

## Use of FADs (Fish Aggregating Devices) in Liftnet Fishing Gear in Lake Guluk Jambi City

### Penggunaan FADs (*Fish Aggregating Devices*) pada Alat Tangkap Tangkul di Danau Teluk Kota Jambi

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#### ABSTRACT

In Teluk Lake, Jambi City, fishermen face productivity constraints when catching fish. Research on using Fish Aggregating Devices (FADs) is necessary to enhance effectiveness and efficiency. This study, conducted in March 2024 in Teluk Lake, Tanjung Pasir Village, Jambi City waters, examines the use of FADs with liftnet fishing gear. The main findings of the research show that using FADs significantly increases catch yields and reduces fishermen's operational costs. The research methodology involved experimental fishing with a t-test to compare the catch results of liftnet using FADs and without FADs. The research showed the capture of 8 types of fish from two repetitions with two treatments (liftnet with FADs and without FADs). The total catch was 150 fish weighing 9.313 g. Catches using FADs reached 114 fish (7.219 g), while those without FADs were only 36 (2.094 g). Lambak fish showed significant results, with 79 fish (3.910 g) caught using FADs compared to 18 fish (781 g) without FADs. The T-test analysis revealed a significant difference ( $P < 0.01$ ) in catch results between the two treatments, both in terms of quantity ( $T_{hit} > T_{tab}$  ( $2.93 > 2.10$ )) and weight ( $T_{hit} > T_{tab}$  ( $114.60 > 2.10$ )). This research has practical implications, as it demonstrates that using FADs can significantly increase the quantity and weight of catches, providing valuable insights for fishery methods.

**Keywords:** Teluk Lake, FADs, liftnet, t-test

#### ABSTRAK

Nelayan di Danau Teluk, Kota Jambi, menghadapi kendala produktivitas dalam menangkap ikan. Untuk meningkatkan efektivitas dan efisiensi, penelitian tentang penggunaan *Fish Aggregating Devices* (FADs) diperlukan. Penelitian ini bertujuan mengkaji penggunaan FADs dengan alat tangkap tangkul untuk meningkatkan hasil tangkapan dan menekan biaya operasional nelayan. Penelitian ini dilaksanakan pada Maret 2024 di Perairan Danau Teluk, Kelurahan Tanjung Pasir, Kota Jambi. Metode yang digunakan adalah *eksperimental fishing* dengan uji-t untuk membandingkan hasil tangkapan tangkul yang menggunakan FADs dan tanpa FADs. Hasil penelitian menunjukkan perolehan 8 jenis ikan dari dua kali pengulangan dengan dua perlakuan (tangkul dengan FADs dan tanpa FADs). Total tangkapan adalah 150 ekor dengan berat 9.313 g. Tangkapan menggunakan FADs mencapai 114 ekor (7.219 g), sedangkan tanpa FADs hanya 36 ekor (2.094 g). Ikan lambak menunjukkan hasil signifikan, dengan 79 ekor (3.910 g) menggunakan FADs dibandingkan 18 ekor (781 g) tanpa FADs. Analisis uji-T menunjukkan perbedaan hasil tangkapan yang nyata ( $P < 0,01$ ) antara kedua perlakuan, baik dari segi jumlah ( $T_{hitung} > T_{tabel}$  ( $2,93 > 2,10$ )) maupun berat ( $T_{hitung} > T_{tabel}$  ( $114,60 > 2,10$ )). Ini membuktikan bahwa penggunaan FADs secara signifikan meningkatkan jumlah dan berat hasil tangkapan dibandingkan tangkul tanpa FADs.

**Kata Kunci:** Danau Teluk, FADs, tangkul, uji-t



## INTRODUCTION

Teluk Lake borders Pasir Panjang, Tanjung Pasir and Olak Kemang Villages, Danau Teluk District, Jambi City. Lake Teluk is a lake that receives water from small rivers from the surrounding rice fields, tributaries, and Batanghari rivers (Hasdiana, 2018). Fisheries activities in Lake Teluk are generally used for capture fishery activities, reaching 70% as permanent and seasonal fishermen and 30% for fish farming activities (Kaban, 2017). The most dominant type of fishing gear used in fishing activities is liftnet, which is 50.37% or 68 fishermen from all the fishing gear used in the Gulf Lake. Liftnet is a lifting net that is installed in the waters using a raft made of wood or bamboo, in the shape of a square, consisting of a net whose four ends are tied to two bamboo or wood and both ends are smoothed (tapered) and then installed crosswise with each other at an angle of 90 degrees (Kirana et al., 2015).

The types of fish caught by liftnet are diverse, but most are pelagic. Some of the types of fish caught include *Barbichthys laevis*, *Thynnichthys polylepis*, *Kryptopterus* sp, *Rasbora argyrotaenia*, *Osteochilus microcephalus*, *Pangasianodon hypophthalmus*, *Cyclocheilichthys* sp, *Oreochromis niloticus* and *Barbodes* sp (Sukandi, 2008). Based on data from the Jambi City Agriculture and Food Security Office (2018), the highest fishery production in the waters of the Gulf Lake in 2017 was 98.70 tons of Lambak fish and 40 tons of seluang fish (Nurcholik, 2019).

Fishermen in Teluk Lake Jambi City have problems in their efforts to increase the productivity of their fishing operations. One way to increase fisheries productivity is to use *fish aggregating devices* (FADs) or fish collecting devices (Rumpon). *Fish aggregating devices* (FADs) are tools designed to attract fish to a specific area by mimicking the environmental conditions where fish usually congregate. Many fishermen have carried out the use of FADs in various places, and have been proven to be effective in increasing catches (Prayitno et al., 2016). To increase the effectiveness and efficiency of fishing efforts, research on using FADs is needed to increase fishermen's catches and minimize or reduce fishermen's operational costs, so that fishing activities are more effective and efficient. The results of this study can provide a better understanding of the use of FADs in liftnet fishing gear to increase

fisheries productivity sustainably. The purpose of this study is to observe the use of FADs in liftnet fishing gear and compare the effect of liftnet Catch using FADs and without FADs.

## RESEARCH METHOD

The research was carried out in Lake Teluk, Tanjung Pasir Village, Danau Teluk District, Jambi City, in March 2024. The material used in this study is the Catch obtained from the liftnet catch by comparison using FADs and without FADs. The equipment used is liftnet fishing gear, rumpon FADs, boats, buckets, cages, scales, stationery, documentation tools (cameras), rulers or meters, thermometers, and pH meters. The method used in this study is *the experimental fishing* method. This method performed direct arrest operations using two liftnet treatments, FADs, and liftnet without FADs. The tools and materials for making FADs consist of 6 large used floats or bottles measuring 1500 mL, two small bottles measuring 200 mL, palm fronds 2 stalks with a size of 150 cm each and a neat rope. The manufacturing process is to prepare all 1500 mL bottles, then tie them together using a neat rope and leave a little, then tie the palm fronds with the residual rope, then fill the 200 mL bottle with sand as a ballast and tie it at the bottom of the palm fronds, and traditional FADs are ready to use.

A T-test was carried out to find out the difference between the catch of liftnet using FADs and those without FADs. The t-test used is the independent sample t-test. Then, calculations were carried out using the t-test (Sudjana, 1992). By using the following formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} - 2r \left(\frac{s_1}{\sqrt{n_1}}\right) \left(\frac{s_2}{\sqrt{n_2}}\right)}}$$

Information:

t = calculated t value

$\bar{x}_1$  = Average Number of catches with FADs

$\bar{x}_2$  = Average Number of catches without FADs

n1 = Number of samples group 1

n2 = Number of samples group 2

n = Sum of n1 + n2

s1<sup>2</sup> = Group value variant

s2<sup>2</sup> = Group value variant

## RESULTS AND DISCUSSION

### Composition of Catch

The composition of the catch in the treatment of liftnet with FADs and liftnet without FADs can be seen in Table 1.

Table 1. Composition of Fish Catch

Scientific Name	Total Catch			
	FADs	Percentage (%)	No FADs	Percentage (%)
<i>Thynnichthys polylepis</i>	79	69.3	18	50
<i>Pangasius</i> sp.	7	6	1	3
<i>Oreochromis niloticus</i>	0	0	1	3
<i>Chirocentrus dorab</i>	1	0.9	0	0
<i>Helostoma temminckii</i>	10	8.8	0	0
<i>Cyclocheilichthys enoplos</i>	11	9.7	7	19
<i>Barbonymus schwanefeldii</i>	2	1.8	5	14
<i>Osteochieus nashii</i>	4	3.5	4	11
	114	100	36	100

Source: Data Processing

Based on Table 1, the composition of fish catches in the Lake Teluk shows that liftnet fishing gear with FADs gets a larger catch, which is as many as 114 fish, with 7 species, compared to the liftnet without FADs, which only gets 36 fish, with 8 species. The composition of the Catch using liftnet with FADs was dominated by *Thynnichthys polylepis*, 79 catches with a percentage of 69.3%, followed by 11 *Cyclocheilichthys enoplos* (9.7%), *Helostoma temminckii* as many as 10 fish (8.8%), *Pangasius sp* as many as 7 fish (6%), and other fish such as *Barbonymus schwanefeldii*, *Osteochilus nashii*, and *Chirocentrus dorab*. Meanwhile, the composition of the Catch with liftnet treatment without FADs was *Thynnichthys polylepis* by 18 catches with a percentage of 50%, followed by 7 *Cyclocheilichthys enoplos* (19%), 5 *Barbonymus schwanefeldii* (14%) and other fish such as *Pangasius sp*, *Chirocentrus dorab*,

*Oreochromis niloticus*, *Helostoma temminckii*, and *Osteochieus nashii*. The diversity of fish types obtained can be influenced by the fishing gear used and the placement of the fishing gear in the waters. This was revealed in Yusfiandayani et al., (2020) research that FADs are generally placed in locations with fairly deep waters. Based on these data, it can be seen that fish caught with treatment using liftnet fishing gear with FADs obtained more fish than liftnet without FADs. The one way to increase catch is to use fishing aids such as rumpon and light (Rahma et al. 2016; Sarianto & Djunaidi 2019; Laoda et al. 2022).

#### Number of Fish Caught

The research conducted in Teluk Lake obtained the average catch results based on two different treatments, namely liftnet with FADs and liftnet without FADs, as shown in Table 2.

Table 2. Number of Fish Caught

Scientific Name	Total Catch (individual unit)			
	FADs	Average	No FADs	Average
<i>Thynnichthys polylepis</i>	79	7.9	18	1.8
<i>Pangasius</i> sp.	7	0.7	1	0.1
<i>Oreochromis niloticus</i>	0	0	1	0.1
<i>Chirocentrus dorab</i>	1	0.1	0	0
<i>Helostoma Temminckii</i>	10	1	0	0
<i>Cyclocheilichthys enoplos</i>	11	1.1	7	0.7
<i>Barbonymus schwanefeldii</i>	2	0.2	5	0.5
<i>Osteochieus nashii</i>	4	0.4	4	0.4
<b>Number of Catches</b>	114		36	
<b>Average</b>		11.4 <sup>a</sup> ±6.54		3.6 <sup>b</sup> ±3.31
<b>T<sub>hit</sub></b>				2.93
<b>T<sub>tab</sub></b>				2.10

Remarks: Different superscripts on the same line show a noticeable difference (P&lt;0.01).

Source: Data Processing

Based on the t-test on the number of fish catches in Table 2, it can be seen that the use of liftnet fishing gear with two different

treatments, namely with FADs and without FADs, showed significantly different results (P<0.01), which is shown from the

$T_{hit} > T_{tab}$  ( $2.93 > 2.10$ ). This aligns with research conducted by Chaliluddin et al., (2018) that the catch using FADs on fishing gear has higher effectiveness than fishing gear without FADs. The size of the catch in a body of water is influenced by the fishing gear used and the fishing area. Liftnet fishing gear is the most commonly used fishing gear in the Teluk Lake. According to Anggoro et al., (2023), fishing gear in the fisheries sector is usually adjusted to the type of fish or the richness of marine resources to be caught, so that the fishing we do can be done as much as possible and produce an optimal catch. In the Solomon Islands, nearshore FADs contributed up to 45% of the total annual fish catch for local communities, significantly enhancing food security and livelihoods (Albert et al., 2014). Productivity in catching fish using purse seine at Tamperan port has generally decreased, except for productivity based on fishing trips, which increased. Factors

influencing productivity include crew size, fishing trips, gross tonnage, engine power, and net length (Muzayanah et al., 2022). The introduction of baited FADs resulted in a 109.3% increase in productivity for mini purse seine operations, with average catches of 226 kg per haul compared to 202 kg for control groups (Laoda et al., 2022). Fishing using Fish Aggregating Devices (FADs) involves utilizing electronic FADs equipped with LED lights to attract fish. The study shows that new electronic FADs with 120 watts of LEDs effectively aggregate fish, outperforming traditional methods in light penetration (Hargiyatno et al., 2018).

### Weight of Fish Catch

Based on the research using liftnet fishing gear with two different treatments, eight different types of fish were obtained, and the total weight of the catch can be seen in Table 3.

Table 3. Weight of Fish Catch

Scientific Name	Total Catch (individual unit)			
	FADs	Average	No FADs	Average
<i>Thynnichthys polylepis</i>	3910	54%	781	37%
<i>Pangasius</i> sp	770	11%	105	5%
<i>Oreochromis niloticus</i>	0	0%	73	3%
<i>Chirocentrus dorab</i>	168	2%	0	0%
<i>Helostoma temminckii</i>	925	13%	0	0%
<i>Cyclocheilichthys enoplos</i>	1315	18%	860	41%
<i>Barbonymus schwanenfeldii</i>	21	0%	135	6%
<i>Osteochieus nashii</i>	110	2%	140	7%
<b>Number of Catches</b>	7219		2094	
<b>Average</b>	721.9 <sup>a</sup> ±311.24		209.4 <sup>b</sup> ±181.26	
<b><math>T_{hit}</math></b>		114.60		
<b><math>T_{tab}</math></b>		2.10		

Remarks: Different superscripts on the same line show a noticeable difference ( $P < 0.01$ ).

Source: Data Processing

Based on the results of the study in Table 3, the weight of the catch using liftnet fishing gear with two different treatments, namely liftnet with FADs and liftnet without FADs, shows a noticeably different result ( $P < 0.01$ ), with  $T_{hit} > T_{tab}$  ( $114.60 > 2.10$ ). So that this proves that there is a difference in the weight of fish catches for two different treatments. Catches with liftnet treatment with FADs obtained a greater catch weight than liftnet FADs. This can be seen in Table 3, the catch of liftnet with FADs is 7219 g, while with liftnet treatment without FADs only 2094 g is obtained. Several studies also show the same thing,

that using FADs results in heavier catches (Wahju et al., 2023; Sari et al., 2014; Novitasari et al., 2022). Studies in South Buton revealed that purse seine fishermen effectively utilized FADs within 0-12 miles of the coast, with dominant catches of scad fish, indicating strategic deployment of FADs for optimal yield (Hamar & Bone, 2021). In Pacitan Regency, purse seine fleets achieved an average productivity of 6.7 tonnes per trip, while handline fleets recorded 0.9 tonnes per trip, indicating a substantial difference in efficiency when utilizing FADs (Prayitno et al., 2017). FADs are instrumental in increasing the catch rates of pelagic species, particularly

tuna, by attracting fish to specific locations (Bode et al., 2023). Fishing using FADs can be efficient, potentially reducing fuel costs and carbon footprints. However, it requires careful management to minimize by-catch and ensure the sustainability of target species and the integrity of pelagic ecosystems (Dagorn et al., 2013). Fishing using FADs involves deploying floating objects to attract pelagic fish, such as tuna. In Ecuador, artisanal fishers have been

documented using improvised FADs baited with marine mammals, raising concerns about illegal practices and conservation impacts on marine mammal populations (Castro et al., 2020).

#### Environmental Parameters

The environmental parameters measured in this study are the temperature and pH of the waters in Lake Bay, Jambi City, which can be seen in Table 4.

Table 4. Environmental Parameters

Environmental parameters	Range
Temperature (°C)	30-33
pH	7-8

Based on the measurement of environmental parameters in the Teluk Lake, Jambi City shows that the temperature range in the waters of the Teluk Lake is on a scale of 30°C - 33°C. The water temperature is normal for tropical fish species that have adapted to warm water temperatures and can develop well. This can be seen in Urbasa et al., (2015), who state that fish can grow well at temperatures around 25 - 32°C. Meanwhile, the pH value measurement obtained is in the range of 7 - 8. This range shows that the pH is in a normal state. This range covers most of the healthy freshwater and supports the life of various freshwater organisms, including fish, plants, and invertebrates. This pH barrier is considered optimal because it supports healthy physiological function for various freshwater fish species. This is by Tatangindatu et al., (2013), who stated that the qualified degree of water acidity is 5 - 8.5. The design of deep-water subsurface FADs allows for long-term ecological studies, providing a platform for monitoring pelagic species and assessing the impacts of anthropogenic structures on marine ecosystems (Schneider et al., 2021).

#### CONCLUSION

The use of FADs (*Fish Aggregating Devices*) on liftnet fishing gear in Teluk Lake, Jambi City, showed a larger number of catches and a heavier catch weight compared to the use of liftnet fishing gear without FADs. This is proven based on the analysis of the t-test, which shows that the catch and the weight of the catch have a real effect on two different treatments of liftnet with FADs and liftnet without FADs.

#### RECOMMENDATIONS

Further research can be focused on analyzing the composition and size of catches between liftnet with FADs and without FADs, to determine whether the increase in the number and weight of catches is dominated by smaller fish or certain species. This is important to assess the selectivity of the fishing gear, the potential for bycatch, and its implications for the sustainability of fish stocks in Teluk Lake. Thus, the research results will not only show differences in catch quantity but also provide insight into the quality and sustainability of fish resource utilization.

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