

ESTIMATION OF CATCH PER UNIT EFFORT OF FISHERS: A CASE STUDY IN HILONGOS LEYTE, PHILIPPINES

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Abstract

This study estimates the catch per unit effort (CPUE) among fishers in Hilongos, Leyte, Philippines. The identified efforts included in the study were fishing expenses, the presence of companions in fishing activity, fishing hours in a day, fishing days in a week, membership in fisher's organization and years of involvement in fishing activity. Descriptive statistics and regression analysis were the statistical methods used to facilitate the necessary analysis. Based on the results, fishing expenses, presence of companions in fishing activity, membership of fishers in organization, and fishing days were the significant variables that influences catch rates based on the available data. For future studies, more coastal barangays should be included and there should be a bigger number of fishers as respondents for each coastal barangay.

Key words: CPUE, fishers, fishing effort, fisheries

INTRODUCTION

Fish is an important component of the total human food consumption. The demand for fish is expanding rapidly throughout the world because of increasing population and income [8]. Fishers are important participants in the economies of South and Southeast Asia [6]. Over 36 million people are employed directly through fishing [2] and as many as 200 million people derive direct and indirect income from fish [3]. The production of fish requires several inputs, one of which is the fish stock itself. Other key inputs include labor, capacity, technology, and fishing time and many others [1]. Due to this variety of inputs, it is therefore necessary to examine the fishing activity through identifying the efforts that significantly influenced the catch through estimation of the Catch per Unit Effort (CPUE). CPUE is the total fish catch per amount of effort used to harvest the catch [6]. This study aims to describe the fishing activity and estimate the catch per unit effort of fishers in Leyte, Philippines. It is a prerequisite to the design and implementation of effective assistance programs. In addition, the results can be used as baseline information

in assessing the impact of fishing projects in the selected coastal areas.

MATERIALS AND METHODS

Study site

The study was carried out in the municipality of Hilongos in the province of Leyte. Leyte is located in Eastern Visayas region, Philippines (Figure 1).



Fig. 1. Map of study site in Hilongos, Leyte, Philippines
Source: [4].

Data Collection

Primary data was gathered through a survey

among selected fishers. The survey instrument aims to describe the fisher's activity and their corresponding fishing efforts. It was pre-tested and further modified based on the results of the pre-test. The fisher respondents were requested to fill up the questionnaires after it was translated into vernacular for easy understanding.

Sampling Design

Stratified random sampling (STRS) was used in this study where the population is partitioned into regions or strata [9] and random samples were taken from each strata. *Barangay* was used as stratifying factor. A *barangay* is the smallest administrative division in the Philippines and is the native Filipino term for a village, district, or ward [5]. There were six strata are identified for this study.

Establishing the profile of the fishers

Descriptive statistics and parameter estimates were used to establish the profile of the fishers. Age, civil status, household size, number of dependents, and highest educational attainment. Other selected variables related to fishing were also measured.

Estimation of the fishers' Catch per Unit Effort by Regression Analysis

Fish catch function was estimated by the multiple regression analysis technique. The dependent variable was fish catch, measured in kg, while the independent variables were selected fishing efforts namely expenses per fishing trip (in PHP), fishing days, membership in fisher's organization, presence of companions, fishing hours per trip, and number of years in fishing activity. It is anticipated that all identified independent variables displays positive association with fish catch. To capture the catch of fishers, the following model was hypothesized:

$$Y = \beta_0 + \beta_1 \text{expenses} + \beta_2 \text{companion} + \beta_3 \text{hours} + \beta_4 \text{days} + \beta_5 \text{member} + \beta_6 \text{years} + e \quad \dots\dots\dots(\text{Equation 1})$$

where:

Y: average daily catch (in kg)

expenses: daily expenses per fishing trip (in PHP)

companion: presence of companion in fishing activity (1= with, 0=without)

hours: total number of fishing hours per trip

days: number of fishing days in a week

member: membership in fisher's organization (1=member, 0=not a member)

years: years in fishing activity

e: error term.

RESULTS AND DISCUSSIONS

Profile of the fishers

The average age of the fisher respondents is 42 and majority of them were married (83%). Fishers with age ranging from 36 to 45 years old composed the largest percentage (31%) in the distribution. The percentages of respondents who were widowers and separated from their spouses were approximately equal which is about 3% and 2%, respectively. Their average household size consists of five members with three dependents on the average. The educational level of fishers was categorized into four groups. More than half of the total fishers were able to reach elementary level (63.87%). Some reached high school level (31.61%), only few were able to reach college level (2.6%) while only small portion (1.9%) had able to graduate college.

Characteristics of fishing activity

The average fishing years of respondents was 21. Majority has 11 to 20 years of fishing experience (56%). Meanwhile, more than half of the fishers were members of organization for fishers which was about 54% of the entirety. Their membership helps them be more knowledgeable with the various techniques, policies and regulation related to fishing activity in their community. Approximately half of the fishers (51%) catch fish in the morning, meaning they are in the sea catching fish between 7:00 AM until 11:00 AM.

The remaining fishers catch fish in the night, they catch starting 6:00 PM and be back early in the morning around 6 AM.

Table 1. Profile of the fisher respondents

Characteristics	Categories	Frequency	Percent
Age	25 & below	6	3.9
	26-35	39	25.2
	36-45	48	31
	46-55	41	26.5
	56 & above	21	13.5
Total		155	100
Mean = 42			
Civil status	Married	129	83.2
	Single	19	12.3
	Widower	4	2.6
	Separated	3	1.9
Total		155	100
Household size	2 & below	12	7.7
	3-4	56	36.1
	5-6	60	38.7
	7 & above	27	17.4
Total		155	100
Mean = 5			
Dependents	2 & below	80	51.6
	3-4	52	33.5
	5-6	19	12.3
	7 & above	4	2.6
Total		155	100
Mean = 3			
Education	Elementary level	99	63.87
	High school level	49	31.61
	College level	4	2.6
	College graduate	3	1.9
Total		155	100
Membership in fishers' organization	Not member	71	45.8
	Member	84	54.2
	Total	155	100
Fishing time	Morning	79	51
	Evening	76	49
	Total	155	100
Companions in fishing	With companion	118	76
	Without companion	37	24
	Total	155	100
Fishing days in a week	1-3	15	9.7
	4-5	44	28.4
	6-7	96	61.9
	Total	155	100
Mean = 6			
Fishing hours in a day	1-6	57	36.8
	7-12	88	56.8
	13-24	10	6.5
	Total	155	100
Mean = 7.7			
Years of fishing	10 & below	36	23.2
	11-30	90	58.06
	31-50	27	17.42
	51 & above	2	1.29
Total		155	100
Mean = 21			

Source: Authors' own calculation and analysis based on survey data, 2021.

In terms of presence of companion in fishing activity, more than three-fourths (76%) of the

total fishers have companions but this depends on fishing method they are using, some fishing methods requires several labourers while some are light enough to be carried out without involving several people. The average fishing days in a week was six. There were about 61.9% of the fishers who went to catch fish almost every day or between 6 to 7 days in a week. The average duration of fishing activity is 7.7 hours. About half spent almost 7 to 12 hours in the sea to catch fish (56.8%).

Fisher's estimated daily catch and income

The estimated mean daily income in fishing activity is PHP 240.87 (USD 5.01) with an estimated standard error of 19.63. The range of the true income at 1% error has a lower limit of PHP 185.91(USD 3.86) and an upper limit of PHP 264.91(USD 5.51). The range of fisher's daily income at 5% error lies within PHP 195.34 (USD 4.06) and PHP 255.48 (USD 5.31). On the other hand, the estimated mean catch of a fisher per fishing day was 6.76 kg with the estimated standard error of 0.419. The ranges of the true catch at 1% error have a lower limit of 4.88 kg and an upper limit of 8.64 kg. The ranges of fishers daily catch at 5% error lies within 5.392 kg and 8.19 kg.

Table 2. Descriptive analysis of income and catch

	Income	Catch
Mean	240.8742	6.76
Standard Error	19.63339	0.419
Standard deviation	244.43371	5.216
Variance	59747.836	27.206
95% Confidence Interval	(195.34, 255.48)	(5.392,8.191)
99% Confidence Interval	(185.91, 264.91)	(4.880,8.640)

Source: Authors' own calculation and analysis based on survey data, 2021.

Estimation of catch per unit effort (CPUE) by regression analysis

Table 3 presents the descriptive statistics of the selected fishing efforts identified in the study. Mean, standard deviation, minimum and maximum value were calculated.

Table 3. Descriptive statistics of selected fishing efforts

Fishing effort	Mean	St. Dev.	Min.	Max.
Catch	6.76	5.22	1	50
Daily expenses in fishing (in PHP)	238.64	199.52	0	1,630
Presence of companion in fishing	.75	.44	1	0
Fishing hours per trip	7.70	3.36	2	15
Fishing days	5.67	1.30	2	7
Membership in fisher's organization	.54	.50	0	1
Number of years in fishing	20.98	12.87	1	60

Source: Authors' own calculation and analysis based on survey data, 2021.

By multiple regression analysis, the identified fishing efforts was examined how it significantly influenced the fish catch (in kg). Table 4 shows that daily expenses in fishing activity significantly affects catch at 1% level of significance. This implies that 1 peso (USD) spent for fishing activity would increase catch by .0117715 kg. Presence of companions per fishing period displayed significance at 1% level.

Table 4. Results of regression analysis

Fishing efforts	Coefficient	Standard errors
Daily expenses in fishing	.0117715***	.0018039
Presence of companion in fishing	2.361205***	.8977255
Fishing hours per trip	-.2234367	.1340129
Fishing days	1.3547***	.3324319
Membership in fisher's organization	-1.897715**	.7955791
Number of years in fishing	-.0137957	.0288774
Constant	-2.463057	2.106603
Observations	155	
R-squared	0.3335	

Source: Authors' own calculation and analysis based on survey data, 2021.

Having a companion when fishing resulted to increase of fish catch by 2.361205 kg. Fishing days is significant at 1% which translates that an added day in fishing would increase catch by 1.3547 kg. Membership in fishers' organization would decrease fish catch by 1.897715 kg. Other identified fishing efforts such as fishing hours per trip and number of years in fishing activity have no significant influence to fish catch using the available data.

CONCLUSIONS

Based on the profile of fishers, age, civil status, household size, number of dependents, and highest educational attainment of the fishers showed variation. Fishing time, availability of companions, and the amount spent in fishing activity merely depends on the fishing methods used. In regression model, daily fishing expenses, presence of companions, fishing days, and membership in fisher's organization are the significant efforts that influences catch based on the available data. The concerned official may subsidized their fishing expenses fishing activity to support the living of the fishers. Fishers are encouraged to catch fish with other fishers however this may not possible with fishers having small boats. In this situation, the government must provide assistance to fishers in terms of owning a boat through loans. Membership in fisher's organization has negative influence to fish catch where it was hypothesized to impact catch positively. With this, extension workers have to revise or improve their approach in connecting with the fishers. They must orient the fishers with the appropriate fishing practices. Fishing communities must also encouraged other fishers to be a member of fisher's organization. Concerned officials should conduct livelihood trainings for other members in the family as additional source of income aside from fishing to sustain their living. For further study, more coastal barangays should be included and there should be a bigger number of fishers as respondents for each coastal barangay.

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