Analysis of the composition of tidal trap (gombang) catches based on time of catching operations in the Bengkalis Strait, Riau Province, Indonesia

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Abstract. The increasing number of tidal traps raises concerns due to a reduction in catches and overfishing in the waters of Bengkalis Strait, Riau Province, Indonesia. To address this issue, a potential short-term solution lies in controlling the duration of fishing operations. This research was conducted to ascertain the species composition and weight of fish captured, with a specific focus on differentiating between daytime and nighttime operations. Furthermore, this research analyzed the influence of operational timing on the catch composition and identified the optimal operating time using the experimental fishing method. The results showed that the operation of tidal traps during the day and at night produced 13 species of fish, namely 322.87 kg of acetes shrimp (*Acetes* spp.), red shrimp (*Metapenaeus monoceros*) (205.62 kg), black tiger shrimp (*Penaeus monodon*) (228.1 kg), hairtail (*Trichiurus lepturus*) (129 kg), Bombay-duck fish (*Harpadon nehereus*) (53.32 kg), tongue fish (*Cynoglossus lingua*) (29.39 kg), goldstripe sardinella (*Sardinella gibbosa*) (56.64 kg), longjaw thryssa (*Thryssa setirostris*) (33.04 kg), wolf herring (*Chirocentrus* spp.) (37.94 kg), shorthead hairfin anchovy (*Setipinna breviceps*) (61.3 kg), croaker fish (*Johnius trachycephalus*) (28.1 kg), narrow-barred Spanish mackerel (*Scomberomorus commerson*) (31.13 kg), and cuttlefish (*Sepia* spp.) (34.93 kg). Operating tidal traps during the nighttime yielded a catch of 684.99 kg, representing a significant increase of 20.94% compared to the daytime, which amounted to 566.39 kg. The best time for fishing was at night with the time for hauling between 05:00-06:00 WIB.

Key Words: catch results, fisheries, fishing time.

Introduction. Tidal traps are passive fishing gear that is operated permanently in coastal waters, typically in shallow areas near river mouths with strong currents. The primary objective of these traps is to capture a diverse range of shrimp and fish species. A distinctive feature lies in its ease of operation, reducing the need for extensive fishing activities at sea since the traps are pre-installed. Fishermen simply await the culmination of the 12-hour immersion period in the fishing cottage and retrieve the tidal traps. Different activities are carried out within the fishing cottage, such as processing the captured fish and this process includes sorting, drying, and packing the fish caught.

The number of units operated by Bengkalis fishermen increased yearly. Statistical data from the Maritime Affairs and Fisheries Service for Bengkalis Regency (DKP 2021) reported that the number of tidal traps in 2018 reached 501 units. The number increased in the next three years, namely to 793, 952, and 1007 units in 2019, 2020, and 2021. Statistical data from the Department of Maritime Affairs and Fisheries of Bengkalis Regency (DKP 2021) stated that the catches in 2018 amounted to 402,237 kg, 300,694 kg in 2019, 476,463 kg in 2020, and 220,017 kg in 2021. The percentage decreased by

34% between 2018-2019, then increased to 37% (2019-2020), before decreasing again by 54% (2020-2021).

An increase in the number of fishing gear units raises concerns that overfishing occurs and threatens fishery resources (Alfaro-Shigueto et al 2010; Ahamed et al 2012; Lloret et al 2018). Currently, cases of overfishing have occurred in several areas of the world's waters (Pauly & Chua 1988; Clover 2008; Srinivasan et al 2010; Le Pape et al 2017), including Indonesia (Ramenzoni 2013; Nane & Paramata 2020). This occurs because the human element is not satisfied due to failure in governance (Davis & Ruddle 2012; Stanford et al 2013; Jaya et al 2022).

The results of direct observations in the field prove that the operation of the tidal traps was carried out intensively throughout the year. Therefore, a solution to maintain the sustainability of fish resources needs to be conducted. This was achieved by limiting the time of fishing operations (Stacey et al 2021) to operate the tidal traps during the day and night. The catches were analyzed by considering the time of day, the specific groups of fish species, and their distinctive characteristics, particularly distinguishing between nocturnal and diurnal species. This approach facilitates a more targeted and precise management strategy for each species. Most of the bans on fishing gear and the closing of the fishing season are only seen from the momentary impact based on comprehensive scientific research. Therefore, many fishermen lose money and become poor due to impartial regulations (Nababan et al 2020; Syamsuddin et al 2020).

Literature containing research regarding the composition of fish caught has not been found. Existing research discussed tidal trap bycatch results (Nofrizal et al 2018) and the composition of bycatch results based on the season (Yani et al 2020, 2022). The objectives to be achieved are: 1) the composition of the type and weight of fish caught by tidal traps based on the time of day and night, 2) the influence of operating time on the composition of fish caught and 3) to determine the best operating time. The hypothesis is that the timing of fishing operations affects the composition of the fish caught. The novelty lies in understanding the composition of catches, which can serve as a fundamental cornerstone for the reduction of fishing operation time. The outcomes serve a dual purpose, firstly, as valuable guidance for fishermen in optimizing their fishing operation schedules, and secondly, as a significant input for local governments and the global community in the formulation of diverse policies within the domain of capture fisheries.

Material and Method

Time and place. The research was conducted between May - June 2023 in the waters of Prapat Tunggal Village, Bengkalis District, Bengkalis Regency, Riau Province, Indonesia. The fishing location was at coordinates $1^{o}33'52.4869''$ N, $102^{o}0'29.9383''$E (Figure 1).

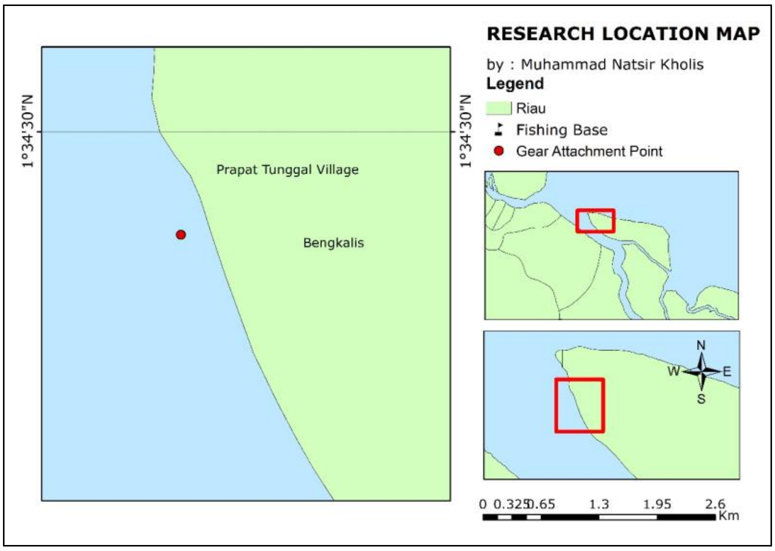

Figure 1. Research location (map generated using ArcGIS 10.8).

Material and Method

Materials. The equipment included measuring tapes, calipers, rulers, whiteboards, cameras, current kites, stopwatches, Secchi disks, buckets, GPS trackers, and tidal trap (Figure 2). The specifications are listed in (Table 1) and the main parts of the construction consist of wings, a body, and a cod end. The materials used are the caught fish and distilled water (mud cleaner for fish).

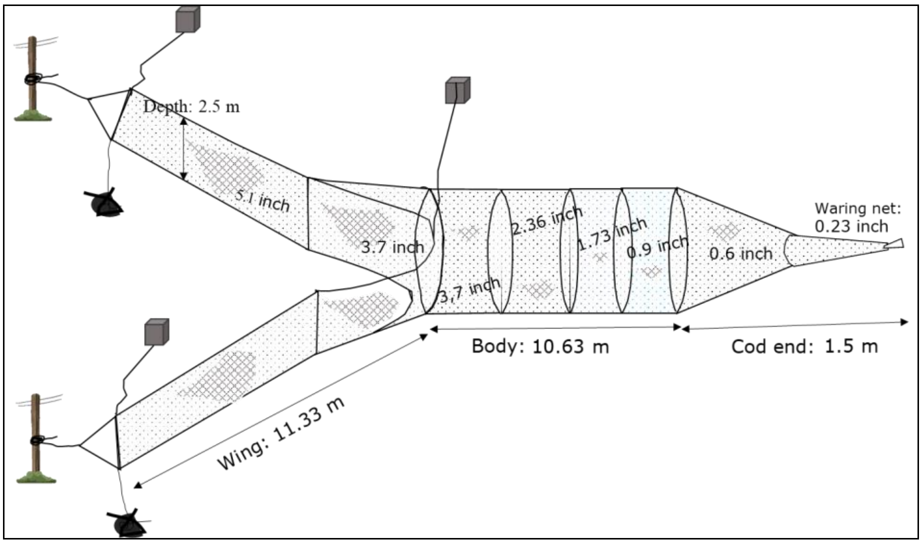

Figure 2. Tidal trap fishing gear and its parts.

Table 1

Tidal trap fishing gear specifications

No.	*Section*	*Description*
1	Wing - Wing rope - Top-rise rope - Lower-rise rope - Net	Mono polyethylene (PE), length 1.78 m, Ø 0.5 cm Mono polyethylene (PE), length 11.33 m, Ø 0.5 cm Mono polyethylene (PE), length 11.33 m, Ø 0.5 cm Multifilament polyethylene (PE), length 11.33 m, mesh size 3.7 inch and 5.1 inch
2	Body -Net	Multifilament polyethylene (PE), length 10.63 m, mesh size 0.9, 1.73, 2.36, and 3.7 inch
3	Cod end -Net	Multifilament polyethylene (PE) and waring net, length 1.5 m, mesh size 0.23 and 0.6 inch

Methods and experimental design. The experimental fishing method, which was a planned method to determine the causes and effects of an experiment was used (Rifal & Sinaga 2018). The research was carried out by participating in fishing activities with fishermen for 17 fishing operations. The determination of the number of fishing operations was based on a formula by Federer (1963), namely (t -1) (r - 1) ≥ 15. From 2 treatments (t), a minimum number of 8 repetitions (r) was obtained. The number of repetitions was set at 17 times, hence the data had better accuracy. The treatment was the operation time for catching tidal traps during the day and at night. During the day and night, hauling was carried out between 11:00-12:00 WIB and 17:00-18:00 WIB, and 23:00-00:00 WIB and 05:00-06:00 WIB, respectively. The division of hauling time was based on the alternation time between high and low tide when the current was calm.

The type of data collected consisted of primary and secondary data. The primary data was the composition of the fish caught, including the type and weight, current conditions, and the brightness of the waters. The secondary data was only in the form of reference data derived from interviews with fishermen and fisheries extension officers, as well as statistical reports from the Bengkalis Regency Maritime Affairs and Fisheries Office (https://statistik.bengkaliskab.go.id), such as the number of fishing gear, fishermen, and fish caught. The method of operating tidal traps follows the method conducted by fishermen. The procedure was as follows:

1. Preparation of provisions and fish containers in the form of buckets or baskets.
2. Checking equipment transporting vessels, such as oars, outboard engines, and drainage on the deck.
3. Travel to the fishing location as far as 0.5 - 1 miles.
4. Install the tidal traps with the position of the mouth facing the direction of the tide and leave the traps for 5 hours.
5. Lifting the tidal traps cod end (hauling) and taking the caught fish.
6. Install the tidal traps again for the next 5 hours.
7. The process of sorting, identifying species, and measuring fish weight after the tidal traps are sunk back into the sea.

Statistical analysis. Data analysis used descriptive tests and t-tests based on the composition of the species and the weight of fish caught. The t-test was used to test the average similarity of 2 populations that are not independent (Gaspersz 1995; Sudijono 2010) and begins by testing the normality of the catch data. The calculation used the Kolmogorov-Smirnov and Shapiro-Wilk tests when the number of data was > 50 and < 50 with SPSS software and Microsoft Excel. The calculation results must meet the *p*-value ($p > 0.05$, or the data is normally distributed) and the formula for the t-test used in manual calculations is (Sudijono 2010):

$$t = \frac{X_a - X_b}{Sp\sqrt{\frac{1}{n_a}+\frac{1}{n_b}}} \quad \text{.......................} \ (1)$$

Where X_a is the group a average, X_b is the group b average, *Sp* is the combined standard deviation, n_a is the number of samples in group a and n_b is the number of samples in group b.

Decision-making is conducted by looking at the significant values in the coefficients table with a level of 5%. Statistical test criteria t, according to Ghozali (2016), H_0 is accepted and H_1 is rejected when the t-test > 0.05. There is no influence between the dependent variables on the independent, hence H_0 is rejected and H_1 is accepted when the significant value of the t-test <0.05. Therefore, there is an influence between the independent variables on the dependent, and the hypotheses used are:

H_0: There is no average difference (type and weight) of tidal trap catches during the day and at night.
H_1: There is an average difference (type and weight) of tidal trap catches during the day and at night.

Results and Discussion

Tidal trap fish catch composition. The tidal trap catches consist of 3 crustaceans, 9 fishes, and 1 mollusk. The crustacean group includes acetes shrimp (*Acetes* spp.), red shrimp (*Metapenaeus monoceros*), and black tiger shrimp (*Penaeus monodon*). A total of 9 species of fish include hairtail (*Trichiurus lepturus*), Bombay-duck fish (*Harpadon nehereus*), tongue fish (*Cynoglossus lingua*), goldstripe sardinella (*Sardinella gibbosa*), longjaw thryssa (*Thryssa setirostris*), wolf herring (*Chirocentrus* spp.), shorthead hairfin anchovy (*Setipinna breviceps*), narrow-barred Spanish mackerel (*Scomberomorus commerson*) and croaker fish (*Johnius trachycephalus*). Mollusks were only represented by cuttlefish (*Sepia* spp.). The total weight of the catch reached 1251.38 kg.

Crustaceans dominate the weight of the catch, reaching 756.59 kg, or 60% of the total weight of the tidal traps catch. Meanwhile, the fish and mollusks weigh 459.86 kg

(37%) and 34.93 kg (3%). Figure 3 shows the weight composition of fish caught by tidal traps. *Acetes* shrimp was in first place weighing 322.87 kg, then black tiger shrimp (228.1 kg), red shrimp (205.62 kg), hairtail (129 kg), shorthead hairfin anchovy (61.3 kg), goldstripe sardinella (56.64 kg), Bombay-duck fish (53.32 kg), wolf herring (37.94 kg), and cuttlefish (34.93 kg). The four types of fish caught in small quantities consisted of longjaw thryssa weighing 33.04 kg, narrow-barred Spanish mackerel (31.13 kg), tongue fish (29.39 kg), and croaker fish (28.1 kg).

Groups of shrimp are caught in large numbers because their habitat is consistent with the location of the operation, namely shallow coastal waters, or estuary where the bottom is sandy and muddy. Carpenter and Niem (1999) stated that shrimp was a tropical organism inhabiting turbid waters and was rich in organic elements. The life cycle commenced in estuary waters proximate to mangrove forests, serving as breeding grounds, and extended to offshore seas, which acted as spawning locations (Subrahmanyam 1971; Gillanders et al 2003; Hedianto et al 2014). The shrimp fishing season is conducted between January and May (Ihsan & Tajuddin 2020). The operation of the tidal traps which began in May was at the top of the shrimp fishing season.

Hairtail dominates the weight of the caught fish, which is 129 kg, or 10% of the total weight of the tidal trap fish. The habitat is closely associated with the existence of shrimp as the main food (Badrudin & Wudianto 2004). The Directorate General of Fisheries of the Republic of Indonesia (DJPK 1998) states that hairtail is a carnivorous fish that feeds on crustaceans, squid, and small fish. Harjanti et al (2012) and Branenda et al (2019) reported that the hairtail fishing season iss February-May, which corresponded to the top fishing season for shrimp. Shorthead hairfin anchovy and goldstripe sardinella ocupy the second and third in quantity for fish species in this research. The habitat is heavily influenced by the existence of mangroves as an important area for fish species, specifically at the juvenile stage (Kawaroe et al 2001). These species belong to the Clupeidae family which has many associations with estuary areas because the waters are fertile and serve as a nursery area (Subiyanto et al 2008; Findra et al 2016). According to Zhang et al (2009), the fishing season for shorthead hairfin anchovy runs from May to June. The number of shorthead hairfin anchovy caught is greater than that of the goldstripe sardinella, whose fishing season occurs between June and July (Chodriyah & Hariati 2010). According to Djunaidi (2021) and Nita et al (2023), many of their habitats and populations are in coastal areas with muddy and sandy substrates, close to river mouths, or suitable for tidal trap operating locations. Bombay-duck fish and wolf herring are carnivorous fish and the food is in the form of marine organisms on the bottom of the waters, such as small fish, shrimp, crabs, and sea eels (Rupawan et al 2011; Jarmanto et al 2014; Febriani et al 2020).

The category of longjaw thryssa includes small pelagic fish of an oceanodromous nature. These fish inhabit coastal waters in proximity to river mouths and tend to congregate in relatively modest schools while approaching their spawning grounds in the open sea (Rosana & Rifandi 2018; Fitri et al 2019). Furthermore, longjaw thryssa feeds on detritus, phytoplankton, and crustaceans (Purnamaningtyas & Hedianto 2015). The operation activities were not conducted during the fishing season, which is between October – December (Firdaus 2010), leading to a small catch. The narrow-barred Spanish mackerel is classified as a pelagic fish that can swim very fast and it migrates from its habitat around the coast (Pane et al 2020). The narrow-barred Spanish mackerel is a carnivorous fish and the diet consists of zooplankton, crustaceans, mollusks, fish eggs, and small fish (Widodo 1989; Ahmed et al 2014). The catch of narrow-barred Spanish mackerel is relatively small since the fishing season is between March - April and October - November (Situmorang et al 2018).

Tongue and croaker fishes are commonly found in shallow marine waters, near the coast, and estuary, with sandy and muddy substrates. In addition, their diets consist of shrimp, crab, shell, and small fish (Damalas et al 2009; Sulistiono et al 2009; Prianto & Suryati 2009; Siagian et al 2017) with a fishing season between September to December (Saputra et al 2008; Nurhayati & Prianto 2017; Supeni et al 2021; Lestari & Machrizal 2022). Operating tidal traps between May and June cannot certainly produce a lot of catches.

Mollusks were represented by cuttlefish, which weighed 34.93 kg. Cuttlefish are marine organisms in neritic areas, living in groups, and concentrated in shallow waters. According to Roper et al (1984), Nabhitabhata (1996) and von Byern and Marwoto (2017), the habitat is located in offshore waters, mangrove forests, coral reefs, and estuaries. Food also depends on the habitat but consists of shrimp, snails, and crabs (Roper et al 1984). The weight of the cuttlefish catch is relatively low because the operation of the tidal traps is not carried out during the cuttlefish fishing season, which runs from September to December (Febrianto et al 2017).

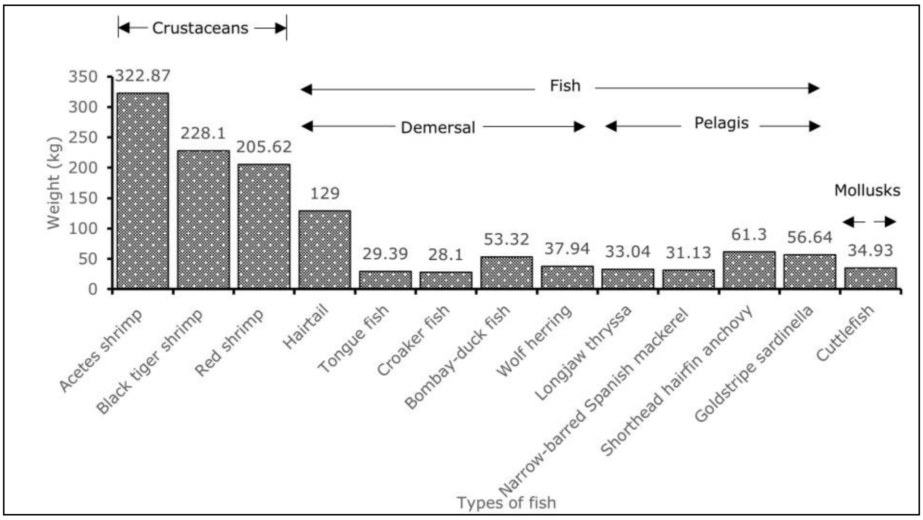

Figure 3. The composition of the tidal trap total catches.

Tidal trap catches based on fishing time

Night. The tidal trap caught at night consisted of 3 crustaceans, 9 fish, and 1 mollusk. The crustacean group includes acetes shrimp (*Acetes* spp.), red shrimp (*Metapenaeus monoceros*), and black tiger shrimp (*Penaeus monodon*). A total of nine types of fish include hairtail (*Trichiurus lepturus*), Bombay-duck fish (*Harpadon nehereus*), tongue fish (*Cynoglossus lingua*), goldstripe sardinella (*Sardinella gibbosa*), longjaw thryssa (*Thryssa setirostris*), wolf herring (*Chirocentrus* spp.), shorthead hairfin anchovy (*Setipinna breviceps*), narrow-barred Spanish mackerel (*Scomberomorus commerson*) and croaker fish (*Johnius trachycephalus*). Mollusks are represented only in the form of cuttlefish (*Sepia* spp.). The weight of catches reaches 684.99 kg, or 55% of the total weight at night.

Crustaceans dominate the weight of the night tidal traps, reaching 394.44 kg, or 58% of the total catch. In addition, 159.31 kg and 102.99 kg of demersal and pelagic fishes weigh 262.3 kg (38%), with mollusks at 28.25 kg (4%). Figure 4 shows the weight composition of fish caught at night by type. Acetes shrimp, black tiger shrimp, red shrimp, hairtail, shorthead hairfin anchovy, goldstripe sardinella, cuttlefish, wolf herring, Bombay-duck fish, and narrow-barred Spanish mackerel weigh 162.7 kg, 126.7 kg, 105.04 kg, 80.5 kg, 34.32 kg, 29.96 kg, 28.25 kg, 25.31 kg, 24.2 kg, and 21.29 kg, respectively. The three types of catches caught in small quantities consisted of longjaw thryssa, croaker fish, and tongue fishe weighing 17.42 kg, 16.79 kg, and 12.51 kg.

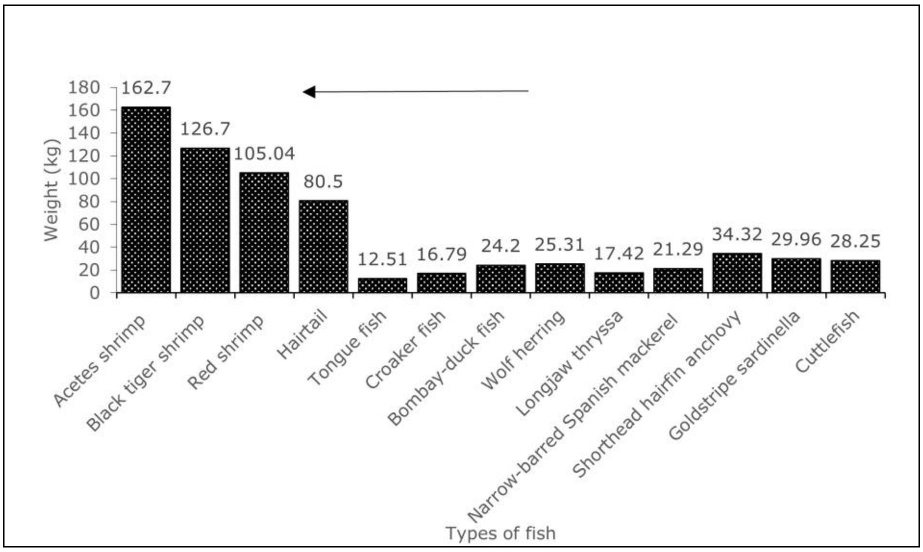

Figure 4. The composition of the tidal trap night catches.

Daylight. The composition of fish species caught by tidal traps during the day is similar to night. The weight reaches 566.39 kg or 45% of the total weight caught during the day and night. Crustaceans are the type of organism dominating the weight of the catch during the day, which is 362.15 kg, or 64% during the day. Furthermore, 118.44 kg and 79.12 kg of demersal and pelagic fishes weigh 197.56 kg (35%), and mollusks weigh 6.68 kg (1%). Figure 5 shows the weight composition of fish caught during the day. *Acetes* shrimp, black tiger shrimp, red shrimp, hairtail, Bombay-duck fish, shorthead hairfin anchovy, goldstripe sardinella, tongue fish, and longjaw thryssa weighed 160.17 kg, 101.4 kg, 100.58 kg, 48.5 kg, 29.12 kg, 26.98 kg, 26.68 kg, 16.88 kg, and 15.62 kg, respectively. The three types of fish caught in small quantities consisted of wolf herring, croaker fish, and cuttlefish weighing 12.63 kg, 11.31 kg, and 6.68 kg.

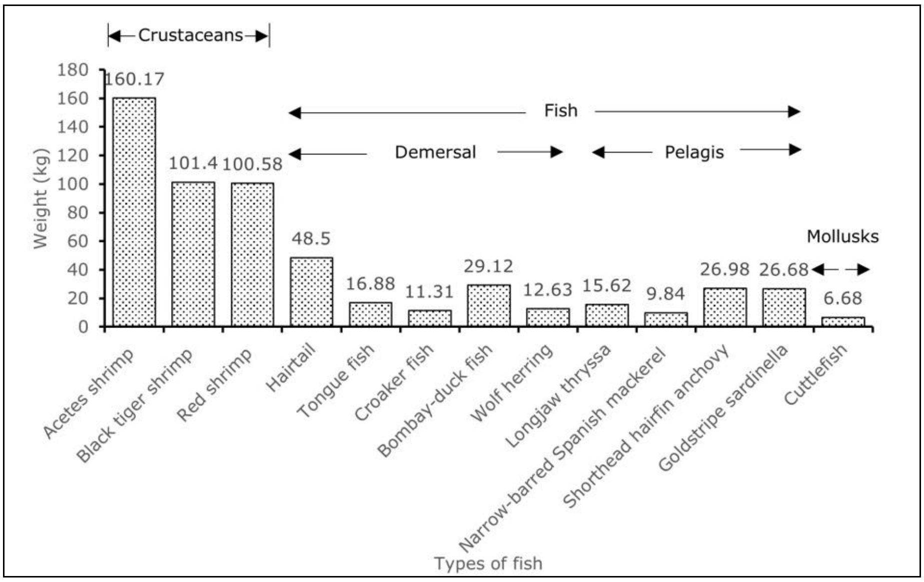

Figure 5. The composition of the tidal trap catches during daylight.

Comparison of tidal trap catches based on fishing operation time. The composition of fish species caught by tidal traps at night and during the day was similar. There are a total of 10 nocturnal species primarily active at night, but they can also be caught during the day. These species include acetes shrimp, black tiger shrimp, red shrimp, hairtail, tongue fish, croaker fish, Bombay-duck fish, wolf herring, goldstripe sardinella, and cuttlefish. A total of 3 diurnal species of fish are active during the day but can also be caught at night, namely longjaw thryssa, narrow-barred Spanish mackerel, and shothead hairfin anchovy. A comparison of tidal trap catches during the day and at night is presented in Figure 6.

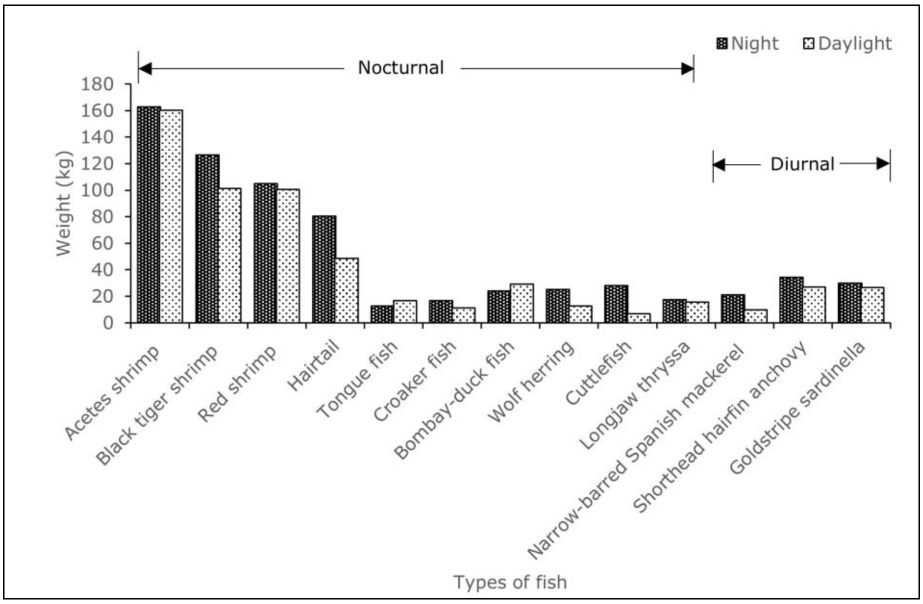

Figure 6. Comparison of the tidal trap catches during daylight and at night.

The total weight caught in the tidal trap at night reached 684.99 kg, or 55% higher than the daytime weight of 566.39 kg. The normality test using the Kolmogorov-Smirnov method proves that the catch data during the day and at night are normally distributed. Furthermore, the t-test shows that there is a difference in the average weight of the catches during the day and at night. The analysis rejects H_0 and accepts H_1 because t-count (8.44) > t-table (2.04).

The different types of crustaceans dominate the weight of tidal trap catches during the day and night. Shrimps are known to be active at night but can be caught at both times (Forbes & Benfield 1986). Sanudin et al (2014) explained that shrimp feeding activity was affected by light intensity. The activity in searching for food is higher with decreasing light intensity. Based on field observations, the weather conditions at the operating location are often erratic and the sky becomes cloudy and dark. Forbes & Benfield (1986) also mentioned the influence of the environment at the bottom of the waters. The current speed during the day at the operating location of the tidal traps was quite fast between 4.20 – 5.57 cm/second. Therefore, the shrimps moved to locate a safe place for shelter and were carried away by the current into the cod-end tidal trap.

Nocturnal fish and mollusks include hairtail, tongue fish, croaker fish, Bombay-duck fish, wolf herring, goldstripe sardinella, and cuttlefish were also caught during the day. The presence of fish and nocturnal mollusks is closely tied to the availability of shrimp as their primary source of food (Roper et al 1984; Badrudin & Wudianto 2004; Asriyana et al 2004; Damalas et al 2009; Sulistiono et al 2009; Prianto & Suryati 2009; Rupawan et al 2011; Jarmanto et al 2014; Siagian et al 2017; Febriani et al 2020). The existence of shrimp activity during the day causes nocturnal fish and mollusks to also move in search of food. Popova (1967) mentioned that hairtail had the nature of diurnal predators and are actively looking for food during the day. Furthermore, tongue fishes were buried in sand or mud during the day and moved slowly when environmental conditions were not calm (Sulistiono el al 2009). Croaker fish have a habit of swimming into the water column during the day and are very sensitive to environmental conditions, such as sound and light (Rosana et al 2021). Wolf herring and Bombay-duck fish are classified as demersal and goldstripe sardinella is classified as pelagic. The three species are nocturnal but are also caught during the day by tidal traps. Liang et al (2020) stated that demersal fish on the continental shelf migrated during the day when the water's brightness was low. Pelagic-neritic fish species also migrated during the shift between day and night. The only nocturnal mollusk caught by tidal traps is the cuttlefish.

Wulandari (2018) explained that the movement of cuttlefish was carried out during the day. Meanwhile, cuttlefish group near the bottom of the water and spread in the column at night. Longjaw thryssa, narrow-barred Spanish mackerel, and shorthead hairfin anchovy are also classified as diurnal fish but were caught more at night than during the day. Based on Figure 6, the weight of longjaw thryssa caught by tidal trap reached 15.62 kg during the day and 17.42 kg at night. Narrow-barred Spanish mackerel yielded 9.84 kg during the day and an impressive 21.29 kg at night, while shorthead hairfin anchovy resulted in 26.98 kg during the day and a substantial 34.32 kg at night. The three types of fish actively search for food in the form of shrimp found in waters with low light intensity (Widodo 1989; Ahmed et al 2014; Purnamaningtyas & Hedianto 2015). According to Lokbere et al (2019), 88% of diurnal fish migrate to the beach during high tide in the afternoon and night, coinciding with the operation at 17:00 WIB. Puspito (2022) explained that longjaw thryssa, narrow-barred Spanish mackerel, and shorthead hairfin anchovies were classified as diurnal and crepuscular fish, that actively looked for food when the water conditions were dim in the afternoon. Boneka (2001) added that the feeding period of the types of fish on the beach was influenced by the rhythm of the tides and ebb.

The optimization of nighttime operations for tidal traps is recommended with a concurrent cessation of daytime operations due to their diminished efficacy. The aim of restricting the duration of fishing activities is to introduce a respite in the exploitation of resources within the waters of Bengkalis. This measure applies to diurnal and nocturnal fish species, captured during their respective time frames. In a region as fertile as the Bengkalis Strait, there is a pressing need for prudent fisheries management including the limitations on fishing activities. Fish captured during nighttime operations can be promptly processed through drying methods, while those caught during daytime operations must await sun-drying. Consequently, the quality of fish harvested during daylight hours is questionable.

Conclusions. Tidal trap operation was conducted during the day and night, and the result yielded a consistent catch of 13 distinct species. These included acetes shrimp (*Acetes* spp.) (322.87 kg), red shrimp (*Metapenaeus monoceros*) (205.62 kg), black tiger shrimp (*Penaeus monodon*) (228.1 kg), hairtail (*Trichiurus lepturus*) (129 kg), Bombay-duck fish (*Harpadon nehereus*) (53.32 kg), tongue fish (*Cynoglossus lingua*) (29.39 kg), goldstripe sardinella (*Sardinella gibbosa*) (56.64 kg), longjaw thryssa (*Thryssa setirostris*) (33.04 kg), wolf herring (*Chirocentrus* spp.) (37.94 kg), shorthead hairfin anchovy (*Setipinna breviceps*) (61.3 kg), croaker fish (*Johnius trachycephalus*) (28.1 kg), narrow-barred Spanish mackerel (*Scomberomorus commerson*) (31.13 kg), and cuttlefish (*Sepia* spp.) (34.93 kg). The results showed that operating tidal traps at night obtained 684.99 kg of fish, or 20.94% more than during the day at 566.39 kg. The t-test analysis rejected H_0 and accepted H_1 because t-count (8.44) > t-table (2.04). Therefore, the best time for fishing using tidal traps was at night with the time for hauling between 05:00-06:00 WIB.

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Conflict of interest. The authors declare that there is no conflict of interest.

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