



## From target to non-target: the shifting catch in Bicol River during the Covid-19 pandemic

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**Abstract.** This study was conducted in order to quantify the effect of Covid-19 in fishing communities, in terms of changes in target species (TS) and non-target species (NTS) composition of catches. Field interviews were carried out in Camarines Norte and Camarines Sur from September 2019 to August 2020. Key informants interviewing (KII) and focused group discussion (FGD) were conducted in six municipalities covering 27 barangays. Data collection was done through face to face interviews and consultation meetings before the pandemic, while printed survey forms were facilitated after the enhanced community quarantine (ECQ). Catch frequency before and during pandemic showed great variations between the same months compared between 2019 and 2020. The monthly average catch of 5,553 specimens before the ECQ dropped by 79.51% during the community lockdown. The catch only returned to normal starting from June–August 2020, showing no significant difference ( $p>0.05$ ) before ECQ. However, the gap level of 92.71% of TS over NTS have declined during the ECQ, then NTS catch increased from 2.67% up to 40.32% till the end of June 2020. Hence, the average catch frequency before and after the ECQ showed no significant difference in terms of TS ( $p>0.05$ ) while in terms of NTS it differs ( $p<0.05$ ). The shift in the catch is the community's mechanism for survival during the pandemic. Therefore, repopulation and stock enhancement projects are necessary to sustain fishers' catch, prevent stock decline and maintain catch balance in the Bicol River.

**Key Words:** catch frequency, enhanced community quarantine, lockdown.

**Introduction.** Rivers are a vital resource for livelihood and an alternative source of food (Garcia et al 2018). In the Philippines, the Bicol River in Luzon contributes to both agricultural and fisheries livelihood. It sustains inland capture fisheries for economically important species like freshwater fishes, crustaceans and mollusks. In the northern side of the Bicol region, freshwater ecosystems are mainly composed of major rivers, smaller streams, creeks, dams, reservoirs, and irrigations. The river encompasses two provinces namely Camarines Norte and Camarines Sur which drains to San Miguel bay. Generally, it is used for agriculture and fisheries activities like farming and fishing. Commonly caught species are goby fish, tilapia, carps, mudfish, eel, catfish, climbing perch and silver perch. Gleaning activities target apple snail, fawn melania and some freshwater clams, while crustaceans being caught are river crabs, prawns and shrimps.

However, with the arrival of the coronavirus disease (Covid-19), fishing activities were stopped, shutting down fishing stations and fish landing sites. The disease was caused by a novel coronavirus SARS-CoV-2, previously known as 2019-nCoV, which focused the global attention on how to flatten the curve of infections and to eradicate the pandemic (Gou et al 2019). Globally, it created negative social and economic effects in fisheries like increased health risks and Illegal Unreported and Unregulated fishing (IUU) (Bennett et al 2020). In Asia, food security risks were reported to increase due to this virus disrupting both domestic and international food supply, which affected food availability and accessibility (Kim et al 2020). To ensure public health safety, enhanced community quarantine (ECQ) was enforced, eventually creating a negative economic impact (Vallejo Jr & Ong 2020). The Philippines was placed under ECQ on March 15, 2020 (Bernardo & Mendoza 2020) deploying police officers and military personnel at checkpoints to enforced border closures, entry bans and ensure people compliance with the lockdown (Duddu 2020). It was implemented to slow down the spread of the virus,

which resulted in hunger and poverty in the case of individuals and households with a non-stable form of employment, due to work restrictions (Ducanes et al 2020). As the government fought to contain the spread of the virus, fishing communities in the Philippines were distressed by extended lockdowns (Ocampo 2020). This study assessed the significant events and changes in fishing activities in the Bicol River, considering the pandemic's context adverse effect on livelihoods. The fishing community mechanisms and strategy of adaptation to the pandemic restrictions, in order to get food and earn an income, are important aspects in the elaboration of an appropriate regulatory response in terms of livelihood support, management and conservation of river resources.

**Material and Method.** This study was conducted for 12 months, between September 2019 and August 2020. Field interviews and monthly catch monitoring were carried out in the province of Camarines Norte and Camarines Sur, covering upstream, midstream, and downstream fishing stations and fish landing sites along the Bicol River. Key informant interviews (KII) and focused group discussion (FGD) were conducted in six municipalities namely San Lorenzo, Basud, Lupi, Sipocot, Libmanan and Cabusao. Catch monitoring and interview covered 27 fishing barangays namely Manlimonsito, Salvacion, Tuaca, Bahi, Polantuna, Napolidan, Sooc, Cristo Rey, Poblacion, Colacling, Bulawan Sr. San Pedro, Taisan, South Centro, Manangle, Malaguico, Gaongan, Tara, Mambalete, Handong, Beguito Veijo, Mambayawas, Aslong, Padlos, Uson, Sta. Cruz and Sta. Lutgarda (Figure 1). Coordinates of the sampling sites are obtained thru onsite geotagging and plotted on a map using geographic information system (GIS) software. Face to face interviews and FGD was conducted before the pandemic, while printed survey forms were distributed after the ECQ was lifted. Survey questionnaires were collected after being accomplished through the help of Local Government Units (LGUs) and barangay key officials. A purposive type of sampling interview was done to a total of 350 respondents who were identified as regular fishermen and residents in the community. The signature of the respondents was affixed at the end of the survey form for ethical consideration and as proof of validity and correct information. Descriptive statistics were used to analyze and compute the result of the study.

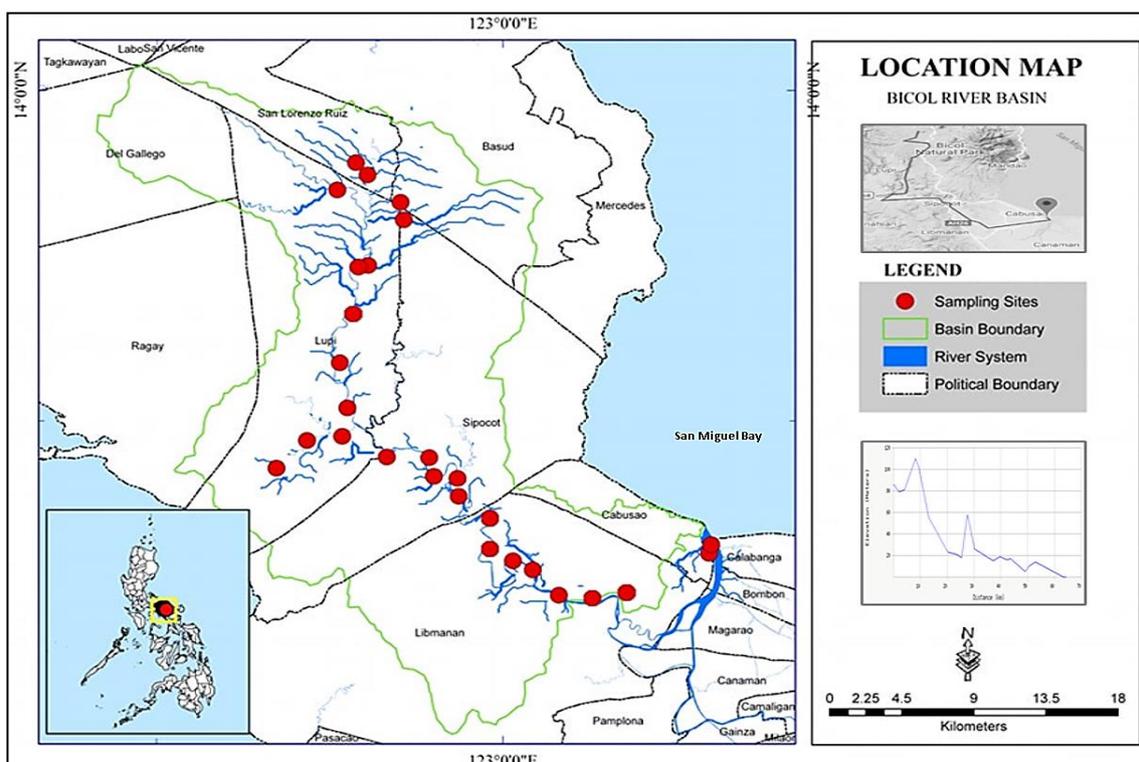


Figure 1. Location map of Bicol River, in the northern side of the Bicol region, showing the study sites.

## Results and Discussion

**Fishing gears and methods.** In the Bicol River, fishing is a way of life: the river offers to the residents feeding and livelihood opportunities. Fishing usually takes place at sites with a high catch frequency of target species. The ideal characteristics of fishing sites with high catch rates are deep lotic/lentic water, with constructed bridge or dam, cooled and sheltered area, covered with trees and vegetation, and with dense aquatic macrophytes. Fishing may occur at any time of the day and evening, up to midnight. Operation of passive-type fishing gears usually takes to 12-24 hours before hauling. Fishing gears like fish traps are set in rivers before dusk and hauled early in the morning. On the other hand, the fishing operation of active fishing gears takes about 1-5 hours. Generally, the lowest catch per fisher is estimated to 1-2 kg fishing trip<sup>-1</sup> in the river upstream. Catch can increase to about 10-20 kg per fishing trip in lower midstream and downstream facing San Miguel bay. Fishing gears may vary depending on the materials used, location, preferences and financial capacity of fisherman. Hence, gear design and structure mainly depend on the target species' size, body form, swimming and feeding behavior, habitat characteristics, water current and bottom topography. The fishing operation employs various fishing gears and fishing methods such as speargun (49.57%), seine net (30.13%), fish traps (28.85%), scissors net (16.24%), electro-fishing (9.40%), hook and line (8.76%), gillnet (2.99%), cast net (1.71%), chemicals and poisonous substances (1.50%), and crab lift net (0.40%) (Table 1). The most commonly used gear is the speargun, which relates to an old and traditional fishing method. Speargun fishing is selective, targeting bigger size fish and at higher market price. The commonly caught species with this fishing gear are flatfish like tilapia, but also fish with elongated body shapes, like eels, and other fusiform species, like catfish and mudfish. This gear is very popular in the upland and remote community since it is very efficient in catching fish and can be fabricated using only indigenous materials. Other fishing gears, like fish traps, crab lift net and gillnet are operated in passive fishing method, while fishing gear like seine net, scissors net, hook and line, and cast net are used to actively catch target species. Illegal types of fishing gear and methods are also being practiced especially in upland and rural communities where fishing operations can be concealed.

Table 1  
The utilization frequency and rank of fishing gears and methods in the Bicol River

<i>Types of fishing gears and methods</i>	<i>Frequency (n=350)</i>	<i>Utilization rank</i>
Speargun	49.57%	1
Seine net	30.13%	2
Fish traps	28.85%	3
Scissors net	16.24%	4
Electro-fishing	9.40%	5
Hook and line	8.76%	6
Gillnet	2.99%	7
Cast net	1.71%	8
Chemicals & poisonous substance	1.50%	9
Crab lift net	0.43%	10

**Target and non-target species.** Of the different species present in the river, 19 were identified to have economic value, also being an important river resource. The fish, crustaceans, and mollusks appeared to be the commonly targeted catch by fishers as a source of food and livelihood. Hence, 10 out of the 19 species belong to the top priority catch category, corresponding to a higher economic value and market demand. The computed average preference rating in each species revealed the commonly targeted species, identified as the top 10 priority catch in the Bicol River: tilapia (97%), freshwater prawn (89%), mudfish (76%), native catfish (71%), freshwater eel (65%), carp (61%), climbing perch (54%), goby fish (48%), freshwater crabs (39%) and fawn melania (35%). These species are within the computed 80% cumulative percentage

known as the vital few. On the other hand, the trivial many, which constitute the remaining 20%, comprised the species of silver perch (31%), golden apple snail (30%), native snail (25%), horn snail (21%), freshwater shrimp (19%), Asian clam (12%), glass perchlet (7%) black melania (5%) and half-beak (2%) (Figure 2). The vital few were categorized as the target species, obtaining high preference ratings, while the trivial many were non-target species, being of less interest for fishing and being caught occasionally. Non-target species also generate income and serves as alternative food in times of low catch of target species, food urgency, disasters, and calamity.

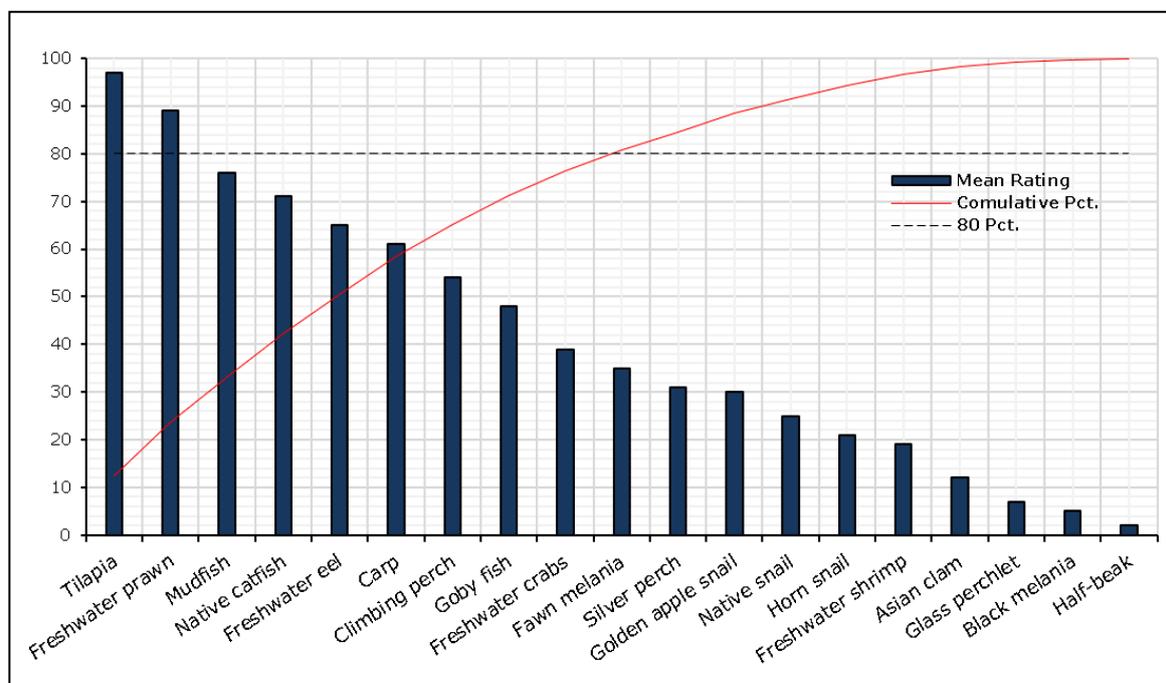


Figure 2. Pareto chart of commonly caught species showing the vital few (80%) & trivial many.

**Catch and landings.** The total annual catch is estimated to 54,357 with a monthly average catch of 4,530 in 2019-2020 (Figure 3). Formerly, there was a stable monthly average catch of 5,553 between October 2019–February 2020, before the community lockdown. However, an abrupt decline of catch volumes occurred starting from the months of March–April 2020, during the ECQ. The previous catch was reduced to 79.51% due to the community lockdown. Fishing activities were stopped during the outbreak, according to the safety protocol for preventing the spread of the virus. The decline in catch lasted up to June 2020, due to the work restrictions and different quarantine statuses between regions. Though, in upland rivers fishing was still possible without having to pass any checkpoint. However, the main livelihood derived from fishing was hampered by Covid-19 especially during the lockdown, especially vulnerable during the pandemic are those marginalized populations (Cuaton & Su 2020). Covid-19 severely disrupted the food supply chains the world has never experienced before (Udmale et al 2020). During this time, fishers have mentioned that they resorted to catching other species and whatever is available. Fortunately, the catch started to increase during the month of May after ECQ was lifted. The average catch after ECQ increased by a factor of 4 during the period of June–August 2020, and by 5.76% compared to September–November 2019. Hence, the average catch showed no significant difference ( $p > 0.05$ ) before and during Covid-19. It appeared that the monthly average catch has returned to normal after the ECQ when the catch started again to boom.

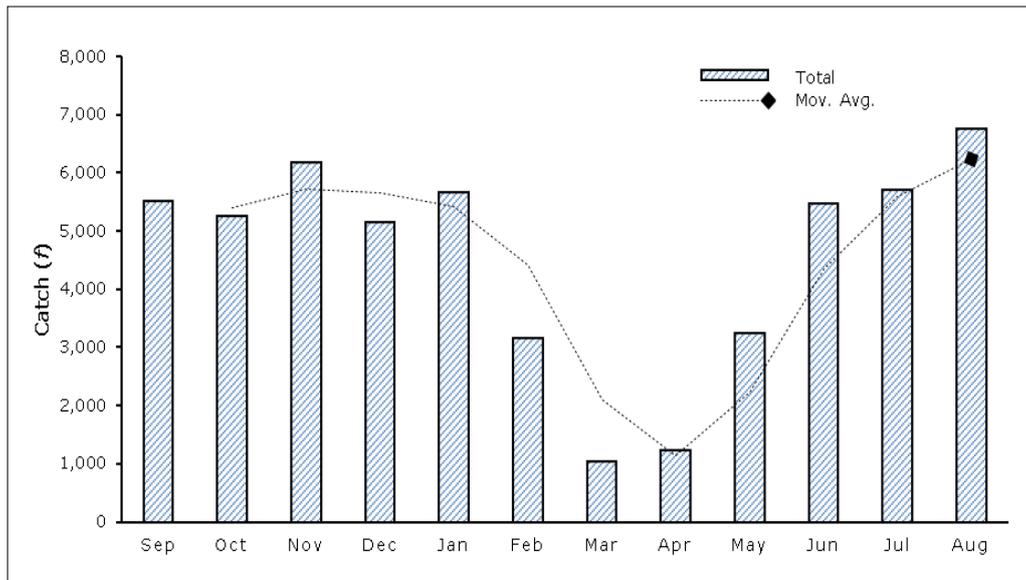


Figure 3. Total annual and monthly catch in Bicol River before and during the pandemic.

**The shift in the catch.** Decline in catches occurred due to community lockdown, but returned to normal after ECQ was lifted, showing no significant changes in the average catch before and after ECQ from September–November 2019 and June–August 2020. However, comparing catches between target and non-target species of the same months displayed great disparities before and after ECQ (Figure 4). The volume of catch in target species, which maintained a gap level of 92.71% over the non-target species before the ECQ (September to January 2019) declined and shifted to catch increase in non-target species during the community lockdown (March–April 2020). The catch of non-target species during the ECQ increased by 2.67% over the target species and progressively increased until reaching 40.32% until the end of June 2020 (Figure 4). This showed that during the pandemic fishers have shifted progressively from catching the usual target species to non-target species. The target species catch during September–November 2019 and June–August 2020 showed no significant difference (T-test=0.23,  $p > 0.05$ ). However, the catch in NTS showed a significant difference (T-test=0.02,  $p < 0.05$ ). These changes can be attributed to the effect of Covid-19 on the fishing effort, livelihood and food availability during the community lockdown.

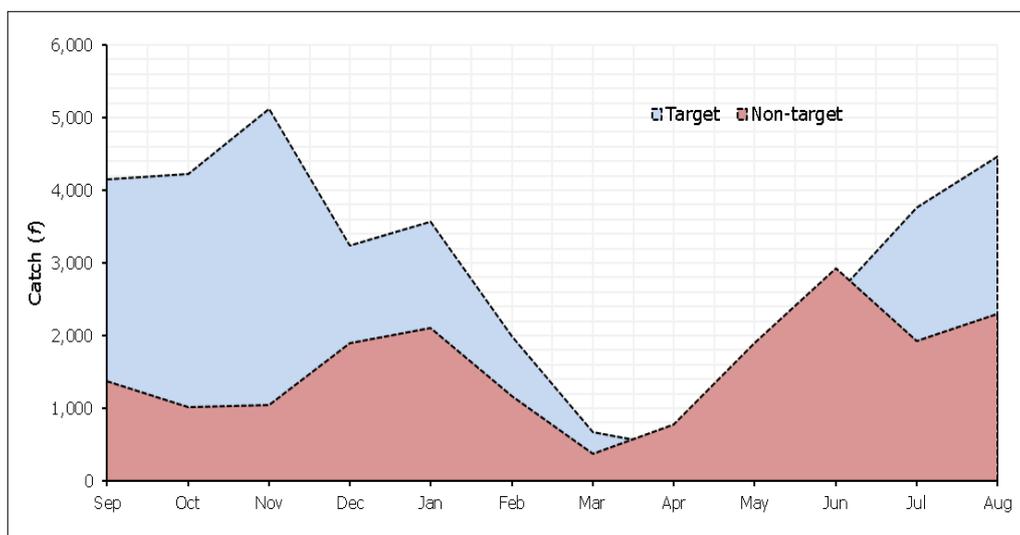


Figure 4. Monthly target and non-target species frequency in catches before and after the enhanced community quarantine.

The Bicol River supports inland capture fisheries activities, for this reason fishing communities experienced food and livelihood difficulty during the pandemic. The crustaceans and mollusks which can be easily caught served as their main food diet during the food urgency. As result, the normal catch frequency between target and non-target species varies between the same months of 2019–2020. The shifting of catch from target species to non-target species was the community's mechanisms and adaptation strategy during the pandemic for fast and easy access to food. Therefore, non-target species can be considered as an emergency food during disease outbreaks, disasters, and calamities and will remain and continue in times of scarcity. Hence, one reason that can be attributed to the catch increase in non-target species was the decline in the target species population. The fishing effort between target and non-target species will go back to normal when the livelihood of the fishing community becomes more stable. If not, the utilization of illegal fishing gears and fishing methods will increase resulting to heavy exploitation. That's why regular catch monitoring and strict implementation of fishery laws is very important especially in times of pandemic. With the constant evolvement of viruses' people needs to live with the new normal (Denworth 2020) and need social and economy empowerment through sustained investments in communities to build adaptive capacity (Susantono et al 2020). The health protocol in fishing and landing sites should be properly observed and shall also adapt to the new normal in the fishing and marketing process. Hence, river stock enhancement projects, especially for economically important species, need to be given attention to repopulate stocks in the Bicol River, providing a source of food and additional income. Especially, that fishing is important at local level economy since livelihood of many low income communities depend on fish (Minahal et al 2020) and after structural transformations during Covid-19 the agriculture sector aims to achieve food security and resiliency for fisher folks (World Bank 2020).

**Conclusions.** On the basis of the findings, to quantify the effect of Covid-19 in fishing communities in the Bicol River, the abnormalities in catch which occurred between March and April 2020 were due to community lockdown during the enhanced community quarantine. Change in catch compositions from target to non-target is due to work restrictions and "stay at home" order being imposed during enhanced community quarantine. The shifting in catch primarily from target to non-target species is the community's adaptation strategy for fast fishing time and access to food and income in order to adapt to strict implementation of safety health protocols, food shortage and prevent possible virus transmission. The short-term changes in normal catch composition during the pandemic are likely to change and impact the lives of the community especially their catch preferences. Hence, aside from food and livelihood support, repopulation and stock enhancement projects are necessary to sustain fishers' catch, prevent stock decline and maintain catch balance in the Bicol River.

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