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Research article

GUT CONTENT ANALYSIS OF PIJANGA (*Glossogobius giuris)* INHABITING THE LAKE MAINIT OF NORTHEASTERN MINDANAO, PHILIPPINES

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ABSTRACT

The lake and its resources are vital to the fishing community for food and livelihood sources. This is the case among the fishing community in Lake Mainit which relied mainly on pijanga fishery. As such, pijanga was described in terms of its gut content wherein it had described the gastrosomatic index as a function of food availability and water quality within the Lake. Standard methods of analysis were used. Results revealed that water quality did not affect the feeding habits of pijanga such that specimens captured were optimally fed. Major food items included fish larvae, crustaceans, some algae, and other identified debris. This means that the Lake ecosystem is still favorable for the growth of pijanga, and therefore, demands appropriate actions for conservation and management.

Keywords: pijanga, Lake Mainit, Northeastern Mindanao, tropical fishes

INTRODUCTION

G. Giuris is a native fish species in Lake Mainit. They rely on the lake for their food and habitat, decrease in availabity of food in the Lake would result to decreasing number of G. giuris. The study on gut content of *G. giuris* tells us the food status. Lake Mainit is threatened by overexploitation, resulting in decreasing fish catches, according to a study made by Mindanao State University at Naawan in year 2008.It is the fourth largest Lake, 28 river tributaries and one outlet river that flows into Butuan Bay.This highly productive and diverse wetland ecosystem supports a thriving freshwater fishery and the livelihood of more than 3,000 fishers using highly diverse gears. Survey shows that five crustaceans, 10 mollusks, 41 species of fish and 15 species of aquatic plants are found in Lake Mainit and its outlet, the Kalinawan River.The survey found that, in terms of fisheries and vegetation, Lake Mainit and Kalinawan river are distinct ecosystems (Icamina 2016).The study on *G guiris* gut content will give an insight on the feeding pattern og G. guiris. Assessing the water quality of thhe

Lake will give basis on the abundance and kind of species in the lake. Community's knowledge, perception and attitude affect the management and utilization of the Lake. There is really a need to study on G. guiris gut content as there are only limited studies that focuses on *G. guiris* gut content.

The Philippine's vast fishery resources could be attributed to its archipelagic nature, providing a lot of available habitats and food sources for different fish species. Rampant overfishing and widespread destructive fishing methods led to the enactment of the Fisheries Code of the Philippines or Republic Act No. 8550 in 1998. This is to regulate the indiscriminate use of fishery resources, which are currently threatened by alarming rates of habitat destruction and fragmentation, increasing population growth, loss of species, uncontrolled pollution levels, and introduction of invasive exotic species in national and local scales. Threats of a changing climatic pattern characterized by erratic rainfall patterns, increased temperature, occurrence of strong typhoons, and prolonged occurrence of drought can also exacerbate the loss of Philippine fishery resources (Vedra and Ocampo, 2014).

The evident result of the known threats mentioned leads to a disturbed habitat and altered food sources of fishes. This in turn leads to a declining fish catch, which directly affect food and livelihood opportunities of the many fishing communities. This may be a major issue in Lake Mainit in Surigao-Agusan del Norte provinces. The Lake is known to be the home of *Glossogobius giuris,* locally known as *pijanga,* a native and considered important fish in Surigao del Norte, Philippines. Its current status in the Lake is threatened by overfishing, catching of its fingerlings and occurrence of sewage disposal and chemical leaching from farms and mines. Despite its abundance, it has a minor commercial value and lesser market price compared to tilapia, carp, and catfish (Vedra and Ocampo, 2014).

The study aimed to analyse the gut contents of *G. giuris* in Lake Mainit in terms of gastrosomatic index gut wet weight estimates. The result of this study gives insights to the future researchers who wish to study got content of freshwater fishes. Fish gut content analysis provides information on the availability of food resources in Lake Mainit. Trophic studies are fundamental components of our understanding of biology and ecology, from observing individual organisms to modelling ecosystem function. When measuring fish gut contents, we rely on collecting samples that represent snapshots in time.

MATERIALS AND METHODS

The MSU-Naawan research team personally went to the different municipalities of Agusan del Norte and Surigao del Norte and asked permission from their very local executives to conduct a study on Lake Mainit. Upon the implementation of this study, the respective government officials were informed regarding the new study that was conducted in the Lake.

Study area

Lake Mainit is the fourth largest lake in the country; it has a total area of about 17,060 hectares and its lakeshore has total length of 62.10 kilometers. The lake is divided almost equally between the provinces of Agusan and Surigao del Norte. It is most known for its rich fish resources. (Work press 2016)
Lake Mainit is reported to be the habitat of rare fish species; the puyo or perch and gabot. These species have become rare due to the introduction of new fish species. Habitats of other rare and threatened wildlife put the lake and its surrounding area of high ecological value. Its water is classified as Class A by the EMB (Work press 2016).

Sampling stations

Four strategic sampling stations were established along the stretch of the Lake
Sampling stations are chosen based on composite sampling procedure.
Station 1 was established at municipality of Jabonga, Agusan Del Norte (9°36'9" North 125° 53'2" East) where settlement areas are near the lake. Station 2 was established at Kitcharao, Agusan del Norte (9°46'1" North 125°53'9" East) there are also houses near the lake. Station 3 was established in Alegria, Surgao del Norte (9°52'8" North 125°59'2" East) where farm land are near the lakeshore. For Station 4 it was established at Mainit, Surigao del Norte (9°69'5" North 125°) where resort, fish landing area and settlement are present.

Sample collection

During the sampling a locally-used cast net fishing gear locally called as *laya or laja* was used for the collection of *G. Giuris* specimens which is done by our partner fishermen. After, collected *G. giuris* samples in every collection site are dissected and weighed for extraction of gut content.

Sampling was done once at Lake Mainit. All samples were analyzed using gravimetric method. In gravimetric analysis of stomach contents, wet weight were used to analyze G. guiris gut content. Wet weight is probably the more convenient measure less time consumed and is usually employed where accurate determinations of calorific intake are required (Glenn & Ward et al. 1968).

Sample preparation

Gut content is preserved in 10% buffered formalin. Samples are weighted first on site then preservation to prevent an addition on over all weight of the gut content after the gut content will be analyzed.

Extraction of gut content

Wet gut weight is determined, after the determination of gut weight the samples were analysed. The variation in the amount of moisture removed has been identified as a major source of error in weight measurements .The total weight of a food category can be expressed as a percentage of the overall weight of stomach contents, where weight is ‘ wet ‘. Alternatively food category weight may be expressed ‘wet’ as a proportion of body wet weight or body dry weight expressed food category dry weight as a proportion of body dry weight. Values, incorporating body weight are probably more useful since they are a measure of food intake relative to fish size. In the case of fish where the amount of stomach contents is too small to be weighed practically an overall picture of dietary composition can be obtained from the pooled weight of each food category (Foltz & Norden et al. 1977). Mean weight of stomach contents has been employed. working on perch fry, with only a small amount of stomach contents, calculated mean weight of contents collectively i.e. as:

$$\mathrm{n} = \frac{Total\ stomach\ weight\ content}{\text{Total fish weight}} X\ 100$$

Sikora et al. (1 972) determined mean dry weight for prey species and expressed this as ‘biomass units’. Variation in the mean total weight of stomach contents relative to fish size is frequently used in determining the die1 rhythm of feeding behaviour (Staples, 1975). The relationship between the gut content of male and female *G. guiris* were represented. The mean and standard deviation of both sexes is analyzed using statistical analysis.

Statistical design

Descriptive statistical analysis is used to examine the central tendency or the location of data as measured by mean, media, mode and the variability or dispersion of data. The relationship between the gut content of male and female *G. guiris* were represented One Way ANOVA. The mean and standard deviation of both sexes is analyzed using past software.

RESULTS AND DISCUSSION

The mean/SD values of male *G. giuris* ranged from 0.32±0.18 to 1.68±0.22. While the female’s gastrosomatic index (GaSI) ranged from 1.25±0.48 to 3.95±0.38. However, there no significant difference among male and female in four municipalities but result shows that the female *G. giuris* is heavier than the female (Table 1).

According to Sano 1993 on *Pinguipedidae,* males spent much less time feeding and more time on territorial and social activities than did females, because males would be able to gain increased mating success by defending their territories, maintaining social dominance over females, and securing mates. Females spent much more time feeding, likely because of limitation of female reproductive success by available energy for gamete production and growth.

Table 1. Gastrosomatic index of both male and female pijanga in Lake Mainit.

Male			
Collection Sites	Mean±SD values (g)	F value	P value
Jabonga	0.32±0.18	0.15	0.86
Alegria	0.72±0.39	0.47	0.63
Kircharao	1.68±0.22	1.02	0.38
Mainit	1.17±0.67	1.18	0.57
Female			
Collection Sites	Mean±SD values (g)	F value	P value
Jabonga	1.25±0.48	1.25	0.34
Kircharao	1.84±0.07	0.73	0.50
Alegria	1.73±0.26	1.02	0.38
Mainit	3.95±0.38	1.47	0.25

Availability of food supply in the environment is very important for fish. Like any organism, fishes require adequate nutrition in order to grow and survive. Through examination of the contents of digestive tracts and through physiological studies in the laboratory, researchers have learned much concerning feeding behavior, the kinds of organisms that are eaten, the mechanisms that have developed for digestion as well as the trophic relationships of fishes (Lagler, 1977).

Gut content description

Gut content of pijanga was estimated in terms of percent by volume. Major food items of pijanga for both male and female included fishes, shrimp, plankton, eggs of unknown species and other unidentified food (Table 2).

Table 2. Gut content description for *G. guiris* inhabiting Lake Mainit.

Alegria	
Gut Description	Frequency
Juvenile fish	100%
Shrimp	25%
Unidentified	50%
Jabonga	
Gut Description	Frequency
Egg	8.33%
Juvenile fish	100%
Plankton	4.16
Shrimp	41.67
Unidentified	100%
Kitcharao	
Gut Description	Frequency
Egg	33.33%
Juvenile fish	100%
Unidentified	100%
Mainit	
Gut Description	Frequency
Egg	16.67%
Juvenile fish	100%
Shrimp	8.33%
Unidentified	75%

Community level trophic dynamics, including feeding ecology, are important in understanding interactions between invasive and native species. Invasive species often have the capacity to process materials differently and consume different prey than native species and subsequently can affect change in how an ecosystem functions The feeding ecology of an invasive species can influence community interactions including distribution and abundance of a species. The limited information available on feeding ecology for most fish species makes it more difficult to accurately assess the stability of fish populations and their vulnerability to changes in prey availability (Arim et al. 2006).

Based on the result *G. guiris* consumes a variety of small prey items like juvenile fish, eggs, plankton, shrimp and unidentified prey items. Juvenile fishes shows the most important prey item as it is present in all fish gut content followed by unidentified fish gut. The main reason for its unidentification is due to their condition some are in its early stage of decomposition while some are cannot be thoroughly seen under a light microscope. According to Andraso et al. (2011) who evaluated patterns based on sex of round goby *Neogobius melanostomus* and found that sex did not predict any parameters of average consumption. His study found trophic diversity was highest for the combined sexes, but females had higher prey dominance than males, an indication that females may be more reliant on large volumes of few prey items.

The food of the various fish species varies with life history stage, the kind of food available and change with the season. The food studies may show details of the ecological relationships among organisms. The food relationships determine population levels, rates of growth and conditions of fish. Feeding of most fishes in nature may presumed to be upon bacteria, desmids, diatoms and other microscopic plankters, both plant and animal. Open water pelagic organism's food includes algae, protozoans and micro crustaceans, debris and plant stems and leaves. The gut content analysis gives an idea about the actual diet of the fish species. In aquaculture practice, to increase the yield of cultured fish the accurate knowledge of food and feeding is essential (Khabade, 2015).

CONCLUSION AND RECOMMENDATION

Based on the result Lake Mainit, is still good in condition and has a favorable water quality for aquatic organisms living especially *G. guiris*, though the condition of the Lake is favorable water quality there are still threats to *G. guiris*. Anthropogenic activities especially fishing pose some threat to *G. guiris* population and food resources due to destructive way of fishing method. During the sampling period the presumed environmental stressors did not affect the biological and ecological status of *G. guiris.* This is justified by the presence of food items for*G. guiris,* wherein juvenile fishes are the primary prey of *G. guiris.* This is present in all fish samples collected and other unidentified debris were also observed as part of their diet. The result of this study revealed that Lake Mainit is still capable for fish growth and reproduction and safe water quality values are within tolerable level set by the DENR but maybe threatened in near future because of anthropogenic activities that exist along the lake and therefore, this study would recommend the following:

1. Conduct of IEC to increase their knowledge and awareness in their role on the conservation and management of the Lake.
2. Further research and scientific study that assess the growth and reproduction of *pijanga.*
3. The LGUwithin the parameter of Lake Mainit must enhance and strictly enforce the existing barangay/municipal ordinances and policies regarding the conservation and management of the lake. Especially with the compliance on Fisheries Code of the Philippines or Republic Act No. 8550 in 1998.
4. Regular monitoring of the river must be done to prevent sudden water quality changes that might affect the growth and reproduction of all species living in the Lake.
5. People and community must be involved in protecting in maintaining the water quality of the river for sustainable lake use.

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