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Research article

DESCRIBING THE MORPHOLOGICAL ATTRIBUTES OF *Glossogobius giuris* (HAMILTON 1882) IN LAKE MAINIT, NORTHEASTERN MINDANAO, PHILIPPINES

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ABSTRACT

The key to identifying certain species is through its morphological attributes, hence, a descriptive means of identifying the morphology of Glossogobius giuris in Lake Mainit, Northeastern Mindanao was conducted. Specimen collections were conducted in the four municipalities surrounding Lake Mainit, namely: Mainit, Alegria, Kitcharao and Jabonga for a two-year period done quarterly using a modified cast net. Twenty four morphometric characters were used and measurements were done using a digital vernier caliper. Average TL of male G. giuris ranged from 145.87 mm to 150.30 mm, while TL among female ranged from 144.37 mm to 150. 13 mm. Variations in lengths and all other morphometric and meristic characters measured did not differ significantly (P value > 0.05), within the 8-quarter sampling periods among the four municipalities. This means that the specimens collected were relatively of similar sizes and lengths.

Keywords: pijanga, freshwater fish, tropical fishery, Lake Mainit, Mindanao

INTRODUCTION

Glossogobius giuris are named as tank goby with flattened head, has a lateral profile straight on the middle to convex onwards its head and caudal fin (UPLB Limnological Research Station 2011). The adult *G. giuris* inhabit in freshwater, estuaries and inshore areas and is usually benthopelagic and amphidromous (Maugé, 1986). They can complete their life history in freshwater but not restricted to the brackish and marine inshore areas. They are mostly associated with rock, gravel, or sand bottoms. They are highly carnivorous, and sometimes, cannibals (UPLB Limnological Research Station 2011).

In some studies, *G. giuris* is a benthopelagic and amphidromous species inhabiting in the sea, brackishwater and freshwater systems (Azad et al., 2017). Its diet includes teleost fishes, crustaceans, molluscs, semi-digested particles, insects, algae and other miscellaneous items. As such, it is considered carnivorous, predatory and bottom feeders, that also exhibiting cannibalism (Roshni et al., 2015).

G. giuris had special preference among the Southeast Asian people, particularly in India, Bangladesh, Pakistan, Myanmar, and Fareast. This could be due to its taste, low fat and high protein content. Its popularity among the consumers had prompted to develop potential culture techniques, systems, and possible huge earnings in the future. Likewise, it plays a key role in the upliftment of the socio-economic conditions of the fishers. However, few research attempts are undertaken for potential aquaculture due to difficulties in the mass production of fry and fingerlings (Hossain, 2014; Roy et al., 2014).

G. *giuris* are found the four municipalities of Lake Mainit, particularly in the shallow grassy bottom, shallow rocky bottom and deep water column (Figure 1). They looked like a tamed fish lying on the rocks or in the sand or floating in a water column but swim swiftly when disturbed. They had semi-thick scales with black and golden yellow spots.

In this study, the morphology of *G. giuris*, named locally as *pijanga,* is described for further scientific inquiry. To this, the morphometric and meristic study could provide a vigorous tool for measuring discreteness of the same species, therefore all such characters had most commonly used by several ichthyologists for the differentiation of fish species or geographically variants or populations. It is helpful to identify any particular species or to determine that whether there is any similarity of characters or differences among their male and female fishes. In fish, morphometric characters represent one of the major keys for determining their systematic relationships, growth variability, ontogenetic trails and various other population parameters (Nath and Kundu, 2017).

Body shape is a difficult, but important, trait to quantify. Researchers have traditionally used multivariate analysis of several linear measures ('trusses') across the body form to quantify shape. Newer geometric morphometric methods claim to better estimate shape because they analyze the geometry among the locations of all landmarks simultaneously rather than the linear distances between pairs of landmarks (Parsonsa et al., 2003).

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).

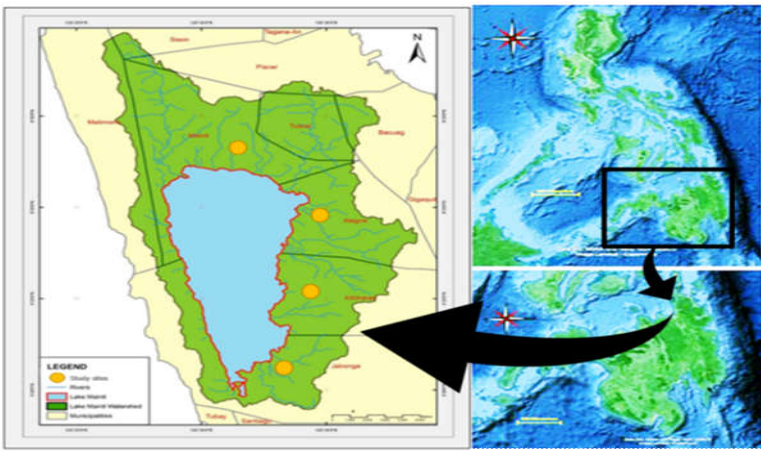

Figure 2. Lake Mainit sampling sites within the municipalities of Jabonga and Kitcharao in Agusan del Norte; and Alegria and Mainit in Surigao del Norte (Sources: Google Earth and Padilla et al., 2015).

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

Morpho-meristic attributes of *pijanga*

Average TL of male *G. giuris* inhabiting the waters of Mainit, SDN ranged from 145.95 mm to 150.11 mm observed in Q6 and Q8, respectively (Table 1). It has only a mean difference of 4.12 mm. In Alegria, SDN male sizes ranged from 145.87 to 148.12 mm with a mean difference of 2.25 mm (Table 2). In Jabonga, ADN size ranged from 146.24 mm to 150.30 mm with a mean difference of 4.06 mm (Table 3). Lastly, in Kitcharao, ADN size ranged from 145.99 mm to 150.12 mm with a mean difference of 4.13 mm (Table 4).

Difference in lengths and all other morphometric and meristic characters measured did not differ significantly (P value > 0.05), within the 8-quarter sampling periods among the four municipalities. This means that the specimens collected were relatively of similar sizes and lengths.

As observed, matured pijanga are found and are caught in the water column in deeper areas. Hence, fishing is usually done in lakeshore portion of the Lake, and may be, similar cohorts of pijanga are caught during fishing. Further, mesh size restrictions of their modified cast would allow similar sizes of pijanga caught. Thus, the potential explanation of the relatively similar sizes and lengths of pijanga caught during specimen collections.

Table 1. Morphometric attributes (mean ± SE) of male *G. giuris* inhabiting Mainit, Surigao del Norte, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	QUARTER								F Value	P Value
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8		
TL	149.12±9.67	147.98±9.30	148.89±9.45	149.49±9.76	146.99±8.92	145.95±8.90	146.30±9.40	150.07±9.57	2.198	0.311
SL	138.97±42.84	136.11±42.11	137.98±41.12	139.05±42.76	137.01±41.99	134.96±43.01	135.92±42.90	139.02±43.05	4.512	0.083
HL	40.47±3.82	39.48±3.60	39.48±3.79	40.52±3.32	39.41±3.78	37.45±3.57	38.48±3.67	39.45±3.83	2.916	0.103
PDL1	55.81±5.92	53.75±5.80	54.70±5.81	55.69±5.79	52.80±5.34	51.31±5.24	52.86±5.79	54.58±5.73	2.145	0.313
PDL2	73.13±14.51	70.11±14.23	72.14±14.43	73.09±14.24	70.15±14.52	69.78±14.84	70.20±13.98	72.17±14.45	3.569	0.092
PPL	44.63±3.91	42.61±3.72	43.57±3.84	44.58±3.87	41.54±3.73	40.68±4.36	41.58±3.35	43.43±4.63	3.161	0.171
PAL	77.58±6.78	75.67±6.54	76.57±6.68	77.59±6.51	74.54±6.34	73.80±7.22	74.62±6.73	76.11±6.63	2.148	0.091
SA	69.71±4.82	67.73±4.79	68.73±4.68	69.73±4.84	66.73±4.56	65.68±6.12	66.76±4.68	68.64±6.47	3.012	0.411
VFA	29.75±3.54	27.70±3.25	28.70±3.23	29.70±3.53	26.64±3.51	25.59±3.13	26.75±3.09	28.69±3.27	1.127	0.176
CPL	25.71±5.83	23.65±5.65	24.69±5.72	25.67±5.64	22.71±5.44	21.05±5.26	22.73±5.42	24.79±5.75	1.552	0.881
CPD	11.93±2.57	9.99±2.48	10.94±2.52	11.92±2.49	8.94±2.51	7.98±2.23	8.95±2.34	10.75±2.36	1.41	0.159
DFB1	15.75±2.73	13.72±2.71	14.72±2.68	15.71±2.74	12.76±2.68	11.87±2.12	12.86±2.65	14.82±2.65	1.442	0.69
DFB2	24.13±3.87	22.10±3.86	23.90±3.72	24.11±3.83	21.80±3.59	20.76±3.98	21.81±3.68	23.84±3.81	1.501	0.291
AFB	22.90±4.35	20.93±4.31	21.88±4.29	22.87±4.30	19.93±4.23	18.98±4.18	19.95±4.27	21.70±4.26	1.718	0.612
CFL	26.22±12.28	24.50±12.22	25.59±12.20	26.19±12.25	23.21±12.16	22.70±12.85	23.42±12.19	25.87±12.31	1.413	0.212
PFL	24.43±2.76	22.52±2.70	23.39±2.72	24.38±2.70	21.62±2.67	20.70±2.62	19.94±2.58	23.99±2.56	1.812	0.671
VFL	18.15±2.09	16.63±2.05	17.73±2.01	18.13±2.07	15.73±1.95	14.94±1.93	13.96±1.97	18.10±2.02	1.216	0.323
AFL	30.33±3.15	28.74±3.10	29.84±3.12	30.24±3.13	27.76±3.05	26.98±2.83	25.88±2.75	30.21±3.08	1.256	0.363
BDPO	22.57±2.32	20.78±2.28	21.86±2.28	22.44±2.20	20.66±2.21	19.90±2.15	18.87±2.07	23.10±2.68	1.491	0.719
BDAF	20.83±3.15	18.86±3.10	19.93±3.07	20.59±3.12	18.73±3.05	17.79±2.85	16.96±3.00	20.25±3.66	1.251	0.617
BWAF	20.57±2.98	19.01±2.50	19.76±2.97	20.31±2.70	18.45±2.68	17.68±2.84	17.98±2.75	20.09±2.76	1.128	0.685
HD	19.95±3.26	18.91±3.19	18.74±3.16	19.38±3.10	18.75±3.17	17.94±2.71	17.90±2.84	19.62±3.13	1.356	0.576
HW	20.88±2.72	20.07±2.65	19.87±2.67	20.58±2.47	19.67±2.65	19..02±2.49	20.23±3.10	20.81±2.50	1.321	0.941
E	6.18±0.64	6.15±0.62	6.15±0.60	6.16±0.64	6.17±0.58	6.14±0.61	6.18±0.65	6.17±0.72	3.129	0.835

Descriptions: The morphometric characters 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).

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Table 2. Morphometric attributes (mean ± SE) of male *G. giuris* inhabiting Alegria, Surigao del Norte, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	QUARTER Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	F Value	P Value
TL	147.98±10.65	145.87±9.67	146.78±10.29	148.10±10.73	146.49±10.37	147.20±10.12	146.99±10.57	148.12±10.65	2.198	0.311
SL	138.30±43.47	136.40±42.43	137.40±43.23	138.57±43.78	138.10±43.21	137.70±43.10	138.05±42.39	138.73±43.65	4.512	0.083
HL	40.32±3.77	40.21±3.56	40.14±3.42	40.44±3.76	39.94±3.78	40.12±3.65	40.04±3.48	40.11±3.56	2.916	0.103
PDL1	57.29±7.07	55.91±7.02	57.31±6.89	57.31±7.15	57.11±6.98	57.22±7.11	56.17±7.07	57.24±7.13	2.145	0.313
PDL2	70.36±15.83	69.78±15.23	70.18±15.64	70.38±15.94	70.08±15.63	70.27±15.34	70.14±15.52	70.41±15.44	3.569	0.092
PPL	44.11±4.71	43.22±4.54	44.03±4.63	44.21±4.67	43.91±4.45	44.23±4.46	43.12±4.54	43.98±4.69	3.161	0.171
PAL	75.75±7.20	74.80±7.12	75.61±7.14	75.83±7.27	75.72±7.27	75.43±7.25	75.23±7.24	75.92±7.42	2.148	0.091
SA	68.67±5.11	67.88±5.07	68.53±5.02	68.76±5.22	68.32±5.01	67.94±5.16	68.28±5.18	68.49±5.23	3.012	0.411
VFA	29.58±3.21	28.95±3.13	29.28±3.17	29.63±3.33	29.26±3.23	29.22±3.23	29.52±3.16	29.61±3.26	1.127	0.176
CPL	26.04±5.94	25.75±5.74	25.45±5.96	26.65±5.99	26.07±5.87	26.13±5.74	26.17±5.86	26.05±5.96	1.552	0.881
CPD	12.21±2.85	11.62±2.56	12.13±2.75	12.43±2.76	12.12±2.75	12.20±2.78	11.92±2.79	12.24±2.89	1.41	0.159
DFB1	16.22±3.11	15.73±3.09	16.13±3.05	16.31±3.23	16.11±3.03	16.18±3.06	16.01±3.10	16.17±3.05	1.442	0.69
DFB2	23.75±4.17	23.53±4.13	23.45±4.10	23.82±4.23	23.43±4.03	23.65±4.12	23.21±4.11	23.82±4.24	1.501	0.291
AFB	22.89±4.38	21.90±4.13	22.38±4.19	22.40±4.32	22.38±4.24	22.46±4.23	22.47±4.14	22.32±4.24	1.718	0.612
CFL	26.69±14.04	25.50±13.89	26.43±14.02	26.74±14.11	26.67±14.02	26.67±14.03	26.32±13.97	26.86±14.07	1.413	0.212
PFL	23.68±2.61	23.12±2.32	23.34±2.24	23.45±2.43	23.34±2.41	23.65±2.44	23.54±2.21	23.34±2.26	1.812	0.671
VFL	17.85±1.97	17.15±1.68	17.32±1.43	17.88±1.98	17.64±1.32	17.76±1.68	17.46±1.86	17.85±1.78	1.216	0.323
AFL	29.93±2.82	29.13±2.76	29.35±2.76	29.54±2.65	29.32±2.41	29.58±2.53	29.34±2.75	29.32±2.54	1.256	0.363
BDPO	23.01±2.48	22.79±2.31	23.04±2.42	22.97±2.32	23.06±2.32	22.96±2.53	23.07±2.35	23.12±2.52	1.491	0.719
BDAF	21.27±3.28	20.82±3.02	21.29±3.30	21.12±3.23	21.12±3.18	21.09±3.24	21.11±3.13	21.32±3.35	1.251	0.617
BWAF	19.67±2.91	19.23±2.84	19.82±2.92	19.85±2.90	19.56±2.59	19.59±2.81	19.47±2.45	19.69±2.86	1.128	0.685
HD	19.05±3.62	18.94±3.54	19.04±3.61	18.89±3.51	19.01±3.55	18.79±3.57	19.02±3.62	19.14±3.65	1.356	0.576
HW	21.03±2.98	20.72±2.78	21.12±2.96	20.86±3.03	20.83±2.93	20.65±2.84	21.14±2.89	21.01±2.94	1.321	0.941
E	6.13±0.64	6.09±0.70	6.14±0.74	6.08±0.52	6.11±0.59	6.16±0.81	6.12±0.54	6.21±0.76	3.129	0.835

Descriptions: The morphometric characters 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).

Table 3. Morphometric attributes (mean ± SE) of male *G. giuris* inhabiting Jabonga, Agusan del Norte, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	QUARTER									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	F Value	P Value
TL	149.31±9.74	149.50±9.82	147.21±9.76	146.24±9.23	150.30±9.85	147.28±9.65	148.12±9.56	150.11±9.74	2.198	0.311
SL	139.23±42.94	138.90±42.83	137.20±41.33	136.76±41.92	140.18±42.98	137.76±41.75	138.64±42.71	140.11±42.37	4.512	0.083
HL	40.47±3.82	39.48±3.78	39.12±3.54	40.13±3.76	40.05±3.79	39.78±3.87	40.34±3.25	40.23±3.65	2.916	0.103
PDL1	55.80±5.92	55.76±5.87	54.71±5.75	54.82±5.64	55.93±5.93	54.54±5.68	55.75±5.76	55.76±5.95	2.145	0.313
PDL2	74.79±13.41	74.53±13.23	73.87±13.11	74.34±13.05	74.56±13.23	74.26±13.21	75.10±13.12	75.16±13.59	3.569	0.092
PPL	44.64±3.94	44.71±3.85	43.63±3.82	43.56±3.62	44.73±3.97	43.78±3.78	44.36±3.87	44.73±3.87	3.161	0.171
PAL	77.66±6.87	77.80±6.88	76.33±6.56	76.12±6.21	77.94±6.84	77.47±6.75	77.52±6.76	77.90±6.89	2.148	0.091
SA	69.75±4.67	69.82±4.73	69.50±4.61	68.10±4.21	69.92±4.82	68.61±4.34	69.36±4.41	69.63±4.48	3.012	0.411
VFA	29.76±3.83	29.47±3.69	28.75±3.52	28.46±3.43	29.86±3.56	28.63±3.72	29.23±3.46	29.92±3.89	1.127	0.176
CPL	25.72±5.84	25.63±5.82	24.73±5.76	24.65±5.73	25.92±5.93	24.65±5.41	25.68±5.65	25.57±5.63	1.552	0.881
CPD	11.96±2.56	11.86±2.49	10.91±2.51	10.85±2.41	11.95±2.73	11.15±2.41	11.26±2.36	11.92±2.68	1.41	0.159
DFB1	15.72±2.76	15.84±2.79	14.84±2.67	15.51±2.64	15.83±2.79	15.24±2.54	15.35±2.57	15.87±2.73	1.442	0.69
DFB2	24.12±3.87	24.42±3.89	24.11±3.86	23.91±3.73	24.34±3.75	23.87±3.68	24.08±3.64	24.36±3.92	1.501	0.291
AFB	22.94±4.30	22.80±4.47	21.83±4.27	21.76±4.18	22.76±4.28	22.43±4.15	22.48±4.35	22.39±4.42	1.718	0.612
CFL	26.23±12.28	26.32±12.23	25.78±12.18	25.63±12.11	26.13±12.06	26.16±12.12	26.31±12.27	26.42±12.33	1.413	0.212
PFL	24.45±2.76	24.52±2.81	23.73±2.83	24.02±2.56	24.38±2.75	24.51±2.63	24.34±2.49	24.66±2.85	1.812	0.671
VFL	18.17±2.10	18.23±2.12	17.96±2.04	18.05±2.11	18.24±2.24	18.25±2.11	18.26±2.19	18.47±2.33	1.216	0.323
AFL	30.37±3.06	30.42±3.12	29.83±3.02	30.05±2.85	30.57±3.11	30.48±3.07	30.40±3.02	30.52±3.23	1.256	0.363
BDPO	22.56±2.31	22.43±2.21	21.77±2.22	22.06±2.10	22.47±2.25	22.34±2.26	22.41±2.28	22.31±2.12	1.491	0.719
BDAF	20.57±3.10	20.42±3.13	19.86±2.97	20.06±3.02	20.42±3.05	20.34±3.08	20.35±3.11	20.72±3.15	1.251	0.617
BWAF	19.99±3.24	19.81±3.31	19.34±3.15	19.18±3.08	19.76±3.20	19.67±3.16	19.61±3.14	19.93±3.28	1.128	0.685
HD	20.89±2.68	20.91±2.71	20.84±2.58	20.73±2.67	20.77±2.54	20.56±2.66	20.68±2.64	20.93±2.80	1.356	0.576
HW	22.02±3.51	22.05±3.61	21.81±3.31	21.92±3.27	22.10±3.53	22.04±3.46	22.05±3.49	22.12±3.57	1.321	0.941
E	6.18±0.62	6.19±0.61	6.19±0.61	6.19±0.62	6.19±0.62	6.19±0.60	6.19±0.61	6.19±0.61	3.129	0.835

Descriptions: The morphometric characters 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).

Table 4. Morphometric attributes (mean ± SE) of male *G. giuris* inhabiting Kitcharao, Agusan del Norte, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	QUARTER									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	F Value	P Value
TL	148.98±11.01	146.96±10.70	150.12±11.34	147.26±11.02	145.99±10.82	147.89±11.00	149.36±11.05	150.03±12.23	2.198	0.311
SL	142.52±48.92	140.40±48.81	144.10±49.13	141.51±48.85	138.86±48.81	141.34±48.83	143.56±48.97	144.76±48.95	4.512	0.083
HL	40.42±3.91	40.32±3.86	40.78±3.96	40.39±3.89	40.12±3.76	40.37±3.76	40.51±3.94	40.67±3.95	2.916	0.103
PDL 1	53.09±5.77	52.57±5.23	53.68±5.84	53.02±5.59	52.59±5.43	53.01±5.65	53.11±5.79	53.21±5.84	2.145	0.313
PDL 2	74.18±10.97	73.97±10.65	74.53±11.12	74.11±10.86	73.66±10.42	74.04±10.57	74.29±11.09	74.66±11.19	3.569	0.092
PPL	44.44±4.63	42.13±4.51	46.17±4.95	44.02±4.42	41.93±4.40	42.68±4.51	44.58±4.72	46.11±4.88	3.161	0.171
PAL	76.12±7.61	74.86±7.42	78.31±7.76	75.73±7.51	75.13±7.48	75.65±7.45	76.26±7.74	76.53±7.83	2.148	0.091
SA	68.63±5.46	66.43±5.36	69.95±5.58	68.12±5.36	67.86±5.25	68.05±5.32	68.82±5.55	69.96±5.71	3.012	0.411
VFA	29.68±3.27	28.09±3.11	30.87±3.36	29.34±3.19	28.00±3.08	29.21±3.21	29.85±3.34	29.95±3.42	1.127	0.176
CPL	25.78±6.44	23.89±6.31	27.17±6.89	25.24±6.31	25.06±6.18	25.25±6.36	26.03±6.32	26.95±6.63	1.552	0.881
CPD	11.74±2.35	11.12±2.24	11.84±2.42	11.63±2.32	11.15±2.11	11.55±2.21	11.81±2.43	11.92±2.45	1.41	0.159
DFB 1	15.78±2.35	15.63±2.21	15.84±2.46	15.56±2.22	15.31±2.05	15.66±2.24	15.83±2.42	15.83±2.51	1.442	0.69
DFB 2	23.83±3.97	23.65±3.73	23.96±4.08	23.74±3.86	23.56±3.67	23.74±3.82	23.93±3.88	23.97±4.10	1.501	0.291
AFB	22.71±4.38	22.53±4.21	22.91±4.54	22.63±4.32	22.34±4.15	22.58±4.24	22.79±4.42	22.95±4.52	1.718	0.612
CFL	25.88±12.34	24.42±12.12	26.17±12.49	25.65±12.28	25.02±12.05	25.65±12.21	25.89±12.36	25.93±12.55	1.413	0.212
PFL	23.98±2.55	23.45±2.24	24.18±2.76	23.78±2.44	23.24±2.15	23.73±2.26	23.86±2.64	24.23±2.74	1.812	0.671
VFL	18.02±1.95	17.30±1.78	18.76±2.22	17.90±1.67	17.89±1.76	18.03±1.94	18.42±1.87	18.86±2.34	1.216	0.323
AFL	30.22±2.41	29.45±2.18	31.91±2.67	30.04±2.34	30.05±2.23	30.18±2.30	30.35±2.52	30.56±2.63	1.256	0.363
BDPO	23.01±2.69	22.70±2.43	24.12±2.89	22.89±2.57	22.76±2.47	22.86±2.64	23.87±2.89	24.22±2.87	1.491	0.719
BDAF	21.26±3.67	20.75±3.45	21.97±3.74	21.04±3.54	20.58±3.34	21.15±3.56	21.67±3.75	21.93±3.78	1.251	0.617
BWAF	20.08±2.91	19.45±2.34	20.89±2.97	19.87±2.86	19.66±2.56	20.05±2.86	20.23±2.96	20.92±2.98	1.128	0.685
HD	19.53±3.24	18.92±3.20	19.86±3.53	19.47±3.20	19.32±3.16	19.28±3.17	19.63±3.31	19.90±3.63	1.356	0.576
HW	20.82±2.51	19.94±2.46	21.11±2.62	20.76±2.43	20.72±2.41	20.77±2.44	20.86±2.55	20.93±2.65	1.321	0.941
E	6.17±0.73	6.14±0.68	6.18±0.75	6.15±0.70	6.14±0.71	6.16±0.71	6.17±0.73	6.18±0.74	3.129	0.835

Descriptions: The morphometric characters 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).

Among the female pijanga specimens, in Mainit, SDN, mean TL ranged from 145.93 mm to 150. 13 mm, as observed in Q1 and Q2, respectively, with a mean difference of only 4.2 mm. In Alegria, SDN, it ranged from 144.34 mm (Q1) to 149.28 mm (Q5) with a mean difference of 4.94 mm. Further, in Jabonga, ADN, it ranged from 145.36 mm (Q5) to 149.18 mm (Q3) with a mean difference of 3.82 mm. Lastly, in Kitcharao, ADN, it ranged from 144.37 mm (Q1) to 148.11 mm (Q8) with a mean difference of 3.24 mm (Tables 5,6,7,8).

The total length and all other morphometric and meristic characters measured did not significantly differ (P value > 0.05) (Tables 5,6,7,8). The similarities in sizes and lengths were observed among the specimens collected all throughout the Lake.

In these size and length ranges, male and female pijanga are relatively similar in sizes and lengths. The relatively similar temperature readings across the Lake could be assumed to cause the relatively similar growth

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among the male and female pijanga.

Table 5. Morphometric attributes (mean ± SE) of female *G. giuris* inhabiting Mainit, Surigao del Norte, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	QUARTER Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	F Value	P Value
TL	145.72±16.25	147.13±16.10	149.18±17.26	146.32±16.26	145.36±16.21	147.37±16.63	146.39±16.66	147.18±16.33	0.423	0.181
SL	129.23±13.75	130.92±13.99	131.65±14.78	129.67±13.88	129.13±13.71	129.87±13.65	129.43±13.69	129.83±13.66	0.326	0.097
HL	37.05±7.54	38.94±7.98	40.04±8.13	37.34±7.61	37.16±7.63	38.99±7.76	37.44±7.64	37.23±7.67	0.501	0.082
PDL1	51.27±8.80	53.24±9.43	54.98±9.89	51.27±8.85	51.34±8.86	51.51±8.60	51.65±8.87	52.78±8.94	0.327	0.092
PDL2	65.11±15.63	66.80±15.80	68.63±16.43	65.23±15.75	65.31±15.64	66.12±15.74	65.38±15.73	65.98±15.88	0.778	0.051
PPL	41.46±7.61	42.83±7.93	43.73±8.81	41.56±7.75	41.53±7.69	41.63±7.73	41.52±7.77	41.75±7.61	0.135	0.063
PAL	67.72±12.88	68.14±12.95	69.24±13.97	67.65±12.82	67.82±12.86	67.78±12.91	67.75±12.93	67.84±12.92	0.418	0.175
SA	62.74±9.65	63.65±9.71	64.88±10.05	62.78±9.71	62.82±9.76	62.82±9.73	62.82±9.72	63.27±9.89	0.258	0.078
VFA	25.43±4.65	26.24±4.76	27.35±5.25	25.57±4.74	25.52±4.73	25.55±4.81	25.82±4.76	26.12±4.72	0.317	0.079
CPL	25.92±5.73	26.62±5.81	28.90±6.32	25.86±5.83	25.98±5.77	26.73±5.84	25.98±5.85	26.42±5.89	0.236	0.067
CPD	13.32±2.56	14.91±2.76	16.78±3.84	13.63±2.86	13.42±2.62	14.53±3.14	13.67±2.88	13.83±2.87	0.148	0.096
DFB1	14.31±2.53	15.80±2.94	17.21±3.73	14.64±2.77	14.42±2.64	14.34±2.65	14.48±2.63	14.79±2.85	0.377	0.074
DFB2	20.32±5.44	21.72±5.88	23.64±6.47	21.04±5.78	20.36±5.66	20.98±5.89	20.76±5.89	20.88±5.99	0.343	0.085
AFB	19.82±3.10	21.00±3.83	23.86±4.53	19.93±3.56	19.87±3.35	20.88±3.79	19.93±3.73	19.93±3.85	0.138	0.048
CFL	28.82±19.74	30.05±20.84	21.85±21.48	28.93±19.81	28.90±19.83	28.89±19.86	28.95±19.69	28.93±19.90	0.174	0.089
PFL	21.11±4.77	22.83±4.83	24.83±5.83	21.43±4.85	21.26±4.87	21.54±4.87	21.43±4.85	21.78±4.87	0.179	0.059
VFL	15.81±2.74	17.11±2.87	18.82±3.81	15.92±2.84	15.87±2.84	15.92±2.82	15.86±2.89	15.95±2.68	0.231	0.008
AFL	27.12±4.26	29.06±4.67	30.76±5.73	27.39±4.53	27.21±4.38	27.64±4.55	27.31±4.35	27.72±4.51	0.146	0.074
BDPO	22.77±2.24	23.98±2.67	26.16±3.43	22.85±2.43	22.82±2.30	22.87±2.42	22.83±2.39	22.86±2.33	0.171	0.074
BDAF	21.39±2.82	22.18±2.97	25.12±3.76	21.43±2.87	21.34±2.76	21.55±2.96	21.42±2.93	21.40±2.93	0.343	0.176
BWAF	18.52±5.10	19.91±5.45	22.23±6.42	18.67±5.65	18.62±5.32	18.81±5.68	18.44±5.41	18.36±5.28	0.246	0.089
HD	17.22±3.51	18.94±3.82	21.04±4.83	17.32±3.72	17.31±3.67	17.54±3.76	17.50±3.74	17.73±3.62	0.133	0.088
HW	17.68±3.92	18.34±3.97	18.79±4.73	17.65±3.86	17.52±3.88	17.75±3.98	17.83±3.97	17.72±3.96	0.561	0.078
E	5.81±0.63	5.82±0.64	5.82±0.66	5.81±0.61	5.81±0.61	5.81±0.62	5.81±0.62	5.81±0.62	0.602	0.089

Descriptions: The morphometric characters 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).

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Table 6. Morphometric attributes (mean ± SE) of female *G. giuris* inhabiting Alegria, Surigao del Norte, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	QUARTER									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	F Value	P Value
TL	144.34±14.63	147.21±14.73	145.13±14.68	146.52±14.58	149.28±15.34	146.08±14.61	145.72±14.83	144.88±14.64	0.323	0.192
SL	127.53±14.42	129.54±14.53	127.83±14.53	127.94±14.65	130.14±15.32	127.86±14.53	127.39±14.52	127.44±14.66	0.298	0.078
HL	36.18±8.14	39.11±8.14	36.20±8.44	36.62±8.62	39.56±8.56	36.26±8.54	36.32±8.45	36.41±8.66	0.311	0.075
PDL1	51.14±8.76	54.03±9.14	51.19±8.82	51.32±8.84	55.18±8.99	51.24±8.83	51.15±8.65	51.23±8.55	0.255	0.092
PDL2	63.06±16.32	66.13±17.51	63.15±16.35	63.20±16.26	67.05±17.11	63.14±16.42	63.19±16.45	63.21±16.42	0.221	0.148
PPL	40.63±8.57	42.98±9.26	40.69±8.62	40.78±8.73	43.44±9.33	40.53±8.49	40.73±8.65	40.70±8.76	0.144	0.075
PAL	66.20±12.74	69.08±13.45	66.32±12.83	66.32±12.87	69.89±13.88	66.96±12.79	66.33±12.78	66.29±12.78	0.225	0.079
SA	61.69±10.10	63.89±11.13	61.72±10.15	61.84±10.25	62.99±10.98	61.77±10.56	61.71±10.16	61.66±10.01	0.258	0.098
VFA	25.48±4.80	28.19±5.81	25.51±4.83	25.53±4.88	27.56±5.46	25.63±4.62	25.64±4.63	25.60±4.52	0.266	0.091
CPL	24.87±5.97	27.13±6.43	24.87±5.96	24.92±5.97	26.98±6.35	24.93±5.96	24.89±5.87	24.93±5.83	0.188	0.187
CPD	13.48±2.77	16.38±3.64	13.51±2.84	13.56±2.87	13.56±2.86	13.59±2.82	13.71±2.81	13.94±2.86	0.166	0.215
DFB1	13.98±2.47	15.97±3.64	13.87±2.51	13.67±2.52	16.01±3.32	13.88±2.76	13.87±2.31	13.76±2.33	0.162	0.190
DFB2	19.56±4.90	22.11±5.32	19.67±4.95	19.77±4.84	21.64±5.35	19.55±4.85	19.37±4.78	19.39±4.81	0.344	0.090
AFB	19.55±3.09	21.96±3.99	19.53±3.05	19.64±3.12	21.88±3.87	19.68±3.30	19.62±3.75	19.42±3.14	0.276	0.093
CFL	27.94±18.53	30.13±19.13	27.88±18.59	27.82±18.67	29.93±18.95	27.77±18.65	27.90±18.48	27.86±18.49	0.155	0.094
PFL	20.47±4.80	22.88±5.32	20.25±4.52	20.56±4.88	22.67±4.62	20.64±4.76	20.39±4.78	20.51±4.70	0.276	0.158
VFL	15.63±2.96	17.53±3.98	15.57±2.87	15.53±2.81	16.99±3.52	15.68±2.90	15.56±2.81	15.74±2.87	0.232	0.081
AFL	26.83±4.58	29.12±5.30	26.89±4.65	26.91±4.67	28.89±5.14	26.78±4.43	26.76±4.48	26.65±4.66	0.165	0.083
BDPO	22.62±2.41	25.13±3.03	22.76±2.48	22.69±2.55	24.93±3.00	22.76±2.33	22.70±2.56	22.61±2.40	0.137	0.072
BDAF	21.28±3.15	24.16±3.96	21.23±3.32	21.40±3.34	23.86±3.84	21.38±3.76	21.33±3.65	21.53±3.47	0.301	0.087
BWAF	17.98±5.11	20.11±5.97	17.86±5.23	18.14±5.27	19.79.±5.88	17.89±5.05	17.92±5.21	17.87±5.23	0.210	0.093
HD	16.73±3.41	19.74±4.32	16.65±3.61	16.86±3.54	18.43±3.97	16.87±3.76	16.82±3.38	16.62±3.56	0.109	0.102
HW	17.21±4.11	20.05±4.89	17.31±4.34	17.45±4.43	19.92±4.77	17.67±4.56	17.44±4.23	17.32±4.52	0.216	0.071
E	5.81±0.64	5.82±0.62	5.80±0.64	5.80±0.60	5.81±0.62	5.81±0.63	5.83±0.62	5.81±0.62	0.390	0.076

Descriptions: The morphometric characters 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).

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Table 7. Morphometric attributes (mean ± SE) of female *G. giuris* inhabiting Jabonga, Agusan del Norte, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	QUARTER Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	F Value	P Value
TL	144.37±16.53	148.05±17.25	145.83±16.64	144.95±16.77	147.52±16.76	144.88±16.70	144.64±16.69	148.11±17.11	0.325	0.072
SL	127.23±13.94	131.02±14.98	127.42±13.89	127.32±13.78	127.34±13.94	127.34±13.43	127.24±13.85	130.62±14.86	0.187	0.099
HL	36.18±7.82	40.12±8.87	36.28±7.96	36.24±7.93	36.67±7.93	36.27±7.90	36.33±7.94	39.63±7.96	0.265	0.190
PDL1	52.17±8.96	54.11±9.86	52.46±8.95	52.32±8.76	53.76±9.25	52.29±8.88	52.35±8.93	53.56±9.21	0.269	0.092
PDL2	63.53±16.73	65.23±17.53	63.44±16.75	63.56±16.79	63.78±16.88	63.65±16.83	63.63±16.89	65.34±17.44	0.225	0.103
PPL	40.66±7.61	42.05±8.53	40.77±7.82	40.71±7.73	41.96±7.78	40.77±7.86	40.82±7.73	42.65±8.65	0.127	0.085
PAL	68.04±13.13	70.14±14.66	68.52±13.33	68.43±13.31	68.86±13.68	68.53±13.71	68.45±13.76	70.22±14.54	0.296	0.109
SA	64.04±9.32	66.05±10.12	64.16±9.42	64.23±9.43	64.75±9.83	64.21±9.42	64.23±9.42	65.78±9.24	0.221	0.078
VFA	25.81±4.84	27.10±5.46	25.89±4.92	25.92±4.96	26.02±4.99	25.87±4.94	25.90±4.93	27.06±5.61	0.147	0.100
CPL	25.17±5.57	26.88±6.49	25.31±5.64	25.33±5.67	26.13±5.96	25.36±5.77	25.51±5.62	27.00±5.61	0.311	0.090
CPD	13.56±2.88	15.49±3.40	13.65±2.78	13.76±2.89	13.98±3.12	13.71±2.95	13.66±2.90	14.96±3.77	0.236	0.133
DFB1	14.21±2.49	16.12±3.55	14.31±2.53	14.77±2.69	14.89±2.68	14.45±2.71	14.33±2.65	15.98±3.72	0.211	0.090
DFB2	19.54±5.67	21.20±6.54	19.58±5.71	19.78±5.82	19.86±5.86	19.62±5.80	19.68±5.77	21.53±5.66	0.314	0.044
AFB	19.74±2.91	21.10±3.53	19.82±2.96	19.79±2.93	20.15±3.10	19.88±2.95	19.77±2.89	21.01±3.20	0.152	0.201
CFL	29.04±19.62	30.86±20.32	29.14±19.68	29.44±19.73	29.69±19.80	29.19±19.75	29.79±19.79	31.12±20.11	0.122	0.191
PFL	20.77±4.81	22.52±5.33	20.83±4.94	20.72±4.92	21.16±4.96	20.91±4.86	20.80±4.81	22.26±5.54	0.261	0.155
VFL	15.74±2.82	17.31±3.45	15.65±2.86	15.82±2.87	15.86±2.88	15.79±2.86	15.83±2.97	17.23±3.25	0.315	0.088
AFL	27.02±4.58	29.24±5.62	27.34±4.67	27.54±4.72	27.43±4.66	27.77±4.81	27.54±4.77	28.91±5.16	0.243	0.094
BDPO	22.41±2.16	24.23±2.98	22.51±2.68	22.65±2.66	23.61±2.78	22.65±2.52	22.67±2.65	24.12±2.94	0.221	0.084
BDAF	21.04±2.89	23.03±3.48	21.23±2.93	21.18±2.76	22.63±2.97	21.31±2.79	21.25±2.92	23.14±3.36	0.264	0.088
BWAF	18.38±4.97	20.15±5.87	18.42±5.10	18.44±4.99	18.52±5.21	18.45±4.95	18.40±4.88	20.12±5.26	0.155	0.131
HD	16.91±3.67	17.20±3.82	16.95±3.76	16.97±3.76	17.66±3.86	16.83±3.86	16.93±3.72	17.21±3.96	0.267	0.081
HW	17.70±4.26	17.90±4.65	17.83±4.53	17.62±4.52	17.81±4.43	17.65±4.44	17.87±4.33	17.93±4.30	0.162	0.079
E	5.81±0.62	5.83±0.58	5.83±0.61	5.82±0.60	5.82±0.63	5.81±0.62	5.81±0.60	5.83±0.64	0.177	0.099

Descriptions: The morphometric characters 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).

Table 8. Morphometric attributes (mean ± SE) of female *G. giuris* inhabiting Kitcharao, Agusan del Norte, Northeastern Mindanao captured on December 2016 to April 2018.

CHARACTERS	QUARTER								F Value	P Value
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8		
TL	145.93±18.82	150.13±19.22	149.76±18.95	147.83±18.85	146.75±18.83	145.98±18.84	148.34±18.83	146.96±18.86	0.517	0.581
SL	128.52±16.41	132.12±16.95	131.23±16.76	129.76±16.65	128.78±16.52	128.57±16.44	130.12±16.52	128.71±16.54	0.406	0.594
HL	38.55±7.23	43.23±7.85	41.87±7.78	39.89±7.23	38.76±7.32	38.57±7.27	39.39±7.33	38.75±7.63	0.501	0.682
PDL1	52.86±10.91	56.87±11.03	56.26±10.97	53.93±10.95	52.92±10.94	52.88±10.94	53.13±10.99	52.90±10.90	0.327	0.912
PDL2	68.52±15.95	73.11±16.14	72.82±16.02	70.34±15.8	68.56±15.97	68.65±15.99	69.97±15.98	68.52±15.90	0.018	0.851
PPL	42.14±6.77	47.05±6.97	46.57±6.87	44.45±6.83	42.76±6.81	42.24±6.86	44.03±6.79	42.73±6.85	0.135	0.863
PAL	71.23±12.51	76.13±13.61	75.54±13.12	72.82±12.65	71.35±12.62	71.26±12.58	72.53±12.65	71.52±12.64	0.418	0.575
SA	65.57±10.70	69.88±11.71	65.38±11.22	66.48±10.86	65.62±10.78	65.63±10.76	67.18±10.92	65.64±10.87	0.258	0.378
VFA	26.13±4.77	31.12±5.13	30.70±4.79	26.23±4.79	26.61±4.82	26.31±4.43	26.81±4.82	26.18±4.83	0.317	0.279
CPL	26.94±6.62	31.23±7.45	30.23±6.98	26.99±6.67	26.97±6.71	26.94±6.58	27.01±6.61	26.91±6.53	0.236	0.167
CPD	13.21±2.46	14.90±2.79	14.87±2.76	13.54±2.52	13.23±2.47	13.22±2.43	13.76±2.53	13.29±2.51	0.148	0.296
DFB1	15.47±2.81	19.48±3.25	18.11±2.98	15.76±2.92	15.51±2.91	15.49±2.89	17.98±3.02	15.52±2.86	0.077	0.274
DFB2	21.78±4.67	24.62±4.98	23.78±4.97	21.82±4.73	21.65±4.63	21.67±4.76	22.30±4.73	21.83±4.74	0.343	0.385
AFB	20.61±4.59	24.60±5.41	23.41±4.93	20.72±4.64	20.65±4.57	20.58±4.52	20.85±4.63	20.81±4.64	0.138	0.348
CFL	27.78±17.27	31.56±18.12	30.32±17.92	27.74±17.23	27.76±17.27	27.65±17.21	29.33±17.67	27.73±17.54	0.174	0.189
PFL	21.94±4.16	24.87±4.86	23.91±4.65	22.03±4.06	21.86±4.11	21.90±4.21	22.58±4.34	21.83±4.32	0.179	0.159
VFL	16.51±2.26	20.45±2.87	19.90±2.75	16.83±2.34	16.71±2.28	16.56±2.30	18.05±2.76	16.78±2.32	0.231	0.408
AFL	27.38±4.61	31.19±5.17	30.41±4.96	27.72±4.83	27.56±4.64	27.43±4.69	28.12±4.98	27.59±4.79	0.146	0.274
BDPO	23.26±2.54	27.32±2.45	26.63±2.75	23.37±2.56	23.33±2.71	23.28±2.36	24.75±2.84	23.45±2.87	0.171	0.774
BDAF	21.74±3.21	25.65±4.98	24.13±3.65	21.89±3.86	21.78±3.32	21.65±3.40	22.86±3.97	21.67±3.32	0.343	0.876
BWAF	18.92±4.46	22.10±5.35	21.95±4.96	19.12±4.78	18.95±4.76	18.93±4.51	19.73±4.93	18.88±4.52	0.246	0.939
HD	18.31±4.11	21.90±5.97	20.78±5.12	19.30±4.54	18.76±4.96	18.41±4.56	19.74±4.87	18.53±4.34	0.133	0.568
HW	18.87±3.75	21.79±4.87	20.75±5.23	18.92±3.91	18.89±3.87	18.81±3.73	18.97±3.78	18.95±3.76	0.061	0.158
E	6.09±0.65	6.10±0.69	6.05±0.62	6.09±0.66	6.09±0.67	6.08±0.61	6.07±0.58	6.09±0.65	0.602	0.189

Descriptions: The morphometric characters 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).

In the study, the morphometric characteristics are described to account the discreetness and relationship among stocks (Quilang et al, 20007). For *pijanga,* the results seemed similar to what has been observed by the study of Quilang et al, 2007, such that the observed clustering and morphological variations were attributed to similarities and differences in the Lake environments. Differences of the biological and physico-chemical factors, as a function of various anthropogenic activities, pose greatest influences among the inhabiting *pijanga* population and other aquatic inhabitants.

Information on the biology and population structure of any species is a prerequisite for developing management and conservation strategies. Morphometric and meristic study will provide a vigorous tool for measuring discreteness of the same species, therefore all such characters had most commonly used by several ichthyologists for the differentiation of fish species or geographically variants or populations. Morphometric characters of fish are the measurable characters common to all fishes. Some arbitrarily selected points on a fish body known as landmarks help the individual fish shape to be analyzed. Also it determines their systematic relationships, growth variability, ontogenetic trails and various other population parameters

In terms of the genetic and environmental identification morphometric analysis provides a great contribution to its approach. The univariate comparisons were the earliest morphometric analysis used for stock identification and soon followed by bivariate analysis of relative growth to detect the changes in ontogeny and geographic variation among fish stocks. During the development of the field of multivariate morphometrics, its application were done to discriminate the variation in growth and form among stocks.Challenges in future morphometric stock identification is to develop a consensus on biological interpretations of geometric analyses, similar to the conventional interpretations of size and shape from traditional multivariate morphometrics. Advanced techniques for morphometric analysis offers more efficient and powerful tools in identify differences between fish populations, detecting differences among groups and to differentiate between species of similar shape. Some of the advanced techniques developed for morphometric analysis in fish population are Truss network measurement, Image analysis- Univarite, Bivariate, and Multivariate, Principal component Analysis (PCA) (Cadrin, 2000; Mojekwu and Anumudu, 2015; Nath and Kundu, 2017) In the study of Parsons et al, 2013, the results indicate that geometric morphometrics can be a more effective way to analyze and interpret body form, but also that traditional methods can be relied upon to provide statistical evidence of shape differences, although not necessarily accurate information about the nature of variation in shape.

Researchers have traditionally used multivariate analysis of several linear measures across the body form to quantify shape. The body shape is a difficult, but important, trait to quantify. Newer geometric morphometric methods claim to better estimate shape because they analyze the geometry among the locations of all landmarks simultaneously rather than the linear distances between pairs of landmarks (Trapani, 2003; Parsons et al, 2013).

CONCLUSION AND RECOMMENDATION

Glossogobius giuris locally known *pijanga* is native in Lake Mainit, and this study might serve as additional information that may indicate that Lake Mainit, is still good in condition as a favourable habitat for the *pijanga* and other aquatic organisms due to similarity of the morphology among the stocks. However, the average size and length of *pijanga* caught may not be at their optimum age of maturity for recruitment and spawning stage, but since, relatively large-sized *pijanga* which are presumed to be the spawners, are no longer available in large number. Hence, the next maturing population of *pijanga* may be forced to spawn to replenish their declining population. Looking beyond in the future, this may result to a relatively smaller-sized *pijanga,* which is a size no longer comparable to what is previously caught. This may be attributed to the unregulated anthropogenic stressors affecting the *pijanga* fishery and their food and habitat quantity and quality, in which some fishermen employed destructive fishing methods and overfishing like catching of fry known as *saguyon.* Hence, it is recommended that both regulatory (e.g. through enactment of resolution and ordinance) and non-regulatory (e.g. production of IEC materials) measures should be undertaken to conserve the *pijanga* and other aquatic inhabitants, the Lake and the livelihood of the community. Further scientific investigations must be needed to support the claims of the policy-makers like establishment of aquaculture for *pijanga* or establishment of seeding program to enhance their natural stock.

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