

## Comparison of Catch Results Using Togok Fishing Gear During High and Low Tides in Kuala Tungkal Waters, West Tanjung Jabung Regency

### Perbandingan Hasil Tangkapan Alat Tangkap Togok Pada Waktu Pasang Dan Surut Di Perairan Kuala Tungkal Kabupaten Tanjung Jabung Barat

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#### ABSTRACT

The potential of Kuala Tungkal waters includes various fish and shrimp such as grouper, anchovies, rebon shrimp, crabs, and cuttlefish. Togok, a passive fishing gear, is commonly used to trap organisms with the help of currents. This study aimed to compare catches at high and low tide and identify main and by-catch using experimental fishing with 5 togok units over 15 days. Results showed rebon shrimp dominated the catch (57% at high tide; 50.23% at low tide) as the main catch, while others were bycatch. Differences were influenced by shrimp behavior, net position, and gear selectivity. In conclusion, togok is more effective at low tide, with rebon shrimp as the primary catch.

**Keywords:** shrimp, togok fishing gear, tides, ebbs

#### ABSTRAK

Potensi perairan Kuala Tungkal meliputi berbagai jenis ikan dan udang seperti kerapu, teri, udang rebon, kepiting, dan cumi-cumi. Alat tangkap yang umum digunakan adalah togok, yaitu alat tangkap pasif yang memanfaatkan arus untuk menjebak organisme. Penelitian ini bertujuan membandingkan hasil tangkapan saat pasang dan surut serta mengidentifikasi hasil tangkapan utama dan sampingan, dengan metode experimental fishing menggunakan 5 unit togok selama 15 hari. Hasil menunjukkan udang rebon mendominasi tangkapan (57% saat pasang; 50,23% saat surut) sebagai tangkapan utama, sementara lainnya merupakan tangkapan sampingan. Perbedaan ini dipengaruhi oleh perilaku udang, posisi alat, dan selektivitas jaring. Kesimpulannya, togok lebih efektif digunakan saat air surut dengan udang rebon sebagai tangkapan utama.

**Kata Kunci:** alat tangkap togok, pasang surut, udang



## INTRODUCTION

Tanjung Jabung Barat Regency is a regency in Jambi Province. It covers an area of 141.75 km<sup>2</sup> and has a coastline of 45 km. Tanjung Jabung Barat Regency comprises marine waters that can be optimally explored. Kuala Tungkal, an area with significant fisheries potential, is located directly facing the South China Sea. The sustainable fisheries potential in these waters is estimated to reach 1,000 tons per year (BPS-statistics Tanjung Jabung Barat Regency, 2025).

The potential of Kuala Tungkal waters consists of various types of fish and shrimp catches including grouper, lomek fish, tongue fish, anchovies, ketak shrimp, dogol shrimp, rebon shrimp, crab, selangin crab, mayung fish, sembilang fish, scad and cuttlefish with a catch of 6.20-1385.70 kg/ton per year (BPS-statistics Tanjung Jabung Barat Regency, 2023).

Togok is a passive fishing tool, in the form of a bag net that waits and traps fish and shrimp that enter the togok bag with the help of currents (Maulidin et al. 2022). The togok bag is cone-shaped so fish and shrimp can easily get trapped in the bag. The advantages of this togok fishing gear are easier handling, operation that only uses current assistance without using bait and low maintenance costs. Togok fishing gear consists of a net frame and a net body. The most common catch of togok is a type of shrimp that lives in waters mixed with river and sea water. According to Imron et al. (2020), the types of fish and shrimp that are caught by togok include yellow shrimp, mantis shrimp, jerbung shrimp, mackerel, anchovies, lomek fish, layur fish, and mullet fish. The large number of types of catch caught is due to the water currents which carry the caught fish and shrimp into the togok bag.

Based on the description above, it is necessary to conduct a study to determine the results of rebon shrimp catches using togok fishing gear during the current position at high or low tide in the waters of Kuala Tungkal, West Tanjung Jabung Regency using Togok Net fishing gear.

## RESEARCH METHOD

### Time and Place of Research

This research was conducted in Kuala Tungkal Waters, West Tanjung Jabung Regency, Jambi Province, on January 7 – March 6, 2025. The research used an experimental fishing method by operating five units of togok fishing gear

in two tidal conditions, high tide and low tide, for 15 times (days). The equipment used included togok, boat, thermometer, refractometer, pH meter, stopwatch, and catch storage container. The research procedure began with determining the fishing location, installing togok following the current direction, operating for  $\pm 2$  hours, pulling the gear, sorting the catch by type, and weighing the total weight. Environmental parameters such as temperature, salinity, pH, and depth were measured in each fishing operation. Catch data were analyzed using an independent two-sample t-test to determine the difference in catch between high tide and low tide, while environmental parameters were analyzed descriptively.

### Tools and materials

The equipment used in this research were 5 units of togok fishing gear, stationery, a camera, and a laptop to process and analyze data. The environmental parameters measured include, temperature, pH, salinity, stopwatch and plastic bottles filled 2/3 with water to measure current speed.

### Research Procedures

Research Procedures: This study involved several stages or steps, including the following:

- a. Operation of the togok fishing gear was carried out with the fishermen. This study began with the preparation of necessary materials and equipment, such as a boat, a togok fishing net with a 1-inch mesh, fuel, and supplies (food and drink).
- b. Determination of fishing grounds was based on the fishermen's own experience, as it is still a traditional method.
- c. Observing the tides.
- d. Lowering (setting) the togok fishing gear. This was done several times.
- e. Lowering (setting) the time required to wait for the catch to enter the fishing gear, which was approximately 2 hours.
- f. Next, environmental parameters on the water surface, such as current speed, temperature, salinity, and acidity (pH), were measured at the designated locations within the fishing area.

- g. The catch was then hauled from the togok fishing gear at the end of the togok net to the water surface.
- h. The fishermen's catch is transferred to containers for sorting and separating the fish and shrimp. The catch composition, number of fish, and weight are then recorded.

### Data Analysis

Data collected during the study, comparing or contrasting two types of treatments, is generally conducted using the t-test. This study was conducted by comparing the differences in catches from togok nets using two treatments, namely, setting high and low tide times. This can be formulated mathematically, as quoted by Gaspersz in Tinambunan et al. (2021):

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2} - 2r \left(\frac{S_1}{\sqrt{n_1}}\right) \left(\frac{S_2}{\sqrt{n_2}}\right)}}$$

Description:

$\bar{x}_1$  = average catch at high tide (fish/kg)

$\bar{x}_2$  = average catch at low tide (fish/kg)

$n_1$  = number of first samples

$n_2$  = number of second samples

$S_1$  = standard deviation of sample 1

$S_2$  = standard deviation of sample 2

$S_1^2$  = sample variance 1

$S_2^2$  = sample variance 2

$r$  = correlation between two samples

## RESULTS AND DISCUSSION

### General Conditions of the Location

This research was conducted in the waters of Kuala Tungkal, located in Tungkal Ilir District, West Tanjung Jabung Regency. This research area is an estuary with a waterbed dominated by muddy substrate. The research location can be seen in Figure 1.

Tanjung Jabung Barat Regency is an administrative region in Jambi Province with an area of approximately 5,009.82 km<sup>2</sup>, including 141.75 km<sup>2</sup> of water. Geographically, the regency is located between 103°23' and 104°31' East Longitude and 0°53' and 1°41' South Latitude. To the north, it borders Riau Province, to the south with Batanghari Regency; to the east with Tanjung Jabung Timur Regency; and to the west with Batanghari Regency and Tebo Regency. Currently, Tanjung Jabung Barat consists of five sub-districts: Tungkal Ilir, Tungkal Ulu, Pengabuan, Betara, and Merlung, and comprises 52 villages and 5 urban villages (BPS-statistics Tanjung Jabung Barat regency 2025).

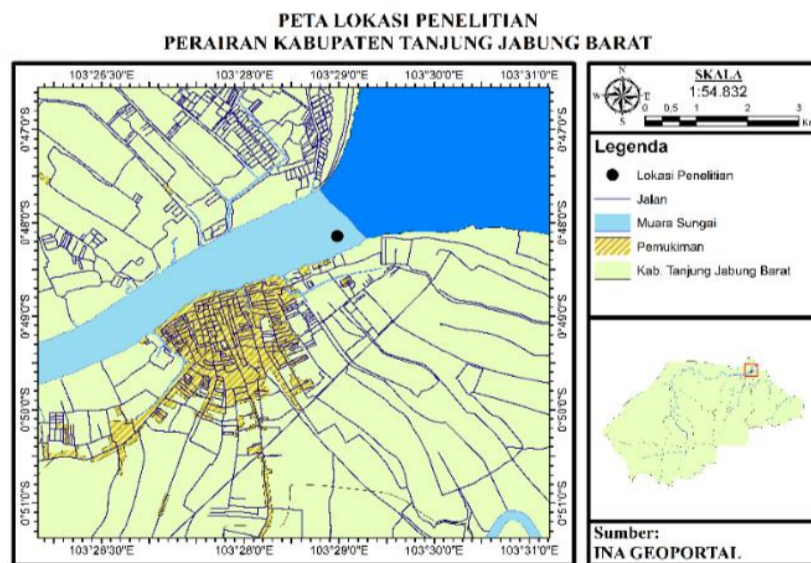


Figure 1. Research location map

### Composition of Catch Results

The catch obtained from the operation of the togok fishing gear during 15 days of observation showed a significant difference in catch composition between high and low tide. Details of the catch are shown in Table 1 below.

The catch of rebon shrimp during high tide reached 445 kg, or 57% of the total catch, while during low tide it increased to 631 kg, or 50.23% of the total catch. This result is significantly higher than other shrimp species, such as the chalk shrimp (*Metapenaeus dobsoni*), which accounted for 4.84% (high tide) and 5.36% (low tide), and other fish species,

which averaged only 0.5–4% of the total catch. These data indicate that, ecosystem-wise, rebon shrimp is the dominant species in the study area and the most important commodity in fishing activities.

Furthermore, the mesh size of the togok net is relatively small, making it more selective against small organisms like rebon shrimp, while larger fish

generally escape. This explains the composition of the catch dominated by shrimp (more than 50%, while fish only appear as bycatch. Similar research by Tatogo (2024) in Kamal Muara also shows that the use of traditional fishing gear such as sondong or togok results in the dominance of rebon shrimp up to 62% of the total catch.

Table 1. Composition of catches from togok fishing gear

No	Common name	Species	Weight at high tide (kg)	Composition at high tide (%)	Weight at low tide (kg)	Composition at low tide (%)
1	Rebon Shrimp	<i>Acetes</i> sp.	445	57	631	50.23
2	Kadal Shrimp	<i>Metapenaeus dobsoni</i>	37.8	4.84	67.3	5.36
3	Yellow Shrimp	<i>Metapenaeus brevicornis</i>	36.4	4.66	63.7	5.07
4	Rainbow shrimp	<i>Parapenaeopsis sculptilis</i>	32.9	4.21	58.4	4.65
5	Mantis Shrimp Indian	<i>Harpioquilla raphidae</i>	30	3.84	59.8	4.76
6	white shrimp	<i>Penaeus indicus</i>	29.5	3.78	54.6	4.35
7	Fourfinger threadfin Daggertoot	<i>Eleutheronema tetradactylum</i>	22.7	2.91	49.2	3.92
8	h pike conger	<i>Muraenesox cinereus</i>	20.3	2.6	44.4	3.53
9	Croaker Fish	<i>Pseudocenna amovenssis</i>	28	3.59	39.9	3.18
10	Longjaw thryssa	<i>Thryssa setirostris</i>	21	2.69	37.4	2.98
11	Silver pomfret	<i>Pampus argenteus</i>	19.7	2.52	40.9	3.26
12	Squids	<i>Sepioteuthis</i> sp.	17.2	2.2	31.5	2.51
13	long tongue sole	<i>Cynoglossus lingua</i>	15.8	2.02	32.4	2.58
14	Mud crab	<i>Scylladea serrata</i>	11	1.41	15.6	1.24
15	Guineafowl puffer	<i>Arothron meleagris</i>	5.3	0.68	6.6	0.53
16	Bilih fish	<i>Mystacoleucus padangensis</i>	5	0.64	11.4	0.91
17	Bombay duck	<i>Harpadon nehereus</i>	0.8	0.1	7	0.56
18	Savalai hairtail	<i>Trichiurus lepturacanthus</i>	2.3	0.29	5.2	0.41
Total			780.7	1.000	1256.3	1.000
Average catch / days			52.05		84	
Average catch / fishing gear			45.92		74	

Source: Data Processing

The data shows that rebon shrimp is the primary catch, while other shrimp

species are bycatch. According to Rizqi et al. (2015), togok fishing gear catches more

shrimp due to its passive working principle, which utilizes water currents. Togok works by trapping fish and shrimp carried by the current into its net bag. Because shrimp are unable to swim against

a strong current, they are carried into the bag and trapped there. The special shape and size of the togok net mesh are also designed to effectively catch shrimp, especially those with high economic value.

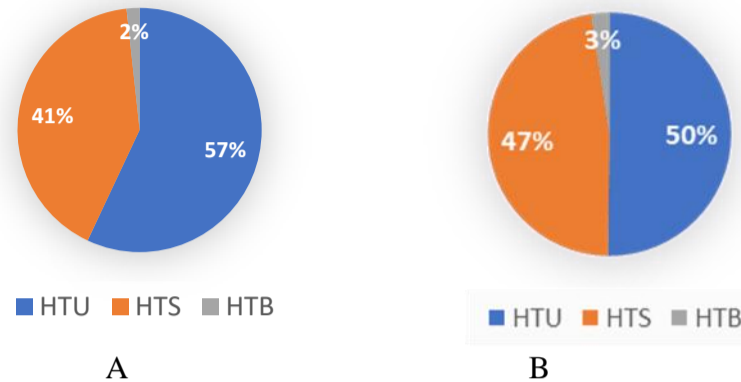


Figure 2. Percentage of Togok catch. A) High tide, B) Low tide

Descriptions:

HTU: main catch

HTS: bycatch

Source: Data Processing

Mauliddin et al. (2022) stated that the largest number of togok catches was in the main catch and the small number of togok catches was in the discard catch. The main catch in togok fishing gear is rebon shrimp (*Acetes japonicas*), the large number of rebon shrimp in togok catches is due to rebon shrimp being a zooplankton with a size of 1-1.5 cm consisting of the crustacean family that lives in coastal waters and also estuaries. Zooplankton acts as primary consumers which will then be preyed upon by larger carnivorous animals as secondary consumers. Therefore, zooplankton which acts as the first

consumer makes its existence very important as a link between producers and animals at a higher 345 trophic level (Indriyawati et al., 2012). Fish, shrimp, and other aquatic biota utilize the presence of zooplankton as the main food source in the waters. This makes the catch results with the togok fishing gear vary with the average size of the catch being immature.

To determine the significance of differences in catches during high and low tide, an independent sample t-test was conducted using catch data from 15 operations. The results of the statistical analysis are shown in Table 2.

Table 2. Results of the T-test comparing high and low tide conditions

	High tide (X1)	Low tide (X2)
Total	445	631
Average	30.333 <sup>b</sup>	42.066 <sup>a</sup>
Standard Deviation	±6.518 <sup>b</sup>	±6.526

Note: Different superscripts on the same row indicate that the P value is < 0.05.

Source: Data Processing

The calculated t-value is greater than the t-table value, and the P-value is less than 0.05. Therefore, it can be concluded that there is a difference in rebon shrimp catches using the togok fishing gear during high and low tide. This means that the operating time of the togok fishing gear significantly influences the catch.

Tides are an oceanographic factor that can significantly affect shrimp catches,

including those caught using the togok fishing gear. The togok is a static fishing gear typically installed in estuaries, coastal waters, or rivers affected by tides. When the tide rises, shrimp tend to move more actively upstream following the current, and when the tide recedes, they return to the sea or deeper waters. Fishermen exploit this shrimp movement to maximize their togok catch.

**Environmental Parameters**

The performance of togok gear is greatly influenced by the oceanographic conditions of the waters where it is used. Tanggok gear, which is generally used to catch shrimp or small pelagic fish such as tuna, operates passively by exploiting fish movements and water currents. Therefore,

understanding the dynamics of the aquatic environment is crucial to optimizing catches. Some of the key parameters that influence the success of tanggok gear include seawater temperature, salinity, current speed, water depth, pH, and tidal patterns.

Table 3. Environmental parameter data

Environmental Parameters	Unit	Range	Average
Temperature	° C	27-29	28
Salinity	ppt (‰)	23	20-26
Depth	meter	8-10	9
pH	-	8.1	7.7-8.5

Source: Data Processing

### Temperature

Temperature is an environmental parameter that significantly influences fish activity and distribution. Optimal temperatures range from 28°C to 31°C, creating conditions that support fish metabolism, plankton growth, and the stability of aquatic ecosystems. Fish tend to congregate in waters with temperatures close to this optimal point (Gede GP et al., 2014). In research (Handoko et al., 2023), the temperature in the waters of Kuala Tungkal, West Tanjung Jabung Regency, was 28°C. When using the tanggok gear, temperatures that are too low or too high can cause fish to move away from the surface or the fishing area, thus reducing productivity.

Water temperature is closely related to the tidal dynamics studied. During high tide, the volume of water entering the waters of Kuala Tungkal increases, bringing not only nutrients and plankton but also water masses with different temperatures. During high tide, water temperatures tend to be more stable and closer to the optimal temperature due to the mixing of seawater with local waters, which can attract more fish to the fishing area. This can increase the effectiveness of the togok fishing gear.

### Salinity

The ideal salinity value between 30–35 ppt is an indicator of water stability that is comfortable for fish (Patangngari et al. 2021). Meanwhile, in research by Handoko et al. (2023), the salinity in the waters of Kuala Tungkal, West Tanjung Jabung Regency, was 27.94 ppt. Salinity fluctuations, which are usually caused by heavy rainfall or the influx of freshwater from the mainland, can trigger fish migration to more suitable areas, thus

affecting fish concentrations in the catchment area.

### Water depth

Water depth at the fishing location plays a crucial role in determining the type and quantity of fish caught, particularly when using tongok fishing gear. Firdaus et al. (2023) found that the Kuala Tungkal waters are estuarine with a muddy bottom with a depth ranging from 8-10 m (Ariana 2016). The optimal depth for catching pelagic fish such as tuna (*Thunnus albacares*) is around 25 meters. At this depth, target fish are abundant, water visibility is optimal, and temperature and oxygen levels support fish activity, resulting in higher catches compared to depths of 50 or 75 meters.

### Acidity (pH)

The results of the acidity (pH) measurement during the study were in the range of 7.7-8.5 with an average of 8.1. The availability of sufficient natural food will attract small fish to gather in an area, especially in the water layer where the tongok device is installed. Thus, stable pH conditions also play a role in increasing catches because fish tend to be more active and gather around that zone. Conversely, if the water pH changes drastically, for example if it is too acidic or too alkaline, then the small organisms that are the fish's food will be disturbed, and fish will tend to avoid that area. This can lead to a decrease in the number of catches because fish are not in the area reached by the tongok device. Therefore, the tongok fishing gear will work more optimally when used in waters with balanced pH conditions. Monitoring water quality, including pH, is very important to ensure that the selected fishing location supports the presence of

fish and provides maximum results for fishermen.

### Ocean Tidal Patterns

According to Ayunarita (2017), tides are the periodic rise and fall of sea levels due to the gravitational forces of the Moon and Sun. This pattern influences aquatic environmental conditions, such as tidal currents that move water masses vertically and horizontally. Tidal patterns, such as mixed tides, have a direct influence on fish distribution. During high tide, fish tend to approach the coast or ascend to shallower water columns to forage, while during low tide they return to deeper waters. Fishermen often exploit this high tide moment to catch fish because it increases the chance of higher fish concentrations. Tides also bring nutrients from the seabed to the surface, stimulating phytoplankton growth and attracting pelagic fish. This finding is inconsistent with the results of research conducted in the waters of West Tanjung Jabung Regency, as shown in Table 1. Fish were caught less during high tide than during low tide.

### CONCLUSION

The use of togok fishing gear is most effective during low tide to achieve optimal catches, with rebon shrimp as the primary commodity and fish as bycatch. Low tide can be recommended as the optimal operating period for maximizing the function of togok in capture fisheries activities in Kuala Tungkal Waters.

### RECOMMENDATIONS

It is recommended to conduct further research that includes seasonal variations and environmental factors such as currents, salinity, and temperature to optimize the operation time of togok fishing gear and ensure the sustainable utilization of rebon shrimp as the main commodity in Kuala Tungkal waters.

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