

## OCCURRENCE OF AQUATIC MACROINVERTEBRATES FROM PALEIK “IN”, SINTKAING TOWNSHIP

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### Abstract

Freshwater macroinvertebrates in accordance with their habitats and microhabitats were collected from Paleik “In”. A total of 16 aquatic macroinvertebrates of different Phyla, *Unio pictorum*, *Pila globosa*, *Viviparus contectus*, *Pheretima posthuma*, *Macrobrachium palaemonoides*, *Anxus darner*, *Nepa cinerea*, *Ranatra linearis*, *Lethocerus gariseus*, *Gerris lacustris*, *Gerris remigis*, *Hydrometra martini*, *Notonecta undulata*, *Pelocoris femoratus*, *Dytiscus verticalis* and *Hydrophilus traingularis* were recorded. Their habitat was subdivided into two water zones: from 0.5 to 1.5 meters (shallow water or littoral zone) and over 1.5 meters (limnetic zone). There was no profundal zone because the present study site was wetland and the light can be penetrated in deepest water area. In two study sites, the highest number of individual was occurred in littoral zine (Site A) and the lowest in limnetic zone (Site B). Among these, the highest number of species and individual was occurred in order Hemiptera and lowest in order Ophisthopora.

Keywords: Occurrence; Freshwater macroinvertebrates

### Introduction

The term macroinvertebrate describes those animals that have no backbone and can be seen with the naked eye. They live in or near the bottom of freshwater ponds, lakes, streams and river for some or all of their life cycle. Some aquatic macroinvertebrates can be quite large, such as freshwater crayfish however, most are very small. Invertebrates that are retained on a 0.25 mm mesh net are generally termed macroinvertebrates (Barnes, 1969).

These animals live in the water for all or part of their lives, so their survival is related to the water quality. Macroinvertebrates are often the most abundant and diverse group of animals found in freshwater and they

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include insects, mussels, snails, worms and all crustaceans. In many types of water bodies, insects are the most dominant and diverse group of macroinvertebrates. The immature stages of many insects spend most of their time growing and feeding in aquatic habitats before they emerge as a winged adult (Popham, 1955).

In insect groups that have gradual metamorphosis, the aquatic life cycle stages are known as nymphs and in aquatic insects with complete metamorphosis, these stages are known as larvae or pupae. Macroinvertebrates are a primary food base for many fishes, birds, amphibians, reptiles and mammals, such as bats and raccoons. They process organic matter by breaking down leaves and woody material that fall into water. Macroinvertebrates are part of all aquatic food webs, representing every major feeding type, including predators, scrapers, collectors, shredders, and filterers (Rana, 2003).

Freshwater macroinvertebrates inhabit all types of freshwater ecosystems. They are very important indicators of the health of streams, lakes, ponds and rivers reflecting water quality and habitat conditions. Scientists survey aquatic communities as a measure of ecological condition or health because these communities provide clues related to the past history of exposure to environmental stressors such as degraded water quality, effects of habitat loss, declines in substrate quality and presence of contaminants (Macan, 1960).

The designated study site was in Paleik "In". The open waters have many macroinvertebrates. Therefore, the objectives of this research work are to identify, investigate and occurrence of this species with their habitats in this study area.

## Materials and Methods

### Study Site

The Paleik “In” is located in Sintkaing Township, Mandalay Region. It is situated at latitude 21° 53′ 39.44″N and longitude 96° 4′ 14.09″E and the whole area is 327.76 hectares in rainy season and 40.47 hectares in hot season. The depth of water level is about 3.9 m in rainy season (Fig. 1).

### Sampling Regime and Identification

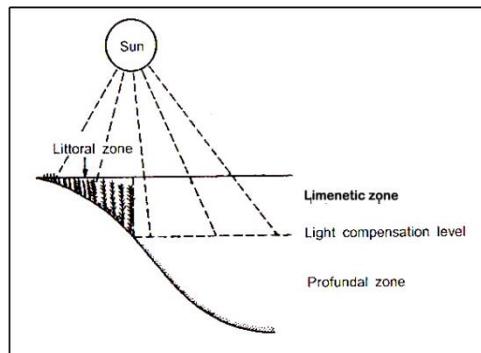
The specimens were collected at 10-days interval between 7.00 am to 9.00 am local time. Collections were made by dipping a 40cm

diameter circular handle net. Hard bodied insect specimens were desiccated, pinned and preserved in dry condition and soft bodied insect were preserved in 75% Ethanol. Collected ten specimens for each species were recorded and listed accordance with subhabitats and microhabitats of present study site and followed after Miller, Jr. (1994) and Rana (2003). Microhabitats are divided into surface, column, margin and bottom region. Aquatic habitat was also divided into three subhabitats littoral, limnetic and profundal zone (Fig. 2).

Collected specimens were identified and classified by followed after Borrer and DeLong (1964), Hungerford (1927), Bland and Jaques (1978), Jordan and Verma (1983).



**Fig. 1 A Map of study area and study site**



**Fig. 2 The three zones of a lake (After, Rana, 2003)**

## Data Calculation

The following calculations of data were based on the formulae given by Thrusfield (1995).

$$\text{Average percentage} = \frac{\text{Total number of each species}}{\text{Total number of all studied species}} \times 100$$

$$\text{Occurrence rate} = \frac{\text{Total number of specific species}}{\text{Total number of all examined species}} \times 100$$

## Results

A total of 16 aquatic macroinvertebrate species were recorded with their habitats (Table 1).

**Table 1 Recorded macroinvertebrate species of Paleik “In”**

| Phylum        | Class         | Order                  | family         | species                |                     |
|---------------|---------------|------------------------|----------------|------------------------|---------------------|
| 1. Mollusca   | Pelecypoda    | Unionoida              | Unionidae      | <i>U. pictorum</i>     |                     |
|               | Gastropoda    | Pectinibranchiata      | Ampullariidae  | <i>P. globosa</i>      |                     |
| 2. Annelida   | Oligochaeta   | Ophisthophora          | Viviparidae    | <i>V. contectus</i>    |                     |
|               |               |                        | Pheretimidae   | <i>P. posthuma</i>     |                     |
| 3. Arthropoda | Crustacea     | Decapoda               | Palaemonidae   | <i>M.palaemonoides</i> |                     |
|               |               |                        | Insecta        | Odonata                | Aeshnidae           |
|               | Hemiptera     | Nepidae                |                | <i>N. cinerea</i>      |                     |
|               |               |                        |                | <i>R linearis</i>      |                     |
|               |               |                        | Belostomatidae | <i>L. americanus</i>   |                     |
|               |               | Coleoptera             | Dytiscidae     | Gerridae               | <i>G. lacustris</i> |
|               |               |                        |                | <i>G. remigis</i>      |                     |
|               |               |                        |                | Notonectidae           | <i>N. undulata</i>  |
|               |               |                        |                | Naucoridae             | <i>P. femoratus</i> |
|               | Hydrometridae | <i>H. martini</i>      |                |                        |                     |
| Hydrophilidae |               | <i>H. triangularis</i> |                |                        |                     |

**Table 2 Species list with habitats, microhabitats and food habits of some aquatic macroinvertebrate species from Paleik “In”**

| No. | Species                 | Habitats |          | Microhabitats |        |        |        | Food habits                  |
|-----|-------------------------|----------|----------|---------------|--------|--------|--------|------------------------------|
|     |                         | littoral | limnetic | surface       | column | margin | bottom |                              |
| 1   | <i>U. pictorum</i>      | +        | -        | -             | -      | +      | +      | Planton, dead organic matter |
| 2   | <i>P. globosa</i>       | +        | -        | -             | -      | +      | +      | Algae, dead organic matter   |
| 3   | <i>V. contectus</i>     | +        | -        | -             | -      | +      | +      | Algae, dead rganic matter    |
| 4   | <i>P. posthuma</i>      | +        | -        | -             | -      | +      | +      | Dead organic matter          |
| 5   | <i>M. palaemonoides</i> | +        | +        | -             | +      | +      | +      | Predator                     |
| 6   | <i>A. junius</i>        | +        | -        | -             | -      | +      | +      | Predator                     |
| 7   | <i>N. cinerea</i>       | +        | -        | -             | -      | +      | -      | Predator                     |
| 8   | <i>R. linearis</i>      | +        | -        | -             | -      | +      | -      | Predator                     |
| 9   | <i>L. americanus</i>    | +        | -        | -             | -      | +      | +      | Predator                     |
| 10  | <i>G. lacustris</i>     | +        | +        | +             | -      | -      | -      | Predator, cannibalistic      |
| 11  | <i>G. remigis</i>       | +        | +        | +             | -      | -      | -      | Predator, cannibalistic      |
| 12  | <i>N. undulata</i>      | +        | +        | -             | +      | +      | -      | Predator                     |
| 13  | <i>P. femoratus</i>     | +        | +        | -             |        | +      | +      | Predator                     |
| 14  | <i>H. martini</i>       | +        | -        | +             | -      | -      | -      | scavenger                    |
| 15  | <i>D. verticalis</i>    | +        | +        | -             | +      | +      | +      | Predator                     |
| 16  | <i>H. triangularis</i>  | +        | +        | -             | +      | +      | +      | Scavenger                    |

+ = Present; - = Absent

**Table 3 The number of specimens and occurrence rate of macroinvertebrate from two study sites of Paleik “In”**

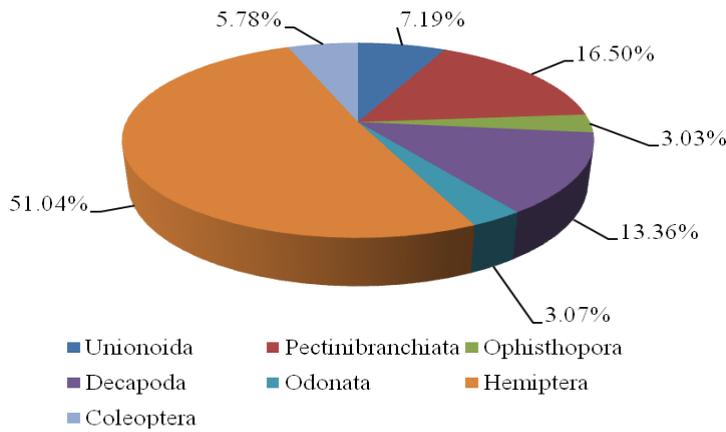
| No.                   | Order             | Species                 | Site A | Site B | Total | Rate    |
|-----------------------|-------------------|-------------------------|--------|--------|-------|---------|
| 1                     | Unionoida         | <i>U. pictorum</i>      | 410    | -      | 410   | 7.19 %  |
| 2                     | Pectinibranchiata | <i>P. globosa</i>       | 585    | -      | 585   | 10.26 % |
|                       |                   | <i>V. contectus</i>     | 356    | -      | 356   | 6.24 %  |
| 3                     | Ophisthopora      | <i>P. posthuma</i>      | 173    | -      | 173   | 3.03 %  |
| 4                     | Decapoda          | <i>M. palaemonoides</i> | 503    | 259    | 762   | 13.36 % |
| 5                     | Odonata           | <i>A. junius</i>        | 175    | -      | 175   | 3.07 %  |
| 6                     | Hemiptera         | <i>N. cinerea</i>       | 142    | -      | 142   | 2.49 %  |
|                       |                   | <i>R. linearis</i>      | 116    | -      | 116   | 2.03 %  |
|                       |                   | <i>L. americanus</i>    | 90     | -      | 90    | 1.58 %  |
|                       |                   | <i>G. lacustris</i>     | 450    | 281    | 731   | 12.82 % |
|                       |                   | <i>G. remigis</i>       | 400    | 364    | 764   | 13.39 % |
|                       |                   | <i>N. undulata</i>      | 384    | 311    | 695   | 12.17 % |
|                       |                   | <i>P. femoratus</i>     | 105    | 103    | 208   | 3.65 %  |
|                       |                   | <i>H. martini</i>       | 166    | -      | 166   | 2.91 %  |
| 7                     | Coleoptera        | <i>D. verticalis</i>    | 90     | 91     | 181   | 3.17 %  |
|                       |                   | <i>H. triangularis</i>  | 80     | 69     | 149   | 2.61 %  |
| Total occurrence rate |                   |                         | 4225   | 1478   | 5703  | 100 %   |
|                       |                   |                         | 74.08% | 25.92% | 100%  |         |

Site A= Littoral zone

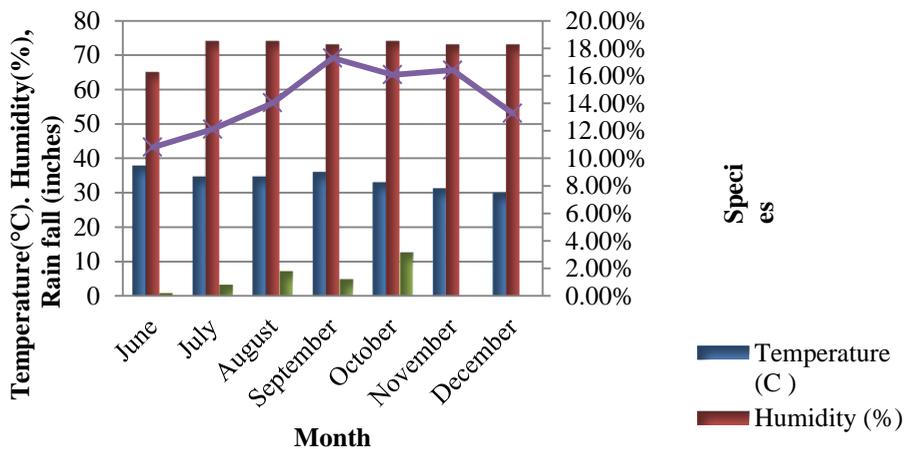
Site B= Limnetic zone

**Table 4 Total occurrence rate of monthly collected macroinvertebrate species from Paleik “In” in June to October 2015**

| No.              | Order             | Family         | Recorded species        | June | July  | Aug.  | Sept. | Oct.  | Nov   | Dec.  | Total | Rate   |
|------------------|-------------------|----------------|-------------------------|------|-------|-------|-------|-------|-------|-------|-------|--------|
| 1                | Unionoida         | Unionidae      | <i>U. pictorum</i>      | 35   | 45    | 85    | 96    | 99    | 40    | 10    | 410   | 7.19%  |
| 2                | Pectinibranchiata | Ampullariidae  | <i>P. globosa</i>       | 30   | 60    | 105   | 180   | 150   | 50    | 10    | 585   | 10.26% |
|                  |                   | Viviparidae    | <i>V. contectus</i>     | 28   | 30    | 78    | 90    | 95    | 30    | 5     | 356   | 6.24%  |
| 3                | Ophisthopora      | Pheretimidae   | <i>P. posthuma</i>      | 5    | 5     | 36    | 59    | 49    | 15    | 4     | 173   | 3.03%  |
| 4                | Decapoda          | Palaemonidae   | <i>M. palaemonoides</i> | 45   | 54    | 119   | 150   | 133   | 130   | 131   | 762   | 13.16% |
| 5                | Odonata           | Aeshnidae      | <i>A. junius</i>        | 10   | 10    | 17    | 27    | 31    | 40    | 40    | 175   | 3.07%  |
| 6                | Hemiptera         | Nepidae        | <i>N. cinerea</i>       | 20   | 19    | 14    | 16    | 18    | 35    | 20    | 142   | 2.49%  |
|                  |                   |                | <i>R. linearis</i>      | 19   | 15    | 10    | 11    | 10    | 33    | 18    | 116   | 2.03%  |
|                  |                   | Belostomatidae | <i>L. americanus</i>    | 12   | 13    | 10    | 11    | 9     | 20    | 15    | 90    | 1.58%  |
|                  |                   | Gerridae       | <i>G. lacustris</i>     | 110  | 112   | 83    | 81    | 70    | 139   | 136   | 731   | 12.82% |
|                  |                   |                | <i>G. remigis</i>       | 101  | 110   | 90    | 99    | 95    | 135   | 134   | 764   | 13.39% |
|                  |                   | Notonectidae   | <i>N. undulata</i>      | 100  | 109   | 78    | 89    | 82    | 125   | 112   | 695   | 12.17% |
|                  |                   | Naucoridae     | <i>P. femoratus</i>     | 30   | 35    | 23    | 21    | 20    | 45    | 34    | 208   | 3.65%  |
|                  |                   | Hydrometridae  | <i>H. martini</i>       | 24   | 25    | 18    | 19    | 18    | 32    | 30    | 166   | 2.91%  |
| 7                | Coleoptera        | Dytiscidae     | <i>D. verticalis</i>    | 27   | 28    | 18    | 20    | 23    | 35    | 30    | 181   | 3.17%  |
|                  |                   | Hydrophilidae  | <i>H. triangularis</i>  | 20   | 21    | 16    | 17    | 15    | 32    | 28    | 149   | 2.61%  |
| Total occurrence |                   |                |                         | 616  | 691   | 800   | 986   | 917   | 936   | 757   | 5703  |        |
| Total rate       |                   |                |                         | 10.8 | 12.12 | 14.03 | 17.29 | 16.08 | 16.41 | 13.27 |       |        |



**Fig. 3 Occurrence rate of macroinvertebrate Orders at two study sites**



**Fig. 4 Relationship between species and weather condition of the study area (June to December 2015)**



A. *Unio pictorum*



B. *Pila globosa*



C. *Viviparus contectus*



D. *Pheretima posthuma*



E. *Macrobrachium palaemonoides*



F. *Anax junius*



G. *Nepa cinerea*



H. *Ranatra linearis*



I. *Lethocerus americanus*



J. *Gerris lacustris*



K. *Gerris lacustris*



L. *Notonecta undulata*

**Plate 1 Recorded macroinvertebrate species**

A. *Plecoris femoratus*B. *Hydrometra martini*C. *Dytiscus verticalis*D. *Hydrophilus triangularis*

### Plate 2 Recorded macroinvertebrate species (Continued)

#### Discussion

Many literatures such as (Morton, 1983) have been studied that some of the fresh water mussels are burrowed in the mud or bottom sediment in the profundal zone. In present study, the live freshwater mussel, *Unio pictorum* were collected from the littoral zone but they are burrowed in sediment of shallow zone (Table 1, 2 and 3).

When the soil is moist and the temperature is moderate, each worm lies by day in the upper part of its burrow, anterior end foremost (Storer and Usinger, 1965). In present study, the earthworm, *Pheretima posthuma* were collected from wet area of the soil in shallow water zone. These findings are agreed with the former authors (Table 1, 2 and 3).

Korkeamaki, 2002 stated that the Odonata are relatively large and spend a large part of their time on the wing. The immature stages are aquatic, and the adults are usually found near water. In present study, immature stage of odonata, such as *Anax junius* was found under the root of aquatic plants (Table 1, 2 and 3).

According to Voshell (2002), the littoral zone (Site A) of present study site is the home of a greater variety of animals than the other zones (Site B). During the present study period, various adult and larval stages of Hemiptera are conspicuous. Abundance of Hydrophilidae and Dytiscidae beetles inhabit in shallow regions of water bodies.

Feeding adaptations can be occurred in present study. The water striders (*Gerris lacustris* and *Gerris remigis*) and back swimmer (*Notonecta undulate*) which spend most of their lives on the surface of water. The *Hydrometra martini*, these insects are occurred in shallow water. They feed on dead and dying insects that fall onto the water surface or onto the mats they inhabit (Table 2).

Khan, (2001) describe that aquatic insects are extremely important in ecological systems for many reasons and are the primary bio-indicators of freshwater bodies such as lakes, ponds, wetland, streams and rivers. In present study, prevalence of Dytiscidae is indicative of the ecological health of studied lakes.

The occurrence rates were different among the months and study sites depending on preferable kind of host plants and climatic conditions. Between these two study sites, the highest (4225) individual (74.08%) in littoral zone (Site A) and the lowest (1478) individual (25.92%) in limnetic zone (Site B) were observed in study period. This may be because site (A) is shallow water zone and that has many aquatic plants and decaying vegetative matter than these of the (Site B) (Fig. 3, Table 3).

Monthly recorded data indicated that significant correlation was observed the population and weather condition. Peak population of macroinvertebrate was observed in September (17. 29%). In this month, mean temperature (36.0°C), relative humidity (73%) and rainfall (4.86 inches) were recorded. This optimum temperature, mild relative humidity, rainfall and various plantation seemed to be favourable to more aquatic macroinvertebrates species to survive and reproduce, reaching a certain level of population size. Occurrence rate was decreased in December (13. 27%), especially when mean temperature is (34.9°C), relative humidity (73%) and rainfall (0.00 inch) respectively. Because these study area were low water level and vegetative plants were scarce in this months (Fig. 4, Table 4).

### **Conclusion**

From the findings of this study, it is concluded that feeding ground area, seasonal flooding, optimum amount of rainfall, temperature and humidity value were seemed to be important factors which influenced the assemblage and occurrence of aquatic macroinvertebrates. Insect populations are often used as an index of ecological conditions. In addition, the insect scavengers and predators are essential to maintain a balance in nature.

## Acknowledgements

First of all, I am greatly indebted to Dr Aye Kyaw, Rector, Dr Khin Ma Ma Tin and Dr Mint Zu Min Pro-rectors, Yadanabon University. I would like to express my heartfelt thanks to Professor Dr. Khin May Nyo, Head of Zoology Department, Yadanabon University, for her permission to conduct this work with the chosen topic. Last but not the least I am deeply indebted to my parents for their encouragement and financial supports throughout the study.

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