Lake Bato Fishing Practices: Input for IEC Material with Science Education

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Abstract— With the great threat on Lake Bato, in Camarines Sur ,of becoming less useful, this study seeks to determine the existing fishing practices done by fishermen, develop an Information, Education, and Communication (IEC) materials with science education input, and design Information, Education and Communication (IEC) material dissemination plan to lake locals. Data were gathered from interviews of the respondents and on the actual observation of local fishing practices. The fishing practices were culturing of tilapia using fish cages, installation of *"ladlad",* compiling of cut trunks of trees, installing of *"bobo",* electric fishing, *"pagsarok", "pagbaklad"* and *"pagtapsaw".* A book is developed to promote the preservation of the lakes which contain physics, earth science and environmental science inputs, and an "Orientation-Seminar on Lake Status" was designed for IEC materials dissemination.

Keywords: *Bato Lake, Fishing Practices, IEC material, Science Education*

INTRODUCTION

The Philippines, with a land area of 30 million hectares, claim agriculture as its backbone. This huge landmass housed Filipino learners where farming takes place everywhere. The 5th District of Camarines Sur, otherwise known as "Rinconada", includes the municipality of Baao, Balatan, Bato, Buhi, Bula, Nabua, and the city of Iriga with an estimated population of 484, 112. Bato, a 3rd class municipality, is the home of Bato lake which has various kinds of fishes. In this municipality, lake fishing is a community practice and considered major activity to sustain the living of locals. Bato Lake is a 2, 810-ha lake with an average depth of 8 meters and the bottom is muddy clay.

This lake serves with an important role in the lives of the locals because it is a key player in their everyday living. It serves as a reservoir that supports human needs such as a source of food and ways for transportation aside from location for fishing and agricultural endeavor. It is sad noting that lakes, like bato like, are in danger due to a lack of policies and management systems for their conservation (Gonzales, 2015; Soliman and Sergio, 2001; Zoleta, 1987).

While studies about these lakes are minimal and mostly focused on the natural sciences, especially fish biology, water quality, limnology, and aquaculture (Brillo, 2015), there are only a limited number of studies focusing on the lives and practices of the people directly interaction on the lake. Addressing lake problems demands knowing vital information about lakes not just natural science researches but also social science research that looks on the living conditions of lake residents and their communities. Brillo (2015) mentioned that a single perspective is simply inadequate in coping with the multitude of challenges confronting lakes today specifically focusing only to limnology and aquaculture as natural science. This was supported by Guerrero (2001); Soliman and Sergio (2001) who pointed out that social dimension of resource management of watershed, like Lake Bato, should be managed also. This is emphasizing the social aspect of lake preservation.

At present, there is a great threat on Bato Lake of becoming less useful due to turbidity of the water, an increase of ammonia, phosphate, and TSS (Gonzales, 2015) just like other lakes which still suffer from degradation, such as eutrophication, acidification, toxic contamination, salinization, siltation, overfishing, and exotic species/weed infestation (Kira, 1997; World Lake Vision Committee, 2003). Concrete examples that manifest a serious problem in Bato lake is the deterioration of water quality (Gonzales, 2015) and the siltation of the lake water resulting in shallow lakes and fish-kill during the summer month and declining fish catch (Regis, 2006). These can also be attributed to the fishing and living activities of local fisherman interacting with the lake everyday as one of the key factor that needs to be visited.

Without intervention, this problem will remain as it is-hence, deterioration of livelihood will arise. To contribute in resolving this problem, this study would like to focus on the activities done by fisherman in Bato lake who are with direct contact to the lake. Proper documentation and education of the role of fishing communities on conservation of the lake that are based on scientific inquiry are deemed important. As part of the academe, promotion and integration of agriculture and fishing concepts can be strengthened. This idea is included in DepEd Order no. 35. series of 2016 where curriculum contextualization is highly encouraged in basic education. In consideration of the diversity of learners, teaching should find a link to the experiences and environment of the learners. As stated in the above-mentioned DepEd order;

"...by linking new content to the local experiences that are familiar to students, learning will be more efficient for and relevant to them. The localization of curriculum is an essential feature of the K to 12 curriculums. The teacher's guide and learner's materials may be modified to accommodate the unique context of a particular locality…"

Knowing that fishing takes place in this learner's environment, creating an Information, Education, Communication (IEC) materials with science education content will support the preservation and

restoration efforts of the local government, uphold the policies of the Department of Education, preserve the agricultural knowledge and practices, and educate the learners on the field of agriculture. With all the above-mentioned gaps and importance, the researcher deemed it significant to explore this area of study.

METHODOLOGY

This qualitative study gathered data from the interview of the respondents and on the actual observation of their fishing and living practices. With the help of an informant, the researcher identified the fishermen respondents and locates organized and non-organized communities beside the lakes. After the identification of the fishermen, unstructured interview followed with the fishermen who have direct contact with the lake. The interview focused on identifying the activities done by the fishermen that may affect the lakes. Fishermen were joined in actual fishing on a scheduled date to verify their fishing practices and to see the actual methods they are doing in fishing. Actual inspection and observation was done to see if the practices conforms with the existing regulation of the BFAR and laws about resources conservation and management such as water and solid waste management acts. The data which was gathered will be an input in developing the IEC on preserving the lakes with physical science education content. An IEC material dissemination plan will be proposed for the use of Bato locals.

RESULTS AND DISCUSSION

Fishing Practices done by Fishermen in Bato Lake. The Bato lake became the primary source of income for most of the Bato locals. The lake is the primary site for fishing and a sort of an avenue for transportation for a few. Manually operated and machine-operated boats were observed to use on the lake. The most common way of fishing in the lake is culturing tilapia using fish cages. Fish cages are rectangular- designed synthetic nets tied in bamboo which are installed in the middle part of the lake where water is deep. In dimension, it is 10 meters in length, 10 meters in width, and 5 meters in depth carrying around 2, 500 fishes. If the dimension of the fish cage is 10 meters in length by 5 meters width and by 5 meters depth, 1, 500 fishes are in the cage by estimate.

The cultured tilapia starts from a fingerling. The fingerling is controlled and fed with fish feeds once a day, and twice a day if it is grown enough in the fish cages for 3 months until it is ready for harvesting. In each cage, 4 sacks of fish feeds are being consumed in one month, and each sack contains 25 kilos. The caretaker stays on a nipa hut or “payag" in the middle of the lake to secure and guard the fish cages. Aside from tilapia, *bighead carp (Hypophthalmichthys nobilis)* is also being cultured in Bato lake.

“Pagsarok" is a way of fishing utilizing fishnets tied in a round or nearly round bamboo. The fishing material is called "sarok”. “Pagsarok” is done by deeping the “sarok” on the lake by using manually operated boats. “Pagsarok” can be done in the deep parts and moderately deep parts of the lake. The catch of the “sarok” depends on the size of the hole of the nets used.

“Pagtapsaw” is a way of fishing utilizing fish nets called “pokot". This is done by laying out the fishing nets in a round orientation on the shallow part of the lake. When the fishnets are laid out, the fishermen create a noise inside the rounded area to distract and let the fishes move towards the fishing nets or "pokot”. The catch in this way of fishing depends on the size of the hole of the nets used.

“Pagbaring” is a way of fishing similar to “pagtapsaw”. The synthetic fishing net is laid in a round/circular orientation on the shallow part of the lake. But, “pagbaring" became distinct because of the difference in the fishnets used and on the act of pushing the nets toward the other side of the net to make the two sides of the net touch each other making it easier to catch the fish that is within/inside the circle during the time that the nets are laid out on the water. All forms and sizes of fish can be caught using the "baring", the instrument used in fishing except the fingerling.

“Pagbaklad” is a way of fishing utilizing synthetic fishing nets and bamboo, forming a cage and maze-like structure. The “baklad” is the structure that was formed. It has its “ladlad” that extends from one side of the lake towards the coast and land area which leads the fish to the designed cage and maze-like structure. The “ladlad", when installed on the passageway, creates an obstruction to the boat users. Catching of fishes is scheduled every morning and afternoon, depending on the preference of the fisherman. All forms and sizes of fishes can be caught using the "Baklad” except the fingerling which can pass by the nets.

“Pagbobo" is a way of fishing utilizing a metal (tin) screen. The tin screen is designed like a tiny cage and installed side by side with each other on a shallow part of the lake. Usually, fishermen install these on the side of the river part of the lake. But the "bobo", which is the instrument used in fishing, are obstructing the right of way of commuters because it is sometimes installed from one point until the end of the other point of the rivers connected to the lake. Like "pagbaklad”, catching of fishes in “pagbobo” is scheduled every morning and afternoon, depending on the preference of the fisherman. The size of the catch depends on the size of the hole of the tin screen.

“Pagtambon” is a way of fishing utilizing cut trunks of trees compiled on the moderately deep part of the lake. It will not be moved and disturbed for 2 to 5 months making it a location or sanctuary for fishes. The fish will be used to stay in the “tambon” which is the compiled trunks of trees. After a certain duration, the “tambon" will be circled by fishnets and then, the "tambon" or compiled trunks of trees will be transferred outside the circled fish nets leaving the fishes inside and making it easier for the fisherman to catch the fishes. The size of the fishes depends on the size of the nets used to circle the “tambon”.

Electrical fishing or “pagkuryente” is a way of fishing utilizing a 12 volts-battery as a source of electricity and two metal rods where electricity runs. The fishing is done by creating an open circuit utilizing the water as an extended conductor of electricity. A hand-press switch is used to close the circuit. Fishes of any kind and size that lie between the two-fishing rods will be electrocuted.

In consideration of the existing regulations of the Bureau of Fisheries and Aquatic Resources and the known effects of observed fishing practices, the table below shows the destructive and non-destructive fishing practices in Bato Lake.

Table 1: Observed Destructive and Non-Destructive Fishing Practices in Bato Lake

Observed fishing practices	Considerations
Destructive	
culturing of tilapia using fish cages	Nutrient pollution from uneaten feeds and excretory products Overpopulation and proliferation of fish cages
Installation of "ladlad" that extends from one side of the lake towards the shallow and land area	*Obstruction to free flow of tide and* obstruction the free navigation Violation of Fisheries Administrative order no. 216, Series of 2001
Compiling of cut trunks of trees	Trunks of trees underwater may be dangerous for boat users and fishermen. Also, the lake
Installing of "bobo" from one end until the other of the lake-connected river	*Obstruction to the free flow of tide and* obstruction of free navigation Violation of Fisheries Administrative order no. 216, Series of 2001
Electric fishing	Fisheries Administrative order no. 84 of 1965 prohibiting electro-fishing in all waters of the Philippines. It is harmful to the fishermen.
Non-destructive	
"Pagsarok"	No destruction observed to the lake
"Pagbaring"	No destruction observed to the lake
"Pagtapsaw"	No destruction observed to the lake

Developed Information Education and Communication (IEC) materials with Physical Science Education Content to Promote the Preservation of the Lake.

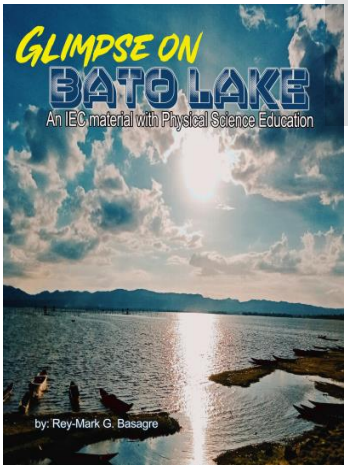

Figure 1: Cover of the IEC Material to promote preservation of the lake

The Information, Education, and Communication (IEC) materials develop to promote the preservation of the lake are in a form of a book. It carries the title of "Glimpse on Lake Bato: An IEC material with Physical Science Education". The IEC material has 14 pages in total aside from its cover page and table of content page. The IEC material contains information about the municipality, about the lake, and about the practices done by fishermen and locals living beside the lake which affect the lake. In each part of the page, questions in a form of identification, multiple-choice, essay, and the like are located at the bottom part. The questions promote reflection in both earth and environmental science, and physics concepts as part of the physical sciences to further preserve the lake. The IEC materials also contain actual pictures of the lake, fishermen's, fishing materials, fishing activities, community beside the lake, and their activities within the community. The last part of the IEC material is some of the laws and regulations in the country about the promotion of the preservation of the lake that needs to be learned by the community.

The IEC material discusses the components of the electro-fishing apparatus and its circuitry. It provides how electrofishing is done and what is the physics behind the fishing practice. It also provides open-ended question on the science of the electrofishing and reflective question on its safety issue. This will give the reader the necessary information to be cautious in dealing with this observed fishing practice in Bato lake.

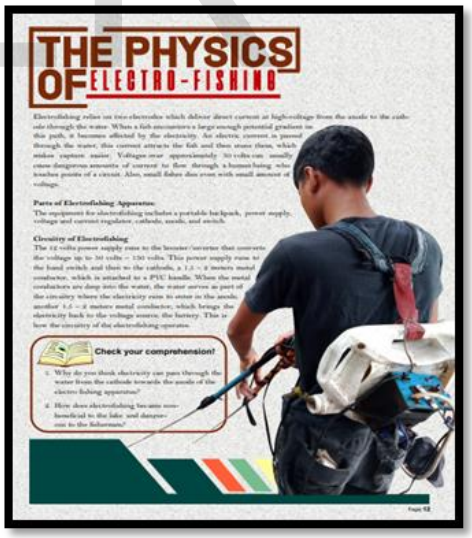

Figure 2: Physics content of the IEC Material as Science Education

In addition to the physics of electrofishing as a science education content of the IEC Material, questions in pertaining so earth science and environmental science were incorporated after the discussion of the observe fishing practices and community practices around the lake. Issues on proper solid and water waste management and disposal were central concern of the question. This will provide the readers with essential question on lake preservation.

Figure 3: Earth Science and Environmental Science Input of the IEC Material

Designed Information, Education and Communication (IEC) Materials Dissemination Plan to Bato Lake Locals.

To disseminate the Designed Information, Education and Communication (IEC) materials to the target audience, an Orientation-Seminar on Bato Lake Status can be conducted. The participants will be the fish cages owners, the small-scale fishermen, and barangay officials of the barangays beside lake Bato with their zone leaders. The activity will aim to inform and disseminate relevant information on the status of the lake, on the practices that affect the lakes, and laws and regulations that need to be considered for its preservation. In the limitation of the IATF protocols on mass gathering due to the Covid-19 Pandemic, this activity can also be done through a *webinar*.

In specific, there can be a talk on the following (1) *Status of Lake Bato: Its Life and its Health, (2) Coastal Community living Practices: Its Effect to Bato Lake, and (3) Fishing Practices of Bato Lake Fishermen.* The resource speakers will be from Bureau on Fisheries and Aquatic Resources, from the Municipality of Bato - Local Government Unit, and the researcher to disseminate the research results of the conducted study on the fishing and community practices. The table below shows the proposed Activities and their Purpose.

Table 3: Proposed Activities on Orientation-Seminar (Webinar) on Lake Bato Status

Activity	***IEC material to be Distributed***	**Purpose**
Talk 1: Status of Lake Bato: Its Life and its Health		To update the Bato Locals about the current situation of the Lake and its possible consequences to the community.
Info-Poster on Fishing Practices Presentation and Viewing	"**Glimpse on Bato Lake**: *An IEC material with Physical Science Education*"	To present the Fishing and Coastal community living practices of Bato Locals
Talk 2: Coastal Community living Practices: Its Effect on Bato Lake		To inform the Coastal Community of their living Practices that affect the status of the Lake
Talk 3: ***Fishing Practices of Bato Lake Fishermen***		To inform the Bato Lake fishermen of their fishing Practices that are beneficial and non-beneficial to the lake.

There can be an Infographics presentation in a form of a poster to show the different Fishing and Coastal community living practices of Bato Locals. The actual pictures gathered in this study can be laid out in a form of a poster. Within the program, the Information, Education, and Communication (IEC) materials crafted in this study entitled "**Glimpse on Bato Lake**: *An IEC material with Physical Science Education*" will be distributed to the participants for more accurate, more precise, and wider dissemination of the develop IEC materials with physical science education content to promote the preservation of the lakes.

The desired output of this plan is to create awareness on the general public about the status of the lake specifically the practices that affect the lake, create a domino effect as the community leaders re-echo the conducted orientation-seminar, and open an avenue to craft a comprehensive policy in the preservation of the lake.

CONCLUSION AND RECOMMENDATION

The fishing practices in bato lake are culturing of tilapia using fish cages, installation of "ladlad", compiling of cut trunks of trees, Installing of "bobo", electro fishing, pagsarok", "pagbaring" and "pagtapsaw". Book as an Information, Education and Communication (IEC) materials with physical science education content was develop to promote the preservation of the lakes and an orientation-seminar was design to disseminate the Information, Education and Communication (IEC) materials to Bato lake locals.

It is recommended to conduct a seminar on rules and regulations in fishing and on culturing fish in lakes/freshwater and on the existing rules and regulations on solid waste and water management. Further, the LGU must create a group/council/taskforce that will focus on lake preservation.

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