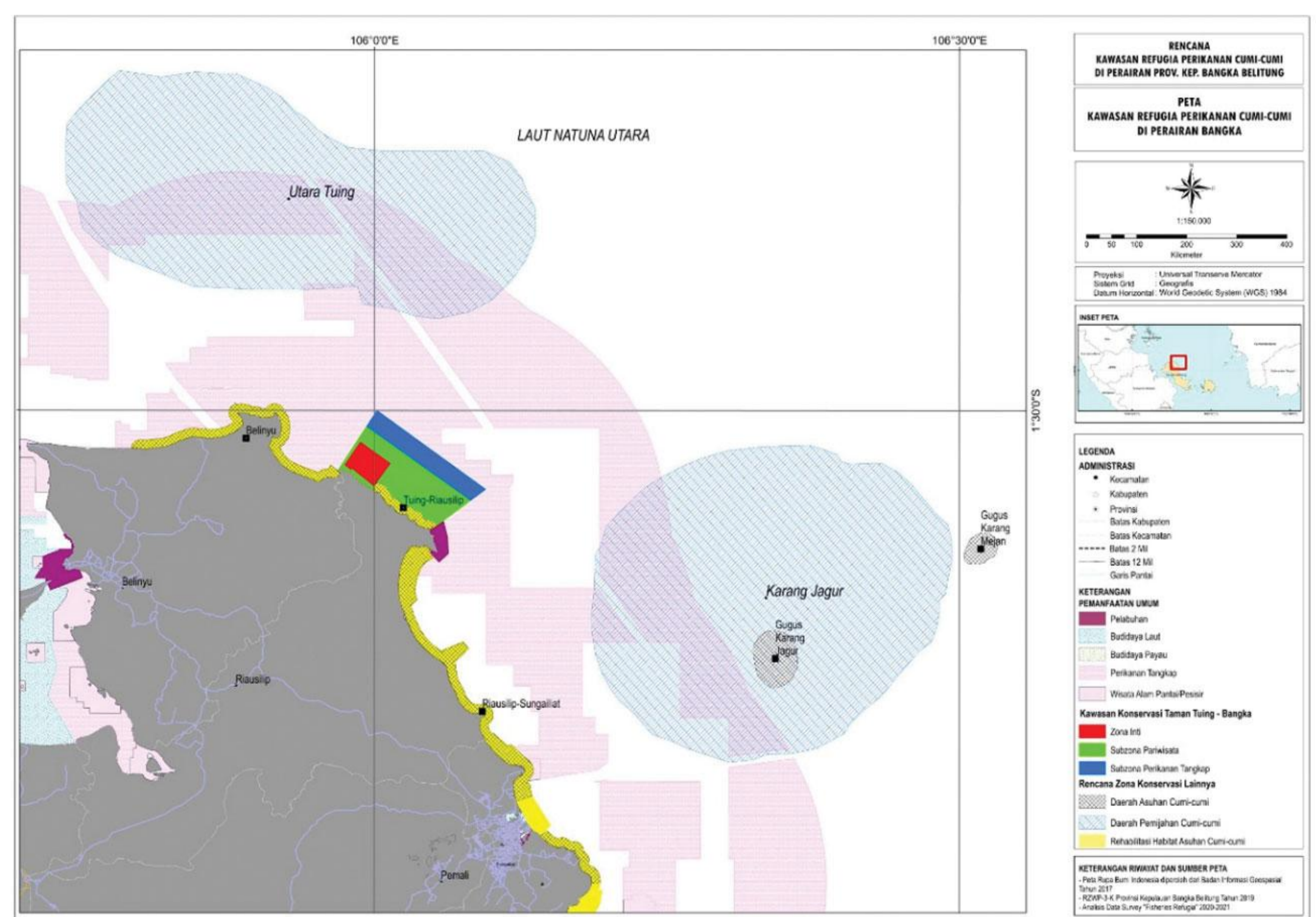


Figure 6. Priority area recommended for squid fisheries refugia in Bangka Belitung Province.

## Squid management recommendation

- Proposing squid refugia area for 1.529.097,93 ha covering Tuing waters, Dua Island, Karang Sembilan, Karang Timah, 4 miles of coastline on the western and northern side of Bangka Barat, Bangka coast, pangkalpinang coast, Bangka tengah coast, kelapa island, karang jagur, karang mejan, and semujur island, and gusung asem waters (Figure 5).
- Implement fisheries refugia to increase the squid management effectivity through:
  - a. Broody squid fishing management through an open-closed fishing mechanism from April to June and October to November implemented in the designated spawning area.
  - b. Regulate squid juvenile fishing by limiting operational lift net and squid juveniles fishing area as well as prohibit the lift net operation in the designated nursery area.
- Conduct a moratorium for adding offshore tin mining permits and regulate the operation of the offshore area use in rotation.
- Conduct coastal habitat rehabilitation through physical (hard structure) and biological (mangrove planting) engineering to trap the sediment.
- Provide alternative fishery-based livelihood for fishermen during the closed fishing season implementation.
- Encourage the establishment of policy regulations on the use of squid resources at the local level based on independent local wisdom.

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