

Socio-Economic Profile and Biodiversity Awareness of Fishers in Upstream Part of Bicol River in Camarines Sur

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ABSTRACT : The present study was carried out to assess Socio-Economic Profile and Biodiversity Awareness of Fishers in the Upstream Part of Bicol River in Camarines Sur, Philippines. Data were collected through focus group discussion and the well-structured questionnaire survey from three municipalities such, M1, M2, and M3 Baao, Nabua and Bula respectively. A Total of 260 fishermen were selected randomly for the interview and participated as the respondents of the present study. The findings of the study revealed some interesting facts and showed most of the fishermen were male (92%) belonging to the age of 49-59 years (42%). Almost all were married (93%) and 48% were elementary graduates. Most fishermen were less perceptive about river biodiversity. The river, constantly flooded, muddy and Abundance of Macrophytes and the river area are increasingly threatened by calamities and human activities. However, less awareness of the fishers were found so alarming. To improve the socio-economic condition of the fishermen and their awareness of the biodiversity of the river, the educational institution should be set up in fishing villages to improve their educational status and strength of public awareness on biological diversity of the river through the various publications and publicity for protecting riverine resources

KEYWORDS - Biodiversity, Awareness, Fishers, Bicol River, Socio-Economic

I. INTRODUCTION

The Bicol River is bounded on the northeast by the Bicol Cordillera, which consists of a chain of volcanic mountains including Mount Iriga, Mount Malinao, Mount Masaraga and Mount Mayon. On the Southwestern side lie the Ragay Hills, which consist of folded and faulted sedimentary formations including limestone, siltstones, conglomerates and shale. In between these higher areas lies Bicol Plain, which is composed of thick alluvial deposits of sand silt^[1]. The Bicol River in Camarines Sur is divided into areas upstream, midstream and downstream. The upstream of Bicol River is located at the one barangay of Baao and nine barangays of Nabua and Bula. Socioeconomic status refers to information on a variety of aspects of a community, such as demography, income, living cost, boat transport, fishing gear, marketing infrastructure etc. and provides information for understanding of social, cultural and economic conditions of people, households and community^[2]. The present study, a survey on the socioeconomic status of the fishermen community was carried out on villages of Upstream Part of Bicol River in Camarines Sur, Philippines. The livelihoods of some families inhabiting the villages of the zone are dependent on fish resources of the river. The survey of the area basically brings out the information on the salient demographic details of the fishing families, the income from fishing and other sources and pattern of fishing adopted in the area. Also, attention is given on the status of fishing activities, gear used, attitude towards fish resources, migration undertaken by fishermen. Moreover, the local biodiversity outlook of rural fisher was also evaluated.

Fresh waters in lakes, wetlands and rivers support ecosystems with diverse life forms that, together with the water itself, provide goods and services of critical importance to human societies everywhere^[3]. An alarming number of people still consume polluted and contaminated water with no form of treatment. The biogeochemical processes and diverse aquatic species that regulate freshwater quantity and quality are not sufficiently acknowledged nor appreciated, as exemplified by pervasive degradation of the world's freshwater resources^[4-5]. Furthermore, freshwater ecosystems underpin global food production based on artisanal and commercial fisheries, aquaculture, floodplain regression agriculture and pastoral animal husbandry^[6-8]. (Postel, 2005; Welcomme et al., 2006a; Sala, Meyerson & Parmesan, 2008). The Bicol River has nourished life along the environs through which it flows, 1.3 million people in the agriculture and fisheries sector benefit directly from it. The river now faces threats from soil erosion, congestion of waterways, accumulation of solid

and liquid wastes, siltation, pollution and fish kills^[9]. Hence, the aim of the study was to analyze the Socioeconomic Profile and the local biodiversity outlook of Rural Fishers in the Upstream Part of Bicol River in Camarines Sur.

II. METHODOLOGY

The present study was conducted to analyze the Socioeconomic Profile of Rural Fishers in the Upstream Part of Bicol River in Camarines Sur. The study was based on collection of primary and secondary data. Before collecting the primary data a draft questionnaire was developed which was pre-tested with a few fishermen in Nato Sagnay Camarines Sur. In this pre-testing, much attention was given to any new information in the draft questionnaire in order to attain the objectives of the study. Permission from the Municipal Mayor to conduct the preliminary survey was requested. Based on the experience gained in pre-testing, the final questionnaire was improved, rearranged and modified. The final questionnaire included the questions on the socio-demographic condition, income of fishermen, family size, family members, factors affecting the level of fish production etc.

Primary data were collected through personal interviews supplemented by multiple methodological Participatory Rural Appraisal tools such as Focus Group Discussion (FGD) and Crosscheck Interviews (CI) with key informants. All the collected information was accumulated and analyzed by MS-Excel and then presented in textual, tabular and graphical forms to understand the present livelihood status and constraints of the fishermen of the studied area.

Study Area: The survey was conducted in the three municipalities of Camarines where the Upstream Part of Bicol River is located, the Municipal I (M1) Baao, Municipal 2 (M2) Nabua, and Municipal 3 (M3) Bula. The survey was conducted to one barangay in Baao and nine barangay from Nabua and Bula.

Data Collection Method : The methodology used in this study was combination of descriptive and analytical. The different data was used for the study with a combination of interviews and observations on the fishermen villages along the riverine area and with the help of a schedule containing both structured and unstructured questions, the head of the family was interviewed. Further enquiries and observations were made during subsequent visits to several riverine villages. Various field exercises were conducted to gather information like population, dependency on river, uses of the net and uses of boats, types of fishing gears etc. The secondary data was also included; those were available from the provincial fisheries office, fisheries bulletins of BFAR, journals and published books. Moreover, personal knowledge was used to make meaningful interpretation of the data.

Respondents of the Study

TABLE 1. Percentage of the respondent participated in the survey

Respondent	M1	%	M2	%	M3	%	TOTAL	%
Local Government Unit Key Officials/Fishers	3	30%	9	8%	3	2%	15	7%
Community Members/Fishers/Farmers	0	0%	5	4%	0	0%	5	2%
NGOs/ Fishers	0	0%	1	1%	0	0%	1	0%
Fishers/Farmers	7	70%	20	17%	37	21%	64	31%
Fishers	0	0%	45	38%	76	43%	121	59%
Total	10	100%	80	67%	116	66%	206	100%

Table 1 reveals the percentage of the respondents who participated in this study. As shown in Table 2 there were a Total of 10, 80 and 116 from the municipalities of Baao (M1), Nabua (M2), Bula (M3), respectively. Out of two hundred six (206) respondents, 121 or 59% are fishers; 64 or 31% are both fishers and farmers; 15 or 7 % are Government key officials and at the same time fishers. Generally they are all fishermen only; some respondents said fishing is just a source of additional income for the family.

III. RESULTS AND FINDINGS

Profile of the Respondents

TABLE 2. Profile of the respondent in terms of sex and age

Gender	M1	%	M2	%	M3	%	TOTAL	%
Male	10	100%	67	84%	112	97%	189	92%
Female	0	0%	13	16%	4	3%	17	8%
Total	10	100%	80	100%	116	100%	206	100%
Age								
19-28	0	0%	1	1%	0	0%	1	0%
29-38	0	0%	7	9%	5	4%	12	6%
39-48	0	0%	21	26%	26	22%	47	23%
49-59	4	40%	33	41%	50	43%	87	42%
60 and above	6	60%	18	23%	35	30%	59	29%
Total	10	100%	80	100%	116	100%	206	100%

Table 2 reveals that out of two hundred six (206) respondents 92% of them were male and 8% were female. This finding shows that fishing is not only a job of men but also for women and as to age it tells that fishing is carried out by majority at age of 49-59 years old and above with a percentage of 42%. This study is comparable with the study of Mercado, J, et. al.^[10] that fishing is not exclusively for male but also for females.

TABLE 3. Profile of the respondent in terms of number of marital status and educational attainment

Marital Status	M1	%	M2	%	M3	%	TOTAL	%
Single	0	0%	3	4%	6	5%	9	4%
Married	10	100%	74	93%	107	92%	191	93%
Widowed	0	0%	1	1%	3	3%	4	2%
Separated	0	0%	2	3%	0	0%	2	1%
Total	10	100%	80	100%	116	100%	206	100%
Highest Educational Attainment								
No formal schooling	0	0%	1	1%	0	0%	1	0.5%
Elementary undergrad	0	0%	1	1%	3	3%	4	2%
Elementary graduate	0	0%	23	29%	75	65%	98	48%
High school undergraduate	3	30%	18	23%	19	16%	40	19%
High school graduate	7	70%	33	41%	12	10%	52	25%
College undergraduate	0	0%	1	1%	1	1%	2	1%
College graduate	0	0%	1	1%	5	4%	6	3%
Vocational courses	0	0%	2	3%	1	1%	3	1%
Total	10	100%	80	100%	116	100%	206	100%

Table 3 Reveals percentage of educational qualification of fishermen from upstream part of Bicol River in Camarines Sur. Majority of the respondents are married with a Total 191 or 93%. Out of 206 respondents,

48% were Elementary Graduate, 25% were High School Graduate and 19% were undergraduate. Only 6 or 3% were college graduates. This result completely acquiesced with the result of Hossain & Pingali ^[11] and Shahjahan et al. ^[12] reported that majority of the fishermen were uneducated (71.12% and 63.33% respectively) while 24.44%, 31.67% of the riverine fishermen had only primary level of education and only 4.44%, 5% of them had only secondary level of education respectively.

TABLE 4. The main and secondary source of income of the fishermen

Main source of income	M1	%	M2	%	M3	%	TOTAL	%
Fishing	0	0%	61	52%	63	47%	124	47%
Farming	7	70%	44	38%	69	51%	120	46%
Employment	0	0%	0	0%	1	1%	1	0%
Poultry	0	0%	1	1%	0	0%	1	0%
Piggery	0	0%	3	3%	2	1%	5	2%
Carpentry	0	0%	7	6%	0	0%	7	3%
Service provision	3	30%	1	1%	0	0%	4	2%
Total	10	100%	117	100%	135	100%	262	100%

Table 4 reveals that other than fishing respondents also engaged in other occupations for additional income of the family. As shown in Table 5 that majority of the respondents in M1, M3 AND M3 the main and secondary income were fishing and farming. Generally, forty seven percent (47%) and forty six percent (46%) of them engage in fishing and farming as the main source of income respectively. Based on the interview, the fishers while waiting for the cropping of their agricultural products they usually catch fishes and other fishery products just to suffice the needs of the family of the fishers. The result implied that most of the fishermen residing close to the upstream portion of the Bicol River engaged in fishing as their principal occupation. Nevertheless, some were engaged in agriculture and piggery (2%), carpentry (3%), and services (2%), as their core occupation (Table 5). The findings of the present study were more or less similar to the results found by Kabir et al. ^[13] and Alam and Bashar ^[14]. Majority of the upstream Bicol River fishermen possessed no land and completely depended on physical labor. They live by catching fishes during the rainy season or engage themselves in other kinds of economic activities during the dry season. Most of the fishermen have no fixed income and income varies from time to time.

3.2 Fishing Practices and Fishing Gears used by Fishermen in Upstream Part Bicol River in Camarines Sur

TABLE 5. Fishing gears used by fishermen

What fishing gears are used in	M1	%	M2	%	M3	%	TOTAL	%
GILL NET	9	33%	54	40%	58	31%	121	34%
Seine Net	9	33%	30	22%	11	6%	50	14%
Scissors Net	0	0%	9	7%	7	4%	16	5%
Traps	7	26%	35	26%	69	36%	111	32%
Spear Gun	0	0%	0	0%	5	3%	5	1%
Electro-fishing	2	7%	7	5%	40	21%	49	14%
Use of chemicals & poisonous substances	0	0%	0	0%	0	0%	0	0%
Total	27	100%	135	100%	190	100%	352	100%

Table 5 shows the percentage of the different kinds of fishing gear by the fishermen in the river system of the upstream part of Bicol River in Camarines Sur. The most common fishing gear used by the fishermen are the gill net (34%) and traps (32%). Based on the interview some fishermen used two or more kinds of fishing gear

depending on the depth of the river and seasons. Usually during the rainy season gill nets are used. Unfortunately, even though electro fishing is prohibited by law, 49 or 14% use it for catching fish. Interestingly, the use of chemicals & poisonous substances no one uses for fishing. Mercado, J. (2016)^[10] also reported that most of the rural fishers Northern Part of Surigao Del Sur have use more than one gear for their fishing and majority of them used the gill nets as their gear in fishing because this is the most common method, at low cost and not specific to any individual species, this net catches all varieties of fish.

Biodiversity Awareness of Fishers in Upstream Part of Bicol River in Camarines Sur : Rivers are the most important environments in the Bicol Region, Philippines. Bicol Rivers support highly diverse habitat and wildlife despite their small area in the landscape. The value of naturally functioning rivers to society both culturally and by the provision of amenity, water supply and flood regulation benefits is clear. The exploitation of rivers by humans has led to widespread degradation of their natural character, resulting in a loss of characteristic habitat, biodiversity and the benefits we rely on. The loss of biodiversity is currently increasing at an alarming rate globally^[15]. Biodiversity is not only the richness of species; it is also their genetic variety and the multiple habitats and ecosystems in which these plants and animals live. Ecosystems contain both the living plants and animals and the nonliving elements (water, sunlight, soils) on which they depend^[16]. Aquatic ecosystems (habitats and organisms) include our rivers and streams, ponds and lakes, oceans and bays, and swamps and marshes, and their associated animals. Aquatic habitats provide the food, water, shelter, and space essential for the survival of aquatic animals and plants. Fig. 1 shows the responses of respondents to the question if they know what River biodiversity is?

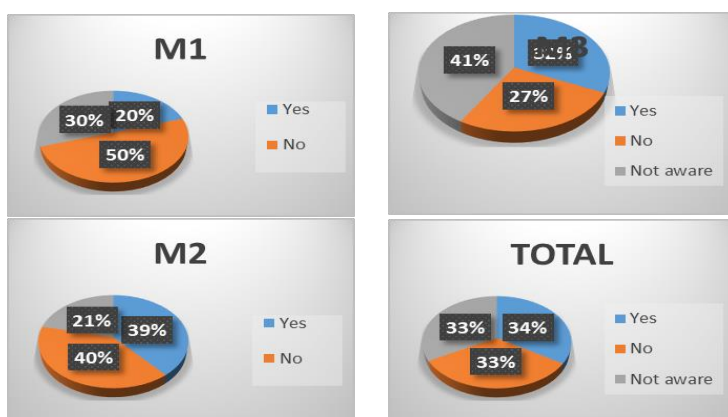


Figure 1. Awareness of Rural Fishers on River Biodiversity

Therefore, it is very important that local fishermen be aware of the river's biodiversity. Sad to note as shown in Figure 2, M1 (50%) and M2 (40%) do not understand the word biodiversity. Generally, 33% of the fishers don't know about river biodiversity and 33% were not aware about biodiversity. This is alarming. No awareness of the local fishers may lead to exploitation of rivers by humans which may result in widespread degradation of their natural character, resulting in a loss of characteristic habitat, biodiversity and the benefits of it. This data of this study will contribute a lot for proper management of the Bicol River.

TABLE 6. Awareness on the composition of river biodiversity

Composition of River Biodiversity	M1	%	M2	%	M3	%	TOTAL	%
Animals/Microorganisms	2	100%	21	48%	27	69%	50	59%
Trees/Plants/Forests	0	0%	13	30%	6	15%	19	22%
Estuaries/Coastal Areas	0	0%	2	5%	2	5%	4	5%
Rivers/Lakes/Streams	0	0%	8	18%	4	10%	12	14%
Total	2	100%	44	100%	39	100%	85	100%

Table 6 shows the awareness on the composition of River biodiversity. It reflected that out of 85 who responded that they know river biodiversity 50 or 59% stated that its composition is animals and microorganisms, 22% for trees, plants and forest and 14% for rivers, lakes and streams. The date noted that the fishers are not very aware or less knowledgeable on river biodiversity as Louis A. H. et.al, (2009)^[16] defines biodiversity as not only the richness of species; it is also their genetic variety and the multiple habitats and ecosystems in which these plants and animals live. Ecosystems contain both the living plants and animals and the nonliving elements (water, sunlight, soils) on which they depend.

TABLE 7. Awareness on the importance of the river systems and other **ecosystems**

Importance of the River Systems and Other Ecosystems.	M1	%	M2	%	M3	%	TOTAL	%
As Habitats of various species	4	16%	39	21%	40	16%	83	18%
Provides food, livelihood and medicinal benefits to the people	6	24%	69	37%	96	38%	171	37%
Protect us from extreme/destructive effects of storm	3	12%	31	17%	45	18%	79	17%
Provides recreational, physical and mental and benefits, tourism activities, and spiritual activities	2	8%	22	12%	70	27%	94	20%
Economic and environmental benefits	10	40%	26	14%	5	2%	41	9%
Total	25	100%	187	100%	256	100%	468	100%

The rich biodiversity of rivers reflects the diversity of environments they flow through. River habitat includes aquatic and terrestrial areas, often changing over short distances and timescales owing to the dynamic nature of rivers^[17]. In this study fishers were asked importance of the river systems and other ecosystems, for the three (3) municipalities 37% agrees that river system provide food, livelihood and medicinal benefits to the people, 20% believes that river system provides recreational, physical and mental and benefits, tourism activities, and spiritual activities and 18% were certain that river systems serve as habitats of various species. These findings remind the researchers that Rivers are highly valued by humans for providing a wide range of essential goods and services, but the exploitation of rivers for society’s needs especially since the Industrial Revolution has led to the widespread degradation of their natural character, resulting in a loss of characteristic habitat, biodiversity and ecosystem services. This means river habitat is one of the most threatened habitat types.

TABLE 8. Awareness on the different ecosystem in the area

Different Ecosystems in the Area	M1	%	M2	%	M3	%	TOTAL	%
Rivers	10	67%	73	65%	112	47%	195	54%
Stream/Creeks	0	0%	8	7%	13	6%	21	6%
Lakes	5	33%	9	8%	43	18%	57	16%
Dam/Reservoir	0	0%	1	1%	1	0%	2	1%
Irrigation	0	0%	21	19%	67	28%	88	24%
Total	15	100%	112	100%	236	100%	363	100%

According to the Bicol River Foundation^[1] Bicol Rivers start from Lake Bato in Albay and Camarines Sur, 6 meters above sea level, and flow 94 kilometers downstream to its estuarine mouth at San Miguel Bay. Three

Lakes, Lake Buhi, Lake Baao, and Lake Bato, drain water into the Bicol River. With regards to the awareness of fishers of the different ecosystems in the Bicol River, it shows that they were not aware that other ecosystems in the Bicol River Basin are Rivers (54%) and Lakes (16%). As observed the Bicol River is also interconnected with the different tributary rivers.

TABLE 9. Awareness on the characteristics of rivers system in the area

Characteristics of Rivers System in the Area	M1	%	M2	%	M3	%	TOTAL	%
With mud & silts are deposited	9	28%	50	28%	99	28%	158	28%
Abundance of Macrophytes (i.e. Water hyacinth, kangkong, etc)	8	25%	66	37%	92	26%	166	29%
As domestic waste discharges (solid & liquid) area	2	6%	7	4%	15	4%	24	4%
With Grease & chemicals	2	6%	5	3%	7	2%	14	2%
With Agricultural wastes	3	9%	14	8%	68	19%	85	15%
Regularly flooded	8	25%	26	15%	67	19%	101	18%
With Structures that obstruct rivers flow	0	0%	11	6%	7	2%	18	3%
Total	32	100%	179	100%	355	100%	566	100%

Table 9 shows the Awareness on the Characteristics of Rivers System in the Area. The data tells that the Bicol Rivers are subject to a wide range of pressures including point source and diffuse pollution, water abstraction, invasive plant and animal species and physical modification. As revealed in Table above that fishers were aware that Bicol River now are abundance of Macrophytes (i.e. Water hyacinth, kangkong, etc) (29%), with mud & silts are deposited (28%), regularly flooded (18%), and with agricultural wastes (15%). This data signifies to the public and private agencies to help one another to restore the biodiversity of the river.

Constraints Faced by the Fishermen near the Bicol Riverine Areas : Rivers are increasingly threatened by human activities such as: overexploitation, water pollution, fragmentation, alteration, destruction or degradation of habitat and invasion by non-native species [18-19]. These fundamental alterations to the freshwater portion of the Earth’s hydrological system are increasing in many regions: human population growth, industrial development, water scarcity and alterations to rainfall /run-off patterns associated with climate change are the main drivers. Current water management practices may no longer be appropriate for the unpredictable flow regimes of a warmer and more densely populated world [21, 21, 22, and 23].

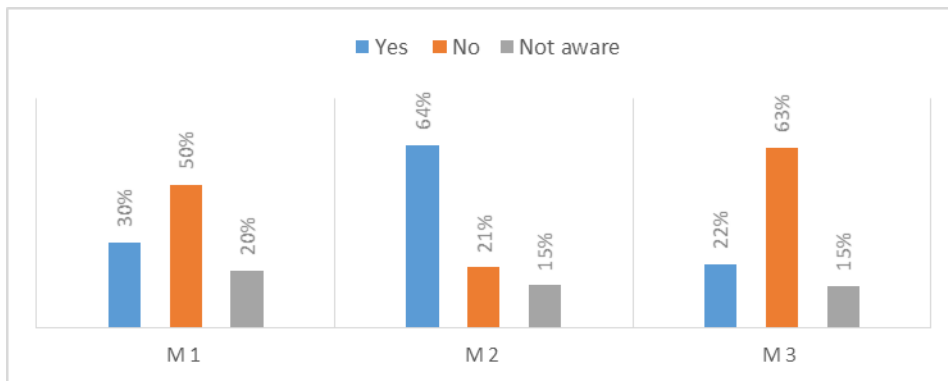


Figure 2. Responses if the conditions of the river systems affect wildlife and aquatic species.

In this study though the respondent observed that the river, constantly flooded, muddy and Abundance of Macrophytes (Table 9) but in M1 (50%) and M3 (63%) perceived that this condition doesn’t affect the river system while M2 (64%) apparently say “yes” it affects (Fig.2). Others were not aware if these conditions can affect the river system. Every living organism has an important role to play, and many are indispensable. Our aquatic wildlife are important sources of food, energy, jobs, atmospheric oxygen, buffers against new diseases, pests, and predators, and protection against shortages and global climate change^[16]. Without the rich natural diversity of native plants and animals, our lives would be poorer. Hence, public and private agencies

particularly the policy and BFAR make an effort to educate the fishers to be concerned on the life in the river by taking care and loving it.

TABLE 10. Factors and activities affecting the rivers.

Factors/activities that affect the rivers	M1	%	M2	%	M3	%	TOTAL	%
Weather disturbance	5	18%	52	32%	80	30%	137	30%
Quarrying	0	0%	10	6%	18	7%	28	6%
Illegal Fishing	10	36%	37	23%	56	21%	103	23%
Transportation	0	0%	11	7%	14	5%	25	5%
Runoff from sewage, deforestation, farming, and other land use	7	25%	28	17%	62	23%	97	21%
Sedimentation, erosion from farming and unsustainable land use	6	21%	19	12%	32	12%	57	12%
Pathogens from sewage and livestock	0	0%	4	2%	6	2%	10	2%
TOTAL	28	100%	161	100%	268	100%	457	100%

The data in Table 10 showed that 137 or 30% of the respondent agrees that weather disturbance is the main factor that affect rivers followed by illegal fishing, Runoff from sewage, deforestation, farming, and other land use, and Sedimentation, erosion from farming and unsustainable land use with the percentage (23%), 21% and 12% respectively. Based on the field experiences, floods and droughts or weather disturbances are the major risks in the upstream river, affecting the fisheries sector, thus making it a high risk municipality. These variability have resulted in loss of diversity of the river. Hence proper management of the river is very important to look into. Policy makers, BFAR, LGUs and SUCS have the responsibility to formulate and implement adaptation and inform the fisher folks.

IV. CONCLUSION AND RECOMMENDATION

The fishing communities of the study area were found to belong to disadvantaged groups. The economic condition of the fishermen was poor, even though they were not fully engaged in fishing. Majority of the fishers in the area were dominantly men, marriage, age ranges 49-59 years old, and at least graduated elementary level. There were 7 types of fishing gears used and the most extensively used was gillnet or depending upon the seasonal variation. Most fishermen were less perceptive about river biodiversity and the effect of the real situation of the river on life in the riverine. As observed, the river, constantly flooded, muddy and Abundance of Macrophytes and the river area are increasingly threatened by calamities and human activities. However, less awareness of the fishers were found so alarming. From the findings of the study, the following recommendations can be made to improve the socio-economic condition of the fishermen and their awareness of the biodiversity of the river thereby improving their welfare. Educational institutions should be set up in fishing villages to improve their educational status; Strength of public awareness on biological diversity of the river through the various publications and publicity for protecting riverine resources. Pollution and flood control must be given attention by the LGUs to save and restore biological diversity; Local government, NGOs should play a vital role for improving and restoring the river system. The Bureau of Fisheries and Aquatic Resources (BFAR) should strengthen mechanisms for the implementation of Balik Sigla sa Ilog at Lawa (BASIL) programs and increase support to LGUs initiatives in protecting and restoring biodiversity of the river in a culturally appropriate manner.

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