

Research article

# ASSESSING MACROINVERTEBRATE POPULATION INHABITING THE TALABAAN RIVER, NAAWAN, MISAMIS ORIENTAL, PHILIPPINES

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## ABSTRACT

Water pollution is rampant due to uncontrolled human activities and using bioindicators could contribute some promising results. As such, this study tried to describe the Talabaan River in terms of the macroinvertebrate population, of which, could be used to assess the water quality condition of the River. Standard methods of specimen collection were done. Results showed that the water quality condition of the upstream until midstream portions of Talabaan River were relatively good, while relatively polluted water was observed at downstream, although it harboured all macroinvertebrate species. Dominance of pollution-sensitive macroinvertebrate was observed in the upstream, while the pollution-tolerant species were observed at downstream. The result of the study could provide preliminary information to be translated into some regulatory measures in a form of implementing the resolutions and ordinances enacted. This is to mitigate further degradation of the water quality conditions of

Talabaan River, and in turn could be used for various socio-economic and ecological purposes, which to be undertaken by all possible stakeholders. **Copyright © WJEAS, all rights reserved.**

**Keywords:** freshwater macroinvertebrates, riverine ecosystem, Talabaan River

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## INTRODUCTION

Riverine ecosystem is one of the most important parts of our environment. Since before, river plays a great role in our civilization and a very important part of human survival. It has been the source to many agricultural activities like irrigation supply for rice plantations and water supply for aquaculture ponds. For some remote and less disturbed areas, river is still the source of their everyday drinking water and a habitat to a diverse aquatic organisms. During this modern age, pollution in river ecosystem seems to be normal in any urban and rural areas. Identification and management of pollution in river system have several factors that had to be considered, the one and most commonly used is the presence or absence of the inhabiting freshwater macroinvertebrates.

Macroinvertebrates are organisms that are touted as important biological indicators for monitoring freshwater ecosystem worldwide because of their high sensitivity to changes in water quality and habitats. They are also easy to capture for sampling due to their limited mobility which can be retained by a mesh net size 200 - 500 micro meter. (Adriaenssens et al., 2002; Hussain and Pandit, 2012; Sharifinia, 2015).

Unfortunately, inevitable changes in our environment like increase number of population, agricultural practices, and industrial development are major reasons that disturb the ecological balance on our aquatic ecosystem. Harmful anthropogenic activities near the streams can mostly influence the disturbances on the community structures, functional feeding group and habitat structures of macroinvertebrates (Martínez-Sanz et al, 2014; Mesa et al, 2013).

In this context, this study aimed to assess the composition and diversity of freshwater macroinvertebrates inhabiting the upstream, midstream and downstream portions of Talabaan River in Naawan, Misamis Oriental. This description could provide some ideas on the current health of the River since some species of macroinvertebrates were touted as indicators of water quality conditions.

## METHODOLOGY

A reconnaissance survey of the collection sites was conducted to allow representativeness of the river system. Hence, upstream, midstream and downstream portions of the river were assessed. Specimens were collected using a fine mesh net (0.35 mm) measuring 1x1m<sup>2</sup>. A dip and kick method was employed, such that, the substrate were disturbed while the net was laid to capture macroinvertebrate samples. Three replicate samples were collected for each collection site. All collected specimens were preserved in 70% ethanol and brought to the laboratory for sorting and identification. A guide to macroinvertebrates in tropical waters was used as a reference. Some ecological measures were obtained like the composition, evenness and diversity of the macroinvertebrate population.

## RESULTS AND DISCUSSION

### Composition of macroinvertebrates

There were 11 macroinvertebrates collected, to wit; leech, diving beetle larvae, mayfly nymph, caddisfly larvae, mosquito larvae, damselfly larvae, shrimp larvae, riffle beetle larvae, water strider, snail and soldier fly larvae. In terms of species richness, the 11 collected macroinvertebrates were present in the downstream, while, 9 species were



collected at midstream and 8 at the upstream portion. In terms of tolerance to water quality conditions, macroinvertebrates at the upstream were composed mainly of sensitive to very sensitive organisms like riffle beetle larvae, mayfly nymph, caddisfly larvae and damselfly larvae. In terms of percent composition, around 69.44% were macroinvertebrates that are pollution-sensitive in the upstream. This could signify that the upstream portion of the river is relatively good. In midstream, a good proportion of pollution-sensitive and pollution-tolerant species was observed. Around 58.18% were pollution-sensitive species of macroinvertebrates, hence, a relatively good water quality is still found at midstream, yet threats of water pollution is at the forefront. At downstream, the 11 macroinvertebrates species were present, yet these numbers were dominated by pollution-tolerant species like the leech, mosquito larvae and diving beetle larvae. Almost 71.82% were composed of pollution-tolerant species, that signified that the water quality conditions at downstream is relatively polluted.

The species composition along the stretch of Talabaan River could be a function of various utilization patterns of the River. The nature of the riparian and surrounding landscape has been modified by anthropogenic activities, which may subsequently alter the composition and functional structure of macroinvertebrate assemblages. The effect of these changes on function of benthic fauna is difficult to assess due to the scarce knowledge on functional structures in tropical streams. Assemblage composition of macroinvertebrates differed between impacted and unimpacted sites. Predators were dominant in taxa number, representing about 60% of total taxa richness. In addition, the diversity and richness of collector-gatherers differed significantly between degraded and unimpacted sites, reflecting the sensitivity of this group to environmental changes and the utility to be used in the assessment of anthropogenic modifications. The results of this study reinforce the idea that riparian corridor management is critical for the distribution of macroinvertebrate assemblages as well as functional organization of lotic streams (Mesa et al., 2013).

Other studies claimed that biological communities and physical habitat are closely linked ecosystems. River stratum diversity, shoreline complexity, vertical meandering, riverbed sediment heterogeneity and other morphological characteristics create a rich diversity in river habitats and biological communities. River morphological diversity has laid an important foundation for maintaining the diversity of river biological communities. Studies revealed that biological communities of benthic macroinvertebrates were directly affected by river meandering, river gradient and other geomorphological features, and that geomorphological factors could be used for effective river ecological assessment. Assuming that water quantity and water quality remain unchanged, biological community diversity is positively correlated with habitat spatial heterogeneity. Thus, the greater the morphological diversity of a river, the more microhabitats are available for species to coexist. In contrast, the unique morphology of a river will have a negative impact on biological community diversity, changing its nature, density, and proportion and resulting in ecosystem degradation to a certain degree. As one key representative of the river morphological diversity, river substrate heterogeneity plays an important role on the river ecosystem (Jinyong et al., 2013).

## **Diversity and distribution of macroinvertebrates**

Shannon's Diversity Index and Pielou's Evenness Index were used to describe the ecological population structure of the freshwater macroinvertebrates. Shannon's Diversity Index was relatively higher at downstream (0.98), followed by the midstream (0.95) and in the upstream (0.93). While diversity is high at downstream, the species composition was not good since the bulk of species comprising this diversity were pollution-tolerant species. Whereas, a good combination of pollution-sensitive and tolerant species comprised the macroinvertebrate population structure at midstream and upstream. Evenness Index measured were at 0.68, 0.56 and 0.54 at downstream, midstream and upstream respectively. This means that dominant species of pollution-tolerant were found at downstream, while pollution-sensitive species were found in the upstream.

Determining the performance of some indices and community attributes frequently used to assess river quality and test the role of macroinvertebrate taxa richness as element of bioindication. Several recommendations were made about taxonomic level used, the ranks of quality of taxa richness, and the effort-results relationship in the field of bioindication (Martínez-Sanz et al., 2014).

Macroinvertebrates are a diverse array of animals without backbones operationally defined as those that are retained by a sieve or mesh with pore size of 0.2 to 0.5 mm, as used most frequently in stream sampling devices. Stream

macroinvertebrates include various groups of worms (flatworms, eelworms and segmented round-worms), molluscs (snails and bivalves), crustaceans (shrimps, crayfish and other shrimp-like groups), mites, and above all insects. Most invertebrates are important components of stream ecosystems. They graze periphyton (and may prevent blooms in some areas), assist in the breakdown of organic matter and cycling of nutrients and, in turn, may become food for predators (e.g., fish). The invertebrates, which live on, in, or near the substratum of running water, include representatives of almost every taxonomical group that occurs in freshwater. There are indeed remarkably few freshwater groups which are not regularly represented in rivers. In contrast, there are several groups which occur only in running water, and many which reach their maximum development and diversity there. This is undoubtedly by the permanence of streams as compared with lakes and ponds. Many river systems have been in continuous existence from far back into the geological time, whereas lakes persist for relatively short periods and give little opportunity for the development of purely lacustrine fauna. Although rivers may change and evolve, they rarely disappear, so they are not evolutionary traps. One of the most striking features of the faunas of stony streams is their remarkable similarity all over the world. This uniformity is much less evolved in the faunas of the softer substrata in the larger rivers (Hussain and Pandit, 2012).

## CONCLUSION AND RECOMMENDATIONS

This study found out that the water quality condition of the upstream portion of Talabaan River is relatively good, until at midstream, while relatively polluted water was observed at downstream, although it harboured all macroinvertebrate species. Dominance of pollution-sensitive macroinvertebrate was observed in the upstream, while the pollution-tolerant species were observed at downstream, yet majority of the species were pollution-tolerant macroinvertebrates.

The result of the study could be a promising preliminary information to allow this scientific finding be translated into some regulatory measures in a form of implementing the resolutions and ordinances enacted. This is to mitigate further degradation of the water quality conditions of Talabaan River, and in turn could be used for various socio-economic and ecological purposes. It is also good to involve various stakeholders to increase their awareness and that this level of awareness could be translated into proactive actions of conserving the River.

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