

Biology, Ecology, and Fishery of the Cross-barred Grunt, *Mesopristes cancellatus* in Mandulog River, Iligan City

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ABSTRACT

Observations on the abundance and certain aspects of the biology, ecology, and fishery of the cross-barred grunt *Mesopristes cancellatus* in Mandulog river, Iligan City were carried out in 1991 to obtain necessary information for the development of culture technology of the species. Data were gathered from two study stations, Hinaplanon and Bayug, representing the upstream and downstream portions of the river. Biological aspects of the fish investigated were sex ratio, sexual maturity, fecundity, and gut content. Physico-chemical description of the river included water salinity, turbidity, velocity, pH, D.O. and substrate characteristics. A description of *M. cancellatus* fishery in Mandulog river was also undertaken in the study. Results indicate that *M. cancellatus* exhibited seasonal abundance apparently influenced by flooding and lunar phase. The fish occurred abundantly in the months of April to September but were not observed between January and March and between October and November. A total of 125 fish were collected within the period with weights ranging from 25-700g, dominated by medium-sized individuals with body weight ranging from 261-420g (64%) while small individuals (25-100g) occurred at a relatively lower frequency (27.4%). Sex ratios generally showed higher number of female than male fish, and gonadal maturity appeared to peak between April and May. Fecundity ranged from as low as 16,800 eggs to as high as 2,078,000 eggs per fish, depending on gonadal size and maturity. Large, mature (Stage IV) females with weight range of 350-560g had a mean fecundity of 1,186,420 eggs. Moderate levels of ambient physico-chemical conditions and abundant plankton populations make Mandulog River an ideal habitat for this economically important species.

Keywords: freshwater, fisheries, catch composition, morphometric characteristics, fecundity.

INTRODUCTION

The cross-barred grunt, *Mesopristes cancellatus*, (Cuvier, 1829) known locally as *pigok* or *pigek* belongs to the family Theraponidae. The fish under the genus *Mesopristes* is identified based on the length of its opercular spine which differs from the genus *Therapon*. It is known to inhabit many freshwater bodies in the East Indies, New Guinea regions and in the Philippines, (Conlu, 1986). The fish is also found in various river systems in Mindanao, Philippines such as in Cotabato (Macabalang *et al.*, 1981a), and has been known to occur in Mandulog River in Iligan City but has not been documented properly. *Mesopristes cancellatus* is considered in several parts of the country as a high-valued freshwater fish. Preliminary investigations into the biology and culture of the fish by Macabalang *et al.* (1981a & 1981b) showed that the fish has a good potential for culture as it meets most of the criteria set for candidate species (Bardach *et al.*, 1972). Data on the abundance, important biological characteristics of *M. cancellatus* and ecological parameters of its habitat are vital information for the development of culture technology for the species.

MATERIALS AND METHODS

Selection of Sampling Stations

Selection of sampling sites for this study was based on the following criteria: established fishing ground for pigok; number of pigok fishers; accessibility; confluence of brackishwater and freshwater bodies; and abundance of the fish. The selected sampling sites were the Bayug rivermouth and the Hinaplanon-Barinaut area located upriver about 4-5 km northeast of the river mouth (Figure 1.).



Figure 1. The location of the Mandulog river (black arrow) in Iligan City where *Mesopristes cancellatus* were collected.

Fish Collection

Experimental fishing to obtain samples of *Mesopristes cancellatus* from Mandulog river was carried out from January to December 1991. The fish were caught by fishermen in each station using fishing methods commonly practiced in the area. Two units of multiple handline consisting of 25 hooks (No. 569-570) per unit were used in the Hinaplanon-Barinaut site. These handlines were set across the river for five hours from 07.00 to 12.00h which was the usual fishing time of local fishers. Three units of drift gillnet with varying mesh sizes (Nos. 6, 7 & 10) with stretched mesh sizes of 6, 5, and 3cm, respectively were used in Bayug station. Each net was 50m long and 2m wide, and was allowed to drift across the river, one end tied to a float while the other end was held by the fisherman on a small boat. The net was then allowed to drift (or *paanod*) for 2-3 hours from a distance of about 100m downriver. This operation was repeated 2-3 times for each gillnet with one sampling done 07.00h and another at 15.00h.

Catch Volume and Size Composition

The number and volume (in kg) of *M. cancellatus* caught were determined after each sampling. In the laboratory, the fish samples were measured individually. Total length was measured from the tip of the snout to the tip of the caudal fin using a plastic ruler. Body weight was measured using a portable top-loading balance (1 kg cap).

Biological Analysis

1. Taxonomy, morphometrics, and secondary sexual characteristics

The morphometric characterization of the fish was based on the taxonomic description provided by Vari (1978), Macabalang *et al.* (1981a) and Conlu (1986). Secondary sexual characteristics such as body coloration, body shape, size, and external distinguishing characteristics of male and female *M. cancellatus* were noted to identify sexual dimorphic characters.

2. Sex Ratio, Sexual Maturity and Fecundity

Sex ratio of *M. cancellatus* was obtained by determining the proportion of males and females caught monthly over one year. Sexes were identified through dissection and ocular investigation of the reproductive organs. Sexual maturity was determined upon dissection and examination of the developmental stages of male and female gonads based on the work of Laevastu (1965).

Fecundity of *M. cancellatus* was determined from Stages 2 to 4 female gonad through a gravimetric method (Laevastu, 1965). One gram of mature gonad was placed on a dish and the number of eggs counted under a compound microscope. The resulting number was then multiplied with the total weight of the gonad to obtain the total number of eggs per gonad.

3. Gut Content Analysis

The stomach and intestine of the fish were dissected and their contents removed and examined under the microscope.

Determination of Selected Ecological Parameters

Selected physico-chemical and biological parameters of the water and substrate in each sampling station were examined to describe the habitat characteristics of *M. cancellatus*. Measurements were taken monthly, simultaneously with the specimen collection during full and new moon phases of each month.

1. Physico-chemical Characteristics

Surface and bottom water salinities were measured using a refractometer. At the Bayug station, samples were collected at the river mouth and at 75m upriver. Tidal level and occurrence of flooding were also noted during sampling. Air and water temperature were recorded using an alcohol-filled thermometer. The time of temperature readings and the prevailing weather conditions were also recorded.

Water pH and dissolved oxygen (DO) measurements were obtained. Three 250ml water samples were collected from each station for laboratory analysis of water pH. As in the measurement of water salinity, two sites were sampled at Bayug station. Dissolved oxygen measurements were obtained in situ using a portable DO meter.

Water transparency in deeper portions of the river was measured using a secchi disc. Water current was measured by the "Float Method" described in the Training Manual on Fishpond Engineering (UNDP-FAO-BFAR, undated). Water depth in each station was determined by line sounding using a calibrated pole. Measurements were made at regular intervals along and across the river to determine the shallowest and deepest portions. River substrate was characterized by collecting about 1 kg of sediment from each station and analyzed in the laboratory.

2. Plankton analysis

Horizontal towing of a plankton net was done for 15min in each site. The samples were placed in separate plastic jars with 10% formalin and brought to the laboratory for quantitative and qualitative analysis.

Notes on the Fishery of *M. cancellatus*

Information on the fishery of *M. cancellatus* in Mandulog river, such as types of fishing gears used, amount of catch, fishing area, and prevailing selling price of fish, was obtained through a survey questionnaire and interviews conducted with the fishermen, fish vendors, and local residents along the river.

RESULTS

A total of 125 individuals of *M. cancellatus* (Fig. 2) were collected from Mandulog River within the one year period (Table 1). The fish were obtained only from April to September and in December, with the highest numbers collected in September and June representing 31.2% and 29.6% of the total catch, respectively. Only three fish were caught in December, while no fish were caught from January to March and October to November.



Figure 2. The cross-barred grunt *Mesopristes cancellatus* collected from Mandulog River, Iligan City.

Morphometrics and Biological Characteristics

Weights of fish collected during the study period ranged from 25-700g. The largest mean weight was obtained in the month of May (315.29 g) and the smallest in December with only 86.67 grams.

Size composition of the catches based on body weight (Fig. 3) showed that the dominant size groups were small- (20-60 g) and medium-sized fish of 261-300g, together comprising 30.1% of the total sample of fish caught by common gears. Overall, medium-sized individuals of *M. cancellatus* with body weight ranging from 261-420g (64%) dominated the collection from Mandulog River.

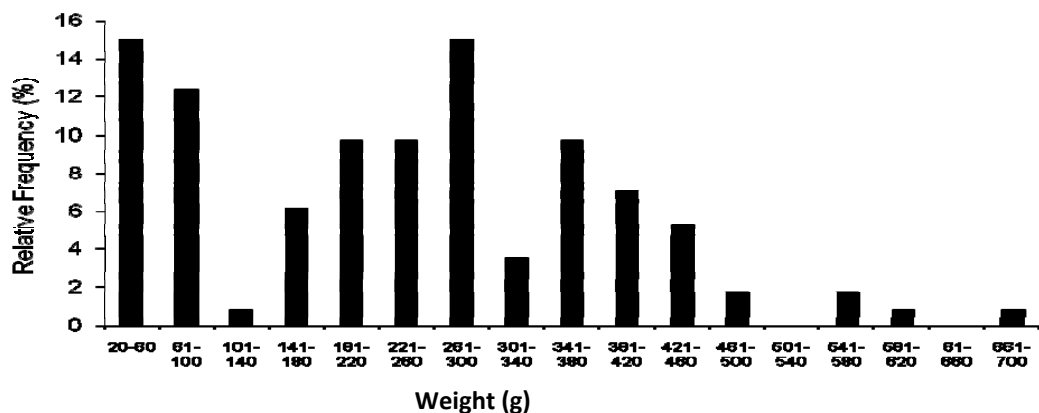


Figure 3. Frequency distribution of the various sizes (g) of *Mesopristes cancellatus* collected from Mandulog river, Iligan City.

Table 1. Abundance and size ranges of monthly collections of *Mesopristes cancellatus* in Mandulog River, Iligan City.

Month	Number of fish	Relative Abundance (%)	Total Weight (g)	Sizes (g)	
				Range	Mean
January	0	0	0	-	
February	0	0	0	-	
March	0	0	0	-	
April	5	4.0	681	48-350	136.20
May	17	13.6	5,360	39-700	315.29
June	37	29.6	9,190	50-450	255.28
July	17	13.6	4,345	25-600	255.59
August	7	5.6	1,305	60-285	186.43
September	39	31.2	9,520	34-490	226.41
October	0	0	0	-	-
November	0	0	0	-	-
December	3	2.4	260	70-100	86.67

Table 2. Morphometric characteristics of *Mesopristes cancellatus* Cuvier 1829, *Therapon cancellatus* Cuvier and Valenciennes 1829 and similar species from Cotabato and Iligan City.

Morphology	<i>M. cancellatus</i> (Vari, 1978)	<i>T. cancellatus</i> (Conlu, 1986)	Cotabato specimen	Iligan specimen
Dorsal spines	XI-XII	XII	XII	XII
Dorsal rays	10-11	10	10	10
Anal spines	III	III	III	III
Anal rays	8-9	8-9	8	8
Pectoral rays	13-16	13	13	13
Pelvic spines	1	1	1	1
Pelvic rays	5	5	5	5
Lateral line scales	48-58	51-58	53	53

Laboratory examination of fish samples showed that the fish has identical morphometric descriptions (Table 2) with that of *Therapon cancellatus* (Conlu, 1986) and *Mesopristes cancellatus* (Vari, 1978). Further comparisons of the two species showed that the fish at Mandulog river belongs to the Genus *Mesopristes* as shown by the length of lower opercular spine which does not extend beyond the margin of opercular lobe (Fig. 4).

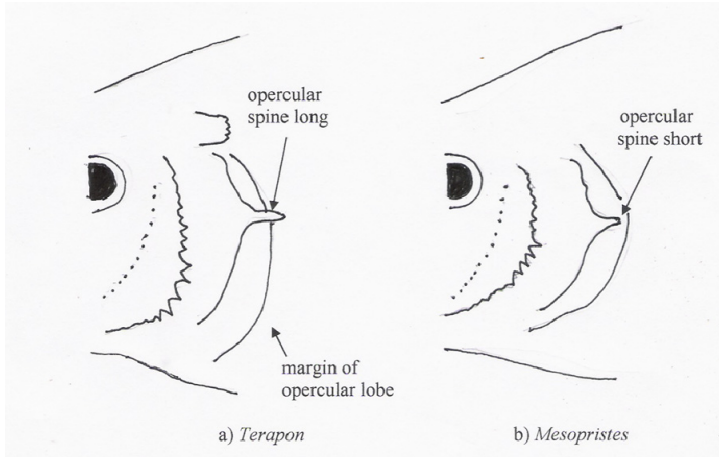


Figure 4. Comparison of the length of lower opercular spines in relation to the margin of the opercular lobe in *Therapon* and *Mesopristes* (Carpenter and Niem, 2001).

Examination of the secondary sexual characteristics through body coloration, shape, and morphological structures of the genitalia showed similar features for both male and female fish. Only upon dissection were the sexes determined which showed that those weighing below 100g were males while those above 100g were females. The smallest male *M. cancellatus* weighed 25g with mature testis and the largest at 90g. On the other hand, the smallest female weighed 100g with already mature ovaries.

Generally, sex ratio determinations showed higher number of female than male fish in all months except April and December. Overall sex ratio (M:F) for all fish was 1:3.42 (Table 3). Examination of female fishes showed that most had ovaries at Maturity Stages 1-4 (Laevastu, 1965), where fish samples from April and May had ovaries at Maturity Stages 2-4 (Table 4). Some samples from June to September had limp and clear gonads. Females with well-developed gonads were discernible externally through their distended bellies.

Table 3. Sex ratios of *Mesopristes cancellatus* collected from Mandulog river, Iligan City between April and December.

Month	Number		Sex Ratio
	Male	Female	
April	3	2	1 : 0.67
May	3	14	1 : 4.67
June	5	32	1 : 6.40
July	3	14	1 : 4.67
August	1	6	1 : 6.00
September	9	20	1 : 2.22
December	2	1	1 : 0.50
Total	26	89	1 : 3.42

Fecundity ranged from as low as 16,800 to as high as 2,078,000 eggs per fish (Table 4). The largest number of eggs was produced by a female weighing 560g with a gonad weight of 68g. Fecundity increases with gonad weight, thus, gonads below 20g had less than 200,000 eggs. Similar fecundity estimates were reported by Macabalang *et al.* (1981b) which they also related to the size of the fish.

The shape of the eggs varied from somewhat oval to spherical with reddish-brown color during early gonadal development (Stages 1-2) to creamy and yellowish during the advanced stages (Stages 3-4). Egg sizes ranged from 0.31mm (Stages 1-2) to 0.57mm (Stage 4).

Analysis of stomach content showed a dominance of small shrimps and an odd mixture of fine twigs, sand, fibrous materials, mud, and even plastic. These materials, observed abundant along the bottom of the river, were believed to have been ingested with the shrimps during feeding by *M. cancellatus*.

Table 4. Profile on ovarian maturation, fecundity and egg color of berried *Mesopristes cancellatus* collected from Mandulog river, Iligan City.

Fish No.	Body Weight (g)	Ovary Weight (g)	Ovary Wt /Body Wt Ratio (%)	Egg Color	No. of Eggs	Mean Egg Size (mm)	Ovarian Maturation Stage
1	100	2.4	2.40	Reddish Brown	*	0.31	1
2	150	3.3	2.20	Reddish brown	*	0.31	1
3	185	13	7.03	Creamy	168,480	0.48	2-3
4	185	5	2.70	Creamy	16,800	0.42	1-2
5	215	22	6.51	Creamy	216,160	0.47	2-3
6	215	22	10.23	Creamy	283,360	0.45	2-3
7	240	30	12.50	Yellow	705,600	0.47	4
8	250	38	15.20	Yellow	559,360	0.46	4
9	265	26	9.81	Creamy	470,080	0.50	3
10	295	10	3.39	Brownish	93,600	0.38	2
11	320	8.4	2.63	Reddish brown	*	0.32	1
12	350	61	17.43	Yellow	819,840	0.56	4
13	365	38	10.41	Creamy	541,120	0.49	3
14	400	9.8	2.45	Reddish brown	*	0.31	1
15	415	58	13.98	Yellow	1,220,320	0.55	4
16	430	29.9	6.95	Creamy	236,808	0.39	2
17	450	34.1	7.58	Yellow	627,440	0.42	4
18	472	14.3	3.03	Brownish	18,304	0.33	2
19	485	28	5.77	Creamy	412,160	0.48	2-3
20	560	68	12.14	Yellow	2,078,080	0.56	4
21	580	30	5.17	Creamy	388,800	0.49	3
22	600	14.2	2.37	Brownish	38,624	0.33	2
23	700	62	8.86	Creamy	1,289,600	0.54	3

Legend: * Eggs too small for visual counting

Physico-chemical Characteristics and Plankton diversity

Water temperatures in Mandulog River ranged from 23.0 to 31.3°C and pH levels from 7.2 to 8.4. During high tides water salinity can reach 33ppt around the river mouth until about 100m upstream but can be down to 0ppt during low tide. The Hinaplanon part of the river was shallower with a mean depth of 0.71m while Bayug had a mean depth of 1.59m (Table 5). Transparency readings for both stations ranged from 10cm to 200cm while water current velocity was stronger at Hinaplanon with an average of 33.73m min⁻¹ than at Bayug at 12.86m min⁻¹. The plankton community in the river was quite diverse with 26 taxa dominated by phytoplankton (24 taxa). *Chaetoceros* sp and *Nitzschia* sp were the dominant phytoplankton while *Brachionus* sp and foramineferans were the abundant zooplankton (Table 6). Coarse sand (> 1.75mm) was the dominant component (50%) of the river substratum at Hinaplanon while most of the substratum in Bayug station (53.6%) mostly consisted of fine sand (150-180µm) and very fine sand (75-150µm).

Table 5. Physico-chemical profile of the two sampling stations in Mandulog river, Iligan City.

Parameters	<u>Hinaplanon</u>		<u>Bayug</u>			
	7AM-7:30AM		9AM-10AM		4PM-5PM	
	Range	Mean	Range	Mean	Range	Mean
Temperature, °C						
Air	23.50-27.50	25.58	27.00-32.00	28.20	26.30-30.50	28.44
Water	23.00-27.00	24.96	24.70-27.80	26.51	27.00-31.30	29.32
pH						
Surface	7.35- 8.37	7.95				
Rivermouth	-		7.26- 8.39	7.87	7.34- 8.35	7.97
75m from rivermouth			7.50- 8.23	7.88	7.58- 8.44	8.09
Bottom	7.53- 8.35	7.98				
Rivermouth			7.48- 8.19	8.00	7.27- 8.37	7.96
75m from rivermouth			7.67- 8.30	8.01	7.39- 8.40	8.03
Salinity, ppt						
Surface	0.00- 0.00	0.00				
Rivermouth			0.00-25.00	3.09	0.00- 7.00	0.60
75m from rivermouth			0.00- 5.00	0.60	0.00- 7.00	0.58
Bottom	0.00- 0.00	0.00				
Rivermouth			0.00-33.00	14.00	0.00-30.00	5.44
75m from rivermouth			0.00-32.00	11.55	0.00-13.00	3.08
Transparency, cm	10.00-150.00	68.39	12.00-200.0	98.23	14.00-90.00	44.70
Current, m/min	21.01-45.45	33.73	4.55-14.50	8.94	6.45-23.92	12.86
Depth, m						
North side	0.22- 0.40	0.32	1.20- 3.00	1.98		
Middle	1.20- 1.50	1.30	0.84- 2.52	1.57		
South side	0.40- 0.60	0.50	0.70- 2.43	1.23		
Average depth		0.71		1.59		

Table 6. Distribution of plankton populations at the Hinaplanon and Bayug stations in Mandulog river, Iligan City.

Genus/Group level	Hinaplanon	Bayug
Phytoplankton		
<i>Amphiphora</i>	x	x
<i>Biddulphia</i>	x	x
<i>Chaetoceros</i>	A	xxxx
<i>Closterium</i>	A	xx
<i>Coconeis</i>	xx	x
<i>Coscinodiscus</i>	xx	x
<i>Cymbella</i>	x	x
<i>Fragillaria</i>	xxx	x
<i>Lauderia</i>	x	x
<i>Melosira</i>	x	xx
<i>Meridion</i>	x	x
<i>Navicula</i>	x	x
<i>Nitzschia</i>	xxxx	xxxx
<i>Oscillatoria</i>	xxx	xxx
<i>Pinnularia</i>	xxxx	x
<i>Plerosigma</i>	x	xx
<i>Rhizosolenia</i>	xx	xxx
<i>Spirogyra</i>	A	xx
<i>Spirulina</i>	xx	xxx
<i>Surirella</i>	x	x
<i>Thalassiosira</i>	xxx	xxx
<i>Tintinnopsis</i>	xx	xx
<i>Trichodesmium</i>	xx	A
<i>Ulothrix</i>	xx	A
Zooplankton		
<i>Brachionus</i>	A	xx
<i>Foraminefera</i>	A	xxxx

Legend: xxxx (dominant); xxx (moderate); xx (few); x (scarce); A (absent)

Table 7. Grain size characteristics of the substrata at Hinaplanon and Bayug study stations along Mandulog River.

Grain Size Range	Description	Relative Volume (%)	
		Hinaplanon	Bayug
> 1.7mm	Coarse sand	50.0	16.9
850µm – 1.7mm	Coarse sand	12.7	9.5
250µm - 850µm	Fine sand	21.8	10.4
180µm - 250µm	Fine sand	6.1	2.7
150µm - 180µm	Fine sand	2.2	18.9
75µm - 150µm	Very fine sand	3.6	34.7
< 75µm	Silt	3.6	6.9
		100.0	100.0

Notes on the Fishery of *M. cancellatus*

Fishermen from Cotabato and at Mandulog River in Iligan commonly use gill nets with mesh sizes ranging from 3-8cm to catch *pigok*. Catching the fish using this gear is done in two ways: by stationary or barricade (“*ali*”) method wherein the net is set across the river at a fixed location or allowing the net to drift (“*anod*”). The drift net is the more popularly used method, set across the river with a float on one end while the other end is held by a fisherman on a *banca*. The net is then allowed to float from about 100m upriver until the river mouth. *Pigok* catchers upriver where the water is shallow and with strong water currents mostly use the bottom-set long line (“*palangre*”) with 25-45 hooks per line using earthworm and shrimps as bait. The fish in Madulog river are sold at PhP200.00 to 250.00 per kg directly from the fishermen but in other cities such as in Cagayan de Oro and Cotabato they can fetch higher prices ranging from PhP450.00 to 500.00 kg⁻¹.

DISCUSSION

The prominent features of *Mesopristes cancellatus* are their compressed body and thick and fleshy lips the upper one longer than the lower lip. Body color is somewhat greenish or brownish and lighter or silvery colored on the lower part. Three bands are present on the sides of the body, the uppermost is prominent while the two lower ones are more or less broken into several lines. The operculum has two flat spines, the lower spine longer than the other. A report by Conlu (1986) indicated that *M. cancellatus* occurs in a wide range and is found in several rivers in Luzon, Visayas and Mindanao. *Pigok* is reportedly also found in Tagoloan, Misamis Oriental and Butuan rivers in Northern Mindanao.

Morphometric examinations of the fish in Mandulog River revealed identical characteristics with that of *Therapon cancellatus* based on the descriptions of Conlu (1986) and *M. cancellatus* as identified by Macabalang *et al.* (1981a) based on the work of Vari (1978). *Therapon* and *Mesopristes* are usually identified interchangeably because of their similarity in physical characteristics. The fish in Mandulog river belongs to the genus *Mesopristes* as seen in their short opercular spine which does not exceed the margin of opercular lobe (Carpenter and Niem, 2001). Fish that belong to the genus *Therapon* have longer opercular spines exceeding the margin of the opercular lobe.

Occurrence of different life stages of *M. cancellatus* in Mandulog River confirm past observations that the fish can be found in freshwater, brackishwater and marine environments. Conlu (1986) described *Therapon cancellatus* as a marine species that occasionally enters brackishwater and freshwater areas, however, fishermen in Mandulog observed that all life stages of the fish were found in the river, thus, can be considered a freshwater species migrating occasionally to sea, Fishermen interviewed in this study caught *M. cancellatus* about a kilometer offshore only during rainy season. These hypotheses, however, cannot be verified from the present data as no sampling was made in offshore or seaward sites.

Although no fish were caught in some months (January to March, October to November) fishers observed the presence of the species in Mandulog River the whole year suggesting that their occurrence is not seasonal. The lunar cycle and river flooding, however, seem to influence their abundance at certain times. The predominance of gravid females from April to June coincided with heavy rains and flooding which suggests that the fish may exhibit a cyclic reproductive behavior (Lagler *et al.*, 1977). This pattern of occurrence may be a manifestation of migration of the fish from upriver towards the river mouth or sea during spawning period. The occurrence of large-sized individuals dominated by gravid females in Bayug between April and May seems to support the observations of fishermen on the migratory behavior of the fish. Migration of this fish towards the sea or around the river mouth for spawning implies that fish eggs require higher salinity levels for development. Fishermen in Pulangi River of Cotabato had similar observations on *pigok* found in the area (Macabalang *et al.*, 1981).

Peak occurrence of *M. cancellatus* occurs in the months of April to September and in December in Mandulog river especially during the new moon. Abundance and possible migration from upstream to the nearshore areas for spawning seem to coincide with the rainy seasons and river floods. Although local fishermen reported that the fish can be found the entire year on the whole length of the river, they were most abundant, however, in June and September. Size composition of catches showed that large fish occur in Mandulog which agree with reports that the fish reach one kilogram in weight and a length of about 30cm (Conlu, 1986). Most females caught between April and July had mature ovaries while others caught from June to September had limp and clear gonads indicating spent ovaries. A more comprehensive study on the reproductive biology and ecology of this fish would demonstrate the relationship between its spawning season and observed migration.

Identification of sex based on secondary sexual characteristics is difficult for the fish but initial observations seem to show sexual dimorphism in *M. cancellatus* which is usually exhibited by a number of fish species (Lagler *et al.*, 1977.). These fishes change their sex upon reaching a certain age. Upon dissection fish samples below 100g (the smallest of which was 25g) were males with mature testes while those 100g and above were all females with mature ovaries, although this observation needs further investigation.

Some work on the biology of locally available *M. cancellatus* had been done by Macabalang *et al.* (1981a, 1981b) particularly those found in Rio Grande de Mindanao in Cotabato. These studies showed that the fish feed on plant and animal materials based on the characteristics of its mouth, teeth parts, and digestive organs. The presence of shrimps in the gut of the fish and the teeth structure suggests that *M. cancellatus* is mainly carnivorous.

The water in Hinaplanon station is shallower than at Bayug (all depth measurements at Bayug was taken during low tide) which may explain the stronger water current velocity in Hinaplanon where the deepest portion is at the middle of the river. The deepest portion of Bayug station is on the north side of the river and the shallowest part is on the opposite side, characterized by several deltaic formations. The presence of these

deltas may have produced a drag on water flow which explain the slower current velocity in the south than in the northern portion, the farthest portion sampled. According to local fishermen, highly saline water reaches up to about 500m upriver during high tide. The substratum in Hinaplanon is primarily rocky with boulders on the shallow portions and sandy soil at the middle. In Bayug, the substratum is made up of gravel and clay along the shallow parts but sandy from about 20m upstream toward the river mouth.

River water in Mandulog can be turbid in December and January which fishermen observed to increase the probability of catching more *M. cancellatus*. High plankton population in Mandulog river indicates that food is available for the riverine food chain and juvenile recruitment.

The catchers of *pigok* in Hinaplanon-Barinaut and Bayug-Santiago fishing areas used different types of fishing gears. In Hinaplanon-Barinaut area, fishing by multiple handline was common while fishers at Bayug-Santiago prefer to use gill net, which is considered more efficient in catching *M. cancellatus* than the multiple handline. Fishing is not a regular activity of the *pigok* catchers in Hinaplanon-Barinaut area. The catchers are mostly young boys at 7-15 years old that considers fishing more a pastime than livelihood. In Bayug-santiago, on the other hand, the catchers are regular fishermen. During peak months, however, there is active fishing for *M. cancellatus* involving more people in both areas.

M. cancellatus caught by fishermen are mostly used only for family consumption especially at Hinaplanon-Barinaut. Excess catch are sold in neighboring areas at PhP100-150.00 kg⁻¹ except at Barinaut where the fish fetches a higher price at PhP150-200.00 kg⁻¹. *M. cancellatus* commands a relatively higher price compared to other fishes sold locally which further indicates the high demand for the fish. The fish seldom reach the public market. These observations suggest that *M. cancellatus* is a potential aquaculture commodity for local, national and probably international markets.

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