

Stock Assessment of the Benthic Macroinvertebrates and Fish Resource of Mestizo River in Wigan, and Caoayan, Ilocos Sur

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Abstract

This study aimed to list down the edible benthic macroinvertebrates and fish resource of Mestizo River in Metro Wigan, Ilocos Sur and assess their natural stocks from January to October 1999. This study also sought to find out the variation of three physical factors of the river, namely: pH, temperature, and salinity.

Five sampling stations were established along the entire length of the river. Data on the benthic macroinvertebrates and fish resource were based on the weekly average catch per fishing effort of the fisher-respondents of this study. A representative sample of each species caught was taken for identification as to its common name, phylum, family, class, and genus.

Fifteen edible benthic macroinvertebrates were caught in Mestizo River. The twelve known species were distributed in two phyla, namely, Arthropoda and Mollusca, in three classes (Crustacea, Pelecypoda, and Gastropoda), and in eleven genera. Three macrobenthic species were still unknown as to their genus classification. These macrobenthos were distributed in the river as follows: six species in Amianance, Wigan; three species in Paggartian, Wigan; five species in Beddeng Laud, Wigan; six species in Cal-laguip, Caoaya; and nine species in Pandan, Caoayan. All the 23 edible fish species caught from Mestizo River belong to Phylum Chordata, Class Osteichthyes. Seventeen of them were distributed in 2 genera. The genera of six species were still undetermined. Of the 23 fish species, none was caught at Amianance; 10 species at Paggartian; nine species at Beddeng Laud; 13 species at Cal-laguip; and 11 species at Pandan.

The water in the Mestizo River is basic as shown by a mean pH ranging from 7.1 to 7.39. The mean temperature readings of the surface water ranged from 26.76°C to 28.50°C and the mean water salinity readings range from 1.0‰ to 4.1‰.

Data gathered indicate that the edible benthic macroinvertebrates and fish resource of the river are habitat-specific. Some are considered persistent species; others are seasonal.

Introduction

The Mestizo River is the only major freshwater ecosystem found in Vigan and Caoayan, Ilocos Sur. Today (1999) it has been noted and observed that the river is no longer as clean and as productive as it was four decades ago. Inasmuch as it is a biological component of the ecosystem that is very much affected by adverse effects of pollution, it is necessary, therefore, to monitor the diversity of the river. Some studies have found out that some biological components can tolerate waters whose quality is below the standard mark while others cannot. Those which are tolerant are so called "biological indicators" of pollution, according to Kova'cs (1992) and Verma, et al. (1991). Indifference to the health *status* of the river would eventually affect not only the people dependent on it for their daily living but also the communities surrounding it, as a whole.

Since, there is no published/unpublished record of the biological components of the Mestizo River, this work was deemed necessary. Results of this study would serve as an "eye-opener" to inconsiderate polluters of the river and as a tool/baseline information for government and non-government agencies in formulating ways and measures to clean, protect, and preserve the river.

Objectives

This project inventoried and assessed the edible benthic macroinvertebrates and fish resource of the Mestizo River. Specifically, it aimed to:

1. Classify the types and study the seasonal and spatial distribution of the edible benthic macroinvertebrates of the river.
2. Assess the stock of the edible fish resource of the river.
3. Monitor the variation of three ecological factors of the river, namely, pH, temperature, and salinity.

Scope and Limitation of the Study

This study was limited to the classification and stock assessment of edible benthic macroinvertebrates and fishes of the Mestizo River or those species with economic/commercial value in terms of the average catch per fishing effort of the fishermen from January to October 1999. Monitoring of the three physical factors (pH, temperature, and salinity) was also done every sampling period.

Methodology

This study made use of the descriptive method of research. Data gathering was from January to October 1999.

Sampling stations in the Mestizo River were chosen for variability in conditions. Station I in Amianance, Vigan, Ilocos Sur was *that* area of the river where a bridge connects the northern part of Vigan Poblacion to the western part of Barangay Capangpangan. A drainage of community and domestic wastes from the poblacion could be seen underneath the western side of the bridge.

Station II in Pagpartian, Vigan was that portion of the river which received most of the liquid and solid effluents of Vigan's slaughterhouse.

Station III of the river was established around the area underneath a bridge connecting Vigan Poblacion to Barangay Beddeng Laud. One of Vigan's big septic tanks was located between Stations II and III.

The last two stations, IV and V, were set in Caoayan, Ilocos Sur. Station **IV** (Callaguip) was that part of the river adjacent to Tamag, a southern barangay of Vigan. This site had some residential communities along the banks and a few fishpens.

Station **V** was in Pandan, Caoayan, an active fishing ground and with a lot of fishpens. These last two stations were the estuarine portions of Mestizo River where they meet the South China Sea.

Two fishermen per station were requested as respondents of this study. The fishermen were chosen based on their regularity of fishing, traditional method of fishing like kammel, rama, sigay, banni-it, dos-dos, tok-tok, tabukd, and fish cages and on their contiguity to the fishing ground. The fisher-respondents were duly advised to record their fresh catches of edible benthic macroinvertebrates and fishes in kilograms for the week. Two data collectors for each station retrieved the recorded catches every Saturday of the month from January 1999-0 October 1999.

The weekly catches of the edible benthic macroinvertebrates and the fish resource of the river were added and divided by the number of weeks of the month to get the average weekly catch per fishing effort. Representative samples of each species caught were preserved in 10% formalin and later identified according to common name, phylum, family, class, and genus.

The three physical factors, pH, temperature, and salinity were also monitored.

Results and Discussion

The Benthic Macroinvertebrates

Types. The benthic macroinvertebrate composition of the Mestizo River that has economic value is presented in Table 1. Fifteen species were caught per fishing effort of the respondent fishermen and were distributed in the river as follows: six species were caught from the northern part, Amianance, Vigan; only three in Pagpartian; five in Beddeng Laud; six in Calaguip; and nine in Pandan.

Table 1. The classification and spatial distribution of the edible benthic macroinvertebrate species of the Mestizo River.

| SPECIES (Common Name) | PHYLUM | CLASS | GENUS | STATION | | | | |
|--------------------------|----------|-----------|-------------------|----------|----------|----------|----------|----------|
| | | | | I | II | III | IV | V |
| Bennek | Mollusca | Crustacea | Soll Corbicula | | | | | |
| Bisukl | Mollusca | | Ar-IIIa | | | | | |
| Durken | Mollusca | | Melanooides | | | | | |
| Kari | | Crustacea | # | | | | | |
| Kanno | Mollusca | | | | | | | |
| Kusileng | Mollusca | | Clihon | | | | | |
| Iabrur | | Crustacea | Macrobrachium | | 7 | | | |
| Iedde | Mollusca | | knrma | | | | | |
| Los-losi | Mollusca | | • | | | | | |
| Padaw | | Crustacea | • | | | | | |
| Pasavan | | Crustacea | Cyanon | | | | | 7 |
| Suso | Mollusca | | Melanooides | 7 | | | | |
| Tiem | Mollusca | | Grassostrea | | | | | |
| INO | | Crustacea | Homarus | | | | | |
| Na. of | | | | 6 | 3 | 5 | 6 | 9 |

Legend U = undetermined yet
/ = Present

Arimbukeng, kappi, lagdaw, padaw, pasayan, and udang were under the Phylum Arthropoda, classified under Class Crustacea. The rest of the species (9) belonged to Phylum Mollusca and were distributed to two classes, namely: Class Pelecypoda and Class Gastropoda.

The highest number of benthic macroinvertebrate species caught per fishing effort in Station V (Pandan, Caoayan) could be accounted to the estuarine characteristics of the river. An estuary is where freshwater of a river meets the saltwater of a sea and because of this peculiarity more organisms are supported in it (Nybakken, 1982). The least number of species caught per fishing effort (three species) was in Pagpartian, Vigan. Because of so much organic wastes loaded into this portion of the Mestizo River, the quality of the water does not allow the proliferation of more species. Only those that have adjusted and

tolerated polluted habitats thrive in such areas (Nandan and Azis, 1995). These species are tolerant species and other researchers use these tolerant species as "pollution indicators."

Seasonal and spatial distribution. Table 2 presents the distribution of the edible macroinvertebrate organisms of the Mestizo River in terms of the fishermen's average weekly catch per fishing effort. Among the six species in Station I (Amianance) the fishermen had the highest average weekly catch per fishing effort in bisukd (336 kg.) followed by kappo (2.78 kg), bennek (2.66 kg), leddeg (2.48 kg), suso (2.22 kg) and duriken (2.03 kg). All species were caught throughout the gathering period except kappo which registered a zero catch in October

Table 2. Seasonal and spatial distribution of the edible benthic macroinvertebrates of the Mestizo River in terms of the fishermen's average weekly catch per fishing effort (in kilogram).

| MACRO-BENTHIC SPECIES | AVERAGE CATCH PER FISHING EFFORT (kg) | | | | | | | | | | IOIL | MEAN |
|---------------------------|---------------------------------------|------|------|------|------|-----|------|------|-------|------|-------|------|
| | J | F | M | A | M | J | J | A | S | O | | |
| Amianance, Vgan | | | | | | | | | | | | |
| Benck | 3.6 | 326 | 225 | 3.5 | 20 | 15 | 27 | 4.88 | 1.28 | 154 | 26.62 | 266 |
| Biskl | 5.6 | 35 | 25 | 276 | 32 | 20 | 24 | 438 | 276 | 4.5 | 33.60 | 336 |
| Durkn | 12 | 3.0 | 4.26 | 1.88 | 1.6 | 024 | 22 | 4.0 | 1.12 | 0.84 | 2.034 | 203 |
| Kao | 20 | 526 | 25 | 1.0 | 60 | 30 | 24 | 4.62 | 1.0 | . | 27.78 | 278 |
| Leddeg | 26 | 25 | 3.76 | 25 | 1.12 | 024 | 09 | 738 | 262 | 12 | 24.82 | 248 |
| Suso | 2.86 | 20 | 262 | 324 | 1.24 | 10 | 14 | 4.24 | 15 | 21 | 222 | 222 |
| Pagsrtian Vgan | | | | | | | | | | | | |
| Kai | | | | | | | | | | | | |
| | 1.15 | 13 | 1.13 | 1.62 | 1.8 | 075 | 05 | 225 | 219 | 015 | 12.84 | 1.28 |
| | 0.6 | 065 | 131 | 1.19 | - | . | 20 | 0.12 | . | 0.1 | 597 | 060 |
| | - | 125 | 031 | . | 315 | 238 | 11 | 1.88 | . | 015 | 1022 | 102 |
| Beddeng Laud, Vgan | | | | | | | | | | | | |
| Biskodl | 1.7 | 213 | 15 | 081 | 1.8 | 1.0 | 24 | 3.75 | 006 | 02 | 1535 | 154 |
| Kapi | 15 | 213 | 15 | 125 | 094 | 106 | 17 | 299 | 225 | 06 | 15.62 | 156 |
| Lag'aw | 057 | 1.19 | 1.12 | 031 | 045 | 06 | 12 | 1.25 | 162 | 025 | 8.65 | 0.86 |
| Pasayan | . | . | 038 | . | . | . | . | . | . | 0.10 | 048 | 005 |
| | . | . | 05 | . | . | . | . | . | . | - | 05 | 005 |
| Calagvip, Caoayan | | | | | | | | | | | | |
| Biskad | . | . | - | - | . | 006 | 1.65 | . | . | . | 1.71 | 017 |
| Kappi | . | 025 | 05 | . | 055 | 081 | 3.75 | 244 | 15 | 0.12 | 9.92 | 099 |
| Kusleng | . | - | 012 | . | . | 025 | . | 1.44 | . | . | 1.81 | 018 |
| Laglaw | 0.45 | 094 | 131 | 0.81 | 1.05 | 062 | 4.2 | . | 1.609 | 0.75 | 7.26 | 0.73 |
| % 2 | 07 | 091 | . | . | 0.75 | . | 03 | 05 | 025 | 0.7 | 4.11 | 041 |
| | 015 | 044 | 106 | 062 | . | 075 | - | 0.25 | - | - | 3.27 | 033 |
| Pandan, Caoryan | | | | | | | | | | | | |
| Arimbukang | - | - | 1.0 | 024 | 10 | . | - | . | . | - | 2.24 | 022 |
| Kapi | 20 | 25 | 238 | 262 | 23 | 15 | 3.0 | 424 | 424 | 22 | 26.98 | 2.70 |
| Kapo | - | - | 4.0 | - | - | . | . | - | - | . | 4.0 | 04 |
| Kusileng | . | . | 162 | . | . | . | . | - | . | . | 1.62 | 016 |
| Laag | 0.8 | 15 | . | 1.12 | . | . | 010 | 024 | 105 | 0.4 | 14.66 | 1.47 |
| Ls-losi | . | . | 20 | . | . | . | 04 | - | . | . | 2.40 | 024 |
| Padaw | . | 024 | - | 0.76 | . | - | - | - | 0.24 | - | 1.24 | 012 |
| Pasaycan | 1.6 | 126 | 1.0 | 1.62 | 28 | 3.0 | 26 | 3.38 | 424 | 26 | 24.10 | 241 |
| Tim | - | - | 3.24 | 05 | 05 | - | 1.8 | - | - | - | 604 | 060 |

In Station II (Pagpartian), the low number of species was coupled by low catches. The highest average weekly catch (128 kg) was among the catches of kappi, followed by 1.02 kg of pasayan, and 0.60 kg of lagdaw. It was noted that kappi was present throughout the gathering period in this station. There were no catches of lagdaw in May, June, and September and of pasayan in January, April, and September.

Among the five species caught in Beddeng Laud (Station III), catches of bisukol and kappi were recorded highest in average (154 kg and 156 kg respectively). The average weekly catch of lagdaw was less than a kilo (0.86 kg) while the average weekly catch of pasayan and udang was 0.05 kg each. Bisukol, kappi, and lagdaw were present throughout the 10-month gathering period in this station, but pasayan was present only in March and October and udang, in March only.

Low average catches per fishing effort in these two areas (II and III) could be attributed to organic effluents from the slaughter house and from probable intrusion/addition of organic nutrients from the big septic tank located between these two sites

All the average weekly catches of the six species caught in Cal-laguip (Station IV) were below 1 kg. In decreasing order of the average catches, the species are arranged as follows: kappi, 0.99 kg; lagdaw, 0.73 kg; pasayan, 0.41 kg; udang, 0.33 kg; kusileng, 0.18 kg; and bisukol, 0.17 kg. There were months in which the catches of all the six species were zero.

As expected of an estuarine, Pandan (Station V) had the highest number of species caught. Of the nine species, the fishermen's greatest average catch was of kappi (2.70 kg). This was followed by pasayan, 2.41 kg; lagdaw, 1.47 kg; tirem, 0.60 kg; kappo, 0.40 kg; los-los-losi, 0.24 kg; arimbukeng, 0.22 kg; kusileng, 0.16 kg; and padaw, 0.12 kg. While Pandan's portion of the river may be considered a well-diversed area in terms of macroinvertebrate composition, it was noted that only kappi and pasayan were caught throughout the year. The rest of the species were present only in a few months and the average catch per fishing effort was quite low.

The Fish Resource

Types. Table 3 presents the classification and number of edible fish species of the Mestizo River caught per fishing effort of the fisher-respondents within the 10-month gathering period.

Twenty-three fish species were caught in the five stations along the Mestizo River. All species belonged to Phylum Chordata and Class Osteichthyes. Due to shallow waters and rocky substrate of Station I (Amianance), the area could not support fish species of commercial value to the fishermen. Station IV (Cal-laguip) recorded the highest number of species caught (13 species), followed by Station V (Pandan) with 11 species, Station II (Pagpartian) with 10 species, and Station III (Beddeng Laud) with nine species.

Table 3. Inventory of the edible fish resource of Mestizo River.

| SPECIES | PHYLUM | CLASS | GENUS | STATION | | | | |
|-------------|----------|---------------|----------|---------|----|-----|----|----|
| | | | | I | II | III | IV | V |
| Anorat | Chordata | Cypriniformes | Anoratus | | | | | |
| Araro | Chordata | Cypriniformes | Araro | | | | | |
| Hooano | Chordata | Cypriniformes | Hooano | | | | | |
| Rooet | Chordata | Cypriniformes | Rooet | | | | | |
| Biot | Chordata | Cypriniformes | Eleotris | | | | | |
| Bulan-bulan | Chordata | Cypriniformes | # | | | | | |
| Rmo | Chordata | Cypriniformes | - | | | | | / |
| Buntaroz | Chordata | Cypriniformes | • | | | | | |
| Dalag | Chordata | Cypriniformes | - | / | / | / | / | |
| Qur-Janni | Chordata | Cypriniformes | li.. | / | / | / | 7 | |
| Igat | Chordata | Cypriniformes | Aroni | | | | | |
| Ikuran | Chordata | Cypriniformes | - | | | | / | 4 |
| Ipsan | Chordata | Cypriniformes | n | | | | | |
| Iwet | Chordata | Cypriniformes | Anoni | | | | | |
| Kaniod | Chordata | Cypriniformes | Sianid | | | | / | |
| Karna | Chordata | Cypriniformes | prinus | | | | | |
| Maio | Chordata | Cypriniformes | Sioanid | | | | | |
| Paltat | Chordata | Cypriniformes | Carias | | | | | |
| Purong | Chordata | Cypriniformes | Liva | | | | | |
| Talakiokcan | Chordata | Cypriniformes | O.. | | | | | |
| Tawis | Chordata | Cypriniformes | • | | | | | |
| Tlabia | Chordata | Cypriniformes | Tilapia | | | | | |
| Twed | Chordata | Cypriniformes | Penhahia | | | | | |
| No. of Spis | | | | 0 | 10 | 9 | 13 | 11 |

Legend: * Undetermined

✓ Present

Catch per fishing effort. As reflected in Table 4, there were no fish catches in Station I (Amianance). In Station II (Pagpartian) 10 species were caught per fishing effort of the fishermen but only gur-gurami, paltat, and tilapia were present throughout the 10-month data gathering period. The fishermen's average weekly catches of these fishes were 1.26 kg, 138 kg and 1.51 kg, respectively. No catches of tawis were done in September nor of dalag in October, but their average weekly catches were 125 kg and 122 kg, respectively. Araro was caught from January to April, then in August with an average weekly catch of 0.22 kg followed by bulan-bulan (from May to August) with an average weekly catch of 0.53 kg. Ipsan was caught from May to July and Karpain May, August, and October, with average weekly catches of 0.34 kg and 0.38 kg, respectively. Igat was caught only in May with an average weekly catch of 0.03 kg.

In Station III (Beddeng Laud) only fish species of bagsang, birot and tilapia were caught in every fishing effort of the fishermen and their average weekly catches were 0.71 kg, 0.58 kg and 1.58 kg respectively. Next to these were the average weekly catches of gur-gurami (12 kg), tawis (0.90 kg), paltat (0.79 kg), and dalag (0.68 kg). There were very rare catches of bagset (only in the month of July), and of bunog (only in the month of October) with an average catch of 0.02 kg each.

Table 4. Distribution of the edible fish resource of the Mestizo River in terms of the fishermen's average catch per fishing effort (in kilograms).

| FISH RESOURCE (Common Name) | AVERAGE CATCH PER FISHING EFFORT (kg) | | | | | | | | | | TOTAL | MEAN | |
|--|---------------------------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| | J | F | M | A | M | J | J | A | S | O | | | |
| I. Amiarancoe, Vgan, Ilocos Sur | * | | | | | | | | | | | | |
| II. Pagpartian, Vgan | | | | | | | | | | | | | |
| Ar-aro | 0.6 | 0.44 | 0.25 | 0.75 | | | | 0.12 | | | | 2.16 | 0.22 |
| Bulan-bulan | | | | | 1.15 | 1.0 | 1.3 | 1.81 | | 0.3 | | 5.26 | 0.53 |
| Delag | 1.28 | 2.0 | 1.5 | 1.19 | 1.6 | 0.75 | 1.6 | 1.75 | 0.5 | | | 12.17 | 1.22 |
| Gur-grami | 1.1 | 0.75 | 1.31 | 0.62 | 0.45 | 2.12 | 2.5 | 2.5 | 0.94 | | | 12.59 | 1.26 |
| Igat | | | | | 0.31 | | | | | | | 0.31 | 0.03 |
| Ipusan | | | | | 0.65 | 1.75 | 1.0 | | | | 0.25 | 3.4 | 0.34 |
| Karpa | | | | | 2.6 | | | 1.0 | | | 0.25 | 3.85 | 0.38 |
| Palat | 1.15 | 1.0 | 1.88 | 1.12 | 1.65 | 2.25 | 2.05 | 2.0 | 0.5 | 0.2 | | 13.85 | 1.38 |
| Tawis | 1.4 | 1.56 | 1.25 | 1.19 | 2.8 | 1.25 | 0.2 | 2.62 | | | | 12.47 | 1.25 |
| Tileoia | 1.6 | 1.25 | 0.88 | 1.12 | 1.45 | 2.0 | 3.15 | 1.12 | 1.0 | 1.5 | | 15.07 | 1.51 |
| III. Beddeng Laud, Vgan | | | | | | | | | | | | | |
| Bagsang | 0.4 | 0.88 | 0.81 | 1.31 | 0.15 | 0.69 | 0.7 | 1.25 | 0.62 | 0.25 | | 7.06 | 0.71 |
| Bagset | | | | | | | 0.2 | | | | | 0.2 | 0.02 |
| Berot | 0.45 | 0.56 | 1.12 | 0.69 | 0.25 | 0.5 | 0.05 | 1.5 | 0.62 | 0.05 | | 5.79 | 0.58 |
| Bunog | | | | | | | | | | 0.21 | | 0.27 | 0.02 |
| Dalag | 0.6 | 0.38 | | | 1.75 | 1.25 | 0.75 | 0.5 | 1.56 | | | 6.79 | 0.68 |
| Gur-grami | 3.2 | 0.56 | 0.62 | 0.88 | | 2.25 | 0.85 | 0.56 | 2.76 | 0.35 | | 12.02 | 1.20 |
| Palat | 0.8 | 0.88 | | | 1.2 | 2.0 | 0.3 | 0.88 | 1.81 | 0.4 | | 7.87 | 0.79 |
| Tawis | 1.7 | 1.56 | 1.38 | 0.62 | 3.3 | | | 0.31 | | 0.15 | | 9.02 | 0.90 |
| Tilapia | 1.4 | 1.0 | 1.12 | 0.62 | 4.1 | 1.81 | 1.7 | 0.88 | 2.62 | 0.5 | | 15.75 | 1.58 |
| IV. Cal-aguip, Caoayan | | | | | | | | | | | | | |
| Bagsang | 0.35 | 0.06 | 0.94 | 0.38 | 0.2 | 0.56 | 0.3 | 0.19 | 0.19 | 0.22 | | 3.39 | 0.38 |
| Bagset | 0.025 | 0.22 | 0.47 | 0.12 | | 0.75 | 1.0 | 0.44 | 0.4 | 0.1 | | 3.52 | 0.35 |
| Berot | 0.325 | 0.19 | 0.5 | 0.25 | 0.62 | 0.06 | 0.25 | 1.12 | 0.5 | 0.02 | | 3.84 | 0.38 |
| Bunog | 0.5 | 0.56 | 0.38 | 0.31 | 0.25 | 0.12 | 0.3 | 0.19 | 0.25 | 0.25 | | 3.11 | 0.31 |
| Buntarog | | | | | | 0.06 | | | | | | 0.06 | 0.006 |
| Dalag | | | | | | 0.06 | | | | | | 0.06 | 0.006 |
| Gur-grami | | | | | | 0.25 | | | | | | 0.25 | 0.025 |
| Igat | 0.05 | | | | | | | 0.31 | | | | 0.38 | 0.038 |
| Ikuran | | | | | | | | | | 0.02 | | 0.38 | 0.038 |
| Ipusan | | | | | | | | | | 0.1 | | 0.1 | 0.01 |
| Iwet | 0.025 | | | | 0.08 | | | | | 0.01 | | 0.01 | 0.001 |
| Kapiged | | | | | 0.6 | | | | | | | 0.105 | 0.010 |
| Tilapia | 2.15 | | 1.25 | 1.06 | 0.1 | 0.25 | 0.05 | | 0.06 | 0.15 | | 0.81 | 0.08 |
| | | | | | | | | | 1.94 | 0.55 | | 7.35 | 0.74 |

Table 4. Continued.

| FISH RESOURCE (Common Name) | AVERAGE CATCH PER FISHING EFFORT (kg) | | | | | | | | | | TOTAL | MEAN |
|--------------------------------|---------------------------------------|------|------|------|------|------|-----|------|------|-----|-------|-------------|
| | J | F | M | A | M | J | J | A | S | O | | |
| V. Pandan, Caoayan | | | | | | | | | | | | |
| Angrat | 0.4 | 0.88 | 1.76 | 0.62 | 1.8 | 05 | 05 | 1.5 | 0.7 | 0.1 | 8.76 | 0.88 |
| Begsang | 0.8 | 05 | 1.24 | 038 | 25 | 024 | 04 | 25 | 1.88 | 03 | 10.74 | 1.07 |
| Berot | 0.7 | | 0.5 | 024 | 1.1 | 0.62 | 12 | 3.0 | 224 | 1.6 | 11.2 | 1.12 |
| Bunog | | | | | | 0.62 | 09 | 0.12 | 0.76 | 0.6 | 3.0 | 03 |
| <i>Buntarog</i> | | | | | | 0.12 | 0.1 | | | | 0.22 | 0.02 |
| Ikauran | 0.2 | 1.0 | | | | 038 | | 05 | 0.24 | | 232 | 0.23 |
| Malaga | 03 | | | | 0.6 | 0.5 | | | | | 1.4 | 0.14 |
| Purong | | | | | | 024 | | 024 | 0.12 | | 0.6 | 0.06 |
| Talakitokan | 02 | 0.25 | | | | | | 0.24 | | | 0.69 | 0.07 |
| Tilapia | 14 | 0.75 | | 212 | 03 | 024 | 1.5 | 1.76 | 224 | 03 | 10.61 | 1.06 |
| Twel | | | | | 0.44 | 0.24 | | | | | 0.68 | 0.07 |

* Empty cell represents zero catch.

While bunog species were rare catches in Station III, they were prevalent in Station IV (Cal-laguip), an estuarine part of the river. They were caught in every gathering period together with bagsang and birot, followed by bagset. However, the average weekly catches of these species were quite low, ie, 0.31 kg, 0.38 kg, and 0.35 kg, respectively. No tilapia catches were done in the months of February and August and the fishermen's average weekly catch of this fish was 0.74 kg. Most of the fish species were caught in one, two, or three months only with low average weekly catches, as follows: buntarog July - 0.006 kg), gur-gurami July - 0.025 kg), dalag July - 0.006 kg), ikuran and ipusan (October - 0.01 kg and 0.001 kg, respectively). iwet (January and May - 0.10 kg) kapiged (May, September, and October - 0.08 kg), and igat January, August, and October - 0.038 kg).

Only two of the 11 fish species caught in Station V (Pandan) persisted throughout the duration of the data gathering periods, namely: angrat and bagsang. The average weekly catch of bagsang (1.07 kg) was higher than that of angrat (0.88 kg). No birot and tilapia were caught in February and March, respectively. But for the rest of the gathering periods, they were caught with an average of 1.12 kg and 1.06 kg, respectively. Bunog catches were done from June to October only with an average weekly catch of 0.3 kg. Caught in some months, ikuran, malaga, purong, and talakitokan had the following average weekly catches: 0.23 kg, 0.14 kg, 0.06 kg and 0.07 kg, respectively. Buntarog was caught only in June and July and twel in May and June. They had average weekly catches of 0.02 kg and 0.07 kg respectively.

Physical Factors

Variations of three physical factors of the river, namely, pH, temperature (C), and salinity (‰) are presented in Table 5.

Table 5. Variations of three physical factors in the Mestizo River.

| PHYSICAL FACTOR | STATION | MONTHLY AVERAGE VARIATION | | | | | | | | | | MEAN |
|------------------|---------|---------------------------|------|------|------|------|------|------|------|------|------|-------|
| | | J | F | M | A | M | J | J | A | S | O | |
| pH | I | 6.77 | 7.0 | 7.4 | 7.42 | 7.4 | 7.35 | 7.39 | 7.43 | 7.43 | 7.42 | 7.3 |
| | II | 6.76 | 6.6 | 6.8 | 7.13 | 7.2 | 7.33 | 7.4 | 7.26 | 7.3 | 7.26 | 7.1 |
| | III | 6.76 | 6.9 | 7.2 | 7.3 | 7.4 | 7.38 | 7.35 | 7.42 | 7.42 | 7.33 | 7.25 |
| | IV | 6.78 | 6.15 | 7.15 | 7.3 | 7.35 | 7.36 | 7.35 | 7.43 | 7.40 | 7.32 | 7.22 |
| | V | 6.0 | 6.95 | 7.42 | 7.48 | 7.68 | 7.73 | 7.72 | 7.40 | 7.60 | 7.64 | 7.39 |
| Temperature O | I | 24.5 | 24.2 | 25.9 | 26.5 | 27.5 | 27.9 | 28.0 | 28.6 | 27.9 | 26.6 | 26.76 |
| | II | 26.2 | 26.2 | 25.8 | 27.4 | 27.5 | 27.3 | 28.7 | 28.3 | 28.0 | 27.6 | 27.31 |
| | III | 27.0 | 27.1 | 27.6 | 27.6 | 27.4 | 27.0 | 28.9 | 28.1 | 28.0 | 28.0 | 27.67 |
| | IV | 27.5 | 27.6 | 27.9 | 27.8 | 28.5 | 28.2 | 28.9 | 28.7 | 28.7 | 28.9 | 28.27 |
| | V | 27.6 | 27.9 | 28.0 | 28.0 | 28.0 | 28.2 | 29.0 | 29.2 | 28.9 | 29.5 | 28.50 |
| Salinity (‰) | I | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| | II | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| | III | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| | IV | 1.0 | 1.0 | 2.0 | 6.0 | 5.0 | 2.0 | 2.0 | 1.0 | 1.0 | 2.0 | 2.3 |
| | V | 2.0 | 2.0 | 4.0 | 6.0 | 5.0 | 5.0 | 6.0 | 5.0 | 4.0 | 2.0 | 4.1 |

pH The average monthly variations of pH of the water in the Mestizo River during the 10-month data gathering period were the following, in decreasing order: Station V, 7.39; Station I, 7.3; Station III, 7.25; Station IV, 7.22, and Station II, 7.1. A solution (or liquid) which has a pH of 7.0 is considered neutral. A value lower than a pH of 7.0 is considered acidic and any value higher than the neutral pH is considered basic. Based on this premise, the water in the five stations of the Mestizo River were quite basic but least in basicity was the water in Station II (Pagpartian). The most basic water was in Station V (Pandan).

Temperature. The average monthly variation of the surface water temperature (C) of the Mestizo River were the following, in increasing order. Station I, 26.76°C; Station II, 27.31°C; Station III, 27.67°C; Station IV, 28.27°C; Station V, 28.50°C, which when compared with the other stations was rather high. This could be due to the openness and wider area of the place.

Salinity. Salinity refers to the total amount of anion and cations or minerals in solutions in bodies of water (Cole, 1975). All the stations had their average salinity levels greater than the standard salinity of a freshwater body of 0.05‰ (parts per thousand) or less, according to Odum (1971), i.e., Stations I, II, and III, 1.0‰; Station IV, 2.30‰; and Station V, 4.1‰. High average salinity levels in Station IV and V could be attributed to their proximity to saltwaters since they are considered estuarine.

Conclusions and Recommendations

The edible benthic macroinvertebrates and fish resource of the Mestizo River showed habitat-specificity. Some of them were persistent species, the others were seasonal ones.

It has been expected that the estuarine portions of a river have an abundance of fish species and catches, but the findings of this study did not indicate so. These evidences should stir the greater concern of everybody. There should be a follow-up study that would look into this problem and find the reasons why the river does not seem to be productive anymore as evidenced by the fishermen's very low average weekly catches per fishing effort.

This is the first and only recorded empirical information regarding the presence and catches of edible benthic macroinvertebrates and fishes in the Mestizo River and its physical aspects. These data would serve as a baseline information for future monitoring of the diversity composition of the river and its water quality.

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