Strategies to Control Illegal Fishing in the Waters of Pasir Limau Kapas District, Rokan Hilir Regency

Strategi Pengendalian Illegal Fishing di Perairan Kecamatan Pasir Limau Kapas Kabupaten Rokan Hilir

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Abstract

The magnitude of the potential has led to the emergence of illegal fishing activities that cause losses to the state and surrounding communities. One of the water zones in Indonesia that has potential and is prone to illegal fishing is the Malacca Strait, including the waters of Rokan Hilir Regency. The research aims to formulate illegal fishing control strategies to prevent and stop illegal fishing activities. This research was conducted in Pasir Limau Kapas District, Rokan Hilir Regency, which consists of Panipahan Kepenghuluan, Panipahan Laut Kepenghuluan, and Panipahan Darat Kepenghuluan from March to July 2023. The primary data are obtained directly through observation and interviews, and secondary data is obtained from relevant agencies and institutions. Data analysis uses a quantitative approach to formulating illegal fishing control strategies using SWOT and descriptive analysis methods. The SWOT analysis results of controlling illegal fishing activities is a W-O (Weakness - Opportunities) strategy by considering existing opportunities and minimizing internal problems that become weaknesses. Some strategies that can be formulated include increasing surveillance in Pasir Limau Kapas Waters, increasing socialization of the impacts of illegal fishing and maintaining marine ecosystems, and improving fisheries support facilities in Pasir Limau Kapas District.

Keywords: Illegal Fishing, SWOT, Rokan Hilir

Abstrak

Besarnya potensi tersebut menyebabkan munculnya kegiatan penangkapan ikan secara ilegal yang menimbulkan kerugian bagi negara dan masyarakat sekitar. Salah satu wilayah perairan di Indonesia yang sangat potensial dan rawan terjadi *illegal fishing* adalah Selat Malaka, termasuk di dalamnya adalah perairan Kabupaten Rokan Hilir. Penelitian yang dilakukan bertujuan untuk merumuskan strategi pengendalian illegal fishing yang dapat mencegah dan menghentikan kegiatan *illegal fishing*. Penelitian ini dilakukan di Kecamatan Pasir Limau Kapas, Kabupaten Rokan Hilir, yang terdiri dari Kepenghuluan Panipahan, Kepenghuluan Panipahan Laut dan Kepenghuluan Panipahan Darat pada bulan Maret hingga Juli 2023. Data yang digunakan adalah data primer yang diperoleh secara langsung melalui observasi dan wawancara, serta data sekunder yang diperoleh dari instansi dan lembaga terkait. Analisis data menggunakan pendekatan kuantitatif dan dalam merumuskan strategi pengendalian illegal fishing menggunakan metode analisis SWOT dan analisis deskriptif. Hasil dari analisis SWOT pengendalian kegiatan *illegal fishing* adalah strategi W-O (*Weakness - Opportunities*) dengan mempertimbangkan peluang yang ada dan meminimalisir permasalahan internal yang menjadi

kelemahan. Beberapa strategi yang dapat dirumuskan antara lain meningkatkan pengawasan di Perairan Pasir Limau Kapas, meningkatkan sosialisasi tentang dampak *illegal fishing* dan menjaga ekosistem laut, serta meningkatkan fasilitas penunjang perikanan di Kecamatan Pasir Limau Kapas.

Kata kunci: *Illegal Fishing*, SWOT, Rokan Hilir

1. Introduction

Optimizing marine wealth will be very useful for the country's foreign exchange reserves and sustainably empowering the community's social life (Anugrah & Alfarizi, 2021), especially in communities in coastal areas. The large potential of marine waters opens opportunities for theft and illegal utilization of marine resources by parties that harm the state and society, such as illegal fishing, piracy, smuggling, human trafficking, piracy, and illegal migration. The rise of illegal fishing in the waters of Rokan Hilir Regency in recent years has been marked by the continuous arrests of fishing vessels in the Sinaboi, Bagansiapiapi, and Pasir Limau Kapas Seas. Nowadays, many fishing vessels damage marine resources by using prohibited or dangerous fishing gear, such as barred bottom trawls, shrimp bottoms, twin-boards, two-boat bottoms, and other prohibited fishing trawls. In addition to the use of fishing gear, the absence of a license to conduct fishing is an act of illegal fishing (Sofwan, 2014).

Zamzami (2021) stated that the rampant fish theft or illegal fishing in the waters of Rokan Hilir Regency impacts the number of traditional fishermen's catches, causing the All Indonesian Fishermen Association to threaten to carry out demonstrations. To prevent and stop illegal fishing activities, an appropriate control strategy is needed so that the potential of the waters in Pasir Limau Kapas District has a good impact on the environment and the socio-economy of the community. So, it is necessary to research the existing condition of the waters and control strategies for illegal fishing in the waters of Limau Kapas Subdistrict, with the hope that the potential of these waters can be preserved in ecological aspects, as well as benefiting the community economically and socially.

2. Material and Method

2.1. Time and Place

This research was conducted in the Pasir Limau Kapas District of Rokan Hilir Regency, which consists of Panipahan Kepenghuluan, Panipahan Laut Kepenghuluan, and Panipahan Darat Kepenghuluan conducted from March to July 2023.
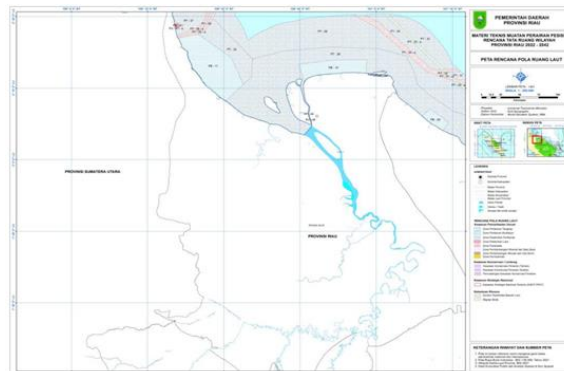

Figure 1. Map of the research area

2.2. Methods

The method used is the survey method. The primary data is obtained directly through observation and interviews, and secondary data is obtained from relevant agencies and institutions such as the Rokan Hilir Regency Fisheries Service and the Region III Marine and Fisheries Resource Control UPT. The sampling technique used purposive sampling technique to determine the number of samples using the Slovin formula, and 97 respondents were obtained, consisting of critical respondents, fishermen, and local communities.

2.3. Data Analysis

Data analysis was conducted using a quantitative approach and formulating strategies to control illegal fishing using the SWOT and descriptive analysis methods. Pasir Limau Kapas sub-district is geographically located at 2°32'44.12" LU, 100°19'22.44" East to 1°58'32.88" LU 100°21'2.16" EAST. The water quality of the Pasir Limau Kapas sub-district is one factor that affects the ecosystem's sustainability, especially fish, which is the

community's leading commodity. The water quality observed in this study includes salinity, temperature, pH, brightness, and current speed.

3. Result and Discussion

3.1. Research Site Conditions

Pasir Limau Kapas sub-district has seven (7) kepenghuluan and one (1) District, and all Kepenghuluan areas have coastal areas (BPS, 2021). Kepenghuluan Panipahan and Panipahan Laut are at an altitude of < 5 meters from sea level, while Kepenghuluan Darat is at an altitude of > 16 meters from sea level. The amount of rainfall in the Pasir Limau Kapas District is based on ten years of average data (2013-2022), which shows that the rainfall pattern of this region is in the category of equatorial rainfall patterns with ZOM Type Equatorial-4, has an equatorial pattern, and has four seasons, namely two dry season periods and two rainy season periods. There are two peaks of the rainy season in May and November and two of the dry season in February and June. The Pasir Limau Kapas sub-district receives yearly rainfall (BMKG, 2023).

The salinity value in the waters of Pasir Limau Kapas sub-district is in the range of 27-28 ppt, which is 27 ppt in Panipahan and Panipahan Laut sub-districts and 28 ppt in Panipahan Darat sub-district. This salinity value is generally lower than seawater salinity levels in Indonesia, which is 32-34 ppt (Dahuri et al., 1996). This is because the waters in the Pasir Limau Kapas area still receive freshwater from the surrounding rivers that empty into the sea, including the Sampai Niat River, Tawar River, Panipahan River, and other small rivers. In line with the statement of Hamuna et al. (2018) that the salinity in the estuary area is lower because the flow of river water to the sea will cause a mixing process or supply of fresh water to seawater so that the salinity value in these waters is in the range of 3-30 ppt. This is because water circulation patterns, evaporation, rainfall, river flow, and tidal factors affect the salinity of water.

Tabel 1. Water quality of Pasir Limau Kapas

No.	Parameters	Measurement results	Quality Standard*
1	Salinity (ppt)	27 – 28	33-34
2	Temperature (°C)	30 - 31	28-32
3	Current speed (m/s)	0.020 - 0.22	-
4	Water brightness (m)	0.017 - 0.018	>3
5	pH	6,8 -7	7 - 8,5

*Quality standards based on Indonesian Government Regulation No.22 of 2021 Appendix VIII for marine biota

The water temperature in Pasir Limau Kapas District in Kepenghuluan Panipahan and Panipahan Darat is 30°C, and Panipahan Laut is 31°C. It is classified in good condition because the optimum temperature in the waters is 28- 32°C. The higher the temperature in a body of water, the lower its dissolved oxygen content. Meanwhile, if the temperature in a body of water is lower, the dissolved oxygen content will be higher, thus affecting the type and number of fish present and the fishermen's catch. According to Ali et al. (2015), water temperature can affect the number of fish caught in these waters.

The current speed in Panipahan Kepenghuluan is 0.020 m/s, and Panipahan Sea and Panipahan Darat is 0.022 m/sec. The speed of the current in these waters is classified as slow current. Slow current conditions are influenced by the condition of the bottom of the water in the form of sandy mud that affects the friction of the base, and the speed at the base layer becomes smaller. Besides, depth also affects the current's fast or slow speed. According to Saiful et al. (2020), the current velocity value will decrease with increasing depth due to the influence of friction forces at the bottom of the water.

The brightness of the waters in Panipahan and Panipahan Darat Kepenghuluan is 18 cm and 17 cm in Kepenghuluan Laut. Based on the brightness value owned by Pasir Limau Kapas Waters, it can be seen that the low level of brightness is due to the water substrate in the form of muddy sand. This causes a large amount of sediment and dissolved particles from both organic and inorganic materials to flow through the flow, and according to Hamuna et al. (2018), this dramatically affects the brightness value of a water body.

The pH of the waters in Pasir Limau Kapas District in Kepenghuluan Panipahan and Panipahan Darat is seven, and Panipahan Laut is 6.8. The degree of acidity of the seas is classified as the quality standard for marine waters, and the ideal pH is 7-8 for the growth of marine biota. Seawater has a tremendous buffering ability to prevent changes in pH. So, changes in pH from the natural pH will indicate the disruption of the buffer system, which can cause changes in pH. The pH in the waters of Pasir Limau Kapas is still in good condition, considering the influence of the surrounding environment in the form of river estuaries. According to Patty & Akbar (2018), the pH of waters with a vulnerability of 6.5-8.5 is an ideal pH for marine biota and allows marine biota to survive.

In his research, Arnes et al. (2021) stated that the daily cycle of ocean tides or the intertidal cycle affects the ecosystem of Panipahan coastal waters. In addition, Panipahan Beach has a mud substrate and sloping seabed. Panipahan waters are where freshwater and seawater masses meet, and mangrove plants are found around the shoreline. Upstream, there are densely populated residential areas.

Based on several water quality parameters in Pasir Limau Kapas Subdistrict, it is known that the condition of the waters is still classified as good. The interview results show that illegal fishing activities today are dominated by fishermen from neighboring provinces who use fishing gear that is not much different from local fishermen, so it does not have too bad an impact on the environment. These fishermen also realize this because they have the same interests and dependencies as local fishermen regarding existing economic resources. It is necessary to increase education and socialization for fishermen to maintain the condition of these waters in the Jepara Waters area. Research by Suwandi et al. (2020) shows that community empowerment through Joint Business Groups can increase the empowerment of fishermen in economic and social aspects while overcoming the problem of environmental damage.

The existence of settlements and several other activities along the coast, such as shipyards, shrimp paste industry, and dock activities, impact the ecosystem at the research site, such as precipitation that affects biota, such as blood clams. This is because these activities produce waste that is discharged towards the sea. From the results of the Metal Pollution Index (MPI) value research conducted by Arnes et al. (2021), the Panipahan Waters area has a value of 5.03, which is at a value of $5.0 < IP \leq 10$ or in the moderately polluted category. The pollution of these waters is thought to come from population activities both on land and in the sea.

3.2. Existing Conditions of Ecological Dimensions

The fishermen's water zones in the Panipahan Kepenghuluan, Panipahan Darat Kepenghuluan, and Panipahan Laut Kepenghuluan areas include Panipahan Waters and Aruah Islands Waters. The diversity of fish species in Panipahan Waters, Pasir Limau Kapas District, can be seen in Table 2.

Table 2. Diversity of fish species in Panipahan Waters, Pasir Limau Kapas District

No.	Family	Genus	Scientific Name
1	Polynemidae	Eleutheronema	*Eleutheronema tetradactylum*
2	Polynemidae	Leptomelanosoma	*Leptomelanosoma indicum*
3	Carangidae	Megalaspis	*Megalaspis cordyla*
4	Scombridae	Rastrelliger	*Rastrelliger* sp.
5	Dasyatidae	Dasyatis	*Dasyatis* sp.
6	Muraenesocidae	Muraenesox	*Muraenesox cinereus*
7	Scombridae	Thunnus	*Thunnus obesus*
8	Portunidae	Portunus	*Portunus* sp.
9	Loliginidae	Loligo	*Loligo* sp.
10	Corbullidae	Potamocorbula	*Potamocorbula fasciata*
11	Plotosidae	Euristhmus	*Euristhmus microceps*
12	Mugilidae	Mugil	*Mugil* sp.
13	Arcidae	Anadara	*Anadara* sp.
14	Arcidae	Anadara	*Anadara granosa*
15	Sciaenidae	Johnius	*Johnius belangerii* Cuvier
16	Engraulidae	Stolephorus	*Stolephorus waitei*
17	Lobotidae	Lobotes	*Lobotes surinamensis*
18	Lutjanidae	Etelis	*Etelis coruscans*
19	Penaeidae	Metapenaeopsis	*Metapenaeopsis palmensis*
20	Penaeidae	Parapenaeopsis	*Parapenaeopsis sculptilis*
21	Carangidae	Parastromateus	*Parastromateus niger*
22	Carangidae	Pampus	*Pampus argenteus*
23	Haemulidae	Pomadasys	*Pomadasys andamanensis*
24	Trichiuridae	Trichiurus	*Trichiurus lepturus*
25	Scombridae	Scomberomorus	*Scomberomorus commerson*
26	Psettodidae	Psettodes	*Psettodes erumei*

The fishermen's catch is influenced by the fishing technology fishermen use in Pasir Limau Kapas Waters. Fishermen in Rokan Hilir Waters generally still use traditional fishing gear, which is dynamic or moving. A gillnet is fishermen's most widely used fishing gear in Pasir Limau Kapas Waters. According to the results of research by Subehi et al. (2017), one fishing gear classified into the environmentally friendly category according to the CCRF (Code of Conduct for Responsible Fisheries) is gillnet and longline. In addition to the fishing gear used, fishermen in Pasir Limau Kapas Waters apply regulations regarding illegal fishing.

3.3. Existing Conditions of Social Dimensions

Panipahan Darat Kepenghuluan has a larger population than the other two Kepenghuluans, totaling 10,562 people, followed by Panipahan Laut Kepenghuluan of 2,580 people and Panipahan Kepenghuluan with a population of 5,136 people. The Panipahan Darat Kepenghuluan area has a denser population density than the two Kepenghuluans because the area is easier to use to settle, build buildings, and grow crops. The majority of the population in the three research areas follow Islam (96.12%), Christianity (3.32%), Catholicism (0.10%) and Buddhism (0.47%). The population in the study areas combines several ethnic groups, namely Malay, Batak,

Javanese, and Chinese. Educational facilities in the Panipahan, Panipahan Laut, and Darat Kepenghuluan areas, according to BPS (2021) data, recorded that educational facilities at the kindergarten (TK) level amounted to 3 units, elementary schools (SD) amounted to 21 units, junior high schools (SMP) amounted to 11 units, and senior high schools (SMA) as many as six units. Furthermore, 71% of the population in the three research areas are primary school graduates.

The people's daily lives in the three research locations are not so different. In their daily lives, most people are sea fishermen who are very dependent on and understand the knowledge of the seasons. This local knowledge about weather and seasons is obtained from their parents and passed down to their children and grandchildren. This knowledge is constructive for fishermen in determining fishing schedules and the ongoing fish season. The criteria that can be seen are the stars' position, the wind's condition and direction, and the tides' condition. Although the community, especially fishermen, knows how to go to sea and the right season, this is not the case with the knowledge and understanding of fishermen regarding illegal fishing incidents. Foreign terms are quite difficult for the community to understand. However, most respondents in this study understand what is included in illegal fishing and things that need to be avoided so that illegal fishing does not occur.

When the tide is deep, fishermen will start fishing, and when the tide is dead, the fishermen decide not to fish. Usually, fishermen do not go to sea at the end of the year until the beginning of the new year due to relatively strong winds from the South. This can cause quite high waves at sea. The fleets fishermen use include boats without motors or PTM (traditional) and motorized boats or ships commonly called KM. Most fishermen use dynamic fishing gear like Gillnet, Tuamang, Batu Octopus, and Rawai.

Another local wisdom or knowledge fishermen in the Pasir Limau Kapas water area still maintain today is searching for clams during low tide using a board. This clam-scratching activity is similar to that carried out by the Duanu tribe community in Indragiri Hilir, namely scratching clams on a muddy bed using a tongkah board (Rosada et al., 2017).

3.4. Existing Conditions of Economic Dimensions

Most people in Panipahan, Panipahan Darat, and Panipahan Laut are professional fishermen. A small portion of the population in Panipahan Darat Kepenghuluan works as farmers. The catch of fishermen joining fishing groups and those not joining reaches 2.8 tons, with a daily income ranging from IDR 45,000 to IDR 65,000. In addition to the catch in the form of fresh fish, fishermen in the Panipahan, Panipahan Darat, and Panipahan Laut Kepenghuluan areas also manage the catch into other commodities in the form of belacan/terasi and salted fish. This region's salted fish processing business preserves fish using salt and does not use chemicals that can harm consumers. Besides that, the drying system is carried out with a drying system under the sun.

3.5. Strategies to Control Illegal Fishing

The IFAS (Internal Factor Analysis Summary) and EFAS (External Factor Analysis Summary) matrices are used to determine the position of each factor, including strengths, weaknesses, opportunities, and threats regarding the control of illegal fishing activities in Pasir Limau Kapas Waters. The IFAS and EFAS matrix consists of weight, rating, and score values. Based on the results of the analysis, the strength factor with the highest value is the diversity factor of fish species. This factor is considered to have the highest influence and impact in controlling illegal fishing activities in the waters of Pasir Limau Kapas District. Meanwhile, the weakness factor with the highest score is the level of understanding of fishermen. The level of knowledge of fishermen is influenced by the level of education of fishermen, who are mostly classified in the low category, and socialization activities that are rarely carried out, causing a lack of information fishermen receive.

Table 3. IFAS matrix (internal factor analysis summary)

No.	Power	Weight	Rating	Score
1	Fisheries licensing and management system	0.09	4	0.36
2	Type of fishing fleet	0.09	3	0.27
3	CPC Ownership of Fishermen	0.08	3	0.24
4	Diversity of fish species	0.16	3	0.49
5	Age level of fishermen	0,10	2	0,20
	Total			1.56
No.	Weaknesses	Weight	Rating	Score
1	Fleet size of surveillance vessels	0.07	4	0.27
2	Number of fisheries supervisory resources	0.07	4	0.26
3	Fish auction site	0.05	3	0.15
4	Education level of fishermen	0.08	3	0.25
5	Fishermen's level of understanding	0.11	3	0.33
6	Income level of fishermen	0.10	3	0.31
	Total			1.57
	Total Score	1.00		3.13

It can be seen that the total score for the strength factor is 1.56, and the score for the weakness factor is 1.57. The total score for strengths and weaknesses is 3.13. Meanwhile, the EFAS Matrix is explained in Table 4.

Table 4. EFAS (external factor analysis summary)

No.	Opportunities	Weight	Rating	Score
1	Fish consumption needs	0.23	3	0.70
2	Fresh fish price	0.18	3	0.54
3	Socialization of illegal fishing by agencies related to Fishermen	0.10	4	0.40
4	Supervision from relevant agencies	0.01	4	0.03
5	Fulfillment of fisheries export commodities	0.01	2	0.02
6	Illegal fishing regulations	0.11	4	0.43
	Total			2.11
No.	Threat	Weight	Rating	Score
1	Transshipment in waters	0.21	4	0.86
2	Cooperation between government agencies	0.01	4	0.02
3	Surveillance budget	0.005	3	0.01
4	Fishing technology	0.13	4	0.54
5	Law enforcement	0.01	4	0.02
	Total			1.45
	Total Score	1.00		3.56

In the EFAS matrix, the score value of the opportunity factor is higher than that of the threat factor. This shows more opportunities in Pasir Limau Kapas Waters than threats. The opportunity factor with the highest score is the need for fish consumption. The threat factor with the highest score comes from transshipment activities in the waters. Transshipment transfers cargo of catches or other goods from one ship to another (ship to ship).

The total score of the EFAS matrix is 3.56, which is higher than the total score of IFAS. This shows that the most influential factors in controlling illegal fishing in Pasir Limau Kapas waters are external, so the position of the quadrant can be determined from the determination of the X and Y axes obtained from reducing the total score of each factor with the following calculation. Internal analysis coordinates (X-axis) = -0,01; External analysis coordinates (Y-axis) = 0,66.

From the results of these calculations, the X and Y axis coordinate values are obtained at points -0.01 0.66, which are in quadrant III. Quadrant III is a position where it is necessary to change strategies or support turnaround strategies, considering all available opportunities and trying to minimize existing weaknesses. The strategy formulated to control illegal fishing activities in Pasir Limau Kapas Waters is explained as follows:

Increase surveillance in Pasir Limau Kapas Waters. The results of this study indicate that the supervision carried out in the Pasir Limau Kapas Waters has been carried out so far. However, it has not been optimal due to a lack of cooperation, coordination, and human resources from related agencies. For this reason, it is necessary to increase cooperation and coordination between agencies authorized and related to the protection of the Pasir Limau Kapas Waters, increase the number of supervisory personnel, and increase the number of supervisory fleets.

Increase socialization of the impacts of illegal fishing and protect marine ecosystems. To prevent and reduce the incidence of illegal fishing in Pasir Limau Kapas Waters, socialization and awareness activities regarding illegal fishing activities are needed. Explanations about the activities included in the illegal fishing, the impacts on the marine ecosystem, and the survival of fishermen need to be socialized regularly and periodically. Thus, fishermen in the Pasir Limau Kapas waters are more careful and can report to the authorities if they find foreign fishermen or fishermen from outside the region fishing using traditional and modern tools that can damage the environment in the Pasir Limau Kapas waters.

Improve fisheries support facilities in Pasir Limau Kapas Sub-district. One of the efforts to increase income and stabilize the selling price of fresh fish in Pasir Limau Kapas Subdistrict must be supporting facilities and infrastructure, including the Fish Auction Place. The Fish Auction Place, or TPI, functions as a place or container for fishermen to sell their catches. This can be monitored so fish sales are more organized, selling prices are more stable, and retribution can be recorded to the Rokan Hilir Regional Government. With the existence of a Fish Auction Place, fish sales and fish production by fishermen can be appropriately recorded so that the number of fish consumption needs in Pasir Limau Kapas District can be known, and can help increase the income of the community, especially fishermen because so far fishermen sell fish to collectors at relatively low prices.

4. Conclusions

Existing conditions in the waters of Pasir Limau Kapas Subdistrict in the ecological dimension based on several parameters measured show that the water conditions are still in good condition. The types of fish that are dominant commodities are senangin, senohong, snapper, cincaru, mackerel, lemongrass, stingray, shrimp, blood clams, and mullet. The social dimension shows that fishers have low education (elementary school). However, fishers are already aware of the importance of licensing in fisheries management, and illegal fishing activities

have also been socialized. Then, for economic conditions, fishermen's income is classified at a low level because the unstable selling price of fish and illegal fishing activities influence it.

Based on the SWOT analysis, the strategy to control illegal fishing activities in the waters of Pasir Limau Kapas Sub-district, Rokan Hilir Regency, results in the Weakness - Opportunities (W-O) strategy. Some strategies that can be carried out include increasing surveillance in Pasir Limau Kapas Waters, increasing socialization of the impacts of illegal fishing and maintaining marine ecosystems, and improving fisheries support facilities in Pasir Limau Kapas District.

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