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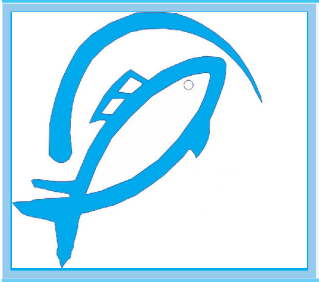

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Research Article

Comparison of Accounting Profit Between Offshore and Deep-sea Commercial Fishing Industry in Pahang State, East Coast of Peninsular Malaysia

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Abstract

Marine capture fisheries in Malaysia plays prominent role in economic growth and commercial fisheries makes great contribution to country's economy. The commercial fishing industry in East Coast of Peninsular Malaysia are mainly operated by trawlers and purse seines which rises a major concern in managing and achieving the goal of sustainable fishery. This study aimed to account the differences of accounting profit level in commercial fishing industry in Pahang State, East Coast of Peninsular Malaysia. In this study, comparison of accounting profits using revenue and profit approach among trawl and purse seine fishery in two different zones: Zone C (offshore) and Zone C2 (deep sea) was carried out based on the intensive survey on fishing capacity and other economic factors. The survey was carried out with the commercial fishermen and total respondents of 156 fishers at landing port. The result showed that trawlers incurred low cost yet provided higher profit than doses by purse seine. Moreover, there are more trawlers vessels operating in the Pahang state fishing ground and the open access nature of the fishery like larger profit invites more effort to use in the fishery which is leading to the over exploitation of fishery resources and threatening the sustainable condition of the fishery. The findings of the research inform the possible impact of fishing profit to overcapacity in sustainable fishery management in Pahang State fishery.

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1. Introduction

Commercial fishing is a global activity that has been labelled as high-risk in several circumstances (Lucas and Case, 2018). Commercial industry is an important industry of the fishing sector and provides opportunities such as source output, income, and employment for a nation (Kirkley, 1997). Commercial fishing has grown significantly in the recent decade as a result of expanding global demand for seafoods (Mileski *et al*., 2019). The fishing industry is an important sector for global food security since it supplies marine food sources (Lucas and Case, 2018). Fish is not only a fundamental in the diets of millions of people, but it is also an important source of income for fishermen and related sectors (Béné *et al*., 2015; Haas *et al*., 2019). Fish and fish products contribute approximately 60 % of total animal protein consumed in the country (compared to poultry, beef, and pork), which is significantly higher than other Asian countries (Ahmad *et al*., 2003; Béné *et al*., 2015). The commercial fishing industry is the world's biggest industry and contributes to the high fatality rate of marine species (Davis *et al*., 2019). Most marine fish populations are overexploited, and fishing fleets worldwide are significantly overcapacity.

Overexploitation of marine fisheries are still a severe problem around the world, and in fisheries that have also been densely managed by coastal nations, multiple uncertainties have significantly hampered the effectiveness of traditional fisheries management strategies in replenishing exploited stocks (Li *et al*., 2020). In a fishery industry, management decisions can have a direct impact on discarding the overexploitation and overcapacity. Overcapacity with extreme overexploitation may lead to depletion and perhaps extinction of fishing populations under the situation of full unrestricted access with no control on access or property rights (Sin *et al*., 2019). Presently, the fishing sector contributes more than 50 % of the global marine fish capture to the nation's fishing industries, but they are confronted with overexploitation, increases in demand, overcapitalization, and new issues imposed by fish markets (Pedroza-Gutiérrez, 2019). Overcapacity refers to a fleet's ability to fish at levels that exceed the sustainable catch level in a fishery, for example, owning to many vessels and/or too many fishermen. Incentives to the fishing industry are common around the world, and such incentives contribute to overcapacity of fishing fleets and overexploitation of fisheries resources. The increasing fishing capacity of vessels increased fishing pressure on fish stocks, resulting in overfishing and depletion of available fish stocks (Sin and Yew, 2016). Overcapacity and overexploitation happen for one main factor which is profit (Harlyan *et al*., 2022).

In Malaysia, the fishery industry is crucial for the generation of income, employment, foreign exchange, and the supply of protein, especially for the rural population (Ahmad *et al*., 2003). The fisheries sectors in Malaysia also plays a crucial role whereas, still contributes significantly to the creation of employment, particularly in rural areas, and to the support it offers to economic growth, despite the fact that its share of the economy is relatively small compared to other sectors (Yaakob and Chau, 2005; Wong and Yong, 2020). In Malaysia, the Malaysian government has pushed local commercial fleets to pursue less-exploited demersal and pelagic species in offshore fisheries since 1987 (Wong and Yong, 2020). However, a trawl survey was conducted by Ahmad *et al*. (2003) that demonstrated how offshore fisheries, which typically account for 20% of all marine landings, have been severely overexploited in just a few short years. The issues in Malaysia can be tackled and controlled by efficient sustainable fishery management and regulations.

The profits of trawlers and purse seines are highly different by comparing as the gear or in the zoning. The zones that usually the trawlers and purse seine catches are in zone C and zone C2. These zones are the zones with no boundaries for the catches and it will lead to exploitation of fishery stock in multiple fishing grounds. The time rate of change in fishing effort is considered to be proportional to the gap between existing fisheries rents and the potential profit in alternative economic activities or opportunity costs for the dynamics of effort (Yew and Heaps, 1996). The profitability of a vessel has huge impacts towards many other factors such as overexploitation, overcapacity, and more fishing effort.

The financial viability of the commercial fishing industry can be extremely uncertain, which may deter sectors depending heavily on the commercial fishing industry (Watson *et al*., 2021). In 1995, 173.73 USD (RM 766) was the average monthly income from commercial fishing (Ahmad *et al*., 2003) but in 2019, the average monthly income for the fisherman was 588.63 USD (RM 2595.39) (Nursyazwin and Zein, 2019). Socioeconomic profile may affect the fishermen behaviors and it leads to overfishing and overcapacity issues. Overexploitation and overcapacity, failure of rules and regulations, damage of marine resources, higher profitable industry than small scale fisheries and extinction of marine species are the present problems in Malaysia's commercial fishing sector. The study's research gap focuses on suitable policy recommendations in fisheries management, where there is a dearth of studies and

recommendations for Malaysia's commercial fishing industry as per profitable analysis. Many of the world's fisheries are witnessing a decrease in fishing yield and commonly interpreted this happens because of overfishing (Perissi *et al*., 2017).

Sustainable fisheries management can be conducted by using efficient policies and other methods such as enforcement on limitation of vessels in daily range at Pahang state, approval on size limitation of the nets and many more. To improve fisheries, management authorities must develop legitimate, enforceable,and proven harvest practices, as well as enough rights-based benefits for the fishing community (Monteiro, 2017). The management approach for this fishery has mostly focused on limiting fishing effort and using technology measures for both professional and recreational fishermen (Castro *et al*., 2019). Effective conservation strategies must include social, economic, cultural, and political considerations, as well as ecosystem-based sustainable fisheries management (Benhardouze *et al*., 2012). As in marine protected area (MPAs) support ecotourism and financially support the sustainable management of fisheries in addition to preserving natural eco-habitats (Wong and Yong, 2020).

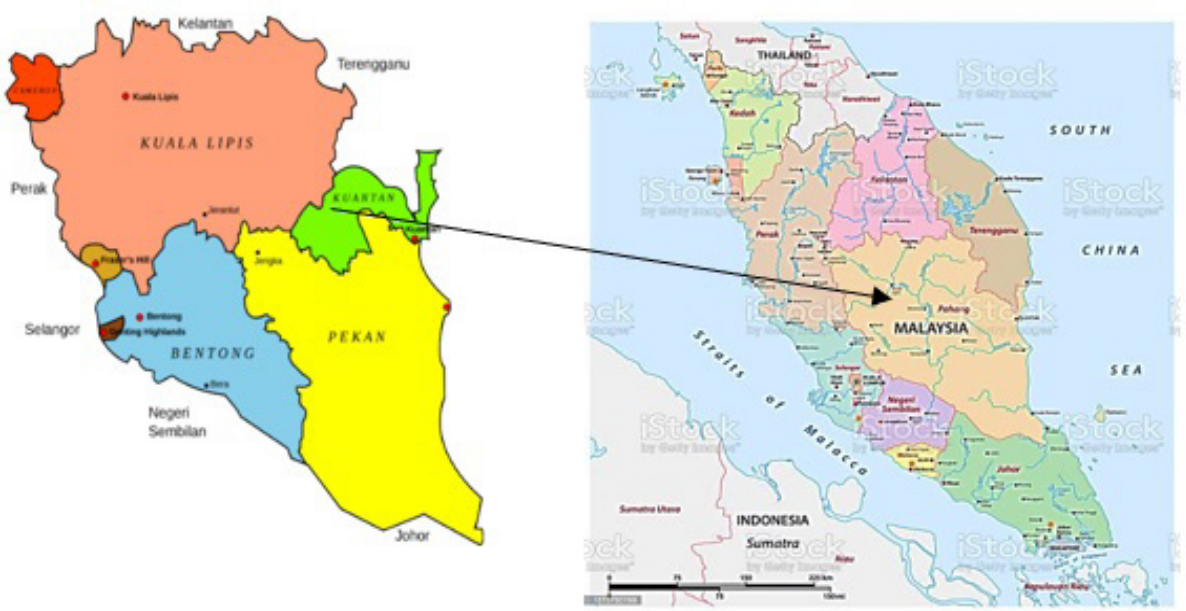

Figure 1. Pahang state map: the study area (Source: Google Image)

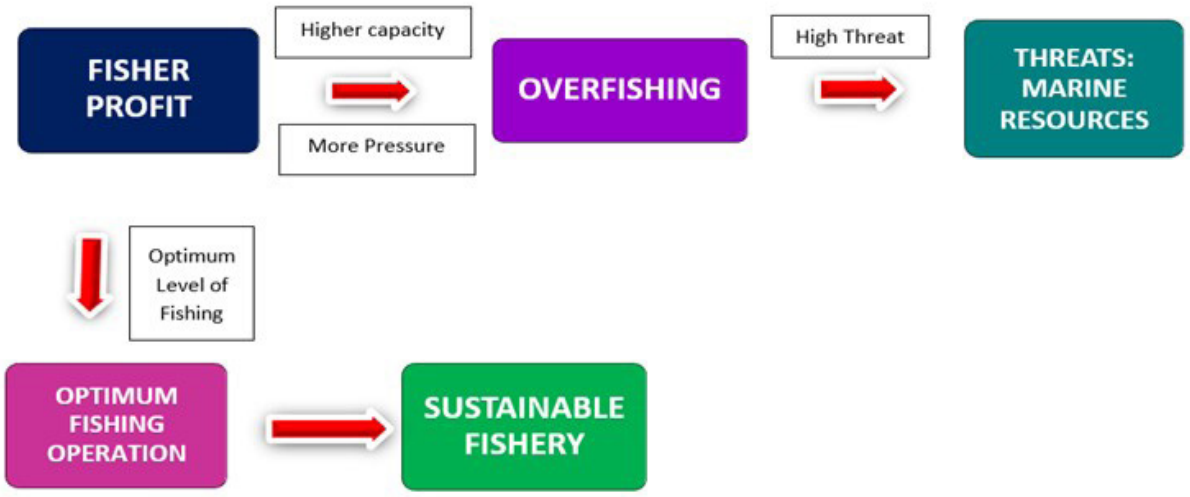

Figure 2. Research framework of the study that shows the factors effected by the profit variable

There are common issues occur such as low-down term in profitability in the commercial fishing industry where it also leads to the increase of food security issue. The fishers will put on more fishing efforts once the profit is high in the certain fishing ground. Whereas the fishing ground will be highly exploited by the fishers because main vessels will target the same fishing ground. From the aspect of food security, the consequences of overlapping exploitation of fish supplies by small-scale coastal and larger-scale commercial fishing are particularly significant and can involve physical violence at sea (McClanahan *et al*., 2015). The fishermen income can be adjusted by multiple reasons. According to Sin *et al.* (2019), crews operating the trawl vessels in Malaysia are not paid a fixed wage. Instead, they are paid a portion of the net profit and the gross revenue of a trawler is measured for each trip. The objective of the study is focus on profitability of the fishermen according to the catch and profit data. Here, this research will benefit the future research and environment whereas it helps to evaluate the profitability of vessels operations.

2. Materials and Method

2.1 Materials

2.1.1 Descriptive data: questionnaire design

The study used the survey conducted method to analyze the accounting profit of the fishers. The material used in the study was a questionnaire which was the survey instrument of the entire finding. The questionnaire had four main sections to analyze the profitability. The information of fishermen profiles and economic parameters were collected using structured questionnaires in Kuantan commercial fishing industry in Pahang State, East Coast of Peninsular Malaysia. The economic information such as (1) fixed costs included main vessel skin, fuel, engine, and gear costs (Trawler, and Purse seine), and (2) variable costs included fishing operation were collected. The catch and landings by fishing vessels, specific gear class, and seasonal variation such as monsoon and non-monsoon seasons were collected to compare the seasonal variation in profit and income generated from the fishery. The collected data was transferred to an Excel spreadsheet and accounting profit was estimated and compared. The sampling selection used was selective sampling which only focused on the commercial fishers from zone C and C2. The data collection was completed in early 2022. The total number of respondents collected in the Pahang region was 156 and they were commercial fishermen such as captain of the vessels, crews, and owner of the vessels.

2.2 Methods

2.2.1 Study area

The research was conducted in Pahang state. Pahang is Peninsular Malaysia's biggest state and is located on the East Coast (Figure 1). In Pahang, the primary landing port is Kuantan, also known as "Complex Perdaratan Lembaga Kemajuan Ikan Malaysia (LKIM) Kuantan." The research was carried out exclusively in Pahang landing port because it is one of the busiest ports which makes it highly strategic to conduct the survey among the fishermen. The East Coast of Peninsular Malaysia (ECPM) was chosen because it has the most seasonable weather, such as monsoon season, which causes fishing challenging. Pahang has a higher concentration of vessels such as trawlers and purse seine in wide range of zoning area especially in Zone C and C2. According to the data from DOFM (Department of Fishery Malaysia), the number of fishermen is increasing in every year and as well as the landing and catches in ECPM marine capture fishery.

2.3 Analysis Data

2.3.1 Research framework

The research focuses on profitability of commercial fishing industry and how it relates to the overcapacity and overfishing factors. Theoretically, fishermen increase the investment and inputs as long as the industry provides greater profits. With the fact of increasing profit by fishing, the hierarchy of overfishing and overcapacity prolongs in the industry (Laloë, 1995; Sin *et al*., 2019). The relationship of each variable in the study is connected relevantly (Figure 2). The profit plays an important variable because when the profit is higher, the fishers will put more fishing efforts to increase the profit than the normal days. Therefore, this causes more vessels to be caught in the same fishing grounds. The higher profit from fishing industry, the fishermen are willing to put more capacity that leads to overfishing and threat to marine resources. Overcapacity and overfishing mainly rely on profit level of fishermen. The fishers will face the decline in number of catches in the fishing grounds.

2.3.2 Zoning system of marine fishery in Malaysia

In Malaysia, commercial industry at Pahang state in the East Coast of Peninsular Malaysia (ECPM) is one of the developing fisheries sectors. The study carried out in Pahang area because it was a key source of fisheries landings in Peninsular Malaysia from year 1991 to 2021 (Shuib and Ali, 2022). Pahang state has the highest catch landings for this sector. However, the East Coast's catch peaked in August and September, and from there, the monsoon caused a decline in landings until February, when they reached their lowest (Yaakob

and Chau, 2005). The Department of Fisheries Malaysia (DOFM) manages and regulates marine capture fisheries under the Fisheries Act 1985. The fishing zone is defined in nautical miles (nm) in Malaysia's fisheries sector. The DOFM established four-zone marine protected areas (MPAs) in 1982, denoted as A (0-5 nm), B (5-12 nm), C (12-30 nm), and D (beyond 30 nm) (Figure 3a). In 2014, a new zoning system was implemented in a few states, including Perak, Selangor, Penang, Perlis, and Kedah (Figure 3b). The zoning of costal fisheries together with the gross registered tonnage (GRT) classes value are assigned to identify the fishing ground for the vessels. In this study, different tonnage classes of the commercial vessels were analyzed and most of the commercial vessels in Pahang state were operating in zone C (12-30 nm: offshore) and zone C2 (30 to EEZ: deep-sea).

2.3.3 Hypothesis of the research

The socioeconomic profile and profitability may also act towards the fishing efforts and profits. The hypothetical behavior of the fishery includes: (1) profit factors have been affected by other economic factors such as revenue and cost of the fisheries that measures connection between profit and efforts by the fishers and (2) the overcapacity and overfishing are positively related with the profit of fisheries in commercial fishing industry.

2.3.4 Accounting profit analysis

Total profit can be considerably affected by the variable cost, fixed cost, catch, and fishing effort of the fishery. In fact, the profit could be indicating the economic performance of fishing industries. The analysis was used to address the effect of the profit, overcapacity, and overfishing factors. Total revenue of the vessel was calculated with different types of vessels, which are (a) trawler and (b) purse seine, and also specified according to the operating zone by the vessels. The economic analysis covers the trawl and purse seine fleet's economic performance in terms of income, expenses, and profit according to the respective zoning. The mathematical specifications for the revenue function, ex-vessel pricing function, total cost function, and total profit were calculated with the following equations that adapted from Sin *et al.* (2019).

$$Total\ Profit:\ \pi_{+} = Y_{+} - TC_{+} \quad \ldots Eq\ (1)$$

$$Total\ Revenue:\ Y_t = \left|\sum_{i=1}^{2}(Catch_{t,i} \times P)\right| \times \sum_{i=1}^{2} V_{t,i} \quad \ldots Eq\ (2)$$

$$Total\ Cost:\ TC_t = \sum_{i=2}^{2} TFC_{t,i} + TVC_{t,i} \quad \ldots Eq\ (3)$$

The total revenue of each fishing industry of trawler and purse seine was calculated by Equation 2 where:

Y_t = the revenue for each trawler and purse
P = price of species
t= time frame
i = zoning of fishery
i1 = zone C
i2 = zone C2

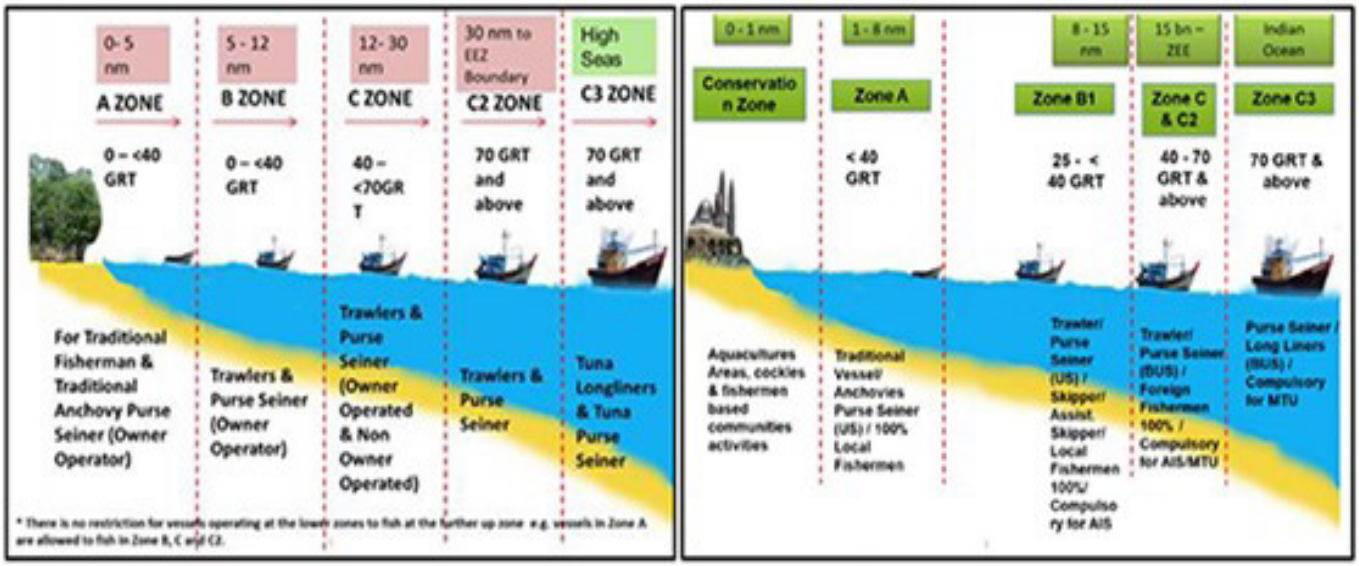

Figure 3. The fishing zoning system of coastal fisheries in Malaysia. Source: SEAFDEC Portal: About SEAFDEC – SEAFDEC. Description: (a) the zoning system is the old one that is still in use in Pahang study area; (b) the renewed zoning system is.

Table 1. The demographic details of the respondents from the survey output (n=156)

Descriptions	Demographic Elements	Percentage (%)
Gear Type	Trawler	66
	Purse Seine	34
Age	15 – 24	0.6
	25 – 40	52.6
	41 – 60	45.5
	60 and above	1.3
Nationality	Malaysia	79.5
	Myanmar	18.6
	Thailand	1.9
Race	Malay	42.9
	Chinese	36.5
	Indian	0.0
	Burmese	18.6
	Thai	1.9
Education Level	Primary	19.2
	Secondary	44.2
	Diploma	12.2
	Bachelor's degree	4.5
	Not Applicable	19.9
Fishing Years Experiences	< 10 years	21.2
	11- 25 years	69.9
	26 years - 40 years	9.0

Source: Author's own compilation.

The revenue was multiplied by the total number of vessels of each industry. The total profit of each industry of trawlers and purse seine was calculated by using Equation 1. While the total fixed cost plus with total variable cost can identify in Equation 3. The and , will be measured by the one-unit fixed cost specifically and variable cost per unit precisely as in Equation 5 and Equation 7 specifically in each zoning of the industry.

$$Total\ Fixed\ Cost: TFC_{ti} = fc_{ti} \times V_{ti} \quad \text{...Eq (4)}$$

$$Fixed\ Cost\ per\ unit: Fc_{ti} = License\ Fee_{ti} + Other\ fc_{ti} \quad \text{..Eq (5)}$$

$$Total\ Variable\ Cost: TVC_{ti} = Vc_{ti} \times V_{ti} \quad \text{..Eq (6)}$$

Where the and are the cost will estimate the cost of per unit and number of vessels. The license fee and there are other fixed costs such as main vessel cost, net cost, vessel equipment's and insurance fee for crew that calculated per unit in Equation 5. The represents the number of vessels per zones.

To calculate the variable cost per unit refer to Equation 7 whereas, (1) represents the crew cost which is the salary of the crew, (2) represents operating cost such as the vessel's fuel cost and food cost (3) represents the landing cost such as landing fee or landing jetty fee per trip and (4) represents the maintenance cost of the vessel such as engine, gear and skin vessel maintenance. The landing cost will be charged by the *Persatuan Nelayang Kemjuan* (PNK) at the landing port.

$$Variable\ Cost\ per\ unit: Vc_{ti} = CrewC_{ti} + OperaC_{ti} + LdC_{ti} + MtnC_{ti} \quad \text{..Eq (4)}$$

$$Operating\ Cost: OperaC_{ti} = FuelC_{ti} + OtherC_{ti} \quad \text{Eq (5)}$$

$$Fuel\ Cost = FuelC_{ti} = SubFuelP_{ti} \times Quantity_{t} \quad \text{..Eq (6)}$$

The in Equation 9 represents the fuel cost where the fuel cost would be calculated by using the subsidies fuel price for the vessels according to the quantity consumption per vessel. The represents the subsidised price of fuel where the Lembaga Kemajuan Ikan Malaysia (LKIM) and government have fixed the fuel price to 0.37 USD/RM 1.65 for the vessels. The quantity consumption will be 8,000 liters for Purse Seine and 10,000 liters for trawler. Once the quantity consumption is maximized, the fuel cost will be charged as the normal market or industry fuel cost for the vessels. For the vessels in Zone C2 there will be no subsidies given by the government due to the capacity of the vessel is huge. For C2 zones the industrial price fuel which cost 1.05 USD or RM4.65/ liter.

3. Results and Discussion

3.1 Socioeconomic Profile of the Fishermen and Vessels in Pahang

3.1.1 Fishermen profiles of trawlers and purse seine vessels

The total number of respondents was 156 respondents at the Kuantan study area (Table 1). The

number of trawlers was 66% higher than the purse seine which was 34% according to the survey. The respondents' age range were 25 to 40 years old with 52.6% whereas most of the respondents were local fishermen. Besides, the type of races of the respondents was the Malay race with 42.9% of the respondents. The education level of the fishermen was categorized in the secondary level of school mostly with 44.2% and most of the fishermen had approximately 11 to 25 years of experience in fishing activity (69.9%).

Table 2. The values of devices used in each type of commercial fishing vessel in Pahang State fishery

Type of Vessel	Item	Mean value (USD)
Trawler	Main Vessel Skin	2,767
	Trawl Net	1,271
	Echo Sounder	1,173
	Fish Finder: Sonar	2,445
	Generator	483
	Fish Compartment	86
	Fish Container	16
	GPS	1,383
	Total	**9,624**
Purse Seine	Main Vessel Skin	3,28
	Seine Net	1,476
	Tuna Net	1,198
	Fish Compartments	76
	Echo Sounder	1,112
	GPS	1,500
	Fish Finder: Sonar	1,500
	Fish Container	14
	Spotlight	17
	Generator	637
	Total	**10,81**

Note: Author's compilation from primary data source. (Currency exchange: 1USD= 4.5 MYR)

3.1.2 Accounting costs: fixed cost and operating cost of the vessels

There were two types of vessels focused on this study: (a) trawler and (b) purse seine (Table 2). The averageixed cost of the trawler was at least 9,624 USD exclud fing other items such as refrigerator, engine value, stove and so on, while the fixed cost for purse seine vessel was 10,810 USD. Some items used in both gear types such as GPS, Echo Sounder, Fish Finder, etc., and commercial vessels mostly used high technology devices to achieve more catch within the short period of fishing time and consequently, causing overcapacity and over capitalization.

The cost had been analyzed according to the seasons (a) non-monsoon and (b) Monsoon (Table 3). For the purse seine vessels, fishermen never went to fishing in the monsoon season and there would behree to four months break till the monsoon season end. In 2005, only 31% of commercial fishermen remained fishing, most likely those who owned large fishing boats (Yaakob and Chau, 2005). Whereas the current survey studied those seiners stopping fishing for months following the seasonal factor, but the trawlers remained in the sea. The mean values of the items required for fishing operation for each trip were varied. The average fishing operation for trawler cost 5842.70 USD (RM 25,761.46) for each trip, while for purse seine costed 5734.50 USD (RM25805.30) (Table 3). The highest operating cost in fishing operation was the fuel cost both for trawler and purse seeing. The fuel price is subsidized by Malaysia government, with 0.37 USD (RM 1.65) per liter for the vessels except the C2 zone vessels. Ali *et al.* (2017) stated that among the subsidy elements, fuel subsidies in fishery sector accounted for over 66% (RM473.9 million) of total subsidy value in 2012.

3.1.3 Catch or landings by the vessels and fishing effort

The average catch by each vessel type was shown based on the monsoon and non-monsoon season (Table 4), by means of catch in the number of trips per month, how many days per trip, and also how many hauls per day by a vessel. The total average of catch in a trip was higher between 50,001 to 10,000 kg for trawler and purse seine in both seasons. Based on the primary data source, the trawler input approximately three trips per month, each trip was ten days of fishing and hauling four times per day and fishing both in monsoon and non-monsoon. Compared to purse seine, the trips per month were 11 trips and only go for fishing in non-monsoon. The average catch per trip for trawler was higher than purse seine. The primary data concluded that the effort by purse seine is higher compared to trawler, however, the technology factors such as usage of engine net and other facilities reflect towards the average catch per trip. Bordalo-Machado (2006) and Gulland (1956) widely assumed that larger vessels capture more fish than smaller vessels, it has frequently been discovered

that vessels with similar characteristics, fishing in the same grounds, have varied individual catches per unit. Sin *et al.* (2019) also mentioned that trawlers are the main fishing vessels that catches and effects the landing of fishes in Malaysia. Therefore, both gear types can become the maximum fishing effort to have more profit.

3.1.4 Ex-vessel price of marine fishes in Pahang State Industry

The price range of the common catches in the Kuantan Port for trawler are *Loligo spp.* (Squid) *Sepia spp.* (Cuttlefishes), *Scomberomorus spp.* (Spanish Mackerel), *Nemipterus spp.* (Threadfin bream),

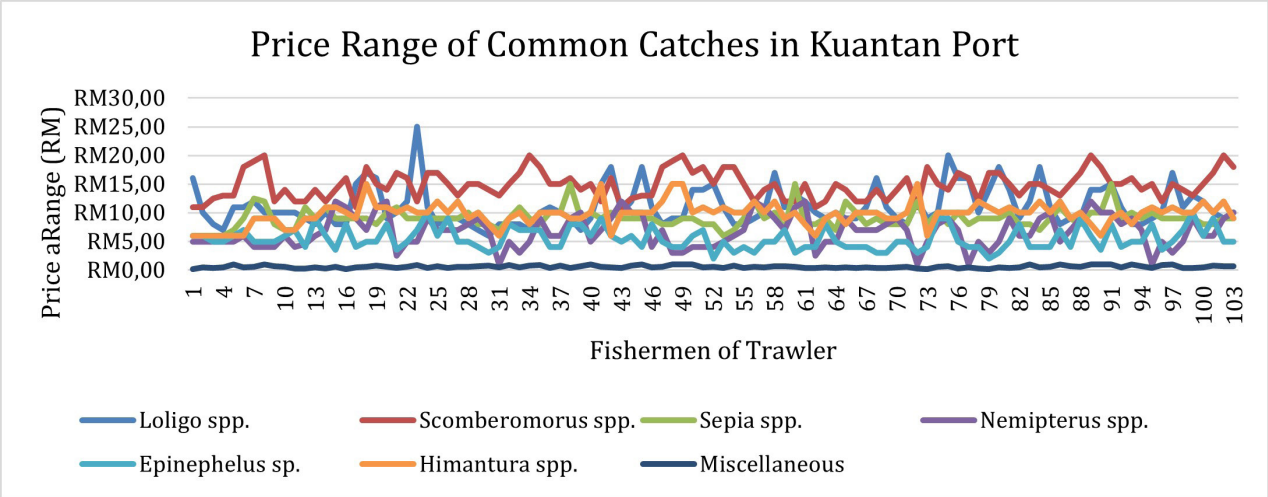

Figure 4. Price range of common catches in Kuantan Port (Trawler). Note: Author's compilation from primary data source

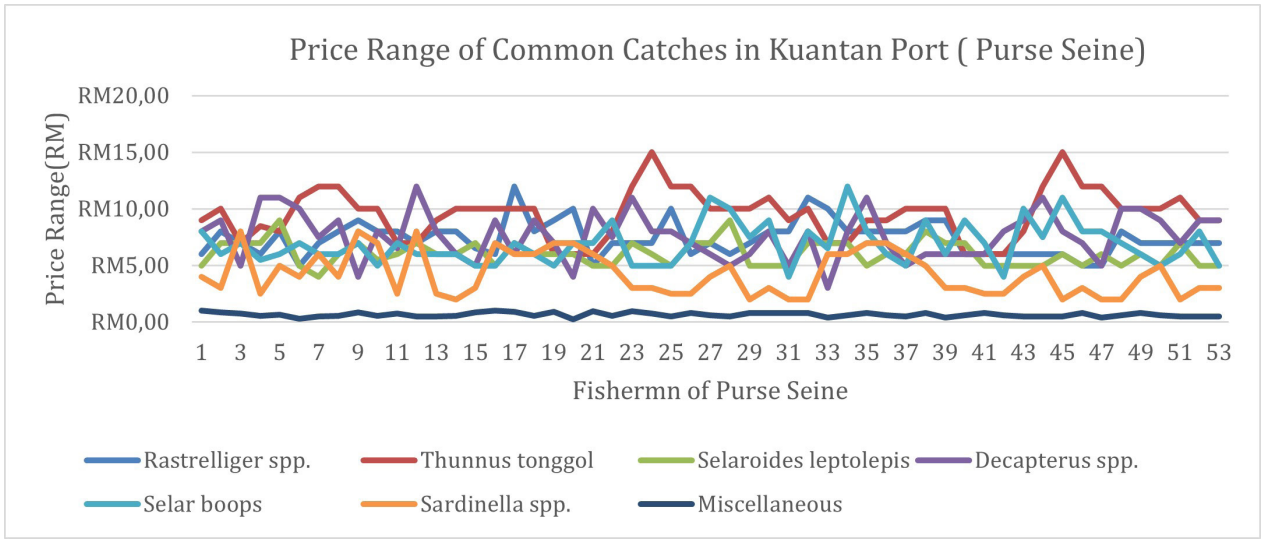

Figure 5. Price range of common catches in Kuantan Port (Purse Seine). Note: Author's compilation from primary data source

Figure 6. The rare catch sea cucumber (Gamat) by Seiners at Kuantan landing port

Table 3. Operating cost of commercial fishing vessel in Pahang state fishery

Vessels	Item of Vessels	Seasons	Mean value (USD)	Cost per Trip (USD)
Trawler	Diesel	Non- Monsoon	5,444	5,843
	Gas Cylinder		12	
	Food		360	
	Water		26	
	Diesel	Monsoon	5,334	5,735
	Gas Cylinder		12	
	Food		361	
	Water		28	
Purse Seine	Diesel	Non- Monsoon	3,234	3,396
	Gas Cylinder		13	
	Food		106	
	Water		7	
	Ice Block		539	

Note: Author's compilation from primary data source. (Currency exchange: 1USD= 4.5 MYR)

Table 4. Catches and efforts of commercial fishing vessels in Pahang state fisheries

Vessels	Seasons	No. of trips per month	Average Catch per Trip (Kg)
Trawler	Non-monsoon	3	10,432
	Monsoon	3	9,243
Purse Seine	Non- Monsoon	11	7,934

Source: Author's compilation from primary data source.

Description: Trawlers: (monsoon & non-monsoon) 4 hauls/day, 10 days/trip. Purse Seine: (only in non-monsoon) 4 hauls/day, 2 days/trip.

Epinephelus sp. (Grouper), *Himantura spp*. (Rays), and *Miscellaneous* (Trash fish). There are many species caught by the trawlers and some common fish species are listed by the fishermen in the Kuantan landing port. The Kuantan fishing ground is highly conquered by the trawlers and the catch of the vessels mostly consists of common species as mentioned above. The commercial fishers using trawl nets achieved high profit as they achieved high catch and naming trawlers as the "Gold Digger" of the sea in this area, and as consequence, overly exploited the marine resources. The overexploitation factor is happening due to the high number of catches in the certain fishing grounds by the many numbers of vessels. Overcapacity is one of the major reasons that leads to overfishing. Since the trawlers has the ability to drag in the seiners fish ground too, its catches are almost common as the purse seine. On the other hand, the seiners catches are not similar to the trawlers. This will impact the revenue of the seiners because the trawlers may give the common species a lower price to the market. The prices of the fishes of common species are not too expensive due to a high supply or big catch by the trawlers. The trawlers also often exploited the pelagic species, and the "Spanish Mackerel" is the best example of the most catch by trawlers in this port in Pahang State.

The price of the trash fish was most likely 0.22USD or RM1.00 only (Figure 4). In 1986, the total amount of fish trawled was 53% food fish and 47% trash fish (Chan and Liew, 1986) and in 2021, one of the common catches is trash fish where it still maintains the lowest price among all other catches (Harlyan *et al*., 2022). According to Razak *et al*., (2014), small fish species such as mackerels, sardines, and scads are often utilized as trash fish, and these fish species typically have been equally exploited by the trawlers in the Kuantan area vessels. According to current market, these trawler

Table 5. Respondents' opinion about fishing operations

No.	Description	Likert Scale Range				
		1	2	3	4	5
1	I feel less secured now during fishing operations.	4	12	36	10	94
2	I have personally faced adverse situations in the sea.	15	55	60	7	19
3	Compared to 5 years ago, the quantity of landings has decreased	0	26	76	14	40
4	Compared to 5 years ago, the composition of trash fish landings has increased	21	21	92	14	8
5	It is easier now to get local crew for fishing operations.	3	13	106	13	21
6	It is easier now to get foreign crew for fishing operations.	4	13	119	6	14
7	It is easier now for investors to get capital funds to start fishing operations.	7	26	102	3	18
8	Given the opportunity I prefer to stop fishing right now.	3	4	28	23	98
9	I like fishing so I'll continue fishing even if it is not that profitable.	61	89	5	1	0
10	Fishing is still profitable if you work hard.	74	80	1	1	0

Note: Author's compilation from primary data source.

Table 6. TFC, TVC and TC value of trawlers by zoning

Item	Offshore (Zone C)	Deep- sea (Zone C2)	Unit
Main Skin Vessel	2,836	3,430	USD. $Ves^{-1}Year^{-1}$
Trawl Net	1,273	2,077	USD. $Ves^{-1}Year^{-1}$
Engine	1,498	2,070	USD. $Ves^{-1}Year^{-1}$
Echo Sounder	1,179	1,021	USD. $Ves^{-1}Year^{-1}$
Fish Finder	2,411	3,289	USD. $Ves^{-1}Year^{-1}$
Generator	483	499	USD. $Ves^{-1}Year^{-1}$
Other Equipment's	1,692	1,933	USD. $Ves^{-1}Year^{-1}$
Insurance	131	210	USD. $Ves^{-1}Year^{-1}$
License Fee	113	181	USD. $Ves^{-1}Year^{-1}$
Total	**11,616**	**14,709**	USD. $Ves^{-1}Year^{-1}$
Operating Cost (Fuel & Food Cost)	69,276	79,42	USD. $Ves^{-1}Year^{-1}$
Maintenance Cost (Vessel, Gears &Engine)	3,286	2,778	USD. $Ves^{-1}Year^{-1}$
Wage & Salary	61,603	62,012	USD. $Ves^{-1}Year^{-1}$
Landing Fee	450	467	USD. $Ves^{-1}Year^{-1}$
Total	**134,615**	**144,677**	USD. $Ves^{-1}Year^{-1}$
Total Cost of a vessel $(TFC_{t,i} + TVC_{t,i})$	**146,231**	**159,386**	USD. $Ves^{-1}Year^{-1}$
Total Cost of whole Industry $(TC \times V_{t,i})$	**14,476,887**	**637,544**	USD. $Ves^{-1}Year^{-1}$

Note: Author's compilation from primary data source

fish species were valued at RM 8-12/kg which means 1.77 USD to 2.67USD/kg (Das *et al*., 2021). According to the respondents for trawler, that was the price range of the species before they entered common market. The price varied according to the species and size (Yusof *et al*., 2022). Besides, the trash fish is the fishes of bycatch. The trawler usually has the highest amount of trash fish compared to purse seine. Trawlers catch a significant proportion of trash fish, which includes juveniles of commercially valuable species (Nuruddin and Isa, 2013). Trawlers catch fish in an indiscriminate approach, with an extremely varied species composition, one-third of which may be "trash" fish (Viswanathan *et al*., 2001).

Besides, the common catch of purse seine are *Rastrelliger spp.* (Indian mackerel), *Thunnus tonggol* (Longtail tuna), *Selaroides leptolepis* (Yellow-striped scad), *Decapterus spp.* (Round scad), *Selar boops* (Oxeye scad), *Sardinella spp*. (Fringescale sardine), and *Miscellaneous* (Trash fish) (Figure 5). The number of catches is lower compared to trawler and the type of species also not diverse as trawler. Purse seine always avoids overexploitation due to some factors. The seiners usually catch the pelagic type of species, and the species are almost the same as the other seiners. The range of seiners prices is 0.11USD or RM0.50 to 3.56USD or RM16.00. The range of price is supposedly much lower than the trawlers. The purse seine also has trash fish, but it is not many as the trawlers. The seiners trash fish have limits of prices which is usually less than 0.22 USD or RM1.00. Moreover, the commonly known fishes among the communities are Indian mackerel, round scads, and longtail tuna where the prices hike between 0.90USD or RM4.00 to 3.33USD or RM15.00/Kg.

Besides, the "Gamat" or sea cucumber known as one of the rare catches for the seiner which makes the price is high and will be top of the seabed in certain time period only according to the wave. "Gamat" is one of the high price range catches for the seiners. "Gamat" is usually in the range of 11.34 USD to 18.14 USD according to the weight and number of catches. "Gamat" is caught by seiners and can be found on the surface of seabed in a certain period or seasonal only (Figure 6).

3.1.5 Profit sharing and income status of commercial fishers in Pahang State

The catches determine the income of the crew. For the crew wage, trawler and purse seine have different concepts to calculate the pay. For trawler, the number of fishermen is most likely three to five including the captain and the wages are calculated according to the number of hauls per trip. For example, vessel A hauls 13 times per trip and the haul price is 33.33 USD (RM 150.00) per haul. Then, the wage of the crew for the trip will be 433.33 USD (RM 1,950.00). In a month, vessel A had three trips means the total wages for a month will be 1,300 USD (RM5,850.00) according to the survey session with fishermen. For vessel A's captain or commonly known as "Tai Kong" will have three to four times wages of normal crew.

Compared to purse seine, the number of fishermen in vessels are usually 15 to 18 including captain, and the wages are monthly salary after deducting all expenses and vessels profit. Approximately, the salary range for the purse seiners is usually 666.67 USD (RM3,000.00) to 888.89 USD (RM 4,000.00) per month and it depends on the total income of the month. The wages are unstable for the fishermen in both vessels but based on the survey, the trawlers have more income than the purse seine. Most of the trawler have high profit, which is more than 22,222.22 USD (RM 100,000) to 66,666.70 USD (RM 300,000) and commercial fishing industry gaining more attention due to income in Malaysia (Figure 7).

3.1.6 Fishermen's opinion on commercial fishing industry in Pahang State

The opinion question was conducted based on the fishing operation, crew, and profits (Table 5). The Likert scale range used in this study was 1 (strongly agree), 2 (agree), 3 (neutral), 4 (disagree), and 5 (strongly disagree). The critical question of the respondent was no 9, which stated, "even though the fishing activity isn't profitable, would they still go for fishing?" and most of the respondents reacted to agree which was in scale 2. The least was 0 for the strongly disagree. The fishermen want to keep fishing even it is not profitable and dangerous. Moreover, the fishermen are not aware about the trash fish increase in the landing ports where almost 92 respondents reacted to the scale 3. In question 8 about stop fishing, 98 of 156 respondents answered strongly disagreed and denied it. Most likely, the fishermen will not stop fishing due to the experiences and also the profit is high as equal the risk. The newcomers to the field are not so many but the locals whom already aware of the income are willing to be in this fishing field straight after the secondary school ends.

3.2 Economic Performance of Pahang State Commercial Fisheries Industry

The economic performance of Pahang fishery

Industry is explained based on the accounting profit analysis with the total revenue and total cost. The prices of different fish species are controlled by local wholesalers on a daily basis (Yusof *et al*., 2022), and fishers have their own favorite wholesalers based on the best pricing and a positive relationship. To calculate the total profit more precisely, total revenue subtracted by total cost includes total fixed cost (TFC), total variable cost (TVC), and cost of each unit plays huge role to measure the economic performance of each type of gears.

In this section, each industry of trawl and purse seine are discussed according to the zoning system such as offshore: Zone C and deep sea: Zone C2. Zone C assigns vessels with 40 – 70 GRT and C2 is for 70 GRT and above. The cost of each trawl and purse seine fishery are spilled into the zones of vessels classified according to tonnage class. Then the overall profit will be calculated by adding both zones together for each fishery as an industry of Pahang fisheries. The capacity and performance of each vessel are different according to the efforts contributed by the fishermen.

To begin with the accounting profit analysis, total fixed cost (TFC) was analyzed by fixed cost per unit and same went to total variable cost (TVC) as mentioned in equation 4 and 9. The results showed the value of TFC, TVC, and TC of the trawlers precisely. The results explained the average cost of the as mean of per vessel, the total mean of number of vessels, and the total amount of the cost for TFC, TVC, and TC. The number of offshore and deep-sea vessels were showed separately according to the trawl and purse seine fishery (Figure 8). The offshore and deep-sea category were split for both types of gear. The purse seine had 38 respondents from offshore and 15 from deep-sea, whereas for trawlers were 99 respondents from offshore and only four from deep-sea area (Figure 8).

3.2.1 Accounting profit by the trawlers

The accounting profit analysis split into offshore and deep sea which was Zone C and C2 of trawler fishery industry. The data received from the respondents showed the total fixed cost, total variable cost, total cost,

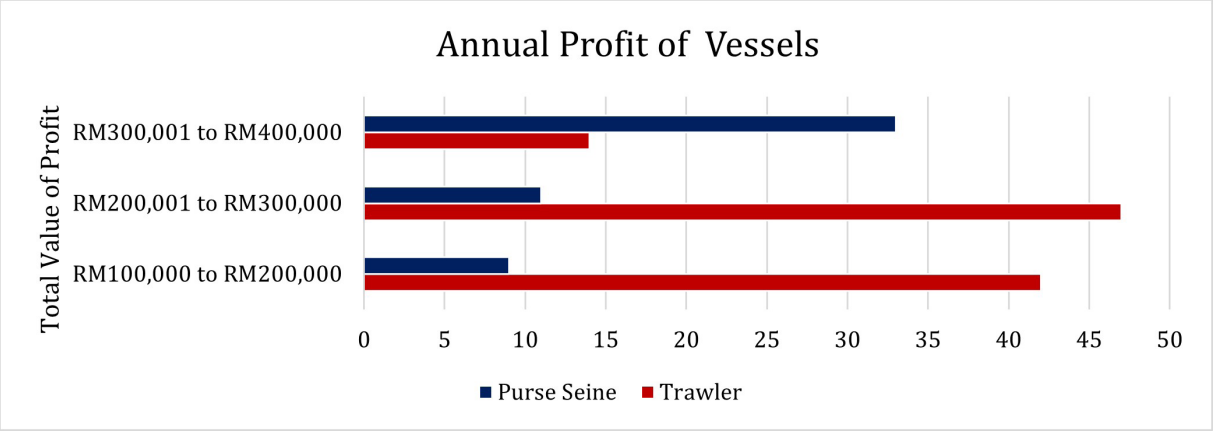

Figure 7. The approximate annual profit of trawler and purse seine

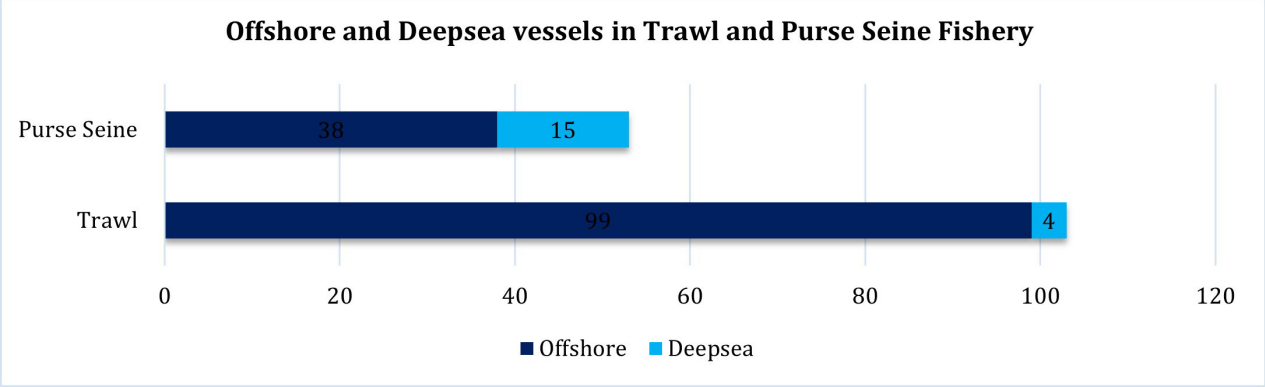

Figure 8. The number of vessels according to the zoning area: offshore & deep sea

and profit of trawler for zone C and C2. By referring to the profit analysis of trawlers, the cost was calculated to identify the overall trawl fishery input and output (Table 6 and Table 7). The cost was calculated for the average mean of a vessel then multiplied by the number of vessels of each zone (Table 10) and provided the total sum of each cost for overall industry. To compare the TFC of offshore and deep-sea vessels, the Zone C2 vessels have high TFC cost for a vessel. The gap differences between the offshore and deep-sea vessels in the same trawl fishery industry are huge.

deep sea vessels or Zone C2 vessels, there are no subsidies and the price of diesel per liter is 0.48 USD (RM 2.15) and the industrial diesel price is 1.03 USD (RM 4.65). The fuel expenses for both zones impacted differently for the vessels. The fuel cost for a vessel in Zone C per year is 63,564 USD (RM 286,036.97), whereas for Zone C2 is 73,817 USD (RM 332,175.00).

The total cost per vessel for trawlers zone C is 143,280 USD (RM 644,758.36) and for Zone C2 is 156,169 USD (RM 702,760.25). To find the overall total

Table 7. Accounting profit estimation of trawlers by zone

Item	Offshore (Zone C)	Deep- sea (Zone C2)	Unit
Total Revenue per vessel (**Total Catch × Price**)	697,457	807,651	USD Ves^{-1} $Year^{-1}$
Total Revenue of Industry (**TR** x $V_{t,i}$)	69,048,243	3,230,604	USD $Year^{-1}$
Total Profit of Industry (trawler) (**TR - TC**)	**54,571,356**	**2,593,060**	USD $Year^{-1}$

Note: Author's compilation from primary data source

The total fixed cost, total variable cost, and total cost value of trawler fishery in Pahang state were calculated according to the output of questionnaire. The value showed the offshore and deep-sea vessel based on the fixed cost, variable cost details from fishermen respondent. means US dollar per vessel per year and USD. means US dollar per year (Table 6 and Table 7). The total fixed cost for a vessel is such as cost of vessel skin, echo sounder, fish finder, generator, engine, trawl net, and other equipment's (fish container, fish compartments, cooking stove, refrigerator, and GPS). The license and insurance fee are fixed cost per year for each vessel too.

The total variable cost (TVC) covers the wages of the crew, operating cost, landing fee, and maintenances cost. The operating cost refers to the fuel and food cost per vessel in a year. The maintenance cost is such as vessel, gear, and engine maintaining cost. The wages of the crew are calculated by using the primary data from the survey analysis. The wages for captain (Taikong) and other crews are calculated separately. A month's average trip for a trawler is three trips, whereas the average wage of a trip is multiple by three trips then it is calculated for a year. The fuel cost for trawlers is calculated for Zone C or offshore vessels by using the subsidies price of 0.37 USD (RM 1.65) per liter. For

cost for the industry, it needs to multiply the number of vessels in each zone. The TC for offshore vessels is 14,476,888 USD (RM 63,831,078.00) and deep-sea vessels is 637,544 USD (RM 2,811,041.00) (Table 6). By comparing, deep sea vessels have a higher total cost value of TFC and TVC than offshore vessel. The amount of total cost industry is higher offshore due to the number of vessels are higher compared to deep sea vessels.

As referring to the result, the total revenue per vessel was 697,457 USD (RM 3,138,555) offshore and 807,651 USD (RM 3,634,429) in deep sea (Table 7). The catch per vessel in a year approximately reached 382,424 kg in Zone C with monthly average catch of almost 31,000 kg. In Zone C2, the average catches are higher of 411,750 kg per year with monthly catches of 34,312 kg. The price of catch was estimated by calculating the average price value of common fish species (Figure 6 and Table 7). The overall profit of the trawl fishery industry in Pahang state for offshore is about 55 million USD (54571,356 USD or RM 246,885,887) and deep sea is about 2.6 million USD (2,593,060 USD or RM 11,726,675.07). The offshore vessels are contributing a high number of profits to Pahang commercial fishing industry. The profit difference between the offshore and deep-sea vessel in trawl fishery is 57,164,416 USD.

By comparing both zones of trawl fishery, the

number of vessels offshore is higher than the deep sea due to the total cost differences. In this research, the trawler in offshore is 99 vessels and for deep-sea is four vessels out of 103. The items in the vessels are the same but there are differences between the number of quantities, such as fish compartments and fish container in Zone C2 vessel will be higher compared to Zone C. The cost of other equipment such as fish finder and echo sounder is generally used by both zoning vessels. By comparing Zone C and Zone C2 of trawl fishery, both zones are highly profitable but the number of vessels in Zone C are larger compared to Zone C2. The method of dragging net on the marine seabed leads to higher number of catches for both zone vessels (Sin *et al*., 2019).

Hence, the fuel price comparison is a big issue among the two different zone vessels. Zone C vessels are able to use the government subsidy fuel, however, the government refuses to give subsidies due to the vessels size in Zone C2 is triple times bigger than the Zone C vessel. Besides, each fishing vessel's monthly quota is determined by the fishing method and vessel size class by the Department of Fisheries Malaysia. Although this subsidy is intended to increase fishermen' socio-economic well-being, it also tends to keep inefficient fishing vessels and fishers in the sector, forcing them to compete with more efficient operators for a restricted and finite resource (Nuruddin and Isa, 2013).

3.2.2 Accounting profit by purse seine

The accounting profit analysis was divided into two zones: offshore and deep sea, which are Zone C and C2 of each fishery industry, purse seine. The purse seine vessels are 53 where Zone C is 38 and Zone C2 is 15. Compared to trawler, purse seine has a higher number of vessels in Zone C2. Purse seiners are usually bigger compared to trawlers. As discussed earlier, the number of crew in a seine vessel is 15 to 17. The vessel has a higher capacity to balance the huge number of crew and the fishing equipment.

The fixed cost of Purse Seine includes cost of the vessel skin, echo sounder, fish finder, seine net, tuna net, engine, generator, and other equipment (fish compartment, fish container, spotlight, GPS, refrigerator, and cooking stove) (Table 8). The purse seiners use two different types of nets which are seine net (*pukat jerut*) and tuna net (*pukat aya*). In this purse seine data, the number of Zone C vessel was 38 and Zone C2 was 15. The purse seiners insurance fees are lower compared to trawlers. The average fixed cost per vessel is 12,813.07 USD (RM 56,495.00) for offshore and 13,393.52 USD (RM 59,054.33) for deep sea vessels. The TFC of deep-sea vessel is high compared to the offshore due to the size of the vessel. The total fixed cost of deep-sea vessels is much higher compared to the offshore purse seine fishery.

The total variable cost (TVC) here includes wages, operating costs, landing fees, maintenance cost, and ice block cost. The operating cost for purse seine is added with the fuel cost and food cost for the trips. The maintenance cost refers to the engine, gear, and vessel maintaining cost. Besides, the average price of ice block is 3.33 USD (RM15) per block and almost 150 ice blocks used by seiners in a trip. The wages of seiners are calculated differently than trawlers. The number of crew usually is between 14 to 17 crews compared to trawler. The wages for the crew are higher for trawlers compared to purse seine. The captain (Taikong) is paid by total percentage of profit share such as 10% to 15% for a month. The rest of the crew is paid monthly compared to trawler; the wages paid according to the number of hauls.

Then, the fuel cost for purse seine is calculated using the subsidies price of 0.37 USD per liter for zone C or offshore vessels. There are no subsidies for deep sea vessels as mentioned earlier. The TVC for each vessel is 81,493.24 USD (RM 359,317.63) for offshore vessels whereas 88,903.18 USD (RM 391,989.33) for deep sea vessels in a year. Deep-sea vessels have a higher cost rate than offshore vessels. The total cost of the overall purse seine fishery industry offshore is 3,583,639.58 USD (RM 15,800,880.00) and deep-sea is 1,534,450.55 USD which means RM6,765,655.00.

The catches offshore vessel is 36,342 kg and deep-sea vessel is 45,266 kg for a month. The average price of the catch is higher for the deep-sea vessels of purse seine than the offshore vessels which is 1.89 USD (RM 8.50) per kg. The total operating months for purse seine are only ten months where in the monsoon seasons both zones of vessels will be off for either two or three months continuously. The deep sea (zone C2) vessels have higher catch compared to the offshore vessels based on the capacity of the vessels. The total revenue of zone C vessels is 25,546,226.56 USD (RM 112,637,682.70) and C2 is 13,087,562 USD (RM57,705,300.00) (Table 9). The total revenue per vessel is comparably higher for deep sea vessels than offshore vessels. The deep-sea vessel will have higher profit than the zone C. The overall profit of the purse seine fishery industry is 33515699.53 USD.

The seine fishery also has its own effect on the fishery, different zones, and different efforts. Industrial fisheries, known as commercial orientation, used purse seine gear to build up a major share of their fishing

Table 8. TFC, TVC and TC value of Purse Seine by zone

Item	Offshore (Zone C)	Deep- sea (Zone C2)	Unit
Total Fixed Cost (TFC)			
Main Skin Vessel	3,235	3,394	USD. Ves^{-1} Year^{-1}
Seine Net	1,525	1,353	USD. Ves^{-1} Year^{-1}
Tuna Net	1,238	1,757	USD. Ves^{-1} Year^{-1}
Engine	1,556	1,615	USD. Ves^{-1} Year^{-1}
Echo Sounder	1,116	1,104	USD. Ves^{-1} Year^{-1}
Fish Finder	3,002	3,092	USD. Ves^{-1} Year^{-1}
Generator	661	576	USD. Ves^{-1} Year^{-1}
Other Equipment's	294	292	USD. Ves^{-1} Year^{-1}
Insurance	54	94	USD. Ves^{-1} Year^{-1}
License Fee	131	116	USD. Ves^{-1} Year^{-1}
Total	**12,813**	**13,394**	USD. Ves^{-1} Year^{-1}
Total Variable Cost (TVC)			
Operating Cost (Fuel & Food Cost)	33,465	42,691	USD. Ves^{-1} Year^{-1}
Maintenance Cost (Vessel, Gears & Engine)	2,675	2,679	USD. Ves^{-1} Year^{-1}
Wage & Salary	38,652	36,976	USD. Ves^{-1} Year^{-1}
Landing Fee	1,276	1,25	USD. Ves^{-1} Year^{-1}
Ice Block Cost	5,425	5,307	USD. Ves^{-1} Year^{-1}
Total	**81,493**	**88,903**	USD. Ves^{-1} Year^{-1}
Total Cost (TC)			
Total Cost ($(TFC_{t,i} + TVC_{t,i})$	**94,306**	**102,297**	USD. Ves^{-1} Year^{-1}
Total Cost of Industry **(TC** x $V_{t,i}$**)**	**3,583,640**	**1,534,451**	USD. Year^{-1}

Note: Author's compilation from primary data source.

Table 9. Accounting profit estimation of Purse Seine by zone

Item	Offshore (Zone C)	Deep- sea (Zone C2)	Unit
Total Revenue per vessel **(Total Catch × Price)**	672,269	872,504	USD.Ves^{-1} Year^{-1}
Total Revenue of Industry **(TR** x $V_{t,i}$**)**	25,546,226	13,087,562	USD.Year^{-1}
Total Profit of Industry (purse seine) **(TR - TC)**	**21,962,587**	**11,553,112**	USD.Year^{-1}

Note: Author's compilation from primary data source.

Table 10. The profitability of Pahang commercial fisheries industry

Item	Trawlers	Purse Seines	Unit
Total Cost of Industry	15,114,431	5,118,091	USD.Year^{-1}
Total Revenue of Industry (**TR** x $V_{t,i}$)	72,278,847	38,633,788	USD.Year^{-1}
Total Profit of Industry (**TR - TC**)	57,164,416	33,515,697	USD.Year^{-1}
Total Profit of Pahang commercial fishing Industry **(Trawler + Purse Seine)**	**90,680,113**		

Note: Author's compilation from primary data source.

capability to harvest the same resource stocks (Kirkley *et al*, 2003a). The catch of zone C and C2 are compatible but zone C2 harvest a higher number of catches annually according to the data gained from the fishers. The seiners have two different types of net such as seine net and tuna net. These two different nets are used to catch the type of species specifically. The tuna net is only for the tuna type of species. The seine net is for all the types of pelagic species. It is common for the seiners in Pahang, Malaysia, to use different equipment for specific type of catch according to the market by both zones. Based on Kirkley *et al*, (2003a), the purse seine fishery catches nine or more distinct species and the most important catches by volume are hardtail, round scads, Indian mackerel, and sardines. In Malaysia, the species of catches are common among both zones, but the quantities are different. Purse seine vessels are the most capable of catching the varieties of fish available offshore in both Malaysia and Indonesia (Kirkley *et al*., 2003b).

If offshore and deep-sea vessels do not make effective adjustments, shifting capacity may result in technical inefficiency. Besides, same as trawlers, purse seine fishing gear operators receive subsidized fuel for Zone A to Zone C vessels. The catch and fuel subsidies are managed by the local fishermen's association, while the Malaysian Fisheries Development Authority is in charge (Jagerroos, 2016). The offshore and deep-sea vessels of purse seine fishery are similar in characteristics but different in number of catches, prices and also in profit. Comparably, the C2 vessels have higher profit than zone C vessels in purse seine fishery.

3.3 Accounting Profit Analysis of Pahang Commercial Fishing Industry

To compare the profit of vessels, the study requires data of total cost and total revenue of trawl and purse seine fishery of Kuantan, Pahang. As refer to the result, the total profit of trawl fishery was 57,164,416 USD and for purse seine fishery is 33,515,697 USD (Table 10). By referring to the summed-up value, the trawl fishery has a higher income compared to purse seine fishery. Both of the fisheries are profitable but by comparing the value, the trawlers are the gold digger of the sea as mentioned earlier. The trawler and purse seine fishery in Pahang state commercial fishing industry have an overall profit of 90680113 USD (RM428,088,688.65) per year.

The research focuses on trawler and purse seine fishery in Pahang state fishing industry. The trawl (*pukat tunda*) and purse seine (*pukat jerut*) nets are the most major industrial gear types, with trawl gear harvesting demersal (bottom-dwelling) species and purse seines harvesting pelagic (surface-dwelling) species (Viswanathan *et al*., 2001). These findings are further supported by the increased fishing effort caused by an increase in the number of trawlers and purse seiners, as well as the number of power boats (Ali *et al*., 2017). According to Viswanathan *et al*. (2001), in 1996, trawlers and purse seiners contributed to 81% of total fish landings and 77% of total wholesale value in Peninsular Malaysia. Yew and Heaps (1996) also mentioned that the gears' combined landings accounted for at least 80% of the total catch for each species category yearly.

Profit always influences the efforts of fishermen; the more effort is put on fishing; the more overfishing issues will happen. In the long term, the fishery resources will be fully exploited, and lack of marine resources will continue if the fishing efforts are not controlled by the management. In addition, the opinion of fishermen matters about the fishing profit and resources. In Malaysian fishery industry, the profit of trawler contribution is higher than the purse seines because there are a greater number of trawl vessels in the sea. The trawlers are conquering the marine sea zone especially in Pahang area

(Department of Fisheries Malaysia Ministry of Agriculture and Food Security, 2020). The trawlers and seiners are major contributors in the landing of catches whereas the huge number of profits are encouraging these fleets to fish. Therefore, the profit factor is contributing to the overcapacity variable directly.

By referring to the survey session conducted by the researcher, it is found that fishermen would love to continue fishing in future due to large profit gained from the industry. The seiners usually hate trawlers because they over-catch the purse seine's catch too. This study concluded that trawlers are sea draggers, highly profitable, and many of the foreign fishers work in trawl fishery. Foreign fisherman on Malaysian trawlers may spend longer time at sea than Malaysian fishermen, enhancing the trawler's fishing effort (Nuruddin and Isa, 2013). Purse seine fishery is highly profitable too and the crew of seiners is mostly locals. Moreover, the annual landing of trawl fishery is high because the number of purse seine vessels are less than trawlers. Because of its significant landings, the trawl fishery is a major component of Malaysia's catch fisheries (Sin *et al*., 2019).

As a Pahang state commercial fishing industry, the total profit of Pahang state is 90,680,113 USD for both trawl and purse seine fishery. Based on DOFM data, the Pahang state contributes a higher amount of GDP towards the country's fisheries sector. The profit comparison of trawlers and purse seine are not that high, and it still has a huge outcome for each vessel in the Kuantan study area. The time rate of change in fishing effort is considered to be proportional to the gap between existing fisheries rents and the potential profit in alternative economic activities or opportunity costs for the dynamics of effort (Yew and Heaps, 1996). Indeed, various assumptions about fishermen's behaviors in terms of fishing effort supply are also conceivable. This can relate to the overfishing and overcapacity in Malaysia especially in the Kuantan area.

However, the profitability affects overfishing. The approximate number of catches per year is higher for a vessel. High profit leads to overcapacity and overfishing. To assume, in the next 50 years, most of the marine resources will go extinct due to these overfishing habits and marine seabed will be destroyed due to overcapacity. Overfishing and overcapacity can only be controlled by the government. The number of trawlers is huge than purse seine. Trawlers are the destroyers of marine seabed (Sin *et al*., 2019; Yusof *et al*., 2022). Technically, the statement has proved that trawlers are marine resources destroyers. Trawls are big nets that are pulled over the bottom, whereas dredges are usually made of a strong iron frame to which a chain-link bag is attached (Watling, 2005). Taylor (2010) stated that instead of calling it a dragger, they should name it a destroyer for the trawlers. The profits are good for those fishermen in long term, but it is destroying the marine coastal and resources. To stop or overcome this, management of effectiveness is a must for all the vessels especially trawlers and purse seiner. To achieve effective implementation, governments may need to adopt mandatory registration of fishermen, vessels, jetties, and other industry related (Yusof *et al*., 2022).

To overcome this factor, the government should stop subsidizing the fuel price for the vessels. Although this subsidy is intended to help to increase fishermen' socioeconomic well-being, it also tends to keep inefficient fishing vessels and fishers in the sector, competing with more efficient operators for a restricted and finite resource (Nuruddin and Isa, 2013). Besides, Yusof *et al*., (2022) suggested to create a traceability system to control its supply chain process, beginning with catch landings, in order to maintain sustainable fishing. This will help to seek the marine resources to sustain longer. The fishing industry is highly profitable and at the same time the fishery stock is highly exploited due to the hidden factors.

4. Conclusion

The study concluded that the Pahang fishing area is mostly by the trawlers. The vessels with high fixed cost investment gain high return of profits which causes the overcapacity and overexploitation of catches theoretically. The commercial fishers like to fish in zone C offshore because it is nearer to the fishing ground. Based on the conceptual framework model, the profit of fishers directly impacts on the overfishing and overcapacity in the marine commercial fishing industry. The present study proves that higher profit will increase more effort and technically, it will increase the overexploitation and overcapacity on seabed. Therefore, the present study has a few proposed policies that may be properly adopted and enforced in future to control the overfishing and overcapacity factors including limiting vessel licenses, reducing fuel price subsidies, and boosting taxation on landing charges. These implementations will aid in the future regulation of commercial fishing sectors.

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Authors' Contributions

The contribution of each author is as follows, MSS; handled research frameworks and theoretical model. MSS and LGK; collected and analyzed data, evaluated the results and drafted manuscript. AZZ and MK; provided literary review. TSY; revised and suggested the manuscript writeup.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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