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Research article

PHENOTYPIC AND BODILY STRUCTURES OF *Glossogobius giuris* (HAMILTON 1882) IN THE LAKESHORE OF LAKE MAINIT, NORTHEASTERN MINDANAO, PHILIPPINES

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ABSTRACT

Certain environmental factors could create some conditions that will isolate and restrict the life history of organisms, and in turn, could affect their phenotypic characteristics. As such, a study was conducted to describe the body proportionality and sexual dimorphism of *Glossogobius giuris* inhabiting the waters of Lake Mainit, Northeastern Mindanao. Male and female specimens were collected in the waters of Lake Mainit within the four municipalities, namely: Mainit, Alegria, Kitcharao and Jabonga for a two-year period done quarterly using a locally available modified cast net. Twenty four morphometric characters were used to account the measures on sexual dimorphism and body proportionality. Measurements were done using a digital vernier caliper. Results showed that *G. giuris* was not sexually dimorphic, and that, no apparent distinction was observed between male and female. Most of the morphometric characters measured were highly correlated, hence, both male and female had well-proportioned body structures. This means that the inhabiting *pijanga* are 'beautiful' and are assumed to be a result of available food sources and good quality of habitat. Further, this means that there was no habitat restrictions or geographic isolation within their habitats in the Lake. It is imperative therefore that appropriate conservation and management options should be enacted to protect the inhabiting *pijanga* and the entire Lake ecosystem.

Keywords: pijanga, sexual dimorphism, body proportionality, Lake Mainit

INTRODUCTION

Glossogobius giuris, which is a member of true goby in Family Gobiidae, inhabits in almost all aquatic ecosystems including freshwater, estuaries and inshore areas. Its life history is amphidromous and benthopelagic. Phenotypically, it has flattened head, with a lateral profile straight on the middle to convex onwards its head and caudal fin, which is very closely similar to *G. celebius*(UPLB Limnological Research

Station 2011). It can complete their life history in freshwater but not restricted to the brackish and marine inshore areas (Maugé, 1986). It inhabits mostly in rock, gravel, or sand bottoms(UPLB Limnological Research Station 2011).

Glossogobius giuris, locally called *pijanga,* are found the four municipalities of Lake Mainit, in Northern Mindanao (Figure 1). They are important fishery resource and become part of livelihood of the fishing communities.

In this study, the morphology of *G. giuris*, is described to assess in terms of sexual dimorphism and body proportionality. This is an important measure to account if there could be some geographic isolation or habitat restrictions due to some influencing environmental factors like the water quality.

In some studies, sexual dimorphism is biologically important for determining the morphological traits of species.Sexual dimorphism can be used by fishes as an adaptive mechanism to maximize predator-escape performance and survival capacity. Furthermore, a significant shape variation between populations can be interpreted as due to geographic isolation which serves as physical barrier on the gene poolincluding predation and biogeographical barriers (Silos et al., 2015).

In case of Etruscan goby *Padogobius nigricans,* sexual dimorphism affect the studied traits, and thus provide usefulcharacters for preservation purposes. Significant intra- and inter-population differences were detected for some meristictraits. In particular most of the studied parameters were affected by ontogeny but not sexual dimorphism exceptfor the caudal fin, for which different values were registered for both sexes in two of the three studied populations.This suggests that the meristic pattern may change from one population to another. Considering the short geographicdistance and the similar environmental conditions among the analyzed locations, this differentiation was not expected (Scalici and Gibertini, 2012).

Figure 1. The inhabiting *pijanga* in Lake Mainit showing its phenotypic attributes.

MATERIALS AND METHODS

Study area and specimen collections sites

Lake Mainit watershed covers about 351.40 km^2 extending from the municipalities of Mainit and Tubod in the North; Alegria and Kitcharao in the east; Malimono in the west; and Jabonga in the south, which the water drains at Kalinawan River. Among these municipalities, about 29.11% or 102.30 km^2 of land area is under the jurisdiction of Mainit (Figures 2). This is followed by Jabonga of about 17.84% or 62.70 km^2 and Alegria of about 15.82% or 55.60 km^2. Not far from Alegria is Kitcharao, which covers about 15.37% or 54.01 km^2. The Municipality of Sison covers about 1.2% of watershed which is about 3.39 km^2 (LMDA, 2014 cited in Padilla et al., 2015).

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Figure 2. Map of Lake Mainit showing the location of the municipalities of Jabonga and Kitcharao in Agusan del Norte, and Alegria and Mainit in Surigao del Norte.

Collection of *pijanga* specimens

A locally-used cast net fishing gear known as *laya or laja* was used for the collection of *pijanga* specimens and done by the partner fishermen either in whole day or overnight basis depending on wave action and weather conditions. *Pijanga* samples collected in each collection site were subjected to morphometric measurements, extraction of gonad samples. Collection of *pijanga* specimens in four collection sites were done in a quarterly basis for two years.

Morphometric and meristic analysis

Twenty four morphometric characteristics were used: total length (TL), standard length (SL), head length (HL), predorsal length (PDL1), snout to second dorsal fin origin (PDL2), prepelvic length (PPL), preanal length (PAL), snout to anus (SA), ventral fin to anus (VFA), caudal peduncle length (CPL), caudal peduncle depth (CPD), first dorsal fin base (DFB1), second dorsal fin base (DFB2), anal fin base (AFB), caudal fin length (CFL), pectoral fin length (PFL), ventral/pelvic fin length (VFL), anal fin length (AFL), body depth at pelvic origin (BDPO), body depth at anal fin origin (BDAO), body width at anal fin origin (BWAO), head depth (HD), head width (HW), and eye diameter (E). All measurements were rounded-off to nearest 0.01 mm using a vernier caliper, and measurements obtained were entered into a designated data sheet.

RESULTS AND DISCUSSION

Sexual dimorphism between male and female *pijanga*

The morphometric and meristic characters measured were used to account if the specimens collected in each sampling municipality would exhibit sexual dimorphism. Results revealed that all of the morphometric and meristic characters of male and female *G. giuris* in the four municipalities were not significantly different (P>0.05) (Tables 1,2,3,4). This means that male and female pijanga were not sexually dimorphic.

Generally, the result showed that *G. giuris* was not sexually dimorphic, and that no apparent distinction was observed on their morphological attributes. This implies that male and female pijanga were relatively similar and could not be distinguished easily (Vedra, 2012). Since they were not sexually dimorphic, this means that there was no habitat restrictions or geographic isolation within their habitats in the Lake. Availability of food supply could also explain their similarities in sizes and lengths resulting to their similarities in their morphology. Also, it could result to a relatively good genetic flow and transfer (Silos et al., 2015). In some studies, the observed no sexual dimorphism of *pijanga* could be due to genetic differentiation in terms of allozyme data, egg size and clutch size (Masuda et al, 1984, Kon and Yusino, 2003). Color polymorphism signifying gene flow for promoting adaptations through genetic nobilities available throughout the species range. In some fish populations, resource polymorph is primarily due to genetic polymorphism (Hori, 1993), while others could be a result of phenotypic plasticity (Meyer 1987; Robinson and Wilson, 1996).

Table 1. Sexual dimorphism based on the mean ± SE (combined sexes) of *G. giuris* inhabiting the waters of Mainit, SDN, Lake Mainit, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	MALE	FEMALE	T VALUE	P VALUE
Morphometric				
TL	149.71±9.62	145.34±18.59	0.236	0.094
SL	139.15±42.86	128.50±16.39	0.310	0.073
HL	40.45±3.81	38.54±7.22	0.139	0.101
PDL1	55.74±5.85	52.83±10.90	0.235	0.078
PDL2	73.13±14.54	68.55±15.89	0.167	0.096
PPL	44.56±3.88	42.13±6.71	0.244	0.080
PAL	77.62±6.87	71.24±12.50	0.192	0.087
SA	69.69±4.78	65.59±10.67	0.262	0.097
VFA	29.75±3.57	26.16±4.75	0.142	0.105
CPL	25.70±5.81	26.86±6.59	0.272	0.095
CPD	11.90±2.57	13.23±2.44	0.167	0.121
DFB1	15.71±2.75	15.44±2.80	0.137	0.084
DBF2	24.12±3.88	21.76±4.62	0.301	0.079
AFB	22.92±4.26	20.64±4.58	0.286	0.112
CFL	26.20±12.22	27.76±17.25	0.172	0.073
PFL	24.40±2.72	21.91±4.10	0.142	0.125
VFL	18.11±2.10	16.52±2.25	0.266	0.100
AFL	30.31±3.07	27.33±4.64	0.197	0.076
BDPO	22.52±2.30	23.32±2.59	0.178	0.092
BDAF	20.81±3.12	21.60±3.26	0.176	0.085
BWAF	20.53±2.95	18.87±4.42	0.221	0.091
HD	19.91±3.23	18.32±4.14	0.284	0.093
HW	20.83±2.73	18.87±3.71	0.221	0.083
E	6.17±0.61	6.06±0.63	0.202	0.075
Meristic				
LLS	53 ±3.11	52±3.24	0.134	0.110
DS1	6±0.63	6±1.33	0.214	0.080

DS2	10±0.51	10±0.83	0.320	0.074
AS	10±0.78	10±0.77	0.131	0.122
PS	16±1.22	16±1.21	0.210	0.092
VR	10±0.52	10±0.93	0.300	0.077
CR	15±0.72	15±1.61	0.217	0.088

Descriptions: total length (TL), standard length (SL), head length (HL), predorsal length (PDL1), snout to second dorsal fin origin (PDL2), prepelvic length (PPL), preanal length (PAL), snout to anus (SA), ventral fin to anus (VFA), caudal peduncle length (CPL), caudal peduncle depth (CPD), first dorsal fin base (DFB1), second dorsal fin base (DFB2), anal fin base (AFB), caudal fin length (CFL), pectoral fin length (PFL), ventral/pelvic fin length (VFL), anal fin length (AFL), body depth at pelvic origin (BDPO), body depth at anal fin origin (BDAO), body width at anal fin origin (BWAO), head depth (HD), head width (HW), and eye diameter (E).

Table 2. Sexual dimorphism based on the mean ± SE (combined sexes) of *G. giuris* inhabiting the waters of Alegria, SDN, Lake Mainit, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	MALE	FEMALE	T VALUE	P VALUE
Morphometric				
TL	147.93±10.65	144.29±14.65	0.328	0.086
SL	138.43±43.45	127.51±14.44	0.314	0.073
HL	40.31±3.71	36.12±8.15	0.313	0.081
PDL1	57.33±7.12	51.14±8.71	0.320	0.087
PDL2	70.33±15.81	63.03±16.34	0.139	0.092
PPL	44.15±4.77	40.69±8.51	0.255	0.086
PAL	75.82±7.24	66.22±12.72	0.203	0.083
SA	68.63±5.10	61.63±10.18	0.286	0.073
VFA	29.54±3.24	25.42±4.87	0.124	0.090
CPL	26.10±5.91	24.84±5.91	0.373	0.094
CPD	12.19±2.78	13.39±2.67	0.314	0.081
DFB1	16.31±3.21	13.87±2.51	0.122	0.065
DBF2	23.68±4.25	19.67±4.88	0.302	0.072
AFB	22.89±4.35	19.61±3.21	0.382	0.106
CFL	26.74±14.21	27.87±18.54	0.281	0.079
PFL	23.74±2.64	20.44±4.82	0.115	0.092
VFL	17.79±1.88	15.72±2.96	0.254	0.080
AFL	29.92±2.80	26.76±4.63	0.144	0.096
BDPO	23.11±2.32	22.10±2.32	0.156	0.092
BDAF	21.31±3.28	21.22±3.21	0.145	0.096
BWAF	19.73±2.86	17.94±5.23	0.242	0.084
HD	19.13±3.57	16.69±3.45	0.386	0.093
HW	21.21±2.87	17.31±4.32	0.207	0.083
E	6.21±0.61	5.84±0.67	0.401	0.068
Meristic				
LLS	53±3.12	52±2.54	0.161	0.091
DS1	6±0.55	6±1.14	0.472	0.068

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DS2	10±0.43	10 ±0.82	0.381	0.076
AS	10±0.92	10 ±0.82	0.264	0.112
PS	16±1.22	16±1.13	0.281	0.099
VR	10±0.58	10±0.71	0.391	0.073
CR	15±0.84	14±1.79	0.347	0.096

Descriptions: total length (TL), standard length (SL), head length (HL), predorsal length (PDL1), snout to second dorsal fin origin (PDL2), prepelvic length (PPL), preanal length (PAL), snout to anus (SA), ventral fin to anus (VFA), caudal peduncle length (CPL), caudal peduncle depth (CPD), first dorsal fin base (DFB1), second dorsal fin base (DFB2), anal fin base (AFB), caudal fin length (CFL), pectoral fin length (PFL), ventral/pelvic fin length (VFL), anal fin length (AFL), body depth at pelvic origin (BDPO), body depth at anal fin origin (BDAO), body width at anal fin origin (BWAO), head depth (HD), head width (HW), and eye diameter (E).

Table 3. Sexual dimorphism based on the mean ± SE (combined sexes) of *G. giuris* inhabiting the waters of Jabonga, ADN, Lake Mainit, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	MALE	FEMALE	T VALUE	P VALUE
Morphometric				
TL	149.32±9.81	145.68±16.31	0.260	0.085
SL	139.31±42.81	129.31±13.69	0.325	0.063
HL	40.51±3.87	37.15±7.47	0.153	0.083
PDL1	55.92±5.86	51.31±8.78	0.162	0.082
PDL2	74.76±13.43	65.21±15.76	0.314	0.092
PPL	44.62±3.90	41.12±7.32	0.271	0.083
PAL	77.61±6.78	67.75±12.87	0.243	0.087
SA	69.68±4.76	62.78±9.55	0.345	0.082
VFA	29.65±3.79	25.32±4.54	0.172	0.090
CPL	25.71±5.77	25.87±5.76	0.261	0.094
CPD	11.86±2.63	13.42±2.64	0.267	0.097
DFB1	15.67±2.65	14.32±2.45	0.160	0.090
DBF2	24.21±3.75	20.21±5.35	0.331	0.073
AFB	22.32±4.42	19.78±3.23	0.253	0.084
CFL	26.32±12.39	28.75±19.52	0.272	0.067
PFL	24.36±2.67	21.42±4.59	0.131	0.092
VFL	18.32±2.12	15.78±2.65	0.365	0.082
AFL	30.27±3.32	27.21±4.32	0.247	0.053
BDPO	22.54±2.31	22.42±2.42	0.183	0.096
BDAF	20.32±3.24	21.13±2.75	0.322	0.096
BWAF	19.32±3.23	18.58±5.12	0.255	0.081
HD	20.92±2.74	17.45±3.23	0.278	0.093
HW	22.23±3.42	17.75±3.86	0.224	0.083
E	6.12±0.61	5.89±0.62	0.406	0.068
Meristic				

LLS	53±3.11	52±2.82	0.109	0.083
DS1	6 ±0.62	6±1.12	0.341	0.067
DS2	10±0.51	10±0.82	0.312	0.076
AS	10 ±0.82	10 ±0.72	0.235	0.130
PS	16 ±1.22	16 ±1.31	0.217	0.099
VR	10 ±0.52	10±0.82	0.351	0.073
CR	15±0.72	15 ±1.92	0.312	0.116

Descriptions: total length (TL), standard length (SL), head length (HL), predorsal length (PDL1), snout to second dorsal fin origin (PDL2), prepelvic length (PPL), preanal length (PAL), snout to anus (SA), ventral fin to anus (VFA), caudal peduncle length (CPL), caudal peduncle depth (CPD), first dorsal fin base (DFB1), second dorsal fin base (DFB2), anal fin base (AFB), caudal fin length (CFL), pectoral fin length (PFL), ventral/pelvic fin length (VFL), anal fin length (AFL), body depth at pelvic origin (BDPO), body depth at anal fin origin (BDAO), body width at anal fin origin (BWAO), head depth (HD), head width (HW), and eye diameter (E).

Table 4. Sexual dimorphism based on the mean ± SE (combined sexes) of *G. giuris* inhabiting the waters of Kitcharao, ADN, Lake Mainit, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	MALE	FEMALE	T VALUE	P VALUE
Morphometric				
TL	148.86±11.13	144.28±16.63	0.291	0.071
SL	142.46±48.76	127.42±13.87	0.241	0.087
HL	40.43±3.92	36.21±7.79	0.232	0.083
PDL1	53.21±5.83	52.23±8.89	0.147	0.084
PDL2	74.21±10.88	63.46±16.70	0.215	0.092
PPL	44.52±4.72	40.58±7.63	0.332	0.136
PAL	76.14±7.50	68.11±13.15	0.253	0.082
SA	68.59±5.65	64.12±9.28	0.365	0.107
VFA	29.70±3.30	25.78±4.80	0.155	0.095
CPL	25.77±6.42	25.12±5.55	0.241	0.093
CPD	11.73±2.32	13.52±2.83	0.273	0.091
DFB1	15.73±2.35	14.23±2.43	0.163	0.092
DBF2	23.81±3.95	19.50±5.63	0.301	0.073
AFB	22.32±4.33	19.68±2.88	0.114	0.073
CFL	25.78±12.28	29.11±19.58	0.270	0.077
PFL	23.92±2.51	20.64±4.78	0.277	0.96
VFL	18.04±1.79	15.76±2.81	0.126	0.088
AFL	30.20±2.52	27.21±4.64	0.157	0.122
BDPO	23.21±2.57	22.43±2.18	0.400	0.096
BDAF	21.34±3.56	21.14±2.77	0.252	0.065
BWAF	20.23±2.87	18.42±4.83	0.267	0.083
HD	19.51±3.24	16.92±3.72	0.153	0.091
HW	20.75±2.62	17.69±4.31	0.242	0.083
E	6.16±0.73	5.82±0.63	0.414	0.063

Meristic				
LLS	54±3.22	52 ±2.42	0.121	0.084
DS1	6±0.52	6±1.32	0.143	0.067
DS2	10±0.45	10±0.81	0.327	0.071
AS	10±0.82	10±0.77	0.257	0.110
PS	16±1.21	16±1.34	0.211	0.099
VR	10±0.72	10±0.70	0.324	0.132
CR	15±0.81	15±2.23	0.343	0.116

Descriptions: total length (TL), standard length (SL), head length (HL), predorsal length (PDL1), snout to second dorsal fin origin (PDL2), prepelvic length (PPL), preanal length (PAL), snout to anus (SA), ventral fin to anus (VFA), caudal peduncle length (CPL), caudal peduncle depth (CPD), first dorsal fin base (DFB1), second dorsal fin base (DFB2), anal fin base (AFB), caudal fin length (CFL), pectoral fin length (PFL), ventral/pelvic fin length (VFL), anal fin length (AFL), body depth at pelvic origin (BDPO), body depth at anal fin origin (BDAO), body width at anal fin origin (BWAO), head depth (HD), head width (HW), and eye diameter (E).

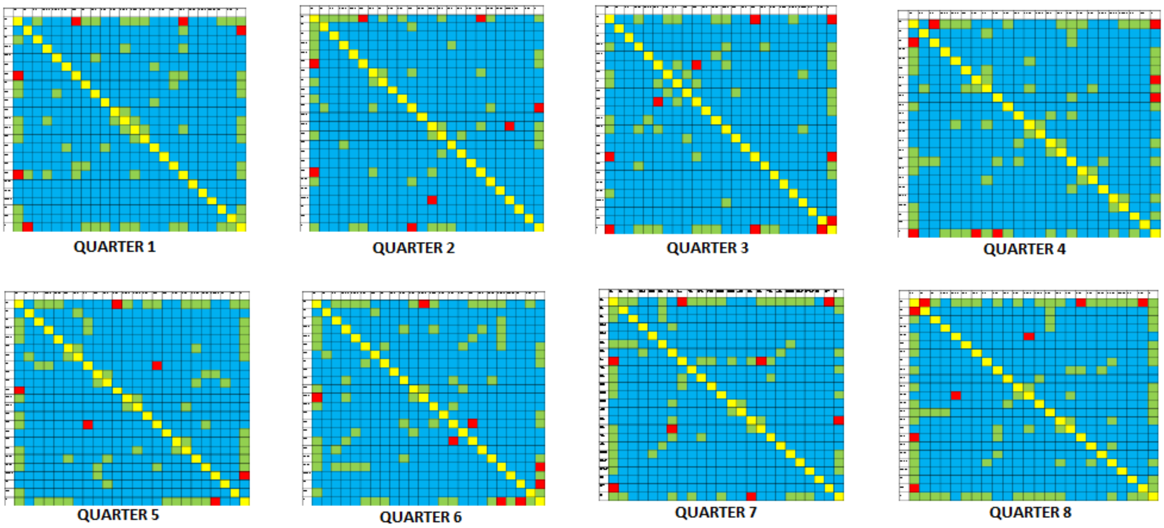
Body proportionality of *pijanga*

Results revealed that male specimens in an 8-quarter sampling periods had uncorrelated (P value > 0.05) morphometric characters ranging from 5.72% to 7.81% as observed in Q2 and Q8. The rest of the morphometric characters were highly correlated (P value < 0.05) ranging from 92.12% (Q2) to 94.28% (Q8). TL was not correlated mostly to HL, PDL, PPL, CFL, PFL, BDAF, and BWAF (Table 5). In short, results showed that based on the morphometric characters of the male *pijanga*, they had well-proportioned body structures.

Among the female *pijanga*, uncorrelated morphometric characters (P value > 0.05) ranged from 4.79% to 5.63% observed in in Q2 and Q7, respectively. Hence, more than 90% of all morphometric characters measured were highly correlated at values ranging from 94.37% to 95.21% in Q2 and Q7, respectively. TL was usually uncorrelated to SL, PDL2, PPL, PAL, VFA, CFL, PFL, VFL, BWAF and HW (Table 6). Thus, female *pijanga* had well-proportioned body structures as well.

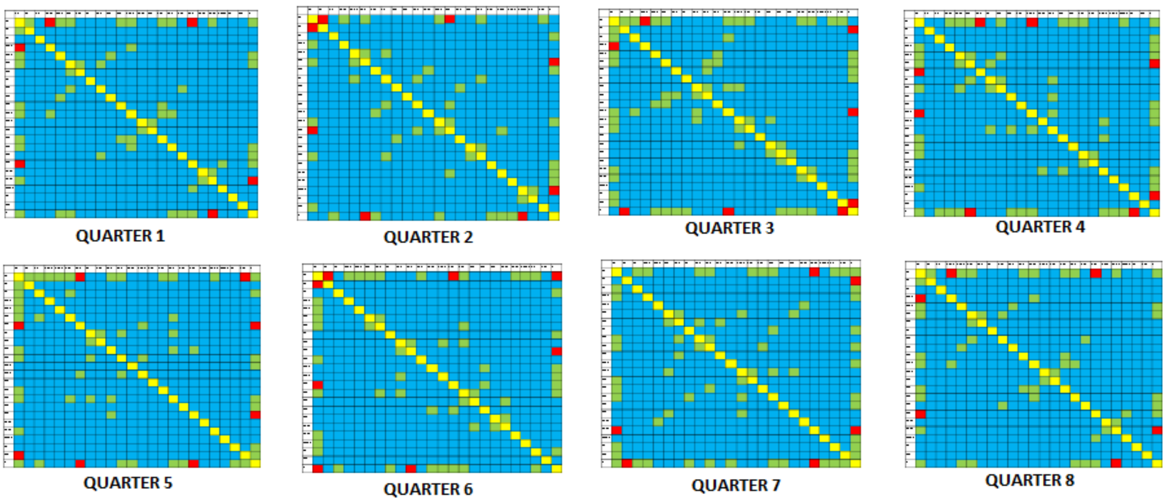
This study revealed that majority of male and female *G. giuris* inhabiting the Lake Mainit had well-proportioned body structures constituting to more than 90% of all morphometric characters measured that attained positive correlation. This means that the inhabiting *pijanga* are 'beautiful' and are assumed to be a result of available food sources and good quality of habitat. Hence, the Lake habitat did not exhibit any signs of geographic isolation and habitat restrictions. This coincides the favourable water conditions in the Lake that passed the DENR standards. As such, given the right environmental cues like favourable water and weather conditions, food, temperature, spawning substrate, and others, spawning may occur throughout the year as also influenced by successful courtship and mating (Vedra and Ocampo, 2013; Mahilum et al., 2013).

Table 5. Modified correlation matrix on the morphometric characters of the male *G. giuris* inhabiting the waters of (A.) Mainit (B.) Alegria, (C.) Jabonga and (D.) Kitcharao, Lake Mainit, Northeastern Mindanao captured on December 2016 to April 2018.



Descriptions: total length (TL), standard length (SL), head length (HL), predorsal length (PDL1), snout to second dorsal fin origin (PDL2), prepelvic length (PPL), preanal length (PAL), snout to anus (SA), ventral fin to anus (VFA), caudal peduncle length (CPL), caudal peduncle depth (CPD), first dorsal fin base (DFB1), second dorsal fin base (DFB2), anal fin base (AFB), caudal fin length (CFL), pectoral fin length (PFL), ventral/pelvic fin length (VFL), anal fin length (AFL), body depth at pelvic origin (BDPO), body depth at anal fin origin (BDAO), body width at anal fin origin (BWAO), head depth (HD), head width (HW), and eye diameter (E).

Table 6. Modified correlation matrix on the morphometric characters of the female *G. giuris* inhabiting the waters of (A.) Mainit (B.) Alegria, (C.) Jabonga and (D.) Kitcharao, Lake Mainit, Northeastern Mindanao captured on December 2016 to April 2018.



Descriptions: total length (TL), standard length (SL), head length (HL), predorsal length (PDL1), snout to second dorsal fin origin (PDL2), prepelvic length (PPL), preanal length (PAL), snout to anus (SA), ventral fin to anus (VFA), caudal peduncle length (CPL), caudal peduncle depth (CPD), first dorsal fin base (DFB1), second dorsal fin base (DFB2), anal fin base (AFB), caudal fin length (CFL), pectoral fin length (PFL), ventral/pelvic fin length (VFL), anal fin length (AFL), body depth at pelvic origin (BDPO), body depth at anal fin origin (BDAO), body width at anal fin origin (BWAO), head depth (HD), head width (HW), and eye diameter (E).

Although the effects of environmental parameters are not yet in threshold level, the unregulated anthropogenic activities undertaken within the Lake may alter the availability of food sources and habitat quality for the *pijanga*. This is in the advent of a changing weather condition that may influence fish assemblage structure (Poff and Allan, 1995) through generating large amounts of debris being deposited to the Lake. Usually, gobies from channels in rock bottoms to lay their eggs (Bell, 1994), and that extreme sediment loading from soil erosion poses significant attention (Brookes, 2000) to the spawning *pijanga.* It therefore alters their usual life history pattern (Bell, 1994), such that, post larvae may find difficulties for post-migration (Hoese, 1998).

Besides, changes in water quality due to the changes in socio-economic activities could potentially increase fish stress factor and infections (Xenopoulos et al, 2005). This may result to extinction of native species because of reduced habitat availability, decreased diversity and abundance (Lake et al., 2000).

In some studies, the morphometric measurements and meristic counts of black jaw tilapia, S*arotherodon melanotheron* (Ruppell, 1852) revealed that they were phenotypically separable populations of the same species. Significant differences ($P < 0.05$) were recorded in body depth, and caudal peduncle length in each month between the fish sampled that suggested to have occurred as a result of difference in the environmental conditions (Akinrotimi et al., 2018).

Some morphometric and meristic characters are used for a good separation of populations like head width, interorbital width and pelvic fin length.These three variables were very useful for separation between western populations and seem to play an important role inspecies feeding activity. The caudal peduncle development is mainly related to the specimen' swimming ability and was particularlyrelevant for discrimination between northern and southern populations and between estuarine and adjacent marinepopulations, apparently due to differences in hydrodynamic conditions. (Costa et al., 2003). Likewise, some morphometric characters are used to distinguish among stocks like first dorsal fin rays (D1FR),transverse scale above lateral line (TSALL), branchiostegal rays and number of vertebrae were same among fishesof these stocks (Mollah et al., 2012; Azad et al., 2017).

Like *G. giuris, t*he Etruscan goby *Padogobius nigricans* is a running water dwelling vulnerable species inhabiting the Tuscano-Latiumdistrict. Since many aspects of the biology of this species are still unknown, ontogeny and sexual dimorphism were studied to provide usefulintra- and inter-population differences. The meristic pattern may change from one population to another. Considering the short geographicdistance and the similar environmental conditions among the analysed locations, this differentiation was not expected (Scalici and Gibertini. 2012).

CONCLUSION AND RECOMMENDATION

Glossogobius giuris locally known as*pijanga* inhabiting Lake Mainit were not sexually dimorphic, and that no apparent distinction was observed on their morphological attributes. This implies that male and female pijanga were relatively similar and could not be distinguished easily. Since they were not sexually dimorphic, this means that there was no habitat restrictions or geographic isolation within their habitats in the Lake. Availability of food supply could also explain their similarities in sizes and lengths resulting to their similarities in their morphology. This study also revealed that majority of male and female *G. giuris* inhabiting the Lake Mainit had well-proportioned body structures constituting to more than 90% of all morphometric characters measured attained positive correlation. This means that the inhabiting *pijanga* are 'beautiful' and are assumed to be a result of available food sources and good quality of habitat. Hence, the Lake habitat did not exhibit any signs of geographic isolation and habitat restrictions. This coincides the favourable water conditions in the Lake that passed the DENR standards. Therefore, it is imperative to do proactive means of both regulatory (e.g. through enactment of resolution and ordinance) and non-regulatory (e.g. production of IEC materials) measures to conserve the *pijanga* and other aquatic inhabitants, the Lake and the livelihood of the community.

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