



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

**THE COASTAL HABITATS CONDITION OF BANGKA WATERS
AS A CRITICAL HABITAT FOR SQUIDS**

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The Condition of Bangka Coastal Ecosystem: Mangroves, Seagrasses, and Coral Reefs

Geographically, the Bangka Belitung Islands Province coastline reaches 1.96 million kilometers, whereas the Bangka Regency has a coastline of 186 km. Based on the description of the Allen Coral Atlas geomorphic zone using Planet Dove image data, it shows that the eastern coastal waters of Bangka are terrestrial reef flat areas and inner reef flat, then to a depth of 15 m in the form of shallow lagoons and reef slopes. Meanwhile, the northern coasts of Riau Silip and Belinyu are flat terrestrial reefs and reef slopes (Figure 1).

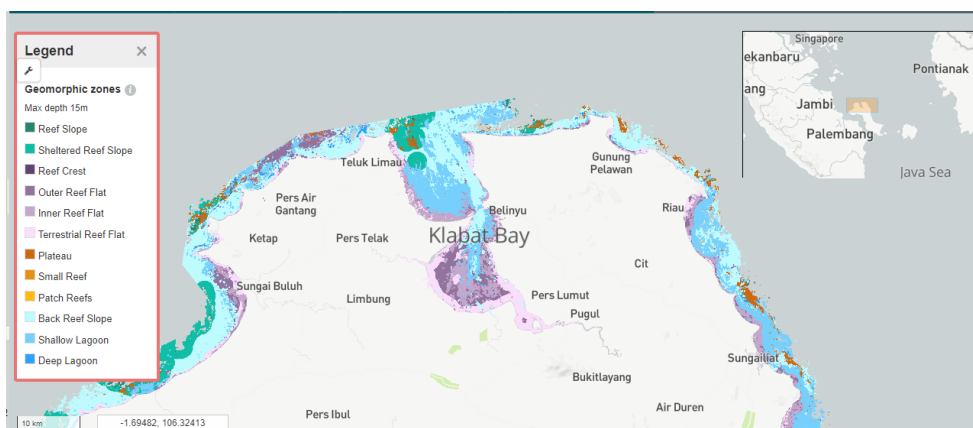


Figure 1 Description of the coastal geomorphological zone of Bangka waters (Source: Allen Coral Atlas, 2021)

The northern, eastern, and southern parts of Bangka Island are open water, and Bangka Strait and Kelabat are semi-enclosed waters. Hydrologically the land and waters of Bangka are part of the Sunda Shelf, where the average water depth is 30 m. Human activities on the mainland influence the coastal ecosystem through rivers such as the Baturusa, Tengkalat, Kepoh, Buluh, Kotawaringin, Layang, Manise, and the Kurau River. The mangrove ecosystem (Figure 2) in Bangka waters is generally found in the estuary areas in the west and Teluk Kelabat in the north. While in the east, mangroves are found in several estuaries such as the Tengkalat River, Baturusa River, and Kurau River. The potential area of mangrove ecosystems in the Bangka Belitung Islands is 81,405.44 ha. The total area of the Bangka Regency mangrove ecosystem is 9,162.4 ha, with 14.7% a good condition, moderate (28.2%), and 57.1% damaged (Agency of Marine and Fisheries of Bangka Belitung Province, 2018).

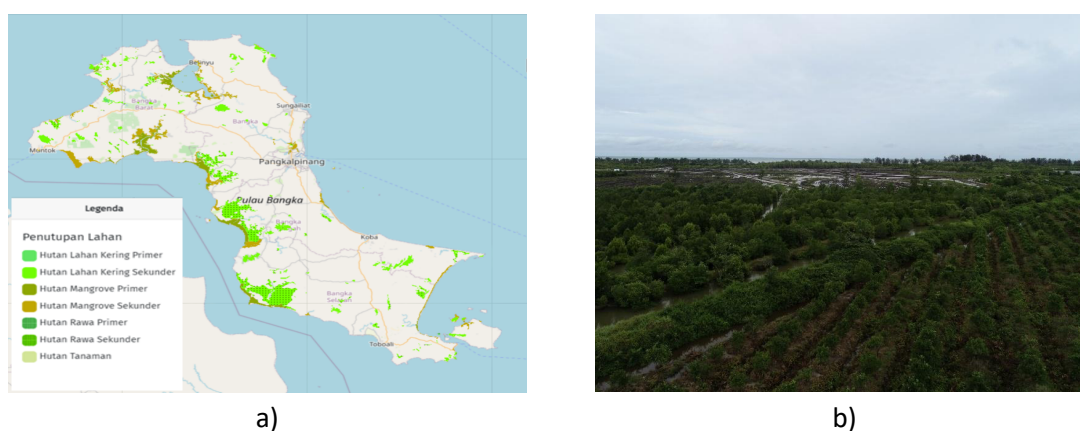


Figure 2. (a) Distribution of mangrove ecosystems and (b) condition of mangrove ecosystems at the Baturusa River estuary in coastal waters of Bangka

Coastal ecosystems, which are important ecosystems in the management of squid refugia, are seagrass and coral ecosystems. The bottom substrate (benthic classes) of northern Bangka waters are mostly sand, rock, rubble, and coral/algae reefs (Figure 3). Referring to the Agency of Marine and Fisheries of Bangka Belitung (2018), there are 11,646.9 ha of seagrass in the Bangka Belitung Islands and 17,744.85 ha of the coral reef ecosystem. Most of the seagrass and coral ecosystems are found in the Belitung Regency and several small islands in the waters of Central Bangka. The area of seagrass ecosystems in coastal waters of Bangka is 364 ha, where seagrass ecosystems are scattered in the northern waters of Mapur and Tengkalat, which are generally associated with coral reef ecosystems. The area of potential coral reef ecosystems in Bangka waters is 231.7 ha, concentrated in the northern waters of Mapur and Tengkalat and several reefs flat in Riau Silip waters. The good condition of the coastal ecosystem in the northern waters of Bangka and West Bangka Regency creates this water area as one of the most important factors in the management and determination of the squid refugia area, especially as a nursery area.

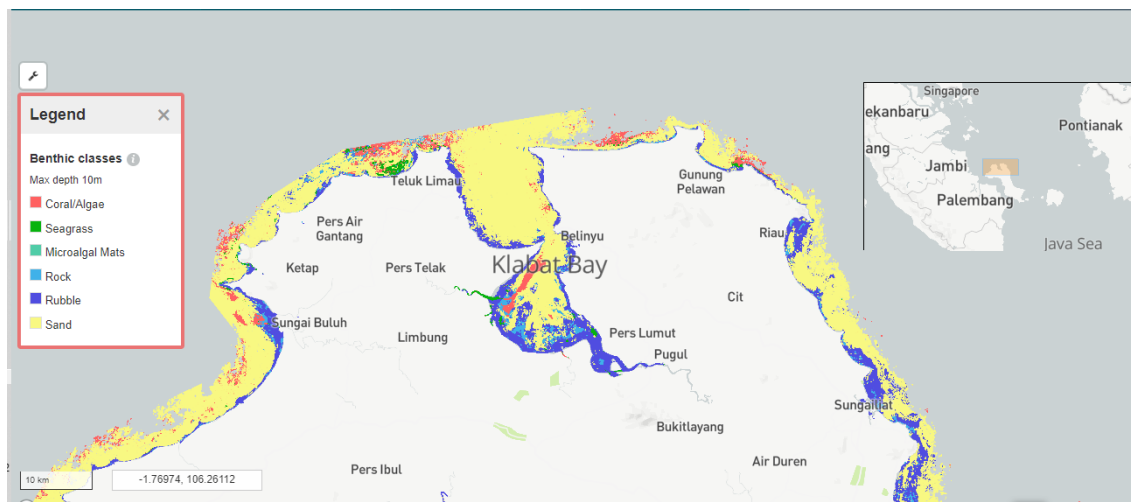


Figure 3. The bottom substrate habitats/benthic classes in the northern waters of Bangka (Source: Allen Coral Atlas, 2021)

The Characteristic of Habitat for Squid Eggs

The results of literature studies related to coral cover conditions are known that there are two typologies of habitat in Tuing waters: the fringing reef and barrier reef (Aliani, 2018). Aliani (2018), observed the condition of coral reefs in the Tuing waters, namely around the inner harbor to the west to Tengkalat waters and to the east to the waters of Tanjung Punggur. Paradise et al. (2019) showed that the percentage of live coral cover was 19.2 – 49.16% (included in the low and medium categories). However, several research points showed coral cover was still in the good category as found around the west coast of Tanjung Punggur, with lifeform cover reaching 50-75%.

Observations on the locations identified as habitats for female squids to lay their eggs were carried out at depths of 4-6 meters (reef flat) and 18-20 meters (edge). Detailed observations are presented in Table 1 and Figure 4. The characteristics of the bottom substrate habitat of Tuing waters are dominated by macroalgae and dead coral with a sandy substrate. The hard coral cover in this location is only 8%, dead coral 23%, macroalgae 49%, and abiotic components 20%. There is a lot of dead coral that has been covered by sediment and macroalgae. The composition of the macroalgae that dominates is the genus *Sargassum*, which lives in with coral. The low live coral cover was due to the shallow reef flat zone. Squid eggs at the dive sites were found in the hatched conditions.

Table 1. Description of observation results at the Tuing site research station

No	Observation components	Observation sites			
		St. 1	St. 2	St. 3	St.4
A	General				
	Dive date	14 Nov 2020	14 Nov 2020	21 Nov 2020	21 Nov 2020
	Dive Coordinates	1°34'49.55"S 106° 1'56.33"E	1°34'51.13"S 106° 1'58.37"E	1°35'44.92"S 106° 2'23.75"E	1°35'52.02"S 106° 2'41.30"E
	Location characteristics	Old stationary lift net	New stationary lift net	Reef-flat	Reef-flat
B	Parameter				
1	Depth	18-20	17-21		
2	Substrate	Sand	Sand	Sand	Sand
3	Coral Reef Composition	-	-	8% Hard coral, 23% Dead coral, 49% macro algae, 20% Abiotic	8% Hard coral, 23% Dead coral, 49% macro algae, 20% Abiotic
4	Association Biota	Sponge, gorgonian, barnacle, hydrozoa, algae	Sponge, gorgonian, barnacle, hydrozoa, algae	Hard coral, macro algae	Hard coral, macro algae
5	Fish Community	<i>Family Serranidae, Lutjanidae, Apogonidae, Leiognatidae, Haemulidae, Scaridae and Caesionidae.</i> Based on the number of individuals, the most found are family <i>Leiognatidae, Serranidae and lutjanidae</i>	<i>Family Serranidae, Lutjanidae, Apogonidae, Leiognatidae, Haemulidae, Scaridae dan Caesionidae.</i> Based on the number of individuals, the most found are family <i>Leiognatidae, Serranidae and lutjanidae</i>	<i>Family Serranidae, Lutjanidae, Apogonidae, Haemulidae, Scaridae, Pomacentridae, Labridae dan Chaetodonidae.</i> Based on the number of individuals, the most found are family <i>Apogonidae (apogon), Pomacentridae (pomacentrus) and Chaetodonidae (chaetodon)</i>	<i>Family Serranidae, Lutjanidae, Apogonidae, Haemulidae, Scaridae, Pomacentridae, Labridae dan Chaetodonidae.</i> Based on the number of individuals, the most found are family <i>Apogonidae (apogon), Pomacentridae (pomacentrus) and Chaetodonidae (chaetodon)</i>
5	Squid Egg	Not found	Not found	Hatched eggs found	Hatched eggs found

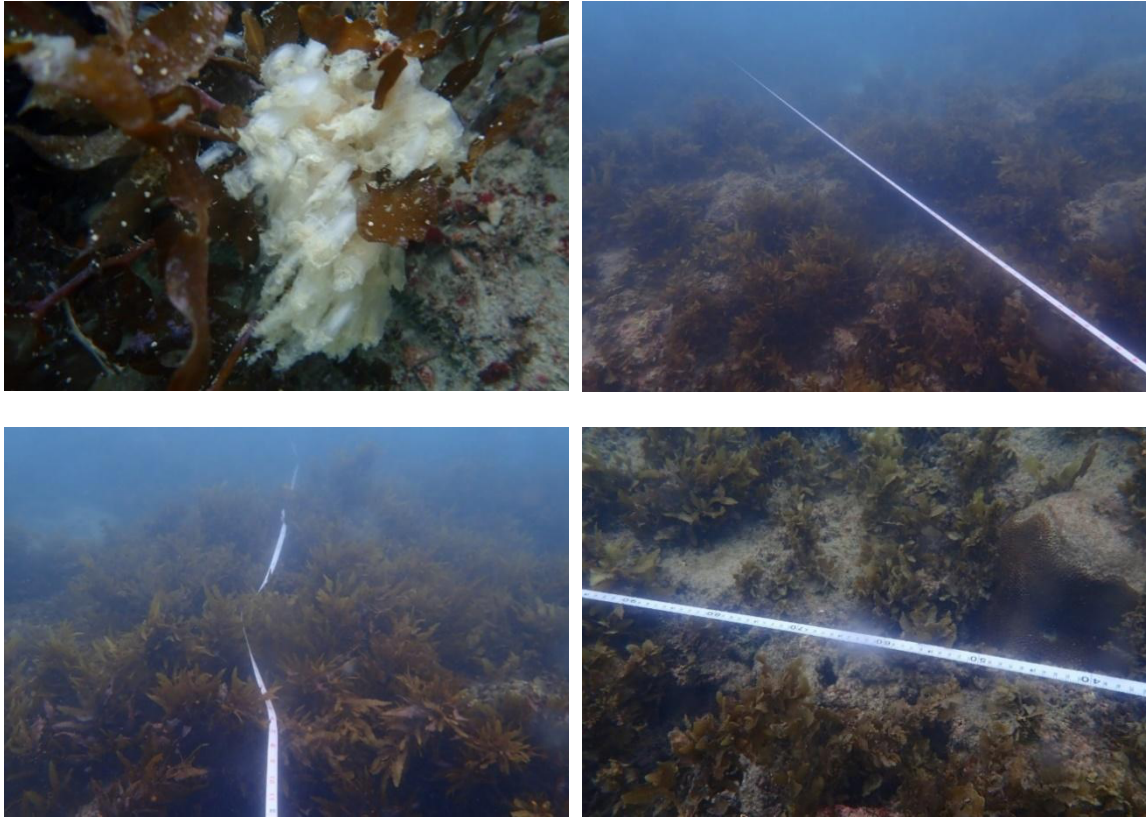


Figure 4. Condition of squid spawning habitat in Tuong waters