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Socio-Economic Assessment of the Slipper Lobster (*Thenus orientalis*, Lund, 1793) fishery in Ragay Gulf

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A B S T R A C T

Slipper Lobster (*Thenus orientalis,* Lund, 1793) is gaining popularity and has increasing economic and commercial value as an alternative seafood with higher demand in the global market. This study focuses on human relations to the marine environment by determining how the fisherfolks in Ragay Gulf economically benefit from slipper lobster fisheries. Specifically, it sought to answer the following objectives: a) assess the slipper lobster fishery in terms of the profile of the fisherfolks and gears used for fishing slipper lobster, and b) measure the catch rate of slipper lobster. A descriptive method of research using survey questionnaire was administered to the respondents that were identified by using purposive sampling. Results were interpreted using frequency and percentage. The results reveal that most of the fisherfolks were middle-aged with 20 years of fishing experience, and the majority of them were married with 4-6 dependents. Most of the respondents earned P 50,000-60,000 annually. Four fishing gears are used to catch slipper lobsters: crab pots, bottom-set gill nets (BSGN), baby trawls, and compressor diving. The slipper lobster fishers go fishing at a frequency of 5 trips/week on a year-round basis. The average catch per week was 1.5 kg for both crab pot and BSGN, 2 kg for compressor fishing, and 3 kg for baby trawl. Slipper lobsters fishery in Ragay Gulf is providing economic significance among the fisherfolks of the place. Illegal practice for fishing is also evident with the use of baby trawl and compressor diving as fishing gear to catch the slipper lobster. The number of daily fishing operations can indicate overfishing, which is an alarming concern that must be addressed for the sustainable use of marine resources. Alternative livelihood schemes, fisherfolk education, and active collaboration with the local government unit are recommended to stop illegal fishing activities and for enhanced management and protection of marine environments.

Keywords: *fishing gear, ecological implications, catch rate*

1 Introduction

The complex relationship and interaction of human social systems and ecological systems influences the health of coastal and marine environments. Human activities that cause drastic changes in these environments include overfishing, affecting the capacity of marine environments to provide ecosystem services with the collapse of stocks in the wild (Refulio et al. 2021). Lobster fisheries are among these fishery resources that are on the verge of depletion. Its expansion began in the 1980s until a closed season was declared in 2020, regulating the catch for lobster and focusing on other species like slipper lobsters as an alternative source of seafood (World Seas 2019).

In the global setting, there is limited information about the fishery potential of lobster species in the family of Scyllaridae, commonly known as the slipper lobsters, because of their size and appearance (Spanier 2007). Slipper lobsters are gaining popularity as a replacement for lobsters and are now used for commercial production, thus increasing their economic value (FAO 2020). In Ragay Gulf, slipper lobsters are a by-product of fishing activities, with inadequate information about the local fisherfolks involved in the slipper lobster fisheries. Understanding human impacts on slipper lobster stocks might provide valuable information to guide restoration and good fishery practices (Partelow, 2014). In such a way, the socio-ecological system can be assessed. A coastal management tool that links humans and the environment where local knowledge and practices about the fishery resources can provide information for local conservation and coastal management (Alves and Souto 2015). Hence, this study aimed to assess the slipper lobster fishery in terms of the profile of the fisherfolks and gears used for fishing slipper lobster; and measure the catch rate of slipper lobsters in Ragay Gulf.

2 Materials and Methods

Study Area/Survey Sites

The survey was conducted in selected municipalities in Ragay Gulf, Philippines, located in the south-eastern part of Luzon Island with coordinates of 13.00°-14.00°North latitude and 122.25°-123.40°East longitude. It is bounded by Bondoc Peninsula to the west and by the Bicol Peninsula to the east. Its gently sloping sandy bottom makes it a suitable place for all fishing techniques, especially for fishing slipper lobster (Ingles and Blaum 1989). Data were gathered from four towns: San Narciso, Guinayangan, and Tagkawayan in Quezon province and Del Gallego in Camarines Sur. In these towns, the 4 major coral reefs of Ragay Gulf can be found, namely Acha Reef, located between Guinayangan, and Tagkawayan; Kapuluan Reef located between Guinayangan and Buenavista; Palad Reef between San Narciso and San Andres; and Ugtok Reef located at the southwest side of Ragay, Camarines Sur. These are the areas where small-scale fishermen were capturing slipper lobsters as their fishing activity.

Data Collection and Analysis

This study was conducted in a year from November 2017 to October 2018. The survey instrument used was made of two parts: the first part was made to answer questions on the socio-economic profile of the respondents and the second part was made for analysis of the slipper lobster fisheries. The survey was administered to one hundred twenty (120) experienced lobster fishers (30 from baby trawl, 30 from bottom-set gillnet, 30 from crab pot, and another 30 from compressor) that were identified using the purposive sampling to be slipper lobster fisherfolks. The use of descriptive statistics was utilized to analyze the results.

3 Results and Discussion

Socio-economic status and fisheries profile of the respondents

The fisher folks that are directly engaged in fishing and catching slipper lobsters in Ragay Gulf are 96.67% male and 3.33% female. Fifty-nine percent (59%) were at the age of 40 years and below while the remaining 41% were at the age of 41 years and above. Majority of the fishermen were high school graduates (53%). They are mostly married (60%) and 68% of them have 4-6 dependents. Most of the fishermen (75%) spent more than 20 years in fishing and earn 50,000-60,000 pesos annually.

The fishing method and the fishing gear used

Four fishing gears are used to catch slipper lobsters: crab pots, bottom-set gill nets (BSGN), baby trawls, and compressor diving. *Crab pots* are small traps baited with fresh or salted fish which are laid down on the seabed for 24 hours to catch crabs and lobsters. They may be set singly, but the fishermen in Ragay Gulf use them in strings. A *bottom-set gillnet* is a large net wall that hangs vertically in the water. Floats line the top of the net, while weights line the bottom of the net. The net is made of transparent monofilament lines, so the fish and other animals are unable to see it. Fishermen vary the mesh size or size of the net holes depending on the size of the species they want to capture. Small mesh sizes are used when targeting small species and large mesh sizes are used when targeting large species. The mesh size or net holes are designed to be large enough for the head of the fish to pass through it, but not its body. As a result, when fish swim into the net they are

Table 1. Socio-Demographic Profile of the Respondents

Parameters	Frequency	Percentage
Sex		
Male	116	96.67
Female	4	3.33
Age		
51-60	13	11
41-50	36	30
31-40	47	39
21-30	24	20
Educational Attainment		
High School Graduate	63	53
Elementary Graduate	57	47
Civil Status		
Married	72	60
Single	48	40
No. of Household Members		
7-9	9	7
4-6	82	68
1-3		25
No. of Years Fishing		
6-10	5	4
11-15	10	8
16-20	90	75
25	15	13
Annual Income		
50-60K	45	38
40-49K	40	33
30-39K	35	29

entangled by their gills. *Trawling* is the operation of towing the net to catch fish. Trawling requires sufficient power to haul the net, a means of holding the mouth open while dragging, a system of wires to connect the net and gear to the source of towing power, and the ability to cast and haul the catch. *Compressor divers* use gloves and an underwater flashlight to gather lobsters at night. Each diver is equipped with a large net basket tied around the waist where the catch is placed. The divers use a compressor device as their underwater breathing equipment to supply their oxygen requirement using an air hose from the engine connected directly to the mouth. The end of the rubber hose lacks a mouthpiece or valve that controls the flow of air coming from the engine. Air in-flow was regulated by the lips and tongue. In addition, the compressor unit has no filter system to purify the air supplied to the divers. These circumstances expose the divers to hazards like inhaling unpurified air and choking due to uncontrolled air pressure. These accidents are mainly brought about by the lack of knowledge such as the relationship between water depth and pressure, and the factors causing the bends (Gonzales 2022).

Specification of the fishing gears

Crab Pot: A total of 30 crab pot respondents were interviewed. The average number of crab pots used was 150 pieces per fisher. The size of the rope used was 10 mm ɵ and the gears are set 9 m apart. The fishing area has an average depth of 20 m. *Bottom-set gill net:* A total of 30 gillnet fishers were interviewed. The average number of units used was 10 units with a length of 100 m per unit or net panel. The height of the net was 25 meshes, with a mesh size of 4 knots and an average fishing depth of 10 m. *Baby trawl*: A total of 30 respondents were also interviewed for the baby trawl operators. The average dimension of the net was 10 m long, 8 m wide, and 3 m deep, with an average depth of 30 m of their fishing area. For *Compressor divers*: a total of 30 respondents were interviewed. The average length of hose used was 30 m with a 12 mm diameter.

The average catch per week was 1.5 kg for both crab pot and BSGN, 2 kg for compressor fishing, and 3 kg for baby trawl. The smallest size caught by crab pot and BSGN was less than 150 g, less than 200 g for the compressor, and less than 100 g for the baby trawl. It can be noted that the volume of the slipper lobster catch was small because the slipper lobster was just a "by-catch" of the four fishing gears, as shown in Table 2.

Frequency of fishing trips

The slipper lobster fishers go out fishing at a frequency of 5 trips/week on a year-round

Table 2. Average catch per week and size of small and big slipper lobsters

Fishing Gear	Average Catch Per Week (kg)	Size of Catch (g)	
		Small	Big
Crab Pot	1.5	< 150	150 >
BSGN	1.5	< 150	150 >
Compressor	2	< 200	150 >
Baby Trawl	3	< 100	150 >

Table 3. Average fishing trip/week, fishing season, time of fishing, length of fishing/ trip, and number of operations/ trips, by fishing gear type (n=30).

Fishing Gear	No. of Fishing Trips/Week	Fishing Seasonality	Time of Fishing (night/day or both)	Length of Fishing Trip	Number of Operations/Trip	Soaking Time (hrs)
Crab Pot	5	All year-round	both	12	3	4
BSGN	5	All year-round	both	9	3	3
Baby Trawl	5	All year-round	night	10	2	5
Compressor	4	All year-round	night	6	3	2

basis using various fishing gears. Their fishing operation is usually done at night and lasts 8-12 hours, with 2-4 operations per trip and 2-6 hours soaking time.

Discussion

In this study, the respondents are within the bracket of working force. They are predominantly male elementary and secondary school graduates with a minimum income that is insufficient to cover the basic needs of a typical Filipino family. These fisher folks are using the four identified fishing gears in fishing slipper lobsters. Among these four gears, compressor diving is an illegal method of fishing that is mostly likely to harm the fisherfolks with improper knowledge on the use of such gears and the health hazard that it might cause them. On the other hand, the baby trawl is among the gears that are restricted by the law from being used within the municipal waters, for these are intended for commercial fishing activities only. Given the number of fishing hours or fishing operations, the volume of slipper lobsters caught per operation is not profitable compared with the number of hours spent in the fishing operations. Among the fishing gears used in slipper lobster fisheries, it is the compressor that can catch higher volumes of bigger-sized slipper lobsters, followed by the baby trawl. Both gear types can cause unwanted consequences to either the fisherfolk and the coastal and marine environment.

Ecological implications of the slipper lobster fishery

The longer hours spent in fishing and the frequency of fishing operation may serve as a basis to conduct more scientific investigations to have empirical explanations on what is happening in the study area. Researchers may consider to further investigate the current status of the coastal and marine environments as well as to conduct biodiversity assessment for marine organisms, with focus on stock assessments for most economically and commercially valued species including slipper lobsters.

4 Conclusion and Recommendations

The study shows that the slipper lobster fishery in Ragay Gulf provides some economic benefit to the local fisherfolks. Illegal fishing practices are also evident, as the results reveals the use of baby trawl and compressor diving as fishing gear to catch slipper lobsters. The number of daily fishing operations can indicate overfishing, which is an alarming concern that must be addressed for sustainable use of the marine resources. With the minimal income earned from slipper lobster fisheries, an alternative livelihood may be introduced to fisherfolks to have an additional income that can help to cover the family basic needs. Educating the fisherfolks about the importance of the health of the marine and coastal environment is also encouraged to be done to stop the illegal fishing activities to

protect these valuable resources. Active community collaboration with the plans and programs of the local government unit may be done to enhance the management and protection of coastal and marine environments. This will ensure the sustainability of the coastal and marine environments of the study area.

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Statement of Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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