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FRESHWATER MACROINVERTEBRATES COLLECTED FROM TRIBOA AND BINICTICAN RIVERS IN BATAAN PENINSULA, PHILIPPINES

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Introduction

Freshwater makes up only 0.01% of the world's water and approximately 0.8% of the Earth's surface, yet this tiny fraction of global water supports at least 100,000 species out of approximately 1.8 million - almost 6% of all described species (Dudgeon et al. 2006). The Philippines has various freshwater ecosystems consisting of lakes, swamps, rivers, reservoirs and ponds with an aggregate area of more than 370,000 hectares. These resources are valuable to the economy and to biodiversity (Guerrero n.d.). The Philippine invertebrate freshwater fauna is insufficiently explored and still requires substantial efforts to record at least the majority of taxa, and identification of taxa could be used for other purposes such as bioindicator of the water quality and health of the freshwater ecosystem (Vidal et al. 2017). This project aims to collect, identify, classify collected specimens from Triboa & Pamulaklakin River in Subic Bay, Zambales, Philippines.

Materials and Methods

The freshwater macroinvertebrates were collected last April 29, 2018 (Saturday) in two of the many rivers found in the area of Subic Bay Freeport Zone (SBFZ), Philippines. SBFZ is located near the town of Subic and Olongapo City, both in the province of Zambales, and Morong in the province of Bataan. In terms of the site, the Triboan River in Subic Bay is shallow and it is surrounded by large rocks and leaf litters. On the other hand, the Binictican River is a stream with a high current of water moving to a lower level in a channel on land.

Specimens were collected from various microhabitats using small aquatic sampling nets. The specimens were then submerged and preserved in small vials with 70% ethyl alcohol. Microscopy and species identification were done during the laboratory sessions. Dissecting materials such as dissecting microscopes, forceps and needles were used to view and examine the gross anatomy of all the specimens that were placed on petri dishes. After inspecting each of the specimen, pictures were taken using a smartphone. The dichotomous key for insect identification distributed in class was used as the reference to gather information on each specimen.

Results

ORDER EPHEMEROPTERA

SUBORDER PISCIFORMA

FAMILY BAETIDAE (Minnow Mayflies)

***Baetidae* sp.**

Minnow Mayflies

Figure 1. *Baetidae sp.* Dorsal view

Material studied

4 exs. "PHIL:Luzon, Bataan Peninsula, SBMA, Binictican River (small hill stream), undisturbed mountain river; rock surface pool; 14°48'44" N 120°17'46" E, 80m asl.; 29 Apr, 2018, A.A. Villaroman

Distribution

Baetidae is a family of mayflies distributed worldwide with 1,000 described species in 110 genera ("Baetidae in GBIF Secretariat" 2017). It has the highest distribution in the cool, flowing freshwaters of Australia (Campbell 1990).

Remarks

Four juvenile baetidae species were found in cool, flowing freshwater, particularly in rock surface pool, but it is also possible for these nymphs to be found in submerged rocks, wood and macrophytes as most of them feed on fine detritus and scrape algae (Huryn 2009). Furthermore, Baetidae species measures 3-12 mm and it contains 2-3 tails and long antennae for they are 2-3 times longer than the width of head. Hindwing pads are minute and sometimes absent. All gills along abdomen are similar in general form, either lamellae or platelike, rarely doubled. Baetidae species is unique having reduced median caudal filaments that are shorter than lateral filaments. The hind corners of last few abdominal segments are not drawn out into spines (Ghee 2004).

ORDER DECAPODA

INFRAORDER CARIDEA

FAMILY ATYIDAE

Caridina sp.

Figure 2. *Caridina sp.* Lateral view

Material studied

2 exs. "PHIL:Luzon, Bataan Peninsula, SBMA, Triboa River (small hill stream), undisturbed mountain river; littoral pool mud; 14°46'44.04"N 120°16'58.08"E, 80m asl.; 29 Apr, 2018, C.L Loo

Distribution

Members of the genus *Caridina* can be found in temperate and tropical regions across Africa, Asia, and Oceania. This includes Japan, Korea, China, India, Sri Lanka, Vietnam, Philippines, Indonesia, Malaya, Burma, Andaman Islands, Philippines, Papua New Guinea, Madagascar, Western and Eastern equatorial Africa, Egypt, Hawaii, and the Polynesian islands (Chace 1997).

Remarks

The specimens were captured by mechanically disturbing the mud of a littoral pool and then sieving the water with a net after the debris settled. The color of the shrimp was originally dark gray before it was preserved in ethanol. Around an hour after preservation, the shrimp's color changed into an orange hue.

This genus is represented in the Philippines by 8 species. There is some difficulty in correctly distinguishing members of this genus, however, due to the fact that the species in this genus have relatively constant morphological characters, and that usually more than one species of *Caridina* is present within a stream if it contains the required microhabitats. Due to this, there is also possibility of hybridization within sympatric species, further complicating identification (Chace 1997).

ORDER DECAPODA

INFRAORDER BRACHYURA

FAMILY GECARCINUCIDAE

***Sundathelphusa* Bott, 1969**

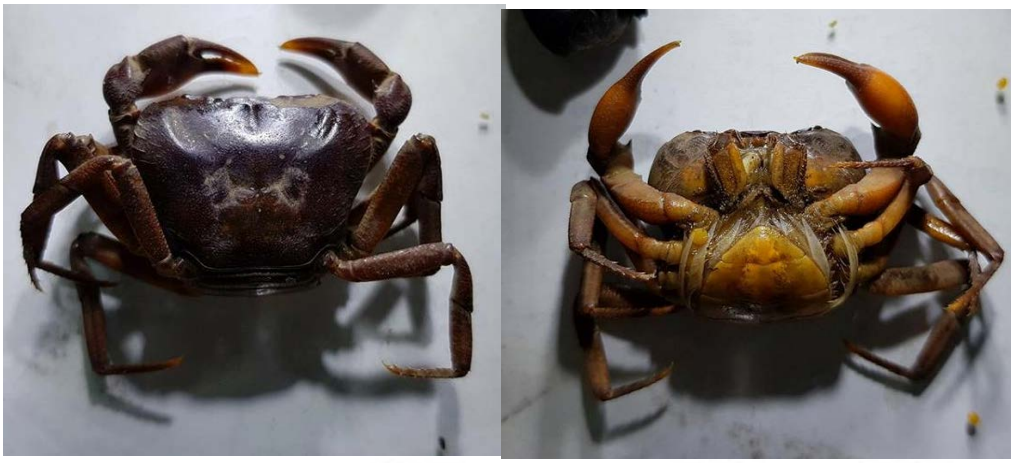

Figure 3. *Sundathelphusa sp.* (Left) Dorsal view (Right) Ventral View.

Material studied

1 exs. "PHIL:Luzon, Bataan Peninsula, SBMA, Triboa River (small hill stream), riverside pool, rock surface in riffle (near the shoreline under the rocks); 14°46'44.04"N 120°16'58.08"E, 80m asl.; 29 Apr, 2018, H. Freitag

Distribution

Sundathelphusa sp. in the Philippine are mostly found in Luzon, with some in the Visayan islands and in Mindanao. The remaining species are found in Sulawesi, eastern Borneo, and the Moluccas islands (Mendoza and Naruse, 2010).

Remarks

The specimens were captured by removing rocks in the rock surface and capturing it by hand.

Sundathelphusa sp., 21 out of 29 known species can be found in and endemic to the Philippines, mostly in luzon. All freshwater crabs undergo direct development, where the ovigerous female broods a few large, lecithotrophic eggs that hatch into tiny hatchling crabs. This restricts freshwater crabs to habitat in or adjacent to freshwater and limit their dispersion to other geographical locations (Mendoza and Naruse, 2010).

ORDER HEMIPTERA

SUBORDER HETEROPTERA

FAMILY GERRIDAE (Water Strider)

***Aquarius sp.* Schellenberg 1800**

Material studied

1 exs. "PHIL:Luzon, Bataan Peninsula, SBMA, Triboa River (small hill stream), riverside pool, water surface); 14°46'44.04"N 120°16'58.08"E, 80m asl.; 29 Apr, 2018, P. Alano

Distribution

The species *Aquarius sp.* can be found in areas of the south and southeast Asian mainland, Sri Lanka, Sumatra, Borneo, and the Philippines, specifically Luzon. The habitat of this *Aquarius* are surfaces of ponds, lakes, slow-moving streams and rivers (McLeod 2007).

Remarks

The specimen was captured along the surface of the water. The legs were slightly bent inside the tube.

Their most common mating system is by "scramble competition polygyny", wherein the male would lunge at any female and grasp her thorax with his fore egs to insert his phallus into her opening (Damgaard 2010). A study by Zettel *et al.* (2003) describes a newly discovered species, *Aquarius philippinensis sp*., from Lake Buhi and Lake Baao in Camarines Sur, South Luzon of the Philippines.

Discussion and Conclusions

River macroinvertebrates are commonly used as bioindicators of water quality due to their variability in pollution sensitivity. A healthy waterway should not have one species dominating the ecosystem, instead it should have a diverse number of species. In contrast, a polluted waterway would have low diversity. (Government of Western Australia 2017). Examples of species which are useful bioindicators are mayfly nymphs, dragonfly and damselfly nymphs, aquatic worms, and midge larva. Mayfly nymphs are pollution sensitive, thus their presence would indicate very low levels of pollution. Damselfly and dragonfly larvae are moderately pollution tolerant, and aquatic worms and midge larvae are pollution tolerant, as they are able to survive in less than ideal conditions such as high/low pH, and low dissolved oxygen (Chadde 2016).

In the first river (Triboan river), a large amount of water striders was noted by the group members. The water in the first river was also visibly dirty, with strange foam at the water surface at the starting point of the expedition. The first river was not so

diverse, containing species of Gerromorpha, Gyrinidae, and Decapoda, which are all somewhat pollution tolerant (Olomukoro and Dirisu 2013). This would indicate a moderate level of pollution in the Triboan river. The second river (Binictican river) had visibly clearer water, no strange smell, and a faster-flowing current. This river was also deeper than the first as water reached above knee level compared to mid shin level for the first river. Baetidae (mayfly) nymphs and damselfly nymphs could be found in this river, indicating that this river was relatively unpolluted considering the sensitive nature of those species.

Despite the group collecting more specimens than described in this paper, some specimens such as the damselfly nymph were damaged (the tip of the abdomen was severed) during collection, thus preventing proper identification. Proper and careful collection will be observed in the next expedition to prevent it from recurring.

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