Fishing Activities of Trawlers and Gillnets in Kien Giang Province, Vietnam

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Abstract- The study on the fishing activities of trawlers and gillnets was conducted from May to October 2018 in Kien Giang province. The results showed that the trawlers and gillnets had highest number of fishing boats and yields. Trawlers and gillnets have been operated whole year round. The main fishing season of trawlers was from October to coming April and from April to August for the gillnets. The fishing capacity of trawling boats (47.8±24.6 HP) was much larger than that of gillnets boats (26.6±11.4 HP). The fishing yield and ratio of trash fish in the final product of trawlers were 39.4±15.9 tons/year and 22.83%, respectively and they were also higher than those of gillnets (26.6±11.4 tons/year; 16.8%). Profit of trawlers (338±114 million VND) was significantly higher than that of gillnets (143±73 million VND), however, rate of return of trawlers (0.66 times) was lower than that of gillnets (0.73 times). For the sustainable development of trawlers and gillnets, the development and management of fisheries resources should be promoted, and training fishermen to use appropriated fishing equipment should be enhanced to increase their fishing efficiency.

Index Terms- Advantages and disadvantages, finance, gillnet, Kien Giang, trawler

I. INTRODUCTION

Vietnam has a long coast line which is favorable for the development of fishing activities. Total aquatic production in 2017 reached 7.2 million tons, of which capture production accounted for 3.39 million tons. Export turnover of the fishery reached about 8.32 billion USD (Center for Informatics and Statistics, 2017). Kien Giang is a coastal province in the Mekong Delta, Vietnam with highest fishery production of 533,300 tons in 2016, and accounting for 39.4% of the fishing production in the Mekong Delta (GSO, 2017). Trawlers and gillnets are two most important fishing activities in Kien Giang province. Gillnets accounted for 33.5% and trawl net accounted for 31.9% of the total number of fishing boats in Kien Giang.

Fisheries exploitation in Kien Giang in recent years have encountered challenges e.g. reduction of fisheries resources, increase in the input cost of many materials and fuels, violations in fishing activities thus affecting the fisheries activities. However, up to now, there has been no research on fishing activities in coastal of Kien Giang province, focusing in trawlers and gillnets, dominated fishing activities in the region. Therefore, the aims of the study are to investigate the current status and challenges of the fishing activities of trawlers and gillnets in Kien Giang province in the Mekong Delta, Vietnam in order to propose appropriate solutions to enhance the effectiveness of these fishing types.

II. METHODS

The study was conducted from May to October 2018 by interview fishermen in coastal provinces of Kien Giang province. A total of 137 fishing households was face to face interviewed. Fishermen involved in gillnets (84 households) and trawl nets (53 households) were randomly selected from the list provided by provincial agriculture and rural development.

The semi-structured questionnaire was piloted in five households in each group of fishing type including technical information e.g. gear structure, loading capacity of the vessel, labor force, fishing grounds, fishing seasons and fishing production. Cost information included fixed costs, variable costs and gross income were also collected for calculation of profit, rate of return. The advantages and disadvantages of the fishing types were also interviewed.

Results are expressed in descriptive statistics e.g. frequency of occurrence, mean value, and standard deviation. Statistical independent sample T-test was applied to compare the differences in technical and financial indicators with a significance level of 95%.

III. RESULTS AND DISCUSSION

3.1 Technical aspects of fishing activities in Kien Giang province
3.1.1 General information of fishing activities

Kien Giang is a coastal province in the Mekong Delta, owning a large fishing ground in the Gulf of Thailand, which has

been enabled the fishing industry to develop. The number of fishing vessels increased from 2008 to 2016. The total number of fishing boats with a capacity of more than 90 horsepower (HP) increased year by year. This proves that offshore fishing vessels in Kien Giang province are increasingly being developed to reduce the pressure on coastal fishing, affecting fisheries resources. Kien Giang had the largest number of fishing vessels (10,555 boats), accounting for 44.4% of the total number of fishing vessels in the Mekong Delta and the highest fishing production in the Mekong Delta (335,300 tons, accounting for 41.0%).

Table 1: Number of vessels and fishing production in period 2008-2016

Contents	Year				
	2008	2010	2012	2014	2016
Number of fishing vessels (boats)	8.665	11.300	11.732	10.211	10.555
Offshore fishing vessels (>90 HP) (boats)	2.052	3.090	3.320	3.950	4.196
Fishing production (tons/year)	253.000	252.700	277.600	299.100	335.300

Fishing activities in Kien Giang mainly gillnets (33.5%) and trawlers (31.8%). Gillnets fishing boats with capacity of less than 90 HP (3167 boats) were dominated whereas and the number of fishing boats over 90 HP was 431. Although in recent years, trawling vessels with a capacity of over 90 HP accounted for 4,196 boat but vessels with a capacity of less than 90 HP still dominated with 55.4% total vessels. Therefore, to strengthen the fishing industry in Kien Giang province, it is necessary to promote more offshore fishing vessels through national support program and encourage fisherman operate with bigger boat during fishing.

3.1.1 General information of fishing households

The average age of fishermen in trawling and gillnets were 43.2 years old and 38.3 years old, respectively. At this age, fishermen had a lot of experience in the field of fishery. The average age of fishermen in trawling was 14.0 years and gillnets was 8.0 years. However, the level of education of the fishermen was very low. In the trawling fishing, up to 35.8% of fishermen was illiterate and 43.4% of primary school while fishermen in the gillnets had primary school of 32.1% and secondary education of 65.5%. This level of education become challenges for fishermen to acquire technical advances, e.g. acquiring maritime knowledge for offshore fishing, knowledge of using fish detectors for more efficient exploitation and knowledge on quality management of harvested products.

The numbers of workers on the trawling boat (3.26 persons) and the gillnet boat (3.27 persons) were not statistically significant difference (P>0.05). The number of employees on board was limited due to the small size of the fishing vessel (20-90 HP) and mainly inshore fishing. However, trawling and gillnets fishing have created jobs for their families. In addition, these two fishing types provided jobs for the local people. According to the survey, the trawling fishing needs to hire 55% of the labor force and gillnet hired 44% of the labor force on board. However, due to high production costs, unstable weather, inefficient exploitation, unstable and low incomes, many of the fishing workers have been finding other jobs with higher incomes. Therefore, hiring labor for fishing has been facing many difficulties.

Table 2: Number of fishing vessels in Kien Giang province, Vietnam

Contents	Power groups of fishing boats			Total boats	Ratio (%)
	< 20 HP	20 - 90 HP	≥ 90 HP		
Gillnets	1,524	1,643	431	3,598	33.5
Trawling	3	134	3288	3,425	31.8
Squid fishing	735	653	57	1,445	13.4
Purse seine nets	0	5	314	319	3.0
Longlines	93	128	69	290	2.7

General Statistics Office (2011 and 2017)

Table 3: Information on the age and fishing experience of the captains

Contents	Trawlers (n=54)	Gillnets (n=84)
Age (years)	43.2 ± 10.7^a	38.3 ± 8.3^b
Fishing experience (years)	14.0 ± 8.6^a	8.0 ± 5.7^b

Values of the same row with different letters were significantly different (p <0.05)

Table 4: Information on the age and education level of the captains

Education levels	Trawlers		Gillnets	
	n	Ratio (%)	n	Ratio (%)
Illiteracy	19	35.8	2	2.4
Primary education	23	43.4	27	32.1
Secondary education	8	15.1	55	65.5
High school education	3	5.7	0	0

Table 5: Labor force (persons) in fishing boats

Contents	Trawlers (n=53)		Gillnets (n=84)	
	Average	Ratio (%)	Average	Ratio (%)
The number of labors from family member	1.47 ± 0.80^a	45	1.82 ± 0.70^b	56
The number of hired labors/employees	1.79 ± 1.13^a	55	1.45 ± 1.00^b	44
Total number of labors on fishing boats	3.26 ± 1.02^a	100	3.27 ± 1.03^a	100

Values of the same row with different letters were significantly different (p <0.05)

Table 6: Reason for choosing fishing activities

Reasons	Trawlers		Gillnets	
	n	Ratio (%)	n	Ratio (%)
Hereditary family	27	31.0	50	31.7
Stable incomes	27	31.0	24	15.2
Experience in fishing	22	25.4	35	22.1
Living near the sea (fishing ground)	11	12.6	39	24.7
No land for cultivation	-	-	10	6.3
Total	87	100	158	100

Table 7: Loading capacity and power of the fishing vessels

Contents	Trawlers (n=53)	Gillnets (n=84)
Loading capacity (tons)	8.5 ± 4.7^a	3.7 ± 1.6^b

Power (HP)	47.8±24.6[a]	26.6±11.4[b]

Values of the same row with different letters were significantly different (p <0.05)

Table 8: Length and mesh size of fishing gears

	Trawlers (n=53)		Gillnets (n=84)
Smallest mesh size (mm)	16.1±2.8[a]	Smallest mesh size (mm)	86.6±5.0[b]
-		Length of the net (m)	16,583±9,338
-		Height of the net (m)	0.91±0.12

Values of the same row with different letters were significantly different (p <0.05)

The reasons for selection of trawling and gillnet fishing are hereditary family, stable incomes, fishing experience and livelihoods of coastal people. Moreover, people in this area had experience in fishing and living near the sea so it is convenient for joining fishing activities. The above reasons have facilitated the development of fishing industry in Kien Giang province. However, it is necessary to support fishermen to exploit effectively, in the manner of protection the fisheries resources for long-term and sustainable exploitation.

3.1.2 Fishing vessels and fishing gears

The loading capacity of the trawling boat in Kien Giang province was 8.5 tons with 47.8 HP which was smaller than the average loading capacity and boat power of the trawling boat in the Mekong Delta from the survey of Long (2014), 8.92 tons and 51.5 HP, respectively. Fishing vessels with smaller loading and HP leading to exploitation activities as close to inshore as possible. Gillnets boats had loading capacity of 3.6 tons and 26.6 HP. They were also smaller than the result from survey in the Mekong Delta, with average loading capacity of 6,11 tons and 39.9 HP (Long, 2014). Thus, gillnet ships in Kien Giang province was impossible to exploit offshore due to small loading capacity and HP. This will put pressure on near-shore fishing, affecting the protection and conservation of fisheries resources.

The trawling nets in Kien Giang province have an average net mesh size of cod end was 16.1 mm. According to the Ministry of Fisheries (2006), the minimum net mesh size for a trawl net was 28 mm. Thus, the trawling net in Kien Giang province slightly violated this provision. On the other hand, small mesh sizes will lead to great impact on fisheries resources in the fishing ground. Therefore, it is necessary to propagate and strictly management the mesh size according to the regulations of the trawling net. The gillnet haD a length of 16,583 m, height of 0.91

m and a large mesh size (86.6 mm). The mesh size was not violated the regulations of the Ministry of Fisheries (2006).

3.1.3 Fishing grounds and fishing seasons

Fishing ground of fishermen in Kien Giang are the sea areas from Gulf of Thailand. Fishery resource was estimated of 478,689 tons and an exploitable capacity of 425,952 tons (Son, 2005). Fisheries activities could be taken place in the whole year, except bad weather.

The number of fishing trips per year was more or less dependent on the duration of a trip, which is long or short. The results showed that the number of fishing trips in one month of trawling were lower than in the gillnets (p <0.05). The duration of a trawling trip was 10.45 days and 1.50 days for the gillnet. Compared to the results of the survey in the Mekong Delta, the duration of a trip was 6.11 days for trawlers and 1.24 days for gillnets (Long, 2014). Trawlers and gillnets in Kien Giang province operated at a longer time because many service boats have been available to collect, transfer fishery products and provide input material (food, energy, ice) to fishing vessels during operation. The duration of a trip of gillnets was shorter than trawler because the gillnet boat size was smaller than that of trawling boat.

Fishing time of trawlers and gillnets was only 8.92 to 9.14 months per year. This result is similar to the results of Chi and Long (2018). The average fishing times in the East Sea of trawlers and gillnets were 8.52 months and 8.93 months per year. The fishing season of trawlers and gillnets in Kien Giang province was not similar. Trawlers had higher yields from October to April of the following year, while gillnets were from April to August. According to this result, trawlers can be converted into gillnets at the lower yield period in order to increase fishing production.

3.1.4 Fishing yield

The yield of the trawlers was higher than that of the gillnets and the difference was statistically significant (P<0.05). The average yield of batch of trawlers (48.74 kg) was higher than the gillnet (16.93 kg). Similarly, the trawler fishing production per year was 39.4 tons and it was also significantly higher than that of the gillnets (3.06 tons/year) (P <0.05). Calculation per 1 HP of trawlers (883 kg/year) was significantly higher than that of gillnets (120 kg/year) (p <0.05). Compared with the results from Thuong *et al.* (2014), the yields of trawlers and gillnets in Bac Lieu province were 33.9 tons/year and 1.3 tons/year, respectively. This proves that trawling and gillnets in Kien Giang are more efficient. However, according to fishermen, the production of these two fishing types have decreased continuously in the last 5 years. Therefore, in order to enhance the efficiency of these two fishing types, it is necessary to strengthen the management policies to mitigate the impacts of these two activities on aquatic resources, contributing to the sustainable development of the areas. Although trawlers had higher yield than gillnets, catching all fish species and sizes of fish without selection, trawlers had higher rate of trash fish (22.83%). The gillnets only caught fish in the appropriated size of their mesh size, trash fish proportion (16.8%) was lower than that of trawlers (P <0.05).

Table 9: Fishing activities of trawler and gillnets

Contents	Trawlers (=53)	Gillnets (n=84)
Time of fishing batch (hours)	3.36±0.55[a]	4.15±3.99[b]
The number of fishing batch in a day (batch)	3.15±0.63[a]	1.00±0.00[b]
The period in a fishing trip (days)	10.45±2.51[a]	1.50±0.61[b]
Number of fishing trip in a month (trips)	10.75±3.05[a]	18.45±4.92[b]
Number of fishing month in a year (months)	8.92±1.67[a]	9.14±1.41[b]

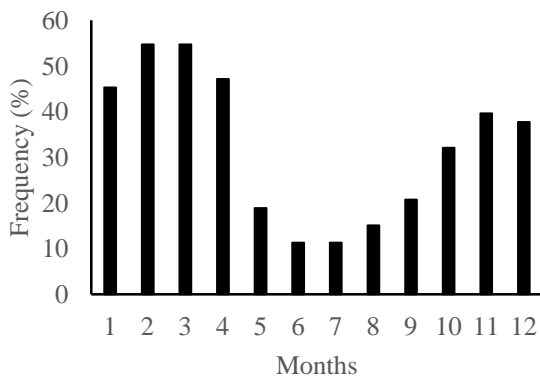*Values of the same row with different letters were significantly different (p <0.05)*
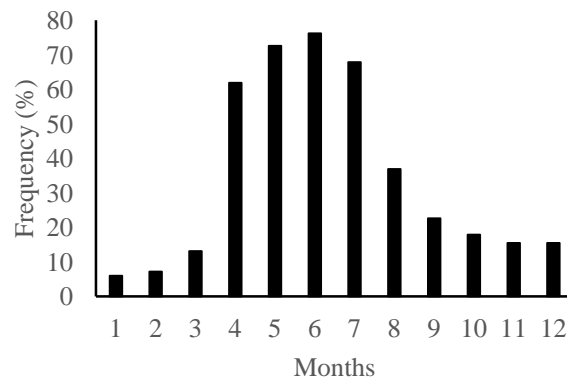

Figure 1: Fishing season of the trawlers

Figure 1: Fishing season of the gillnets

Table 10: Fishing production of trawlers and gillnets

Contents	Trawlers (n=53)	Gillnets (n=84)
Yield (kg/batch)	48.74±8.46[a]	16.93±8.35[b]
Production (tons/year)	39.4±15.9[a]	3.06±2.23[b]
Productivity (kg/HP/year)	883±186[a]	120±83[b]
Ratio of trash-fish (%)	22.83±8.57[a]	16.8±3.9[b]

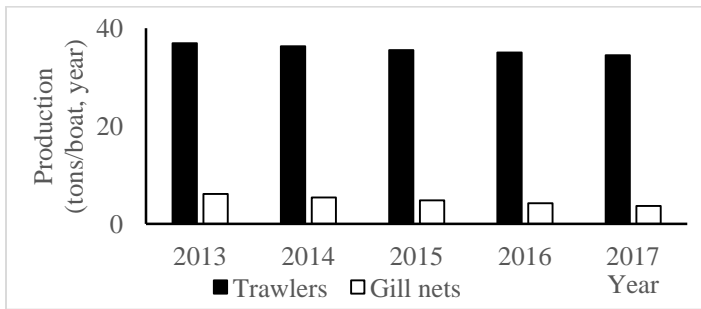*Values of the same row with different letters were significantly different (p <0.05)*

Figure 3: Fishing production of trawlers and gillnets for the
period 2013 -2017

3.2 Financial aspects of fishing activities

3.2.1 Costs of fishing activities

The results show that the average investment for a trawling boat was 300 million VND, of which ship hulls accounted for 73.31%, 15.26% for engines and 7.22% for fishing gear. While the investment for a gillnet vessel was 179 million VND, of which hulls accounted for 54.49%, 10.36% for engines and 23.50% for fishing gear. As analyzed above, the trawlers in Kien Giang were larger scale in fishing activities, so the investment cost for a trawl boat was higher than the gillnet boat ($P < 0.05$). The cost of the hull of the two occupations was high. Next, trawling vessels had a large proportion cost for engine (15.26%), while gillnets hold a large proportion cost for fishing gear (23.50%). This is because the trawlers need a large power to pull the net. For gillnets, it was not necessary to have large engine as trawlers. Therefore, the cost of the machine in the gillnets was small, it required more input for fishing gear.

The variable cost of trawlers was 515 million VND/year, mainly fuel costs (43.94%) and labor costs (36.56%). For gillnet vessels, the variable cost was lower than that of trawlers (154 million VND/year) ($P < 0.05$). The highest cost was for fuel (40.75%) and labor cost (38.50%). Both occupations had high fuel and labor costs. The increase fuel prices and the scarcity of labor force may effect on fishing activities efficiency.

Table 11: Fixed cost and depreciation of fishing types

Contents	Trawlers (n=53)		Gillnets (n=84)	
	Average	Ratio (%)	Average	Ratio (%)
Fixed cost (*million VND*)	300±254[a]	100	179±79[b]	100
Cost of hull (*million VND*)	220±109	73.31	104±50	54.49
Cost of engine (*million VND*)	45.7±14.6	15.26	19.7±10,6	10.36
Cost of fishing gear (*million VND*)	21.7±8.8	7.22	44.7±21.4	23.50
Other cost (*million VND*)	12.6±5.4	4.21	10.9±4.11	5.73
Depreciation cost (*million VND*/trip)	31.39±11.77[a]		39.34±16.94[b]	

Values of the same row with different letters were significantly different (p <0.05)

Table 12: Variable cost structure of fishing types

Contents	Trawlers (n=53)		Gillnets (n=84)	
	Average	Ratio (%)	Average	Ratio (%)
Variable cost (*million VND*/year)	515±186[a]	100	154±59[b]	100
Fuel (*million VND/year*)	226±34	43.94	62.76±14.31	40.75
Oil (*million VND/year*)	16.64±5.15	3.23	3.07±1.37	1.99
Food (*million VND/year*)	46.55±11.54	9.05	20.56±7.65	13.35
Ice (*million VND/year*)	10.74±4.12	2.09	1.63±1.24	1.06
Labor cost (*million VND/year*)	188±89	36.56	59.29±17.04	38.50
Maintenance costs (*million VND/year*)	17.13±3.50	3.33	5.66±1.42	3.67
Other cost (*million VND/year*)	9.23±2.15	1.79	1.04±0.13	0.67

Values of the same row with different letters were significantly different (p <0.05)

3.2.3 Financial analysis of the fishing types

The gross income of trawlers was 887 million VND/year and the profit was 336 million VND/year. The rate of return was 0.66 times higher than that of the trawlers in Soc Trang province (0.51 times; Long and Phuong, 2010).

For the gillnets, the average annual revenue was 336 million VND/ year and profit was 143 million VND/ year. The rate of return of the gillnets was 0.73 times which was much higher than the gillnets fishing in Soc Trang province (0.46 times; Long, 2012). The average cost of trawlers (VND 549 million/year) was higher than the total cost of gillnets (VND 193 million/year) and it was statistically significant difference (P

<0.05). Similarly, net return of trawlers (VND 338 million/year) was also significantly higher than that of gillnets (VND 143 million/year) (P <0.05). On the other hand, net return per HP of trawlers (7.44 million VND/HP/year) was also significantly higher than that of gillnets (5.59 million VND/HP/year) (P <0.05). The gillnets fishing was more efficient than the trawlers because the rate of return of gillnets (0.73 times) was higher than that of the trawlers (0.66 times) (P <0.05).

The survey results show that the fishing products were mainly sold to whole sale traders, 96.94% in the trawlers and 90.48% in the gillnets. It is agreed to results of Ven (2012) showing that most of the harvested products were sold to whole sale traders (81.6%), only 4% was sold to the processing factory, the remaining was sold to sea-going ships (9.7%) and retail (4.7%). This showed that fishermen chose to sell to whole sale traders because traders had the ability to buy all products of fishermen in a short time, so it is convenient for fishermen to prepare for the next fishing trip. However, the whole sale traders were the one who decided the trading prices leading to the profit was highly depended on the price proposed by traders.

3.3 Advantages and disadvantages

According to fishermen, during operation of trawling and gillnets in Kien Giang province, they could work independently due to long time experience and traditional career. The second advantage was that the exploitation remained effectively and brought stable income to fishermen. Another advantage was about natural conditions that fishermen living near fishing grounds and it became convenient for fishing. All of these advantages provided the trawlers and gillnets in Kien Giang province grew with larger numbers of vessels and production.

Beside advantages, trawlers and gillnets in Kien Giang province also faced with many difficulties. The biggest problem was that other fishing vessels have competed with fishing grounds, affecting fishing production and fisheries resources. Inclement weather affects fishing season resulted in unstable output, effected to the income of fishermen. The second difficulty was declining of fisheries production. The trawlers (86.0%) and gillnet households (96.40%) said that fishing production decreased in recent 5 years. Besides, losing net and lack of capital for operation were also problems for many fishermen.

In order to facilitate the development of these two fishing types, it should be able to (i) promote management and control to prevent fishing vessels from fishing outside the fishing grounds, (ii) enhance management of fishery resources e.g. reduction coastal fishing boats, increase the inspection of mesh size, banning fishing in the breeding season, and (iii) train fishermen on how to use modern fishing equipment for example, fish finder to enhance the fishing activities efficiency, even in bad weather conditions.

Table 13: Financial analysis of fishing types

Contents	Trawlers (n=53)	Gillnets (n=84)
Gross income (*million VND*/trip)	887 ± 286^{a}	336 ± 157^{b}
Total cost (*million VND*/trip)	549 ± 191^{a}	193 ± 68^{b}
Net return (*million VND*/year)	338 ± 114^{a}	143 ± 73^{b}
Net return (*million VND*/HP/year)	$7,44\pm2,10^{a}$	$5,59\pm2,37^{b}$
Rate of return (times)	$0,66\pm0,37^{a}$	$0,73\pm0,47^{b}$

Values of the same row with different letters were significantly different (p <0.05)

Table 14 Consumption patterns of fishing products

Contents	Ratios (%)	
	Trawlers (n=53)	Gillnets (n=84)
Retailer	2.81	-
Wholesale to trader	96.94	90.48
Family consumption	0.26	9.52

Table 15: Advantages of trawlers and gillnets

Advantages	Trawlers		Gillnets	
	n	Ratio (%)	n	Ratio (%)

Experience in fishing		42	53.85	67	49.26
Stable incomes		22	28.21	39	28.68
Living near the sea (fishing ground)		14	17.95	12	8.82
Stable output of fishing products			-	18	13.24
	Total	78	100	136	100

Table 16: Fishing products and profits compared to previous 5 years

Contents	Trawlers (%)			Gillnets (%)		
	Increase	Un-change	reduction	Increase	Un-change	reduction
Fishing production compared to previous 5 years	0.0	14.0	86.0	0.0	3.6	96.4
Profits compared to previous 5 years	20.0	58.0	22.0	35.7	46.4	17.9

Table 17: Difficulties of trawlers and gillnets

Difficulties	Trawlers		Gillnets	
	n	Ratio (%)	n	Ratio (%)
Fishing vessels compete	24	31.17	31	20.67
Inclement weather	15	19.48	41	27.33
Declining production	15	19.48	22	14.67
Cost of production increased	10	12.99	9	6.00
Labor shortage	8	10.39	14	9.33
Net loss		-	12	8.00
Lack of capital		-	21	14.00
Total	77	100	150	100

Values of the same row with different letters were significantly different (p <0.05).

IV. CONCLUSION

Kien Giang has the strongest fisheries exploitation in the Mekong Delta. In particular, trawlers and gillnets had the highest number of ships and production. The trawlers and gillnets could be operated all year round, but trawlers had high yields from October to April, while the gillnets was from April to August. Trawling boats were bigger than gillnet vessels. The yield and net return of the trawlers were higher than that of the gillnets, but the rate of return of the gillnets was much higher than that of the trawler because of the lower input cost of gillnets. In general, both gillnets and trawlers in Kien Giang province have been operated effectively.

ACKNOWLEDGEMENT

REFERENCES

1. Center for Informatics and Statistics (Ministry of Agriculture and Rural Development) 2017. Report on the implementation of the December 2017 Agriculture and Rural Development Plan, 24 pp.
2. Chi, L.V., Long, N.T., 2018. Comparison of technical and financial aspects of inshore trawlers and gillnets in Bac Lieu province. *Journal of Science, Can Tho University.* 54 (6B): 98-107.
3. GSO, General Statistics Office, 2011. Statistical Yearbook 2010. Statistical Publishing House. 879 pages.
4. GSO, General Statistics Office, 2017. Statistical Yearbook 2016. Statistical Publishing House. 946 pages.
5. Long, N.T., 2012. Research on management solutions for aquaculture and coastal fishing in Soc Trang province. *Agricultural Publishing House. Ho Chi Minh City.* 147 pages.
6. Long, N.T., 2014. Technical and financial aspects of gillnets, trawls and purse seines in the Mekong Delta. *Journal of Science, Can Tho University* 35b: 97-103.

7. Long, N.T., Phuong, N.T., 2010. Economic and technical analysis of major capture fisheries in Soc Trang. *Journal of Science, Can Tho University*. 14b: 354-366.

8. Ministry of Fisheries, 2006. Circular No. 02/2006/TT-BTS dated March 20, 2006 guiding the implementation of the Government Decree No. 59/2005/ND-CP dated May 4, 2005 on production conditions. Exporting and trading in some aquatic products. 16 pages.

9. Son, D.M., 2005. Research and exploration of marine resources and selection of suitable exploitation technologies for offshore fisheries development in Vietnam. *Proceedings of Marine Fisheries Research, Volume 3*. Agricultural Publishing House. 620 pages.

10. Thuong, H.V., Hung, H.P., Yen, H.T.H., 2014. Current status of exploitation and management of marine resources in Bac Lieu province. *Journal of Science, Can Tho University*. 30b: 37-44.

11. Ven, N.T., 2012. Analysis of production efficiency in capture fisheries in the Mekong Delta. *Master thesis of Science in Aquatic Resource Management, Can Tho University. Can Tho City*. 105 pages.

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