Ecological Impacts of Fishing and Tourism-Related Activities in San Vicente, Palawan, Philippines

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ABSTRACT - *The decline of fish production is one of the environmental issues in the province of Palawan, in which many households are highly dependent on fishing. This phenomenon may lead to a decline in household income or mass shifting of livelihood to other forms of livelihood like tourism-related activities.*

This study was conducted to determine the perceived ecological impacts of fishing livelihood and tourism-related activities to marine habitats which include seagrass, mangroves and coral reefs in Poblacion and Port Barton, San Vicente, Palawan. The perceived ecological impacts of fishing livelihood and tourism-related activities were determined using household interviews and key informant interviews through a face-to-face interview. Results show that the ecological impacts of fishing and tourism-related activities are degradation of coral reef, seagrass and mangroves and improvement through policies

Keywords: *Perceived ecological impacts, fishing, and tourism-related activities*

I. Introduction

Fishing is one of the common livelihoods in the Philippines. This activity is usually done by the people that are accessible to the coastal area or aquatic ecosystem with the use of the different gears which are categorized into traps, fishing nets, hook and line, trawl, use of a poisonous substance and many others. Responding to increasing international demand from the rapidly industrializing regions of Asia, the market value of live fish exports in the Philippines has increased from US\$7.2 million per year during the 1990s to an annual average of approximately US\$11 million since 2000 (Fabinyi, 2007). Large scale fisheries comprised 66% of fish catch, followed by a small-scale of about 23% and recreational fishing of 1% (Palomares and Pauly, 2014). In 2015, the Philippines reached 26,510 million tons of annual fish catch (Barut and Garvilles, 2016). The Philippines is one of the leading countries in exporting marine products, especially those high valued fishes. The rate of export in the country is continuously increasing due to the increasing demand in the world market. Currently, live fish trading is concentrated in the province of Palawan, which was estimated to have produced 55 percent of the country's live fish in 2002 (Padilla et al. 2003). Within Palawan, the Municipality of Coron in the Calamianes Islands is a focal point for the trade. The market value in the Calamianes in 2002 was estimated at P265.1 million, or about US\$5.3 million at PhP 51.5 in 1 US\$ (Fabinyi, 2007) (Pomeroy et al. 2005).

Many households in the Philippines, especially in the province of Palawan, are highly dependent on fishing. The benefits for small-scale fishers are clear, with prices for individual groupers of a suitable size (9cm to 12 cm length) bringing in more than PhP2,000, a significant value in a region where fishers have an average monthly income that is often less than PhP5,000 (Fabinyi, 2007). The local market price ranges from PhP 300 to PhP 600 per kg (fresh). This activity serves as a great help in the economy of the province.

Destructive way of fishing, like the use of illegal fishing gear, also has negative impacts on our marine habitat like coral reef, seagrass and mangrove. It can cause a decline in fish production due to the frequent undertaking of this activity, an increase in the number of fishers, and the use of illegal and highly destructive fishing gear. It can also cause a decline in income and an increase in time to consume

According to the 2008 Community-Based Monitoring System (CBMS) survey, as stated in the report of World Fish (2011), there were 2,659 fishers in San Vicente. Nearly one-fourth (23.88%) of the fishers were residing in barangay Poblacion. It followed by Caruray (19.14%), Port Barton (18.92%), Alimanguan (15.04%), and Binga (11.21%). Based on the report of Municipal Agriculture Office (2016), about 65% of the household in the entire San Vicente, Palawan, particularly Barangay Poblacion and Port Barton, engaged in fishing. Currently, they experience a decline in fish production due to the frequent undertaking of this activity and the use of illegal, highly destructive fishing gears and mangrove cutting for building houses.

This study aims to determine the perceived ecological impacts of fishing livelihood and tourism-related activities to marine habitats which include seagrass, mangroves and coral reefs.

II. Research Method

This research was conducted in Barangay Poblacion, San Vicente, Palawan, and Barangay Port Barton, San Vicente, Palawan. The areas are located in the northern part of the province of Palawan. Bgy. Poblacion is approximately 186 kilometers away from Puerto Princesa City, which is the heart of the province. The area of the entire Poblacion is about 4,361 hectares. Only three puroks of Poblacion out of five were covered in this study: Purok Panindigan, Rosal, and Sampaguaita. They comprised 10.8% or 473.4 hectares of the total land area of the said barangay. The said areas are the puroks in Poblacion that engaged in fishing. Barangay Port Barton is 25 kilometers southwest of the Poblacion and more or less 120 kilometers from Puerto Princesa City. Only five puroks of Port Barton out of seven were covered: Mangingisda, Pagkakaisa, Masigla, Maunlad, and Pag-asa. These puroks are in coastal areas, and the households were involved in fishing.

Figure 1. Map of the Philippines showing the Palawan (A), Map of Palawan showing San Vicente (B), Map of San Vicente showing Bgy. Port Barton (C) and Map of San Vicente Showing Bgy. Poblacion (D)

This study was exclusive to the household that engages in fishing and tourism-related activities and are residents of Purok Panindigan, Rosal and Sampaguita, Poblacion, San Vicente, Palawan, and Purok Mangingisda, Pagkakaisa, Masigla, Maunlad and Pag-asa, Port Barton San Vicente, Palawan. The total household population of fishers in the said puroks of Poblacion and Port Barton is 520 and 450, respectively. Through random sampling, the sample size was 30% of the population (520 and 450 household population) that engaged in the fishing of Poblacion and Port Barton, which is equivalent to 156 and 135 respondents, respectively. The total number of respondents is 291. The researcher utilized a semi-structured survey questionnaire through the Household Interview (HHI).

III. Results and Discussions

3.1 Seagrass

Note: Very good (76-100% Cover), Good (51-75% Cover), Fair (31-50% Cover), Poor (11-30% Cover) Very Poor (1-10% Cover)

Figure 2. Status of Seagrass from 2007 to 2011 (A) and from 2012 to 2016 (B)

Cover)

Figure 2 (A) shows the status of seagrass from 2007-2011. Out of 291 respondents, 43 (14.78%) said that the seagrass has very good condition (76-100% cover), 210 (72.16%) said that the area is good (51-75% cover), no one said that the area has fair condition, 9 (3.09%) said that the area has poor condition (26-50% cover), 1 (0.34%) said that the area is already very poor (1-25% cover) and 28 (9.62%) are not aware of the status of seagrass. Based on the result, the majority of the respondents said that the seagrass from 2007-2011 has good condition.

Figure 2 (B) shows the status of seagrass from 2002-2016. Out of 291 respondents, 19 (6.53%) said that the seagrass has very good condition (76-100% cover), 199 (68.38%) said that the area is good (51-75% cover), no one said that the area has fair condition, 47 (16.15%) said that the area has poor condition (26-50% cover), 9 (0.34%) said that the area is already very poor (1-25% cover) and 25 (8.59%) are not aware of the status of seagrass. Based on the result, the majority of the respondents said that the seagrass from 2012-2016 has good condition. The status of seagrass from 2007-2011 and 2012-2016 are both good in condition but not the same in the area covered. Based on the respondents, the area covered by seagrasses declines because of fishing and tourism-related activity (see Tables 1&2).

Table 1 shows the impacts of fishing on seagrasses. Out of 291 respondents, 104 (35.74%) said that degradation through anchoring and fishing gears is an impact of fishing on seagrasses. Out of 104, the number

of respondents said that this impact has low, medium and high impact is 49 (47.12%), 43 (41.35%) and 12 (11.54%) respectively. 33 (11.34%) said that the seagrass improved because of some fishing policies. Out of 33, the number of respondents said that this impact has a low, medium and high impact is 5 (15.15%), 11 (33.33%), and 17 (51.52%) respectively. 65 (22.34%) said that the decline of the area covered from illegal fishing is an impact. Out of 65, the number of respondents said that this impact has a low, medium and high impact is 25 (38.46%), 30 (46.15%), and 10 (15.38%) respectively. 123 (42.27%) said that fishing has no impact on seagrasses and 27 (9.28%) are not aware. Based on the results, the leading impact of fishing to seagrasses is the degradation through anchoring and fishing gears (low-level impact) which followed by a decline of the area covered from illegal fishing (medium level impact) and the least impact is the improvement due to some fishing policies (high-level impact).

Table 1. Impacts of Fishing to Sea Grasses

Impacts of Fishing to Sea Grasses	Low		Medium		High		Total	
	Number	%	Number	%	Number	%	Number	% (n=291)
Degradation through anchoring and fishing gears	49	47.12	43	41.35	12	11.54	104	35.74
Improved through Fishing Policies	5	15.15	11	33.33	17	51.52	33	11.34
Decline of area covered from illegal fishing	25	38.46	30	46.15	10	15.38	65	22.34
No impact							123	42.27
Not Aware							27	9.28

Table 2 shows the impacts of tourism-related activities on seagrasses. Out of 291 respondents, 138 (47.42%) said that degradation through anchoring and other tourism activities is an impact of fishing on seagrasses. Out of 138, the number of respondents said that this impact has a low, medium and high impact is 46 (33.33%), 77 (55.80%) and 15 (10.87%) respectively. 55 (18.90%) said that the decline of the area covered from illegal activities is an impact. Out of 55, the number of respondents said that this impact has a low, medium and high impact is 33 (60.00%), 15 (27.27%) and 7 (12.73%) respectively. 95 (32.65%) said that the seagrass improved because of some tourism policies. Out of 95, the number of respondents said that this impact has a low, medium and high impact is 16 (16.84%), 42 (44.21%) and 37 (38.95%) respectively. 63 (21.65%) said that tourism-related activities have no impact on seagrasses and 27 (9.28%) are not aware.

Table 2. Impacts of Tourism Related Activities in Sea Grasses

Impacts of Tourism Related Activities in Sea Grass	Low		Medium		High		Total	
	Number	%	Number	%	Number	%	Number	% (n=291)
Degradation through anchoring and other tourism activities	46	33.33	77	55.80	15	10.87	138	47.42
Decline of area covered from illegal activities	33	60.00	15	27.27	7	12.73	55	18.90
Improved through tourism policies	16	16.84	42	44.21	37	38.95	95	32.65
No impact							63	21.65
Not Aware							27	9.28

3.2 Mangrove

Note: Very good (76-100% Cover), Good (51-75% Cover), Fair (31-50% Cover), Poor (11-30% Cover) Very Poor (1-10% Cover)

Figure 3. Status of Mangrove from 2007 to 2011 (A) and from 2012-2016 (B)

Cover)

Figure 3 (A) shows the status of mangrove from 2007-2011. Out of 291 respondents, 21 (7.22%) said that the mangrove has very good condition (76-100% cover), 205 (70.45%) said that the area is good (51-75% cover), no one said that the area has fair condition, 20 (6.87%) said that the area has poor condition (26-50% cover), no one (0.00%) said that the area is already very poor (1-25% cover) and 45 (15.46%) are not aware of the status of mangrove. Based on the result, the majority of the respondents said that the mangrove from 2007-2011 has good condition.

Figure 3 (B) shows the status of mangrove from 2012-2016. Out of 291 respondents, 32 (11.00%) said that the mangrove has very good condition (76-100% cover), 155 (53.26%) said that the area is good (51-75% cover), no one said that the area has fair condition, 53 (18.21%) said that the area has poor condition (26-50% cover), 5 (1.72%) said that the area is already very poor (1-25% cover) and 46 (15.81%) are not aware of the status of mangrove. Based on the result, the majority of the respondents said that the mangrove from 2007-2011 and 2012-2016 have both good condition but not the same in the area covered. Based on the respondents, the area covered by mangrove decline because of fishing and tourism-related activity (see Tables 3 & 4).

Table 3 shows the impacts of fishing on the mangrove. Out of 291 respondents, 117 (40.21%) said that the decline of the area covered through fishing is an impact of fishing to mangroves. Out of 117, the number of respondents said that this impact has a low, medium and high impact is 95 (81.20%), 19 (16.24%), and 3 (2.56%) respectively. 100 (34.36%) said that the mangrove improved because of some fishing policies. Out of 100, the number of respondents said that this impact has a low, medium and high impact is 24 (24%), 40 (40.00%) and 36 (36.00%) respectively. 26 (8.93%) said that fishing has no impact on mangrove and 48 (16.49%) are not aware. Based on the results, the leading impact of fishing to mangrove is the degradation through fishing activities (low-level impact) which followed by the improvement through tourism policies (medium level impact).

Table 3. Impacts of Fishing in Mangrove

Impacts of Fishing in Mangrove	Low		Medium		High		Total	
	Number	%	Number	%	Number	%	Number	% (n=291)
Decline of area covered through fishing activities	95	81.20	19	16.24	3	2.56	117	40.21
Improved through policies	24	24.00	40	40.00	36	36.00	100	34.36
No impact							26	8.93
Not Aware							48	16.49

Table 4 shows the impacts of tourism-related activities to mangroves. Out of 291 respondents, 34 (11.16%) said that degradation through anchoring and other tourism activities is an impact of fishing to seagrasses. Out of 34, the number of respondents said that this impact has a low, medium and high impact is 8 (23.53%), 24 (70.59%), and 2 (5.88%) respectively. 110 (37.80%) said that the decline of the area covered through charcoal production and other illegal activities is an impact. Out of 110, the number of respondents said that this impact has a low, medium and high impact is 32 (29.09%), 58 (52.73%) and 20 (18.18%) respectively. 100 (34.36%) said that the mangrove area improved because of some tourism policies. Out of 100, the number of respondents said that this impact has a low, medium and high impact is 26 (26%), 39 (39%) and 35 (35%) respectively. 26 (8.93%) said that tourism-related activities have no impact on mangrove and 48 (16.49%) are not aware. Based on the results, the leading impact of tourism-related activities to mangroves is the decline of the area covered through charcoal production and other illegal activities (medium level impact) which followed by the improvement through tourism policies (medium level impact) and the least impact is the degradation through tourism activities (medium level impact).

Table 4. Impacts of Tourism related Activities in Mangroves

Impacts of Tourism Related Activities in Mangrove	Low		Medium		High		Total	
	Number	%	Number	%	Number	%	Number	% (n=291)
Degradation through tourism activities	8	23.53	24	70.59	2	5.88	34	11.68
Decline of area covered through charcoal production and illegal activities	32	29.09	58	52.73	20	18.18	110	37.80
Improved through tourism policies	26	26.00	39	39.00	35	35.00	100	34.36
No impact							26	8.93
Not Aware							48	16.49

3.3 Coral Reef

Figure 4. Status of Coral Reef from 2007 to 2011 (A) and from 2012-2016 (B)

Note: Very good (76-100% Cover), Good (51-75% Cover), Fair (31-50% Cover), Poor (11-30% Cover) Very Poor (1-10% Cover)

Figure 4 (A) shows the status of the coral reef from 2007-2011. Out of 291 respondents, 27 (9.28%) said that the coral reef has very good condition (76-100% cover), 229 (78.69%) said that the area is good (51-75% cover), no one said that the area has fair condition, 16 (5.50%) said that the area has poor condition (26-50% cover), no one (0.00%) said that the area is already very poor (1-25% cover) and 19 (6.53%) are not aware of the status of coral reef. Based on the result, the majority of the respondents said that the coral reef from 2007-2011 has good conditions.

Figure 4 (B) shows the status of the coral reef from 2012-2016. Out of 291 respondents, 38 (13.06%) said that the coral reef has very good condition (76-100% cover), 196 (67.35%) said that the area is good (51-75% cover), no one said that the area has fair condition, 35 (12.03%) said that the area has poor condition (26-50% cover), 1 (0.34%) said that the area is already very poor (1-25% cover) and 46 (15.81%) are not aware of the status of coral reef. Based on the result, the majority of the respondents said that the coral reef from 2007-2011 and 2012-2016 have both good condition but not the same in the area covered. Based on the respondents, the area covered by coral reef decline because of fishing and tourism-related activity (see Tables 5 & 6).

Table 5 shows the impacts of fishing on a coral reef. Out of 291 respondents, 108 (37.11%) said that degradation through anchoring and fishing gears is an impact of fishing to coral reef. Out of 108, the number of respondents said that this impact has low, medium and high impact is 43 (39.81%), 52 (48.15%) and 13 (12.04%) respectively. 8 (2.75%) said that the decline of area covered from illegal activities is an impact. Out of 8, the number of respondents said that this impact has a low, medium and high impact is 5 (62.50%), 2 (25.00%) and 1 (12.50%) respectively. 118 (40.55%) said that the coral reef improved because of some fishing policies. Out of 118, the number of respondents said that this impact has a low, medium and high impact is 12 (10.17%), 59 (50.00%) and 47 (39.83%) respectively. 44 (15.12%) said that fishing activities have no impact on coral reef and 21 (7.22%) are not aware. Based on the results, the leading impact of fishing to coral reef is the improvement through fishing policies (medium level impact) which followed by the degradation through anchoring and fishing gears (medium level impact) and the least impact is the decline of the area covered from illegal activities (low-level impact).

Table 5. Impacts of Fishing in Coral Reef

Impacts of Fishing in Coral Reef	Low		Medium		High		Total	
	Number	%	Number	%	Number	%	Number	% (n=291)
Degradation through anchoring and fishing gears	43	39.81	52	48.15	13	12.04	108	37.11
Decline of area covered through illegal activities	5	62.50	2	25.00	1	12.50	8	2.75
Improved through policies	12	10.17	59	50.00	47	39.83	118	40.55
No impact							44	15.12
Not Aware							21	7.22

Table 6 shows the impacts of tourism-related activities on a coral reef. Out of 291 respondents, 103 (35.40%) said that degradation through anchoring and other tourism activities is an impact of fishing on a coral reef. Out of 103, the number of respondents said that this impact has a low, medium and high impact is 38 (36.89), 52 (50.49%) and 13 (12.62%) respectively. 9 (3.09%) said that the decline of the area covered from illegal activities is an impact. Out of 9, the number of respondents said that this impact has a low, medium and high impact is 6 (66.67%), 2 (22.22%) and 1 (11.11%) respectively. 118 (40.55%) said that the coral reef improved because of some tourism policies. Out of 118, the number of respondents said that this impact has a low, medium and high impact is 14 (11.86%), 58 (49.15%) and 46 (38.98%) respectively. 44 (15.12%) said that tourism-related activities have no impact on a coral reef and 21 (7.22%) are not aware. Based on the results, the leading impact of tourism-related activities to the coral reef is the degradation through anchoring and other tourism activities (medium level impact) which followed by the improvement through tourism policies (medium level impact) and the least impact is the decline of the area covered from illegal activities (low-level impact).

Table 6. Impacts of Tourism Related Activities in Coral Reef

Impacts of Tourism Related Activities in Coral Reef	Low		Medium		High		Total	
	Number	%	Number	%	Number	%	Number	% (n=291)
Degradation through anchoring and other tourism activities	38	36.89	52	50.49	13	12.62	103	35.40
Decline of area covered through illegal activities	6	66.67	2	22.22	1	11.11	9	3.09
Improved through tourism policies	14	11.86	58	49.15	46	38.98	118	40.55
No impact							44	15.12
Not Aware							21	7.22

IV. Conclusion

- Based on the results, the leading impact of fishing to seagrasses is the degradation through anchoring and fishing gears (low-level impact) which followed by decline of area covered from illegal fishing (medium level impact) and the least impact is the improvement due to some fishing policies (high-level impact) while the leading impact of tourism-related activities to seagrasses is the degradation through anchoring and other tourism activities (medium level impact) which followed by the improvement

through tourism policies (medium level impact) and the least impact is the decline of area covered from illegal activities (low-level impact).

- The leading impact of fishing to mangrove is the degradation through fishing activities (low-level impact) which followed by the improvement through tourism policies (medium level impact) while the leading impact of tourism-related activities to mangroves is the decline of area covered through charcoal production and other illegal activities (medium level impact) which followed by the improvement through tourism policies (medium level impact) and the least impact is the degradation through tourism activities (medium level impact).
- In addition, the leading impact of fishing to coral reef is the improvement through fishing policies (medium level impact) which followed by the degradation through anchoring and fishing gears (medium level impact) and the least impact is the decline of area covered from illegal activities (low-level impact) while the leading impact of tourism-related activities to coral reef is the degradation through anchoring and other tourism activities (medium level impact) which followed by the improvement through tourism policies (medium level impact) and the least impact is the decline of area covered from illegal activities (low-level impact).

V. Recommendations

- The non –government organizations, the national or local government, may provide awareness programs as well as monitoring and evaluation programs about sustainable fishing and ecotourism. They should control the local people from shifting to any tourism activities. Shifting must be based on their capabilities and interests.
- The national or local government should provide mechanisms to monitor and evaluate implemented policies and implement policies effectively and efficiently, particularly about the fishing gears, fishing area, the time frame of fishing, and tourism activities. It will serve as a great help to manage the natural resources, particularly the mangrove, seagrass and coral reef.
- The national or local government should delineate specific areas for fishing and tourism activities with the involvement of all stakeholders in decision making.
- The concerned agencies should always monitor the status of fishing areas and tourism areas

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