

Research Article

Economic performance of tuna longline fisheries in the central area of Vietnam

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Abstract

Longline fishing for tuna is a technique employed in commercial fisheries and it has been a significant contributor to the economic performance of fisheries in Vietnam, especially in the central area. It has also played an important role in the improvement of quality of life for fishermen and their families. Longlines are the main fishing method used in tuna fisheries and it is highly developed in the central provinces, e.g. Da Nang, Phu Yen, Khanh Hoa and Binh Dinh. This study was conducted in 2010, based on a survey of cost and revenue data of a sample of 87 longline tuna vessels in the year 2009 in the central area of Vietnam. The results revealed that, on average, most vessels had positive income, gross value addition, gross cash flow and profit. The offshore longline tuna vessels in Khanh Hoa and Phu Yen provinces were found to have the highest economic efficiency, profit and annual income.

Keywords: Khanh Hoa Province, Phu Yen Province, South China Sea, per capita GDP

Introduction

Due to its long coastline, the sea plays a pivotal role in the lives of many Vietnamese, in terms of food security, job creation, income generation, poverty elimination and national economic growth. In the overall development of the country, the fisheries sector has become an important industry. With government support, many of the problems faced in the past are being overcome and the industry as a whole is adjusting to the new market realities for higher quality and a more sustainable fishery. The contribution from fisheries to GDP and total export values has been increasing. Fisheries are important in the development of international trade relations and for foreign exchange earnings.

The coastline of Vietnam passes through 13 latitudes laying between 8°23'N and 21°39'N and is over 3,300 km long from Mong Cai (Quang Ninh province) to Ha Tien (An Giang province). The Exclusive Economic Zone (EEZ) is around one million km² in extent, of which approximately two thirds (700,000 km²) is continental shelf, including numerous islands and reefs.

The potential of the offshore fishery for tuna has long been recognized, as noted in the previous section. Interest in realizing this potential was initially generated by a resource survey utilizing longlines and gillnets in the early 1990s. The Government of Vietnam response to the previously slow growth in the offshore fishery was the development of a new modernization drive in 1997 - the National Target Program on Offshore Fishing Development. It was designed to provide preferential loans for fishermen to upgrade their fleets, with the goal of creating a fleet of around 800 deep-sea fishing vessels which would exploit Vietnam's exclusive economic zone (EEZ) [1]. This was also intended to relieve pressure on over-exploited inshore areas [2, 3]. The Program would also improve logistics and support facilities. Investment in facilities that would process tuna products for export was also encouraged. The tuna fishery has grown steadily since that time, most notably in the south central provinces of Da Nang, Binh Dinh, Phu Yen and Khanh Hoa, but also to a lesser extent in Binh Thuan and Baria Vung Tau [4, 5].

In Vietnam, longlines have been the main method used in tuna fisheries which target species such as bigeye and yellowfin tuna [6]. Approximately 70% of the tuna catch is bigeye and the resources of bigeye and yellowfin tuna are mainly distributed in the central region. Unfortunately, up to now, research into these resources has not been given much attention and thus critical data to meet the information needs of the fishermen and the industry are not readily available [7].



Figure 1. Boats in harbor, Nha Trang.



Figure 2. Typical longline vessel.

There are more than 1800 vessels in the tuna longline fisheries in Vietnam [1], mostly concentrated in several provinces in the centre of Vietnam; such as 580 vessels in Phu Yen, over 300 vessels in Khanh Hoa, 500 vessels in Binh Dinh, and smaller numbers in other provinces such as Da Nang, Quang Ngai, Quang Nam, Ninh Thuan, Binh Thuan, Baria - Vung Tau (Figs. 1 & 2). Most offshore longline fishermen have good fishing experience and often come from traditional fishing households. Thus, many vessel owners have organized themselves into groups that operate on the same fishing grounds, mutually cooperating in the harvesting activities and sharing information about market prices as well as other information for the benefit of the members of the groups necessary in case of unexpected incidents. Skippers and vessel owners are usually between 20-45

years old and most have a minimum of 7-18 years experience of fishing with longline gear. Each longline vessel has from 7 to 12 crew members. The fishing grounds geographically vary depending on the season and time of the year, but the fishing areas are partly in the EEZ of Vietnam and partly in the disputed areas of the South China Sea [8]. During the early part of the year, the longline operations are conducted about 100-400 km from shore [9, 10, 11].

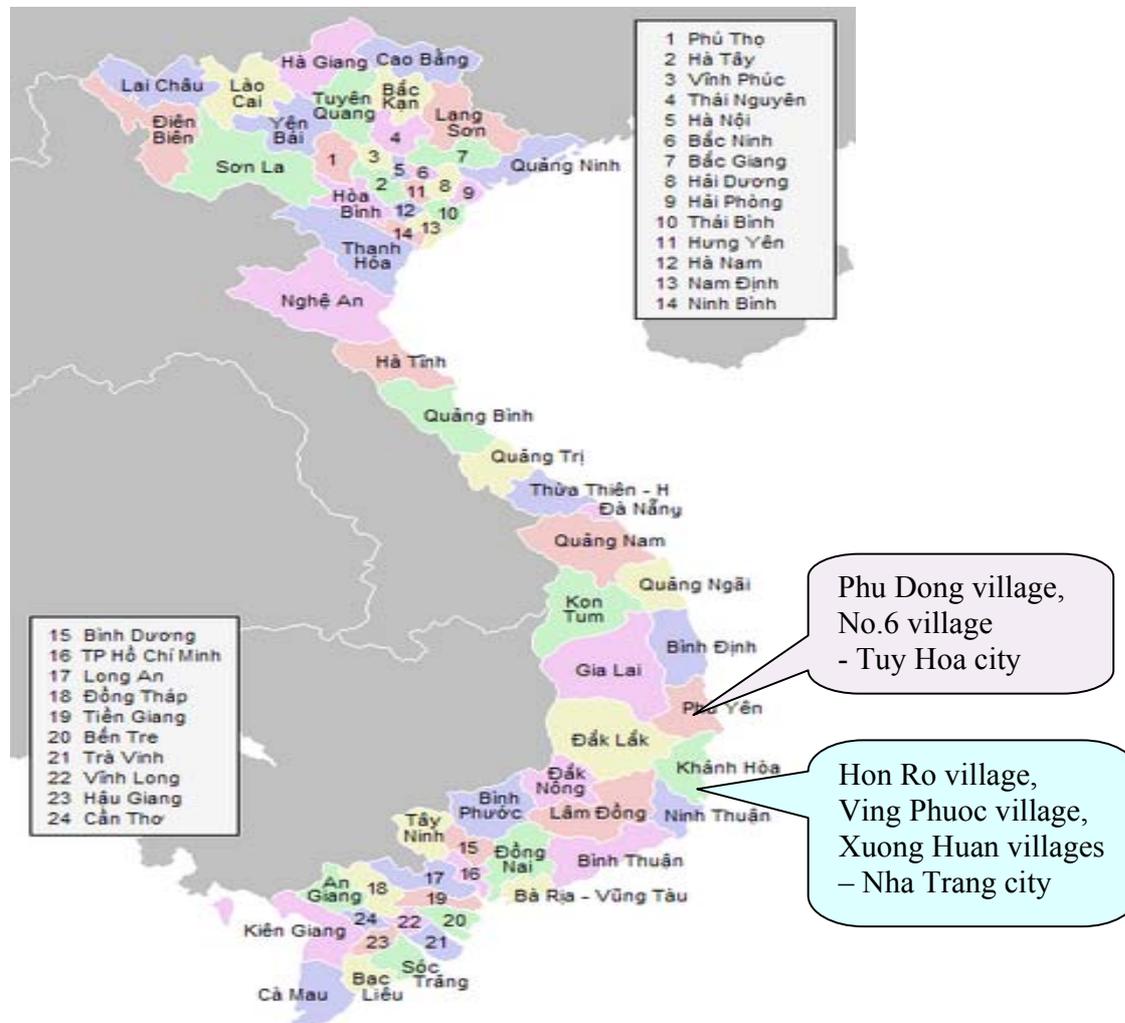


Figure 3. Map showing coastline and area for case studies.
Source: Industrial Review of Vietnam

The purpose of this study will be to review and assess the economic performance of the tuna longline fishery in the central area of Vietnam by analyzing the revenue and profit of vessels, including any available information on important technical and operational characteristics. This information will then be applied to identify the most economical group for engine power, as well as establishing an economic database that will support fisheries development policies for Vietnam in general and for the central area, Khanh Hoa and Phu Yen, in particular. The study describes the important economic performance indicators for tuna longline fishing operations, including gross

revenue, expenses, income, net profit and ratio of gross revenue to total costs, ratio of net profit to gross revenue, and total cost [12].

Methodology

Data was collected by survey questionnaire (with 38 observations in Khanh Hoa province and 49 observations in Phu Yen province) and direct interviews with vessel owners and/or captains in order to capture information relevant to the research problem [13, 14, 15, 16]. The interviews were undertaken at the fishermen's homes or onboard the vessels during November 2009 through February 2010.

Collected data was processed using Microsoft Excel, SPSS [17] to calculate and estimate the unknown parameters in production function. The study considers using some statistical testing methods to test the independent variables and uses statistical methods to present the results of gross revenue, income, net profit, available costs as well as the other costs of the vessel.

Results and Discussion

The study carried out in 2010, based on a survey of cost and revenue data of a sample of 87 tuna longline vessels in the year 2009 in the central area of Vietnam. The results provided some important economic performance indicators and greater insight into the impact of operating characteristics on gross annual vessel revenue, annual income and net profit of an offshore tuna longline vessel in the year 2009.

As can be seen from Table 1, the sample vessels in Khanh Hoa province are quite heterogeneous in terms of technical and operational characteristics such as hull length, engine power, number of hooks, total tuna fishing days and crew size. The average hull length of tuna longline vessels was about 16.932m, ranged from 12.5m to 21.5m, depending on the engine size. Based on the statistics, the mean length of vessels increases as the size of the various engine power groups increases. Main engine power ranged from 50 to 360 horsepower (Hp), with a mean of 146.32Hp. The number of hooks used on the lines [6] also varied with a minimum of 600 to a maximum of 1000 hooks. The average number of hooks was 760.79. The average total fishing days in the year 2009 for tuna longline vessels was 227.08 days, with a range from 100 to 317 days. The crew size in 2009 ranged from 6 to 13 persons per vessel, with an average crew of 9.31, including the captain.

In addition, the survey collected the most important economic performance indicators and these are also shown in Table 1. The average annual indicators such as gross revenue, income, gross value added, gross cash flow and net profit, were all positive. The annual gross revenue of a tuna longline vessel in Khanh Hoa province in the year 2009 substantially varied from 590.00 million VND to 2560.00 million VND, with an average of 1281.36 million VND. The average income of the vessel after deducting all variable costs (not including labour cost) in 2009 was about 492.74 million VND. However, this value had a large range between 195.40 million VND and 990.40 million VND. While most vessels achieved a high gross revenue and high income, their variable costs were also very high. The total variable costs (not including labour) also varied greatly from 363.26 million VND to 1569.60 million VND, with an average was about 788.62 million VND in the year 2009, corresponding to 61.54% of gross revenue [18]. Additionally, other costs such as labour and fixed costs were 185.86 and 128.21 million VND respectively, which was approximately 14.51% and 10% of gross revenue.

Table 1. Descriptive statistics of the main technical characteristics of longline tuna fishery in Khanh Hoa and Phu Yen, 2009.

Province	Khanh Hoa			Phu Yen		
Observation	N=38			N=49		
Indicators	Min	Max	Mean	Min	Max	Mean
Hull length (m)	12.5	21.5	16.932	16.5	21.5	17.922
Engine power (hp)	50	360	146.32	60	350	146.33
No. of Hooks/vessel	600	1000	760.79	550	900	716.94
Fishing day/year (day)	100.00	317.00	227.0789	120.00	300.00	209.5102
Crew size (person)	6	13	9.32	7	13	10.04
Variable costs (mill.VND)	363.26	1569.60	788.6189	350.00	1216.8	714.6122
Labour costs (mill.VND)	69.90	340.70	185.8613	57.50	270.50	136.1020
Income/Labour (mill.VND)	6.35	34.07	19.7771	6.39	20.81	13.3992
Fixed costs (mill.VND)	73.36	201.37	128.2074	80.23	235.08	130.4592
Insurance costs (mill.VND)	.00	6.00	4.0526	3.00	6.00	4.0408
Interest costs (mill.VND)	.00	50.00	9.6803	.00	40.00	12.3265
Depreciation (mill.VND)	44.72	155.08	87.6587	24.20	155.08	82.9898
Main repair (mill.VND)	15.00	50.00	26.8158	.00	50.00	31.1020
Gross revenue (mill.VND)	590.00	2560.00	1281.358	480.00	1840.0	1091.935
Income (mill.VND)	195.40	990.40	492.7389	130.00	670.40	377.3224
Gross value added (mill.VND)	.90	789.04	364.5337	36.55	469.04	246.8639
Gross cash flow (mill.VND)	-69.00	518.54	178.6729	-20.95	221.94	110.7620
Net profit (mill.VND)	-207.5	352.67	81.3350	-87.70	107.76	15.4457
Ratio of Gross Revenue to Total Costs	0.90	1.30	1.15	.96	1.21	1.1061
Ratio of Net Profit to Gross Revenue	-0.35	0.180	0.046	-.17	.08	.0047
Ratio of Net Profit to Total Costs	-0.31	0.24	0.06	-.16	.09	.0082

The average gross value addition of the tuna longliners in Khanh Hoa province in 2009 was 364.53 million VND with a range from 0.9 to 789.04 million VND. Annual gross cash flow of the vessels also varied widely with large range between -69.00 million VND and 518.54 million VND, with an average of 178.67 million VND. Average net profit was 81.34 million VND, with the lowest being 207.50 million VND and the highest 352.67 million VND. It can be concluded from this data that while vessel owners generally receive significant remuneration for the operating year,

the net profit of a tuna longline vessel is not always able to cover all expenses and depreciation. The survey revealed that costs, income and profit varied considerably.

Table 1 also shows the average income of fisherman varying widely with a range between 6.35 million VND and 34.07 million VND, and the mean of 19.78 million VND. This corresponds to 100.85% of GDP per capita (about \$1.330) in the year 2009 of Khanh Hoa Province. Since the average number of fishing days in the year 2009 was 227.08 days, thus, the average monthly crew share during the fishing season is 2.65 million VND, which is about 36.6% more than the GDP per capita in 2009 of Khanh Hoa. It is also important to note that Khanh Hoa was one of the top five provinces for GDP per capita and labour earnings in 2009. However, the average income per fishermen still appears low because these men are the main source of labour in almost all fishing communities.

The ratios of most of the important indicators are also presented in Table 1. The ratio of gross revenue to total costs of Khanh Hoa tuna longliners fluctuates from 0.9 to 1.3, with an average of 1.15. In simple terms this means if they spend one VND for expenses they can get on average 1.15 VND gross revenue in return. The average ratio of net profit to gross revenue and ratio of net profit to total costs in 2009 of a tuna longline vessel were 4.6% and 6% respectively, not considered a good result [19].

Table 1 also shows that the sample of 49 vessels in Phu Yen province are quite heterogeneous in terms of technical and operational characteristics such as hull length, engine power, numbers of hooks, total fishing days and crew size. Hull length varied from 16.5 to 21.5m, with a mean of 17.922 m. The average engine power was 146.33 Hp, very various, the minimum being 60Hp and the maximum 350Hp. The average numbers of hooks was 716.94 hooks, ranging from 550 to 900. Total fishing days in the year 2009 ranged from 120 to 300 days, with an average of 209.51 days, corresponding to 6.98 months in the year 2009. Each tuna longline vessel has a mean average of 10.04 fishermen, ranging from 7 to 13 crew, including the captain.

In general, the gross revenue tends to increase following the increasing of engine power. The average gross revenue of a tuna long line vessel in the year 2009 in the Phu Yen case was about 1091.935 million VND, however this value also varied widely with a large range between 480.00 million VND and 1840.00 million VND. Although a tuna longline vessel could achieve high gross revenue, its variable costs were also very high. In other words, operating costs in Phu Yen province were higher than Khanh Hoa province, which makes for disadvantaged conditions for fishing operations in Phu Yen province. The average total variable costs (not including labour) of a tuna longline vessel was 714.6122 million VND in the year 2009, corresponding to 65.44% of gross revenue. Labour and fixed costs were 136.1 and 130.46 million VND respectively, being approximately 12.46 and 11.95% of gross revenue.

Total average income in 2009 of a tuna longline vessel in Phu Yen province, less all variable costs (except labour cost), was 377.32 million VND, with the lowest of 130 million VND and highest of 670.40 million VND. For the net profit positive for almost all vessels, the mean of net profit of the tuna longline vessels in 2009 in Phu Yen province ranged from -87.7 to 107.76 million VND. This indicates that not only are the boat owners of tuna longline vessels capable of paying for all expenses, but they also have reward for the operating year. The reason may be the average age of Phu Yen province's tuna longline vessels is higher than other fishing areas. The average age of vessel was estimated from 15-30 years. This means that the vessel's age may affect the fixed cost

directly, when the total cost increases, the net profit decreases. Also, generally speaking, Phu Yen province captains have more experience than Khanh Hoa province.

Table 1 also shows that the average income of a fisherman was very assorted with a range between 6.39 million VND and 20.81 million VND, with a mean of 13.3992 million VND. This corresponds to 103.07% of GDP per capita which was 13 million VND in the year 2009 for Phu Yen province (Phu Yen news, 2010). While the fishing days average in the year 2009 of a fisherman was 209.51 days, the average monthly crew share during the fishing season is 1.95 million VND, which is about 79.57% more than that the GDP per capita in 2009 of Phu Yen province. This demonstrates that crew members may earn a higher income than labour in other areas.

The average gross value added and gross cash flow were 246.86 and 110.76 million VND, respectively. The ratio of gross revenue to total costs ranged from 0.96 to 1.21, with a mean ratio of 1.106. Put simply, this means that if 1 VND is used for expenses they can expect to receive 1.106 VND gross revenue on average. In addition, the ratio of net profit to gross revenue and ratio of net profit to total costs were 0.47% and 0.82%, respectively, on average.

To compare some major economic performance indicators and assess economic performance indicators between different groups, three ranges of engine power were examined for both provinces. These were less than 90Hp, a range from 90 to 140Hp, or greater than 140Hp and the results, covering 87 vessels, are shown in Table 2.

The results in Table 2 show that the sample vessels are heterogeneous in terms of technical and operational characteristics. Characteristics such as hull length, number of hooks per vessel, total number of fishing days and crew size had remarkable differences amongst the three groups. The group with engine power greater than 140Hp had higher investment in both technical and operational characteristics. On average, gross revenue, income and net profit of a tuna longline vessel in the group with engine power greater than 140Hp was also higher than in the 90-140Hp group, though the ratio of gross revenue to total costs, ratio of net profit to gross revenue and ratio of net profit to total costs were not higher.. In the group of engine power vessels greater than 140Hp, almost all of their costs were much higher than other groups. As a consequence, although the group had the highest gross revenue, income and net profit, it did not have the highest economic performance efficiency for the two provinces of Khanh Hoa and Phu Yen.

From the results in Table 2 it can also be seen that the group of vessels with engine power less than 90Hp in both cases (Khanh Hoa and Phu Yen provinces) had much worse economic performance indicators than the group with engine power greater than 90Hp. This data may serve as a guide to both vessel owners and the policy decision makers to consider investment to expand engine power beyond 90Hp in order to improve their economic efficiency. Some explanations for this are given below.

Vessels with engine power larger than 90Hp, especially those 140Hp and above, often earned larger annual gross revenues than those with smaller engines. Larger engine vessels can afford to go further into deep sea fishing grounds where fish stocks are more abundant, take longer fishing trips and get a larger catch as well as a more choice catch. Because of the large vessel size, these vessels could carry more hooks and nets. As a result, the larger engine power vessels catch a greater fish volume, therefore achieving a larger amount of gross revenue.

Table 2. Descriptive statistics of economic performance indicators for tuna longline vessels in Khanh Hoa & Phu Yen Provinces by engine power groups (2009).

Indicators	<90 HP (N=24)	90–140 HP (N=31)	> 140 HP (N=32)
Hull length (m)	16.313	17.287	18.569
Engine power (hp)	69.79	120.32	228.91
Hook of vessel	650.42	729.03	807.19
Fishing day/year (day)	174.5417	228.8387	237.8750
Crew size (person)	7.92	9.68	11.13
Variable costs (mill.VND)	487.8925	749.1581	939.0687
Labor costs (mill.VND)	95.6571	189.4558	173.8384
Income/Labor (mill.VND)	12.3629	19.7698	15.5787
Fixed costs (mill.VND)	92.4796	125.0029	161.5556
Insurance costs (mill.VND)	2.9583	4.0323	4.8750
Interest costs (mill.VND)	7.1667	12.7371	12.6563
Depreciation (mill.VND)	59.0629	78.9110	110.4306
Vessel and Gear cost (mill.VND)	23.2917	29.3226	33.5937
Gross revenue (mill.VND)	730.9583	1247.448	1436.953
Income (mill.VND)	243.0658	498.2903	497.8844
Gross value added (mill.VND)	150.5875	373.2877	336.3309
Gross cash flow (mill.VND)	54.9300	183.8323	162.4934
Net profit (mill.VND)	-11.2992	92.1852	39.4066
Ratio of Gross Revenue to Total costs	1.0821	1.1613	1.1228
Ratio of Net profit to Gross Revenue	-.0188	.0590	.0181
Ratio of Net profit to Total costs	-.0163	.0739	.0241

In addition, the majority of the large engine power vessels are new with more modern equipment, thus they can reach the main migration of tuna schools. By contrast, the vessels with engine power with engine power less than 90Hp were restricted to fishing grounds in offshore and coastal waters nearer the mainland, with shorter trips and catching tuna smaller than 30kg, which is the standard for sashimi export, meaning fish prices are lower than the larger size. These vessels not only caught a lower quantity and quality compared to the larger engine size group, but also incurred greater repair and replacement costs for fixing and mending hooks since risks of damaging and losing fishing gear, hooks, etc. were high in the shallower waters.

Conversely, the higher engine power vessel groups incurred higher absolute operational expenses than the smaller engine group because large engine power vessels operated for more days, with a greater number of hooks and crew members and higher fuel consumption. Additionally, larger engine power vessels incur higher depreciation and interest payment on loans, due to relatively larger investment. Thus, these vessels may be considered to have higher cost efficiency than other vessel groups.

The average annual income per fisherman according to the engine/vessel size groups demonstrates that fisherman's income increased with the increase in engine power/vessel size. The two groups of engine power size which is larger than 140Hp in Phu Yen case and 90-140Hp in Khanh Hoa case, paid the highest annual incomes for crew members in each case. This may not be unexpected since these large engine power vessels spent a greater amount of time for fishing activity than small engine power vessels.

Conclusions

The offshore tuna longline vessels in Khanh Hoa and Phu Yen province in the central area of Vietnam achieve high economic efficiency, high profit and annual income. The average annual income of a fisherman is much higher than the average personal income on the national scale and in the same province, which is about 36.6 and 79.57% more than that the GDP per capita in 2009 of Khanh Hoa and Phu Yen province, respectively. For these reasons, the offshore tuna longline fisheries could be attractive for both labour as well as investment. However, the total costs in offshore tuna longline fisheries in Khanh Hoa and Phu Yen province were considered high, the average total costs in Khanh Hoa and Phu Yen province were 1102.69 and 981.17 million VND, approximately 86.06 and 89.85% of gross revenue in the operating year 2009, respectively.

Currently new regulations are being introduced globally that have significant impact on this industry. EC regulation 1005/2008 to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing also came into effect on 1 January 2010 and vessels not having certification are already attracting lower prices. The governments of Vietnam and the Netherlands have embarked on a three-year program to assure the sustainability and environmental acceptability of long-line fishing for tuna in Vietnamese waters. This will be supported by training in new methods and the introduction of better technology. Thus, fisheries administrators should carry out more research into this fishery for planning and development in the future, in order to reduce costs and increase catch, increase fish quality leading to higher prices to achieve a higher net profit margin and ensure the sustainable development of the tuna longline fishing industry.

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