Utilization of AIS Satellite Data as Behavior Information Towards Interruption Violations in the Makassar Strait

Pemanfaatan Data Satelit AIS sebagai Informasi Perilaku terhadap Pelanggaran Gangguan di Selat Makassar

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Abstract : *Indonesia is the world's largest archipelagic country, with a coastline of 81,000 km. Indonesia's beaches and seas are rich in natural resources, especially marine commodities like fish. The abundance of fish in the Indonesian seas has led to crimes committed by domestic ships not equipped with documents and foreign vessels. This study aims to analyze the causes of crime in the Makassar Strait with a crime orientation in the middle of the sea. In particular, this study also examines the security monitoring process using AIS Satellite. So that in the future, the enforcement carried out by stakeholders related to sea and maritime security will become more conducive and transparent. This research method uses a qualitative descriptive approach to describe data from AIS satellites in the Makassar Strait. The data collection process is carried out by taking satellite data directly and processing it so that some information about ship types and loading and unloading activities can be known comprehensively. Then it is used to determine which ships are initially identified as committing a violation. This information is used to act effectively, efficiently, and appropriately on sea breaches. This method is expected realization that*

institutions and stakeholders can work together to patrol at sea and promptly act against violations at sea. The discussion location is in the Makassar Strait because the area borders other countries and is one of the locations for abundant fish resources and international shipping lanes. The data for identifying ships suspected of committing crimes in the Makassar Strait was processed from 2019 to 2022. The violations include 22 smuggling ships, 13 drug smuggling ships, and 12 offending crime ships. The data revealed significant violations. Thus, from the analysis results, it is better to need the right timing in implementing patrols and the appropriate momentum for enforcement. Therefore, AIS Satellite is expected to help and improve law enforcement in that location.

Keywords : *AIS Satellite; Stakeholders; Makassar Strait; Violations, Maritime security*

Abstrak : *Indonesia adalah negara kepulauan terbesar di dunia, dengan panjang garis pantai 81.000 km. Melimpahnya ikan di perairan Indonesia mengundang terjadinya kejahatan yang dilakukan oleh kapal domestik dan asing yang tidak dilengkapi dokumen. Penelitian ini bertujuan menganalisis penyebab terjadinya kejahatan di Selat Makassar dengan orientasi kejahatan di tengah laut. Riset ini juga mengkaji proses pemantauan keamanan menggunakan Satelit AIS. Harapannya, ke depan penegakan oleh pemangku kepentingan terkait keamanan laut dan maritim semakin kondusif dan transparan. Penelitian ini menggunakan pendekatan deskriptif kualitatif untuk mendeskripsikan data dari satelit AIS di Selat Makassar. Proses pendataan dilakukan dengan mengambil data satelit secara langsung dan mengolahnya sehingga beberapa informasi mengenai jenis kapal dan kegiatan bongkar muat dapat diketahui secara komprehensif. Kemudian digunakan untuk menentukan kapal mana yang awalnya teridentifikasi melakukan pelanggaran. Informasi ini digunakan untuk bertindak secara efektif, efisien, dan tepat pada pelanggaran laut. Dengan cara ini diharapkan terwujudnya lembaga dan pemangku kepentingan dapat bekerja sama melakukan patroli di laut dan segera menindak pelanggaran di laut. Lokasi pembahasan berada di Selat Makassar karena wilayah tersebut berbatasan dengan negara lain dan merupakan salah satu lokasi sumber daya ikan yang melimpah dan jalur pelayaran internasional. Data identifikasi kapal yang diduga melakukan tindak pidana di Selat Makassar diproses sejak 2019 hingga 2022. Pelanggaran tersebut meliputi 22 kapal penyelundup, 13 kapal penyelundup narkoba, dan 12 kapal pelanggar. Data tersebut mengungkapkan pelanggaran yang signifikan. Sehingga dari hasil analisis tersebut, sebaiknya perlu waktu yang tepat dalam melaksanakan patroli dan momentum penertiban yang tepat. Oleh karena itu, AIS Satellite diharapkan dapat membantu dan meningkatkan penegakan hukum di lokasi tersebut.*

Kata kunci : *Satelit AIS; pemangku kepentingan; Selat Makassar; Pelanggaran; keamanan maritime*

Introduction

In the marine or maritime sphere, the character of maritime security also follows and has a broad meaning. Indonesia is an archipelagic country that has abundant natural wealth, one of which is fish in the Indonesian seas which are very abundant. Marine wealth in the form of fish in Indonesian seas makes illegal fishermen and foreign fishermen try to commit violations. Then maritime security is not only argued with oceans free from conventional military threats from other countries. However, security threats also occur in other forms of crime.

In carrying out its primary task of protecting the archipelago's seas, the Indonesian Navy will be faced with an obstacle where the forces possessed by the Indonesian Navy are still minimal when faced with the vastness of Indonesian waters that must be secured[1].

The Marine Defense Strategy must be supported in protecting and safeguarding Indonesia's sea areas. The Indonesian Navy needs cross-line collaboration with other units carrying out maritime security for the archipelago and Indonesian maritime affairs using satellite AIS to increase security and safety in the Makassar Strait. By monitoring vessel traffic in real-time, satellite AIS can help identify and track ships crossing the strait. This satellite enables better monitoring of ship activities, including vessels that may threaten security or disrupt shipping safety.

The Malacca Strait is one of the most strategic maritime passages in the world, connecting the Indian Ocean with the South China Sea. Maritime security and natural resources in this region are essential in regional and global contexts. From the point of view of maritime security, the Malacca Strait is the focus of attention because of the importance of this shipping lane for international trade. Terrorist threats, sea pirates, and other maritime crimes can disrupt ship traffic and endanger the region's security. Anticipating those challenges in regional and international cooperation has been established. Regional cooperation between Indonesia, Malaysia, and Singapore has so far been carried out in maintaining the security of the Malacca Strait. The three countries have established joint patrols known as the Malacca Strait Patrols (MSP) to increase their security presence and counter maritime crime threats. This cooperation

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[1] Lukman Yudho Prakoso, Suhirwan, Muhammad Ikmal Setiadi, *Kebijakan Pertahanan Laut*. (Surabaya: Pustaka Media Guru, 2021)

was outlined in the Trilateral Cooperative Arrangement (TCA), signed in 2006. In addition, international cooperation also plays an essential role in maintaining the security of the Malacca Strait, with countries such as the United States, Australia, and several European countries providing technical, intelligence, and joint patrol[2].

When viewed from the perspective of its natural resources, the Malacca Strait also has essential natural resource potential, especially in oil and natural gas. The seas around the Malacca Strait contain significant oil and gas reserves. Countries like Indonesia and Malaysia have essential oil and gas fields in their territorial waters. Exploiting these resources is crucial for the economic growth of the countries concerned and has global implications in terms of energy sustainability. However, the potential of this natural resource can also be a source of conflict. Territorial disputes, territorial water claims, and maritime disputes between countries around the Malacca Straits can cause tension and threaten the region's stability. Therefore, there is a need for a diplomatic approach and good cooperation between related countries to manage potential conflicts related to natural resources in the Malacca Strait[3].

In 2021, the Directorate General of PSDKP of the Ministry of Maritime Affairs and Fisheries arrested 94 Indonesian fishing vessels and 24 foreign fishing vessels for violating regulations[4]. On May 24, 2021, the KKP arrested an illegal fishing vessel (FB. GENEVIEVE) of 85 GT. This foreign ship with a crew of 27 people has been secured and carrying out inspections at the Bitung PSDKP. That is why the emergence of fishing fleets, especially fishing companies, engaged in illegal fishing. In addition, fishing activities also trigger the fishing industry's emergence and development, causing a scarcity of fish resources[5].

The emergence of the threat of crime at sea has been detected by many vessels using trawl nets to catch fish. Using trawl nets can cause other problems, such as damage to coral reefs, reduced catches of traditional fishermen, and uplifted habitat for small fish.

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[2] Graham Gerard Ong-Webb, "Ed. Piracy, Maritime Terrorism and Securing the Malacca Straits," in *Vol 2* (Institute of Southeast Asian Studies, 2006).

[3] Senia Febrica, *Maritime Security and Indonesia: Cooperation, Interests and Strategies*. (Francis: Taylor & Francis, 2017).

[4] KKP. *KKP Ringkus Dua Kapal Illegal Fishing Berbendera Filipina di Laut Sulawesi*, (2021, Mei Jumat). Retrieved from kkp.go.id: https://kkp.go.id/djpsdkp/artikel/31282-kkpringkus-dua-kapal-illegalfishing-berbenderafilipina-di-laut-sulawesi

[5] Yumiko. *Fishing for Answers Making Sense of The Global Fish Crisis*. (Washington DC: World Recourse Institute, 2004)

Crimes committed at sea, such as illegal fishing, impact the environment because the use of fisheries destroys habitats on the seabed. In comparison, the indirect effect includes changes in the balance of the primary production process, consumption, and secondary production on economic value[6]. These crimes can be identified quickly using one of the tools, namely the AIS Satellite. By knowing the occurrence of crimes at sea using AIS Satellite at the outset, stakeholders related to the enforcement and prosecution of violations at sea can conduct inspections and prosecutions quickly, effectively, and precisely.

Maritime security in Indonesia includes various kinds of threats, including conventional military threats from other countries and various forms of criminal activity. As an archipelagic country with a vast coastline and abundant natural resources, Indonesia's sea is often the target of illegal and foreign fishermen, causing violations and crimes. However, the Indonesian Navy faces significant challenges in protecting vast waters with limited resources. The Indonesian Navy must collaborate with other units responsible for maritime security throughout the archipelago and Indonesian maritime affairs to enhance its maritime defense strategy.

The impact of illegal fishing on the marine environment is increasingly concerning because the use of trawl nets not only destroys the habitat on the seabed but also disrupts the balance of primary and secondary production processes. In 2021 alone, the Directorate General of PSDKP of the Ministry of Maritime Affairs and Fisheries arrested several Indonesian and foreign fishing vessels for violating regulations. By leveraging AIS Satellite technology, the Indonesian Navy, and related stakeholders can quickly identify and monitor criminal activity at sea, enabling them to take swift and effective action against violations.

This study aims to provide an overview of the use of AIS Satellite technology in detecting and prosecuting violations in the Makassar Strait. By analyzing criminal activity patterns and identifying violations' timing and locations, stakeholders can establish effective patrols and countermeasures. This study aims to increase the readiness of marine security activities carried out by relevant stakeholders, increasing the protection and security of Indonesia's seas.

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[6] Jhon Steele, *et al*, *Effects of Trawling and Dredging on Seaflor Habitat* (Washington DC: National Academy Press., 2002), www.nap.edu./catalog/10323.html.

Research Methods

The method used in writing AIS Satellite data is a qualitative descriptive method, a technique or method that explains scientifically and comprehensively. The data is collected via https://www.vesselfinder. com/, observations are made, data is retrieved from the internet, and data processing uses statistics to produce tables and graphs. Besides that, it also uses data collection techniques with literature study, including collecting sources from journals, the internet, news, and books in the form of the internet and related sources. Writing this article is expected to reveal various qualitative information with descriptions.

Utilization of satellite AIS to identify and improve security in the Makassar Strait. Then how many violations were monitored in the period 2019 to 2022? With the following boundaries to the east of the island of Kalimantan. The north of the island of Sulawesi. The borders are with the Philippines and Malaysia. In several cases in 2021, there have been violations at sea, namely crimes. The research object is located in the Makassar Strait.

Figure 1. Makassar Strait

Results and Discussion

AIS Satellite

AIS Satellite is a Very High Frequency (VHF) radio transmitter system that conveys data via the VHF Data Link (VDL) to send and receive information automatically to VTS or SROP stations[7]. The AIS Satellite will make recognizing ships sailing in the Indonesian seas easier. This AIS Satellite must be installed and operated on ships with a minimum size of 35 GT for passenger ships and fishing vessels as low as 60 GT, both with Indonesian flags and foreign flags. They started with cargo ships, passenger ships, and fishing boats. The installation and operation of this Satellite AIS are under the supervision of the Minister of Transportation.

This AIS Satellite is very helpful in monitoring ships sailing in Indonesian seas. It can be detected quickly and accurately so that this information can be used for arrests and prosecution of crimes at sea by the Indonesian Navy, Bakamla, KKP, or stakeholders related to maritime security. Periodic surveillance is hoped to detect anonymous ships carrying out crimes on the border of Indonesian territory or in waters. According to Law Number 3 of 2003 concerning National Defence, what is meant by a threat is any business and activity, both domestic and foreign, which is considered to endanger the country's sovereignty, the territorial integrity of the country, and security of the country[8].

According to [9] the Navy around the world universally has three roles known as the Navy's role trinity, including (1) Military Role (Military) The essence is the optimal use of force to win a war or armed conflict. The use of force is carried out in the context of upholding national sovereignty at sea by way of national defense and deterrence through preparing forces for war, warding off any military threats, and protecting and guarding sea borders with neighboring countries. (2) Police Role (Constabulary). Implemented to uphold the law at sea, protect national marine resources and wealth, maintain order at sea, support national development, and contribute to national stability and development. (3) The Role of Diplomacy (Diplomacy) This role for navies worldwide is carried out with sea power

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[7] Kementerian Perhubungan, "Automatic Identification System," 24 maret, 2019, http://dephub.go.id/org/disnavtanjungpinang/post/read/automatic-identification-system-%28ais%29?language=id.

[8] Sekretariat Negara, "Undang-Undang Nomor 3" (Jakarta: Sekretaris Negara, 2002), https://peraturan.bpk.go.id/Home/Details/44421/uu-no-3-tahun-2002.

[9] Ken Booth, *Navies and Foreign Policy* (New York: Routledge, 1977), https://doi.org/https://doi.org/10.4324/9781315769646.

as a means of diplomacy in supporting the government's foreign policy. With a vast sea, crime can occur at sea, from smuggling and sending illegal immigrants, and many other crimes. Based on this theory, enforcing legal regulations at sea is essential and must be carried out carefully and precisely. Thus, in the future is where the role of the Indonesian Navy, BAKAMLA, KKP, and other stakeholders is to work together in upholding the law at sea.

Monitoring Ships in the Makassar Strait

Theoretically and empirical data support are needed to get a more in-depth study. Theoretical support can come from scientifically reliable sources. This writing uses several data collection techniques, including literature review techniques and the use of data from https://www. vesselfinder.com/. The results of daily AIS Satellite observations of passing ships are shown in Figure 2.
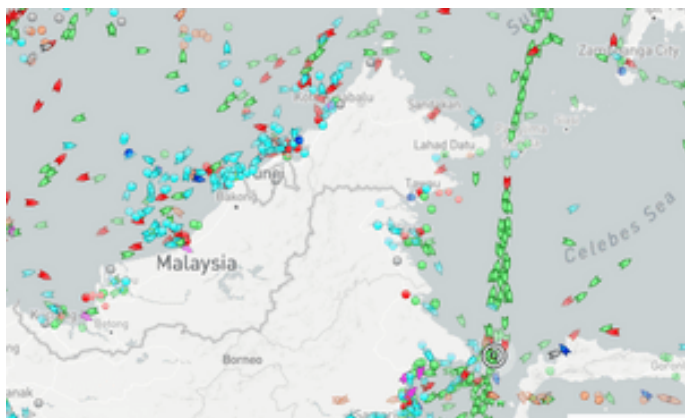

Figure 2. Marine Traffic

From the Marine Traffic[10] observations above, it is evident how busy the shipping lanes that pass through the Makassar Strait are, but what is busy is that only the west side is close to the island of Borneo, but the east side can be said to be quieter. The potential that will arise in the Makassar Strait with the level of traffic is that the level of violations can also arise at any time by taking advantage of the crowds of the shipping lanes.

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[10] "Https://Www.Marinetraffic.Com/," n.d., https://www.marinetraffic.com/en/ais/home/centerx:120.0/centery:0.2/zoom:8.
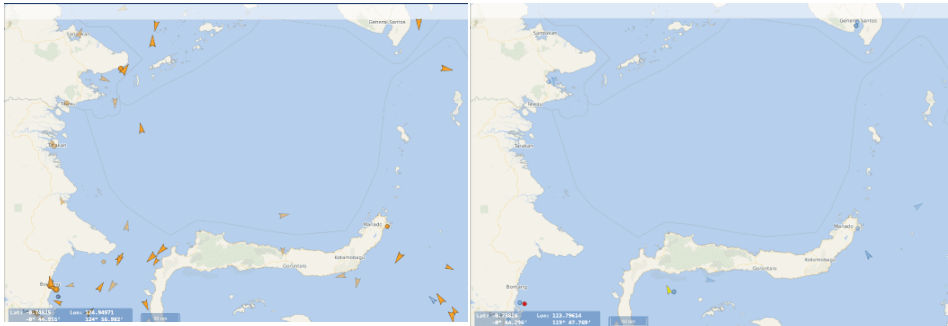
| (a) | (b) |

Figure 3. (a) Tanker Monitoring, (b) Fish Daily Monitoring

In Figure 3, we can see monitoring from the AIS Satellite on the daily activities of tankers and fishing vessels carrying out sailing activities. So, sailing ships must turn on AIS to find information on ship movements.
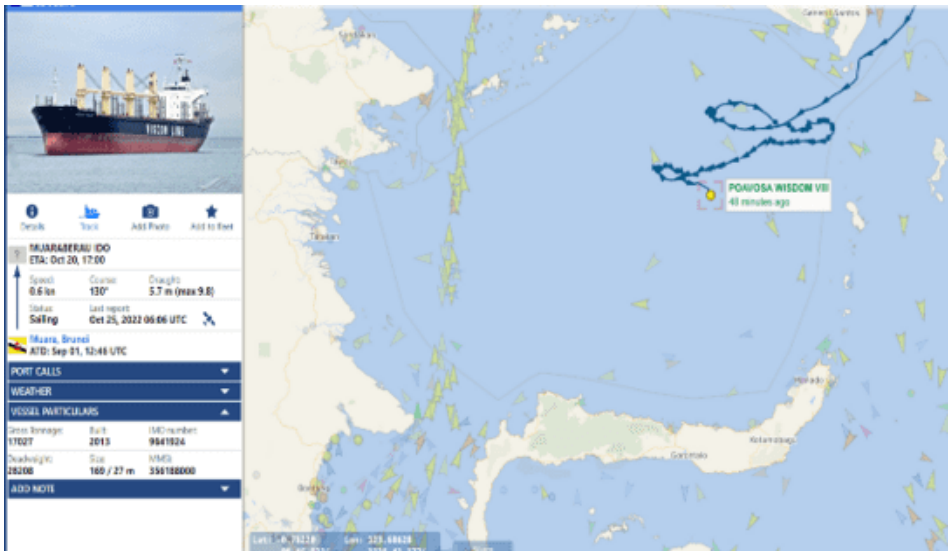

Figure 4. Anomaly Ship Monitoring

Figure 4 shows that the Poavosa Wisdom VII ship is suspected of having committed an offense due to the regulation of the Republic of Indonesia Law number 6 of 1996, that ships sailing across peace must continuously and must not turn around, direct, fast, and unhindered[11].

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[11] Menteri Negara Sekretaris Negara Republik Indonesia, "Undang Undang RI No 6 Tahun 1996," 1996, 36, http://bphn.go.id/data/documents/96uu006.pdf.
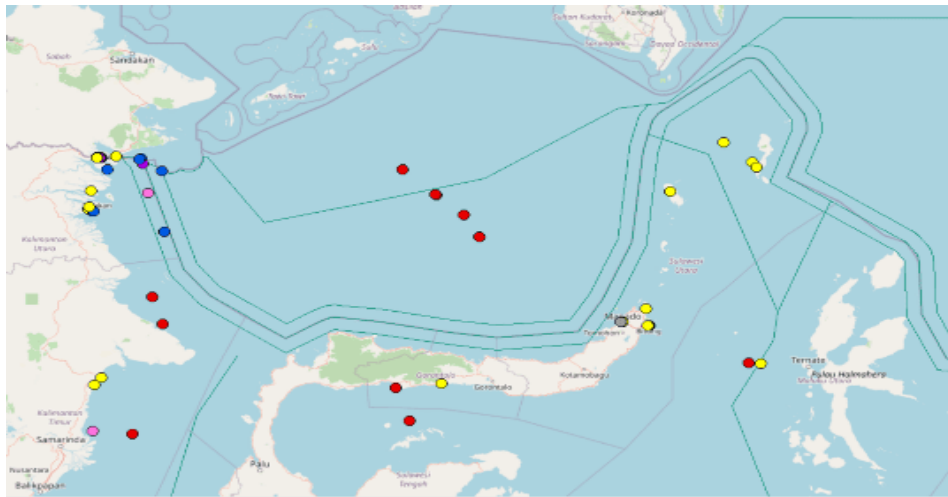
● Contraband Smuggling
● Drugs Trafficking
● Irregular Human Migration
● IUUF
● illegal Fuel/ Siphoning
● PettyTheft and Robbery

Figure 5. Ship Violations

There are examples of monitoring suspicious ship anomalies and ships that committed violations from 2019 to 2022. Figure 5 is part of the information from the AIS Satellite that carries out monitoring. The different colors indicate the ship violations and where they were located.

The role of the Indonesian Navy, BAKAMLA, KKP, and other stakeholders is crucial to maintain and controlling stability on the borders of Indonesia and neighboring countries concerning maritime security from violations. Data usage is the role of AIS Satellite in observing and early detecting violations in the Makassar Strait, especially goods smuggling violations because the Makassar Strait is an international shipping route. In addition, not only goods smuggling violations are monitored, but all forms of violations at sea are also monitored by AIS Satellite. To understand the distribution of satellite AIS data it can be shown in table 1.

With the AIS satellite being monitored, it will provide information quickly if there is a violation of a ship sailing in the Makassar Strait. With ships detected and suspected of committing violations, the Indonesian Navy, BAKAMLA, KKP, and related stakeholders currently operating can immediately conduct pursuits and inspections and take action in the Makassar Strait.

Table 1. Ship violation data sample in the Makassar strait from 2019 to 2022

No	Type	Date	Latitude	Longitude
1	Contraband Smuggling	1/4/2019	1.717	125.155
2	Contraband Smuggling	30/05/2019	4.167	117.903
3	Contraband Smuggling	5/6/2020	4.398	126.230
4	Drugs Trafficking	11/1/2019	4.149	117.674
5	Drugs Trafficking	5/4/2019	3.302	117.569
6	Drugs Trafficking	5/11/2020	3.291	117.580
7	Irregular Human Migration	28/05/2022	4.160	117.674
8	Irregular Human Migration	1/6/2022	4.148	117.669
9	Irregular Human Migration	15/07/2022	4.059	118.264
10	IUUF	23/05/2019	3.547	122.284
11	IUUF	23/05/2019	3.547	122.284
12	IUUF	1/2/2021	0.429	121.732
13	Illegal Fuel/ Siphoning	15/06/2021	1.502	124.822
14	PettyTheft and Robbery	5/5/2020	-0.264	117.585
15	PettyTheft and Robbery	19/07/2022	3.584	118.334

Based on Figure 6, the violations and crimes in the Makassar Strait show that the highest value is for ships carrying out smuggling, then drug smuggling, and fishing theft, some of which can be seen in the graph above. The violation data above is from 2019 to 2022.
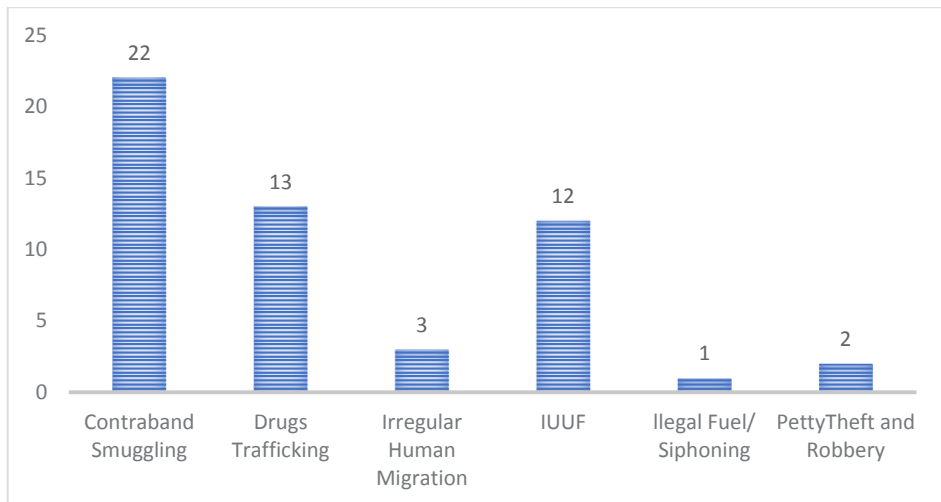

Figure 6. Distribution of Violations in the Makassar Strait from 2019 to 2022

To get a detailed description of a ship's violations, several cases are studied more deeply to ascertain the violations. As shown in Figure 7, it can be seen that the foreign ship Xinghe Express allegedly committed a breach because the ship suddenly lowered its speed drastically to 1.5 knots and then dropped to 0.6 knots by changing course 108°. Whereas in the regulation of the Republic of Indonesia Law number 6 of 1996, foreign ships passing through international shipping lanes must continue at a constant speed and must not make turns.

Figure 8. Shows that the foreign ship Zhepuyu44212 was detected on the radar while sailing to turn off AIS, and suddenly when it was about to enter an international shipping lane, it turned on AIS again. Meanwhile, according to the 1982 UNCLOS regulations and the Republic of Indonesia Law number 6 of 1996, all ships, when carrying out voyages, are required to turn on AIS. With the occurrence of the foreign ship Zhepuyu44212, which committed these deviations. The ship was suspected of having committed an offense. So, with this incident, the relevant stakeholders can carry out the pursuit and investigation of the ship.
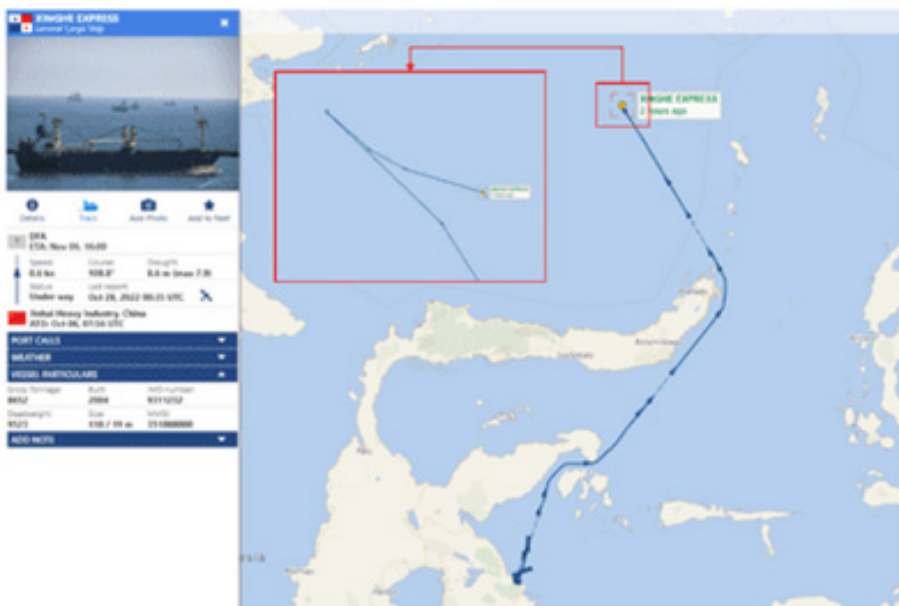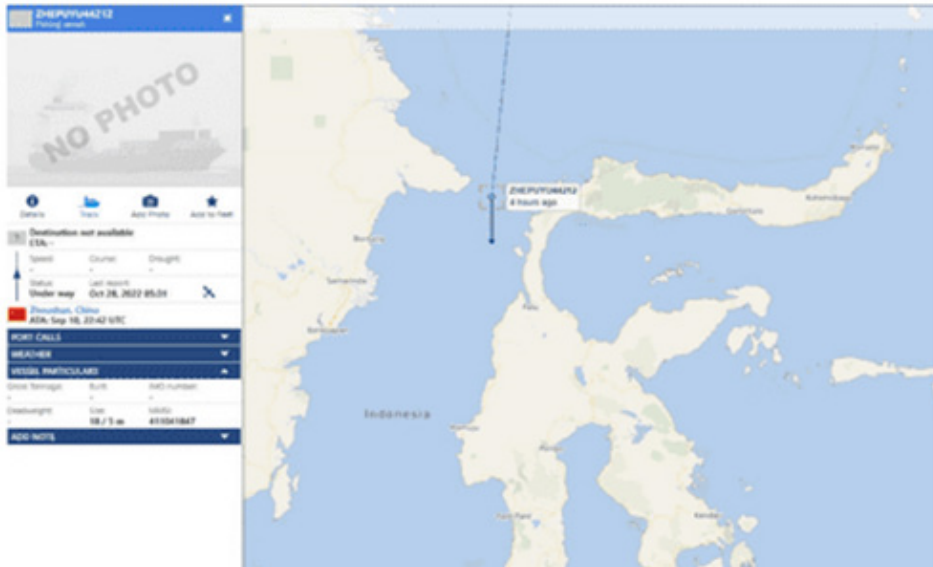

Figure 7. Xinghe Express Ship Tracking

Figure 8. *Zhepuyu44212* Ship Tracking.

Figure 9 shows AIS's detection that the Tangguh Jaya ship currently sailing does not comply with sailing ship regulations. The Tangguh Jaya ship maneuvers back and forth in the Sulawesi Sea, whereas in rules that the ship's movement must be according to the course and a constant speed, it is not allowed to go back and forth, as shown above. With the ship's movement like that, the vessel is suspected of committing a violation, and an inspection must be carried out immediately.

The Makassar Strait is a sea adjacent to the borders of neighboring countries and is an international shipping lane prone to violations at sea. Therefore, it needs extra observation and cooperation between solid maritime security agencies. Not only foreign fishing vessels entering the waters of the Makassar Strait will be prosecuted, but Indonesian vessels without identity and deemed suspicious will also be examined and prosecuted if they violate the provisions.
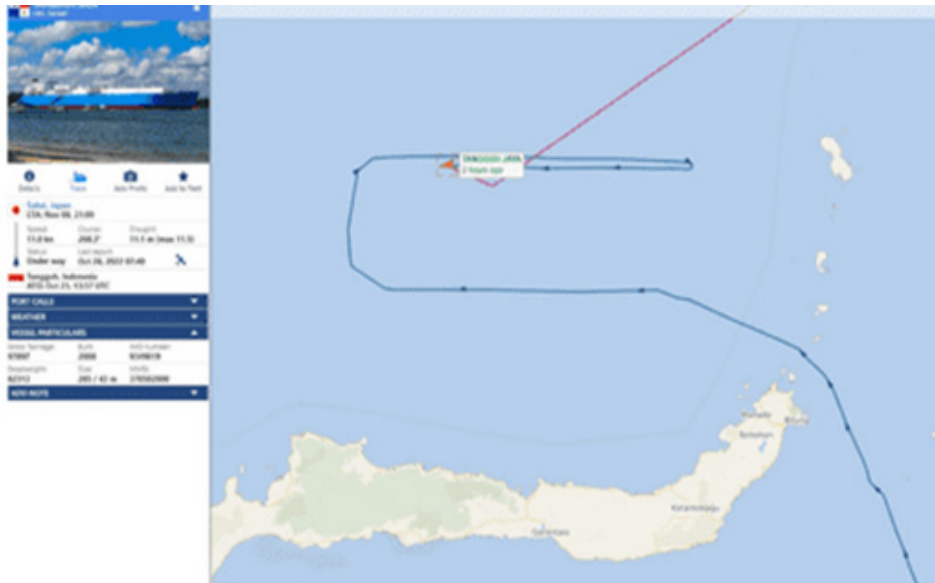
Figure 9. Tangguh Jaya Ship Tracking.

Conclusion

From the description of the discussion above, it can be concluded: *First*, Satellite AIS is essential and must be turned on for passenger ships and cargo ships with a minimum size of 35 GT, then for fishing vessels with a size of 60 GT. Satellite AIS is useful for monitoring the movement of ships passing or fishing vessels in the Makassar Strait. If a ship is monitored on AIS Satellite without a name, pursuit, and inspection can immediately be carried out by the Indonesian Navy, BAKAMLA, KKP, or stakeholders related to maritime security.

Second, Several ships were indicated to have committed violations because some had turned off AIS, and some had maneuvered, not following the Republic of Indonesia Laws. Ships that are sailing but whose maneuvers are not by shipping regulations nationally and internationally are suspected of committing violations and must immediately carry out inspections by the relevant stakeholders. Violations in the Makassar Strait for 2019 to 2022 include 22 violating smuggling ships, 13 violating drug smuggling vessels, and 12 violating crime ships sourced. Stakeholders related to maritime security who function as police officers work together and be solid in protecting the sea, especially in the Makassar Strait.

With maritime violations in the form of crimes committed by Indonesian-flagged ships or foreign ships entering Sulawesi waters, it is hoped that stakeholders related to maritime security can optimize the pattern of sea operations that are precise and fast. Eliminate sectoral egos between law enforcement agencies at sea.

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