



## Coastal and Marine Journal

journal homepage: <https://nusantara-research.com/index.php/coastal-and-marine-journal>

Original research article:

### Analysis of Squid (*Loligo sp.*) Utilization and Sustainable Management Strategies in The Water of North Sulawesi Province, Indonesia

Talitha Zerlinda Gunawan , Anaya Noveleta\*, Dianatalia, Elsa, Paraning Gita Cahyani, Sudirman Adibrata, Lizha Dwi Mulya Putri

*Aquatic Resources Management Study Program, Faculty of Agriculture, Fishery and Marine Science, Bangka Belitung University, Indonesia*

#### ARTICLE INFO

##### *Article history:*

Received 28 June 2025

Received in revised from 18 July 2025

Accepted 29 August 2025

Available online 30 December 2025

##### *Keywords:*

fishery production

squid

sustainable management

IFMA 715

#### ABSTRACT

This study aims to analyze the utilization status of squid (*Loligo sp.*) resources and formulate sustainable management strategies in North Sulawesi Province, Indonesia. The study was conducted in May 2025 in the waters of North Sulawesi Province, which are part of the Indonesian Fisheries Management Area (IFMA) 715. A quantitative descriptive method was employed, using secondary data obtained from reports published by the Ministry of Marine Affairs and Fisheries, capture fisheries statistics, and relevant scientific literature. The data analyzed include squid (*Loligo sp.*) catch production, the number of squid (*Loligo sp.*) fishing gears, and the estimated Allowable Catch (TAC) for the years 2020–2024. The research results indicate that squid (*Loligo sp.*) production has experienced fluctuations, with the highest production in 2024 at 1,933.21 tons, still below the TAC value of 2,712 tons; however, the utilization rate has approached the optimal limit. The relationship between the number of fishing gear and production shows a negative pattern influenced by environmental factors, seasons, and resource stock conditions. The recommended management strategies include the implementation of the Ecosystem Approach to Fisheries Management (EAFM), control of fishing effort, limitation of fishing gear, and the use of environmentally friendly fishing technology to ensure the sustainability of squid (*Loligo sp.*) resources in the water of North Sulawesi Province.

#### Introduction

Fisheries resources are one of the strategic sectors in Indonesia's maritime

development because they play an important role in supporting food security, economic development and the well-being of coastal communities. Based

\*Corresponding author:

Email address: [anayanoveleta16@gmail.com](mailto:anayanoveleta16@gmail.com)

<https://doi.org/10.61548/cmj.v3i2.83>

on Law of the Republic of Indonesia No. 31 of 2004 concerning Fisheries, Article 1 Paragraph 7, fisheries management includes all integrated processes ranging from information collection, analysis, planning, decision-making, to policy implementation to ensure the sustainability of fish resources. One of the fishery commodities that has high economic value and continuously increasing market demand is squid (*Loligo sp.*). This commodity is widely used as a source of domestic and export food, so the intensity of its capture continues to increase year by year. The high demand for squid (*Loligo sp.*) has the potential to increase exploitation pressure on this resource if it is not accompanied by sustainable management. (Merliana *et al.* 2025).

North Sulawesi Province is one of the strategic fisheries areas in Indonesia, located within the Indonesian National Fisheries Management Area (IFMA) 715. This area includes the waters of Tomini Bay, the Maluku Sea, the Halmahera Sea, the Seram Sea, and Berau Bay, which are known to have high potential for pelagic and demersal fish resources (Pranowo *et al.*, 2019). squid (*Loligo sp.*) fishing activities in this area are relatively intensive due to oceanographic conditions that are suitable for the habitat and distribution of squid (*Loligo sp.*). In addition, North Sulawesi's geographical position, which directly borders international trade routes, causes squid (*Loligo sp.*) catches to have a high economic value and become one of the region's flagship capture fishery commodities. However, increased fishing activities without control can lead to a decline in resource stocks and threaten the sustainability of squid (*Loligo sp.*) fisheries in the future (Susanti *et al.*, 2020).

The government sets a policy for estimating the allowable catch in sustainable fisheries management as a reference for controlling the utilization of

fishery resources in each Fishery Management Area of the Republic of Indonesia (IFMA). This policy aims to maintain a balance between the level of exploitation and the regenerative capacity of fishery resources so that the sustainability of the stock is preserved. The government determines the AAC based on studies of fishery resource stock, utilization levels, and sustainable potential in a particular water area (Ministerial Decree MMAF No.19, 2022). IFMA 715 has a fairly high level of utilization of fishery resources, so the government needs to conduct regular evaluations of actual catches, including squid (*Loligo sp.*) commodities, to ensure that their use does not exceed the allowed catch limits (Riadi *et al.*, 2024)

Squid (*Loligo sp.*) are a group of cephalopods that have relatively fast growth, a short lifespan, and high sensitivity to environmental changes as well as fishing pressure. These biological characteristics make squid (*Loligo sp.*) populations vulnerable to fluctuations in case of overexploitation. Research on Squid (*Loligo sp.*) population dynamics in several regions of Indonesia shows that an increase in the exploitation rate can affect the size structure, growth, and sustainability of squid (*Loligo sp.*) resource stocks. Therefore, squid (*Loligo sp.*) catch data becomes an important component in fisheries management evaluation, particularly in determining the level of utilization and its compliance with the estimated allowable catch (Ernaningsih *et al.* 2019).

The implementation of the measured fishing policy currently applied by the government also requires data-based management and catch quotas. In this context, analyzing squid (*Loligo sp.*) catch results in North Sulawesi Province becomes important to determine the extent to which the utilization level of squid (*Loligo sp.*) resources is still within safe limits according to the TAC estimates in IFMA 715. This analysis is

also necessary to support the evaluation of sustainable fisheries resource management. Therefore, this study aims to analyze the potential of squid (*Loligo sp.*) resources and formulate sustainable management strategies in North Sulawesi Province, Indonesian Fisheries Management Area (IFMA) 715.

## Research Method

### *Time and Place*

This research was conducted in May 2025 using secondary fisheries data representing North Sulawesi Province within IFMA 715. This time was used for the collection and analysis of secondary data obtained from various official sources related to capture fisheries.

### *Research Tools and Materials*

The equipment and materials used in this research consist of secondary data, namely data on squid (*Loligo sp.*) catch production, data on the number of squid (*Loligo sp.*) fishing lines in the waters of North Sulawesi Province IFMA 715 for 2020-2024, data on the estimated Total Allowable Catch (TAC), data on the level of utilization of fishery resources, scientific literature, journals, fishery statistics publications, official reports from the Ministry of Marine Affairs and Fisheries (MMAF), data processing software such as Microsoft Excel, as well as applications that support scientific writing.

### *Data Analysis*

The research applied a quantitative descriptive approach through the use of secondary data analysis. The quantitative descriptive method is used to describe the condition of squid (*Loligo sp.*) resource utilization based on actual catch data and estimated TAC values in the waters of North Sulawesi Province, IFMA 715.

The data used was obtained from capture fisheries statistics publications, reports from the MMAF and various relevant scientific literature. The data

collected includes squid (*Loligo sp.*) catch production, estimated TAC value, and the level of utilization of fishery resources (Kartika *et al.* 2024). The calculation results are then used to determine the status of squid (*Loligo sp.*) resource utilization, whether it falls into the safe, optimal, or over-exploited category.

The research stages began with the collection of secondary data in the form of squid (*Loligo sp.*) catch data and the estimated Total Allowable Catch (TAC) values in the North Sulawesi Province area of IFMA 715. This data was obtained from reports from the Ministry of Marine Affairs and Fisheries (KKP), published capture fisheries statistics, and various scientific literature relevant to the research (Purwoko *et al.*, 2022). Next, all obtained data are organized and tabulated into table form using Microsoft Excel to facilitate the process of data processing and analysis.

The tabulated data were then analyzed descriptively and quantitatively to determine the level of squid (*Loligo sp.*) resource utilization based on a comparison between actual catch results and TAC estimated values. The results of this analysis were subsequently interpreted to determine the status of squid (*Loligo sp.*) resource utilization, whether it is still in the safe, optimal, or overexploited category (Saepulloh *et al.*, 2025). Based on the research results obtained, recommendations and management strategies for sustainable squid (*Loligo sp.*) fisheries in the North Sulawesi Province IFMA 715 area were then prepared. The analysis was carried out by comparing the actual catch values with the estimated TAC values in the North Sulawesi Province IFMA 715 area (Faizah & Kasim, 2023). The analysis results were then interpreted to understand the condition of squid (*Loligo sp.*) resource utilization, so that they can be used as a basis for providing recommendations for sustainable fisheries management.

## RESULTS AND DISCUSSION

### General Overview of IFMA 715

IFMA 715 Figure 1, is one of the fishery management areas that has a fairly large marine and fishery resource potential in eastern Indonesia, covering an area of around 47 million hectares, of which 45% of the waters fall under the authority of provincial governments within a radius of 0–12 nautical miles, while the remaining 55% is under the authority of the central government. IFMA 715 has high marine resource biodiversity, including pelagic, demersal fish, and economically important cephalopods such as squid (*Loligo sp.*).

This area covers six provinces: Central Sulawesi, Gorontalo, North Sulawesi, Maluku, North Maluku, and West Papua. The IFMA 715 area includes Tomini Bay, the Maluku Sea, Halmahera Sea, Seram Sea, and Berau Bay, which are known as potential fishing areas in Indonesia. For North Sulawesi Province, the Maluku Sea and Tomini Bay Sea are the main fishing grounds for fishermen due to their highwater productivity. Fishing activities in this area are also supported by the presence of the Bitung Ocean Fishery Port (PPS) as the largest fishery port center in North Sulawesi, which plays an important role in the landing and distribution of fish catch (Albasri & Pratama, 2021).

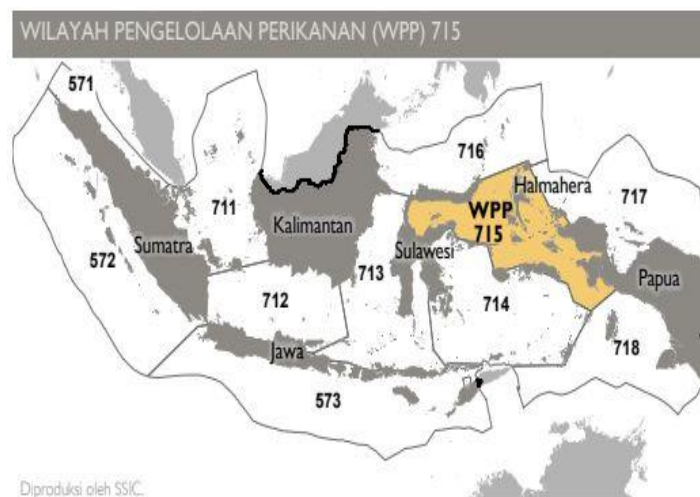


Figure 1. Fisheries Management Area 715

### Squid (*Loligo sp.*) Potential

The potential of squid (*Loligo sp.*) in North Sulawesi is quite large because this region has productive coastal waters, support from coastal ecosystems, and long-established capture fishing activities. Squid (*Loligo sp.*) is a high-value economic commodity and is in great demand in the market, making its presence important for traditional fishermen as well as regional fisheries development. In North Sulawesi, this

potential is even more attractive because several coastal areas still support the spawning and egg attachment processes of squid (*Loligo sp.*) (Faradizza *et al.* 2019). The potential of squid (*Loligo sp.*) in North Sulawesi can be understood as a combination of biological potential and economic potential. Biologically, this region supports important habitats for squid (*Loligo sp.*); economically, this commodity provides high market value and promising business opportunities for small-scale fishermen. However, this

potential will only be sustained if managed with principles of sustainability, for example through the protection of spawning areas, the use of squid (*Loligo*

*sp.*) attractors, the restriction of environmentally unfriendly fishing gear, and the regular recording of catch results (Mulyono *et al.* 2023).

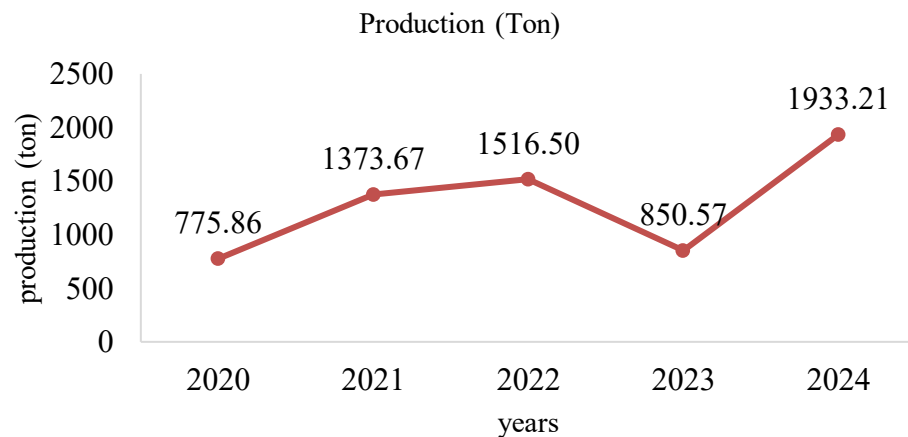


Figure 1. Squid (*Loligo sp.*) Production

Based on Figure 2, squid (*Loligo sp.*) production in North Sulawesi during the 2020–2024 period experienced a fluctuating pattern. In 2020, squid (*Loligo sp.*) production was recorded at 775.86 tons, which was the lowest production during the 5-year period. In 2021, it increased to 1,373.67 tons, and production increased again in 2022 with a total production of 1,516.50 tons. Subsequently, in 2023, production decreased quite significantly to 850.57 tons and then rose drastically in 2024 to 1,933.21 tons, which was the highest production during that period. This condition is related to IFMA 715 data, which shows a squid (*Loligo sp.*) utilization rate of 0.9, indicating that its utilization is approaching the optimal limit. This is because the catch has approached the allowable catch limit (TAC) of 2,712 tons. The increase in squid (*Loligo sp.*) production indicates that the fishing pressure on the squid (*Loligo sp.*) stock is getting higher. Although production has not exceeded the MSY, the increasing production trend up to nearly 2,000 tons shows that the utilization of

squid (*Loligo sp.*) resources is already quite intensive. If fishing efforts continue to increase without proper management, it is feared that it could exceed the MSY limit and cause a decline in squid (*Loligo sp.*) stock in North Sulawesi Province IFMA 715 (Ministerial Decree MMAF No. 19, 2022).

Fluctuations in squid (*Loligo sp.*) production can be caused by changes in the distribution of squid (*Loligo sp.*) in the waters as well as the effectiveness of the fishing gear used. According to Albasri & Pratama, (2021), squid (*Loligo sp.*) catch productivity is influenced by the intensity of fishing operations, the environmental conditions of the waters, and the availability of resource stocks. Thus, changes in squid (*Loligo sp.*) production each year indicate that squid (*Loligo sp.*) fisheries activities are greatly affected by environmental factors and the dynamics of aquatic resources.

Squid (*Loligo sp.*) fishing generally uses lift hooks, boat jigging, and fixed gill nets, with lift hooks being the most dominant fishing gear (Ansori *et al.*, 2022). The fishing gear used for squid

(*Loligo sp.*) fishing in North Sulawesi is squid (*Loligo sp.*) jig. Squid (*Loligo sp.*) jig is a handline fishing gear that has been modified by fishermen on the auxiliary part of the catching tool, namely the lighting. The light technology used is additional flashing LED lights directly connected to the handline gear, positioned above the squid (*Loligo sp.*) hook to attract squid (*Loligo sp.*) towards the fishing gear. Squid (*Loligo sp.*) jigs using LED lights are widely used by fishermen because they have low operational costs, the construction of the gear is relatively simple, more environmentally friendly, easy to operate, and the squid (*Loligo sp.*) catch has a high market price (Palawe *et al.* 2021).

Based on Figure 3, it shows that the number of squid (*Loligo sp.*) fishing hooks during the 2020–2024 period experienced quite significant fluctuations. The figure shows that in 2020, the number of squid (*Loligo sp.*) hooks was recorded at the highest, amounting to 293 units. However, in 2021 it experienced a drastic decrease to 61

units and was relatively stable in 2022 at 62 units. Furthermore, in 2023 the number of squid (*Loligo sp.*) hooks increased again to 230 units, then decreased again in 2024 to 80 units. These fluctuations in the number of squid (*Loligo sp.*) hooks indicate changes in fishing activities, which can be influenced by several factors, such as weather conditions, fishing season, operational costs, availability of squid (*Loligo sp.*) resources, and fishermen's interest in using these fishing tools. The decreasing number of fishing gears in certain years can occur due to suboptimal catch results or fishermen switching to other fishing gear considered more effective. In addition, a high number of squid (*Loligo sp.*) lines does not necessarily indicate a steady increase in fishing activity every year. This is evident from the fluctuations in the number of fishing gear that rise and fall sharply during the research period. Thus, the use of squid (*Loligo sp.*) lines in North Sulawesi is still influenced by changing fishery conditions and environmental factors every year.

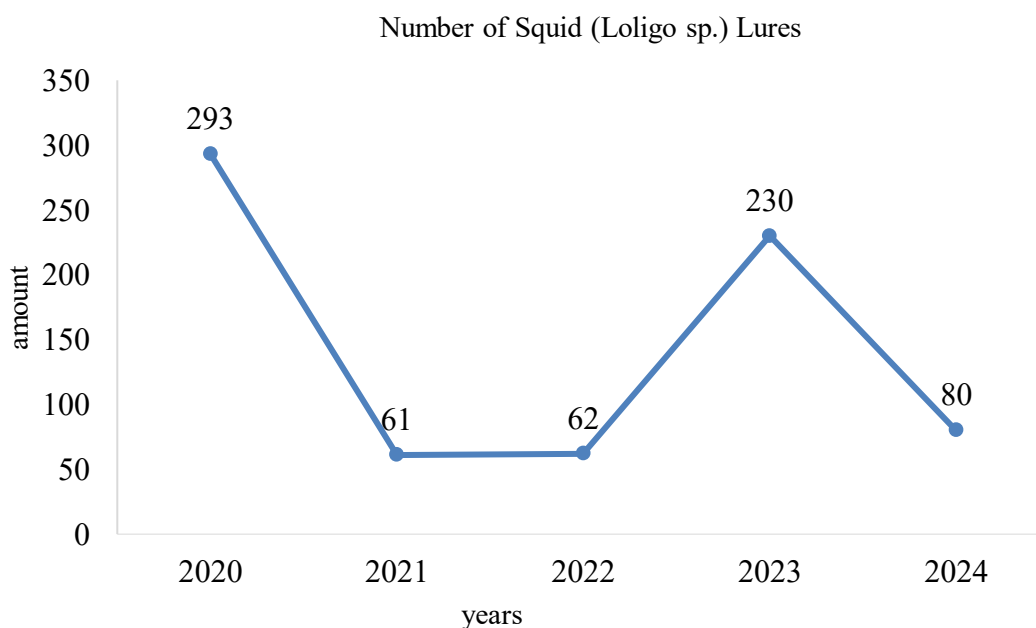


Figure 3. Squid (*Loligo sp.*) fishing gear

Based on Figure 4, the relationship between the number of squid (*Loligo sp.*) fishing lines and squid (*Loligo sp.*) production in North Sulawesi Province shows a negative or inverse pattern. This is indicated by the regression equation  $\text{squid} = -3.8284x + 1845.9$ , which suggests that each addition of 1 unit of squid (*Loligo sp.*) fishing line is estimated to decrease squid (*Loligo sp.*) production by approximately 3.83 tons. The negative slope value indicates the influence of environmental variability, stock

abundance, and fishing efficiency. In addition, the coefficient of determination value of  $R^2 = 0.7459$  shows that around 74.59% of the changes in squid (*Loligo sp.*) production are influenced by the number of squid (*Loligo sp.*) fishing lines, while the remaining 25.41% are influenced by other factors, such as environmental conditions, fishing season, weather, availability of squid (*Loligo sp.*) stocks, fishermen's skills, and the effectiveness of the fishing gear used.

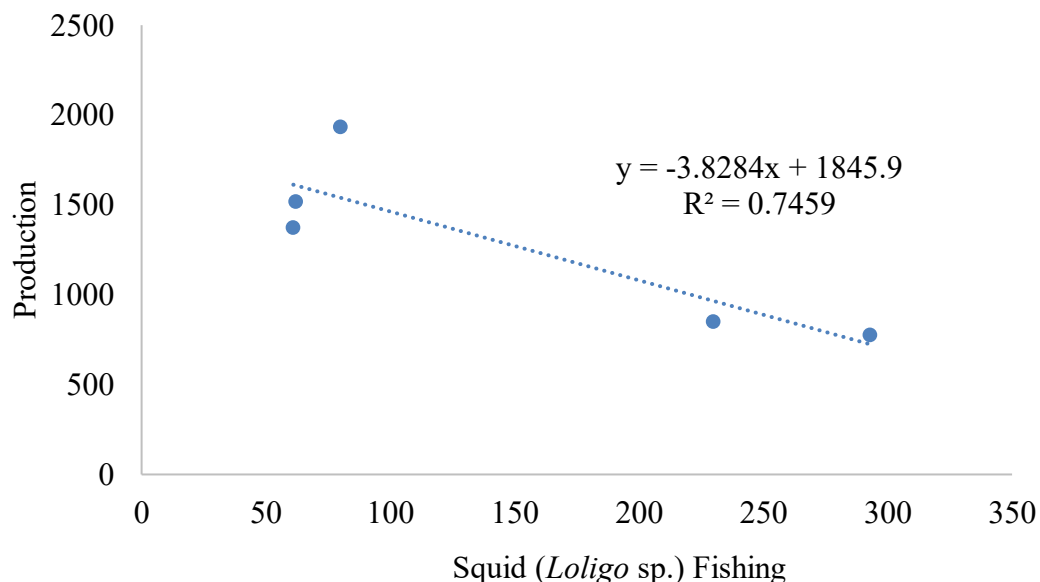


Figure 4. The Relationship Between the Number of Fishing Gear and Squid (*Loligo sp.*) Production

Based on the data in the graph, the year 2020 had the highest number of squid (*Loligo sp.*) fishing rods, totaling 293 units, yet the production generated was only around 775.86 tons. In contrast, in 2024, the number of squid (*Loligo sp.*) fishing rods was lower, at 80 units, but production increased to 1,933.21 tons. This condition shows that an increase in the number of fishing gear does not always accompany an increase in production. This phenomenon can occur due to a decline in squid (*Loligo sp.*) resource stocks, differences in fishing gear efficiency, as well as the influence of

environmental and seasonal factors that affect fishing success.

The moon phase is also known to affect squid (*Loligo sp.*) catch results in the waters. According to Palawe et al. (2021), the moon phase has a significant impact on squid (*Loligo sp.*) catch results because the intensity of moonlight can influence the behavior, activity, and movement patterns of squid (*Loligo sp.*) in the waters. During certain phases, squid (*Loligo sp.*) tend to be more active in approaching light sources, thereby affecting capture effectiveness. Therefore, catch productivity is not only



influenced by the number of fishing gear, but also by other ecological and technical factors. Overall, Figure 3 shows that the relationship between the number of squid (*Loligo sp.*) lines and squid (*Loligo sp.*) production is negative with a fairly strong degree of correlation.

### *Squid (Loligo sp.) Management Strategy*

The management of squid (*Loligo sp.*) resources in North Sulawesi Province in IFMA 715 needs to be carried out sustainably considering the high potential of resources and the increasing fishing activities in the area. IFMA 715, which includes the Maluku Sea, Halmahera Sea, and Tomini Bay, is a productive fishing area that supports squid (*Loligo sp.*) fishing activities by both small-scale and industrial-scale fishers. However, fluctuations in production, changes in environmental conditions, and fishing pressures can affect the sustainability of squid (*Loligo sp.*) resource stocks, so appropriate management strategies are needed. One of the main strategies in squid (*Loligo sp.*) management is the implementation of the Ecosystem Approach to Fisheries Management (EAFM). This approach emphasizes fisheries management that not only considers the catch, but also maintains the balance of the ecosystem, habitat, the socio-economic conditions of fishers, and management institutions. EAFM-based squid (*Loligo sp.*) fisheries management is able to provide a comprehensive evaluation of resource conditions and serves as a basis for determining sustainable management policies (Harahap *et al.*, 2023).

The next strategy is controlling fishing effort. Regulating the number of fleets and fishing gear is very important to prevent overfishing. In recent years, the use of squid (*Loligo sp.*) fishing gear with the help of LED lights in North Sulawesi has increasingly developed because it is considered more effective and environmentally friendly. However, if the

number of fishing units continues to increase without supervision, it can lead to excessive pressure on squid (*Loligo sp.*) stocks. Therefore, the government needs to limit the number of fishing gears and regulate fishing zones according to the carrying capacity of the resources. The use of environmentally friendly fishing technology also becomes an important part of the management strategy. Squid (*Loligo sp.*) fishing technology with blinking LED lights is considered more selective and has a smaller environmental impact compared to other active fishing gears. In addition, the development of squid (*Loligo sp.*) attractors as a fishing aid can increase capture efficiency without damaging the bottom habitat of waters. The use of squid (*Loligo sp.*) attractors in North Sulawesi is able to increase catch productivity more efficiently (Patty *et al.*, 2021).

This study is limited to using secondary data and a relatively short observation period (2020–2024). The analysis does not include direct stock assessment, CPUE data, biological parameters, or environmental variables that may affect squid abundance and catch productivity. Future studies are encouraged to incorporate longer time-series datasets, stock assessment approaches, and environmental indicators to improve the accuracy and reliability of fisheries management recommendations.

### **Conclusion**

Based on research results, squid (*Loligo sp.*) resources in North Sulawesi Province IFMA 715 have quite significant potential and are economically important for the capture fisheries sector. Squid (*Loligo sp.*) production during the 2020–2024 period fluctuated with the highest production reaching 1,933.21 tons in 2024, but it is still below the Allowable Catch number (TAC) of 2,712 tons, so its utilization is considered safe even though it has approached the optimal level. The relationship between the



number of squid (*Loligo sp.*) fishing gears and production shows a negative pattern, indicating that an increase in the number of fishing gears does not always increase catch because it is influenced by environmental factors, fishing seasons, and resource stock conditions. Therefore, to maintain the sustainability of squid (*Loligo sp.*) resources in IFMA 715, it is necessary to implement a management strategy based on the Ecosystem Approach to Fisheries Management (EAFM), control fishing efforts, control the number of fishing gears and implement selective and environmentally sustainable fishing technologies to preserve the equilibrium between the use and conservation of fishery resources.

## References

- Albasri, H., & Pratama, I. (2021). Potential and management of marine cultivation in the fishery management areas of the State of Indonesia (IFMA) 715. *AMAFRAD Press*, 203-232.
- Ansori, A., Adibrata, S., & Aisyah, S. (2022). Management of squid (*Loligo sp.*) resources with a bioeconomic approach in Belitung Regency. *PELAGICUS: Journal of Applied Science and Technology in Fisheries and Marine*, 3(2), 109-123.
- Ernaningsih, Jamal, M., & Indah, N. (2019). Population dynamics and exploitation rate of squid (*Sepioteuthis lessoniana*) in the Spermonde Islands, South Sulawesi. *Journal of Indonesian Tropical Fisheries*, 2(2), 248-259.
- Faizah, R., & Kasim, K. (2023). Management policy for the optimization of squid resource utilization in the Arafura Sea (FMA 718). *Indonesian Fisheries Policy Journal (JKPI)*. 15(2), 105-113
- Faradziza, D. M., Andaki, J. A., & Pangemanan, J. F. (2019). Analysis of the squid capture fishery business in traditional fishermen in Motto Village, North Lembah District, Bitung City. *Acculturation (Scientific Journal of Fisheries Agribusiness)*, 7(1), 1155. <https://doi.org/10.35800/Akulturas.i.7.1.2019.24409>
- Harahap, W. A. J., Zairion, Kamal, M.M., & Adrianto, L. (2023). Evaluation of small-scale squid fisheries management using an ecosystem approach in the Waters of Medan, North Sumatra. *Marine Fisheries : Journal of Marine Fisheries Technology and Management*, 14(1), 103-116. <https://doi.org/10.29244/jmf.v14i1.45714>
- Kartika, H., Ernaningsih, D., & Telussa, R. F. (2024). Analysis of the utilization rate of squid (*Loligo spp.*) landed at PPS Nizam Zachman. *Satya Minabahari Scientific Journal*, 09(02), 92-108.
- Law No. 31 of 2004. (2004). Fisheries. Jakarta
- Merliana, Kantun, W., & Kabangnga, A. (2025). Composition of catch results and size distribution of squid (*Loligo chinensis*, Gray 1849) using attractors in the waters of the Makassar Strait. *Indonesian Journal of Fisheries Research*, 29(4), 215-223.
- Ministerial Decree MMAF No.19. Ministerial Decree Ministry of Maritime Affairs and Fisheries. (2022). Estimation of fish resource potential, allowable fish catch, and the level of utilization of fish resources in Indonesian Fisheries Management Area.
- MMAF. Ministry of Maritime Affairs and Fisheries. (2020). Capture fisheries production and the fishing gear used. Jakarta. <https://portaldata.kkp.go.id/portals/data-statistik>
- MMAF. Ministry of Maritime Affairs and Fisheries. (2021). Capture fisheries

- production and the fishing gear used. Jakarta.  
<https://portaldata.kkp.go.id/portals/data-statistik>
- MMAF. Ministry of Maritime Affairs and Fisheries. (2022). Capture fisheries production and the fishing gear used. Jakarta.  
<https://portaldata.kkp.go.id/portals/data-statistik>
- MMAF. Ministry of Maritime Affairs and Fisheries. (2023). Capture fisheries production and the fishing gear used. Jakarta.  
<https://portaldata.kkp.go.id/portals/data-statistik>
- MMAF. Ministry of Maritime Affairs and Fisheries. (2024). Capture fisheries production and the fishing gear used. Jakarta.  
<https://portaldata.kkp.go.id/portals/data-statistik>
- Mulyono, M., Imron, M., Hestirianoto, T., Kholilullah, I., Prasetyo, S. L., Komarudin, D., & Yuwandana, D. P. (2023). Effectiveness of squid attractors in East Lombok, West Nusa Tenggara. *Journal of Fisheries and Marine Technology*, 14(1), 55–64.  
<https://doi.org/10.24319/Jtpk.14.55-64>
- Palawe, H. J., Kaparang, F. E., Luasunaung, A., Masengi, K. W. A., & Sumilat, D. A. (2021). The influence of moon phases on squid fishing catch using blinking LED lights. *IPTEKS PSP Journal*, 8(2), 58–69.
- Patty, W., Pangalila, F. P. T., Kayadoe, M. E., Majore, E., & Dien, H. V. (2021). Iron frame squid attractor technology: an effort to increase the productivity of fishery resources in the waters of Kalasey Dua Village, Mandolang District, Minahasa Regency, North Sulawesi Province. *Journal of Fisheries Capture Science and Technology*, 6(1), 26–30.  
<https://doi.org/10.35800/jitpt.6.1.2021.24843>
- Pranowo, W. S., Setiawan, R. Y., & Wirasantosa, S. (2019). Potential of marine and fisheries resources of IFMA 715. AMAFRAD Press, 137–173.
- Purwoko, R. M., Akbar, M. A., Mahulette, R. T., & Widodo, A. (2022). Management status of squid resources in the waters of the southern Indian Ocean off Java based at Nusantara Fishery Port Prigi, Trenggalek. *Indonesian Fisheries Research Journal*, 27(4), 229–236.
- Riadi, S., Susanti, A., & Arkham, M. N. (2024). The economic analysis of fisheries management of big pelagic fish in IFMA 715. *Journal of Tropical Marine Science and Technology*, 16(1), 37–46.
- Saepulloh, A., Simamora, D. C., Sabina, A., Alam, A. F., & Radiarta, I. N. (2025). Spatial and temporal distribution of squid catches in WPP 718 based on the GAM model. *BAWAL Capture Fisheries Research*, 17(2), 88–98.
- Susanti, A., Fahrudin, A., & Kusumastanto, T. (2020). Economic impact due to IUU fishing of large pelagic capture fisheries in IFMA 715. *Journal of Marine and Fisheries Socio-Economics*, 15(2), 135–144.