

ORIGINAL PAPER

Diversity of Harpacticoid Copepods (Crustacea: Maxillopoda: Copepoda) from Prasae Beach in Rayong Province

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Abstract. Harpacticoid copepods is a small benthic meiofauna, with a body length between 0.1 and 2.5 mm. They distributed in almost all aquatic habitats including freshwater, brackish-water and seawater, especially in intertidal zones, mangroves, seagrass beds and algal mats. They can be found in all sediment types from mud to sand, and at all depths from the intertidal zone to deepest oceanic zone. In addition, harpacticoid copepod density changes with sediment type and with depth. This research aims to examine the diversity of harpacticoid copepods. Sand samples were collected from Prasae Beach, Rayong Province in July 2020 during low-tide with a plastic hand corer. The samples were fixed in a solution of 10% formalin and rose bengal-sea water mixture for 24 hours, kept in the laboratory room for sorting, dissecting and identification. Environmental factors; temperature, salinity, pH and dissolve oxygen were measured. The sand samples were subsequently sieved through 63 μm sieve and the identified under a stereo-microscope by

using morphological characters. In terms of diversity; 7 families, 7 genera and 7 species were found. The species that was found in each family are as the followings: Family Ameiridae – *Nitokra* sp., Family Canuellidae – *Scottolana* sp., Family Ectinosomatidae – *Ectinosoma* sp., Family Harpacticidae – *Tigriopus* sp., Family Longipediidae – *Longipedia* sp., Family Miraciidae – *Shizopera* sp. and Family Tachidiidae – *Neotachidius* sp., a total number of harpacticoid copepods in Prasae Beach were found 1,152 ind/10 cm^2 and the family Harpacticidae was the most abundance which is total 486 ind/10 cm^2 . The family Harpacticidae having behavior as a predator, very fast movement and high mobility may cause them well-adjust to living and survival in the study area

Keywords: Harpacticoida, Copepods, Meiofauna, Intertidal sandy beach

1. Introduction

Copepods are aquatic crustacean, the diminutive relatives of the crabs and shrimps. In terms of their size diversity and abundance, they can be regarded as the insects of the sea. The sheer abundance of copepods in marine plankton secure for them a vital role in the marine economy Sir Alister Hardy (1970) estimated that the copepods are the most numerous metazoan animals in the world, even outnumbering the insects which have more species but fewer individuals and the nematodes, both of which have had some

claim to the position of preeminence. Copepods are also abundant in freshwater planktonic communities, and they are also living in marine sediments, inhabiting the microscopic spaces between the sediment particles. In this meiofaunal community they are typically second in abundance only to nematodes (Boxshall, G. A. & Halsey S. H., 2004). Meiofaunal copepods tend to become abundant as the particle size of the sediment and increases in coarse sands, they often outnumber the nematodes (Hicks & Coull, 1983). The copepods are sensitive to the low of dissolved oxygen in water, therefore, they

can use as bioindicator in aquaculture. Hicks & Coull (1983) reported that the harpacticoid copepods are small meiofauna that plays an important role as a natural food source for shrimps, crabs, and fishes. Meanwhile, it feeds on other smaller organisms such as ciliates, bacteria, microalgae, diatoms, and detritus. Copepods are small benthic animals that are important in the food chain in aquaculture. The grain size, dissolved oxygen, temperature, salinity, light, wave and tide, all effects to the diversity and distribution of harpacticoid copepods.

Harpacticoid copepods are small benthic animals which pass through a sieved of 1 mm and 0.5 mm mesh but are retain on a sieved of mesh 0.063 mm, or 63 μm (George & Schminke, 2002; Wells, 1967, 1988). At present, order Harpacticoida comprises of 56 families with 4,500 described species around the world (Well, 2007). Chullasorn & Kangtia (2019) reported that many families of harpacticoid copepods were found, family Cylindropsyllidae and family Laophontidae were dominant families with almost the same quantities at various beaches on Samet Island in Rayong Province. However, sandy beaches are classified as habitats for benthic species that spread vertically into the intertidal zone according to the quantity of seawater, dissolved oxygen, and organic matter. It seems that harpacticoid copepods are highly disperse on the surface such as in the fine sandy beaches. Prasae beach is in Rayong Province and located around the inner Gulf of Thailand those are fisheries and tourism area. It was very important for the economic benefit of the community in the province which is interesting to study the

diversity of harpacticoid copepods and keep as data base in Thailand.

2. Materials and Methods

2.1 Study sites

Prasae beach, Rayong Province ($12^{\circ} 40' 0'' \text{ N} / 101^{\circ} 42' 0'' \text{ E}$) is located at the inner Gulf of Thailand.

2.2 Data collection and analysis

2.2.1 Collecting samples

The study area is designated as quadrat, each quadrat size 30 x 30 cm., the samples were collected during low – tide with a plastic hand corer insert into sand sediments deep at 2 cm. for 4 quadrats and each quadrat collected for 4 cores then the samples were fixed in a solution of 10% formalin and Rose Bengal-seawater mixture for 24 hours.

2.2.2 Extraction

After fixation for 24 hours, the extraction of copepods from sediment samples was achieved by using tap water to rinse them for about 10 minutes on a 63 μm mesh, lightly tapping this by hand until the samples was cleaned.

2.2.3 Sorting

Copepods were sorted by a small loop of thin stainless steel (Irwin loop) under stereo microscope, using a magnification of x4 or higher. Harpacticoid copepods were colored red from rose Bengal. Each individual was transferred into vials or observation dishes containing 6% formalin

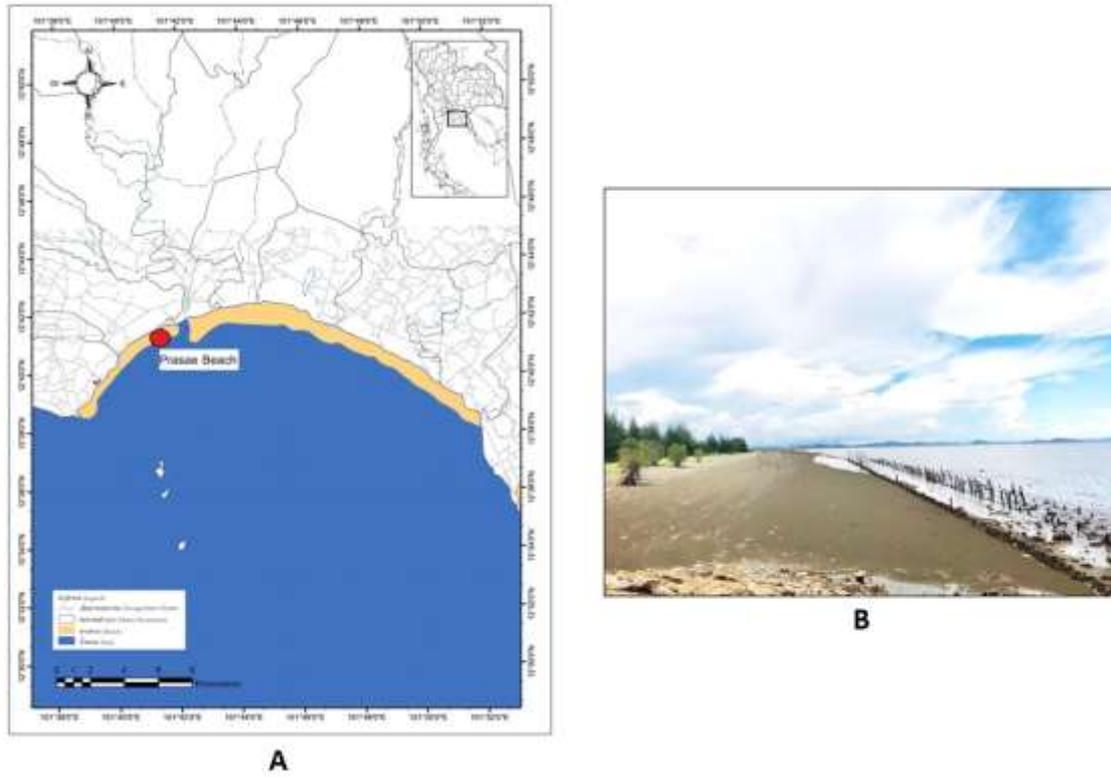


Figure 1. A. Map of the study area B. Prasae Beach, Rayong Province, Inner Gulf of Thailand

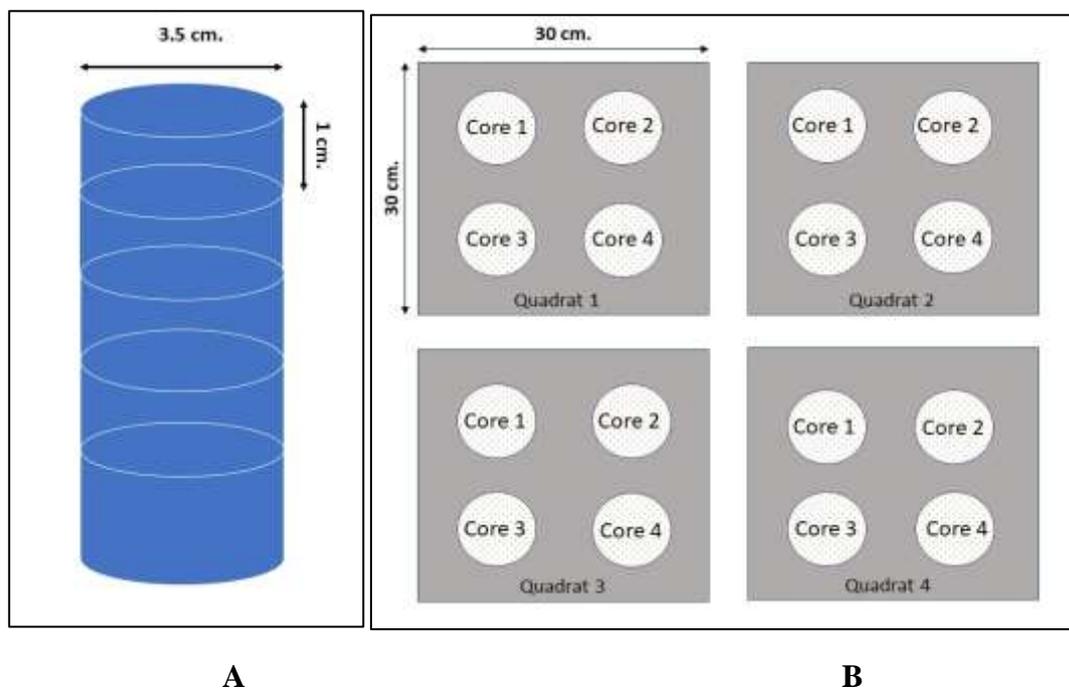


Figure 2. A. Plastic hand-corer B. Quadrat

2.2.4 Examining

Each individual was identified under a stereo microscope and light microscope respectively. This is the most efficiency method of preliminary sorting of large collections. Adult specimens were sorted into groups of putative species according to their similarity, important features to examine at this stage include body size, shape, color and length of antennules, size and shape of rostrum and caudal rami and presence of any conspicuous swimming legs. For species identification, if possible, one adult female and male of each putative species group was selected for dissection. Moreover, any other similar specimens must be checked for conspecificity (Huys et al., 1996).

2.2.5 Microphotography

Samples of harpacticoid copepods representing each family were taken to permanently mount slides by evaporating the sample with glycerin by using glycerin mix with alcohol in the ratio of 60:40 for 24 hours, then specimens were mounted on slide in conc. glycerin. Adhesive plasticine was used to support the cover slip in temporary mounts (Kihara & Huys, 2009) for the protection of the body. The habitus of samples that we have classified are permanently mounted on both lateral and dorsal view. When the slide is dry, seal the slide with nail polish to keep as a permanent slide. Then photographs were taken whole mount of harpacticoid copepods in dorsal and lateral view with scale bars on the ocular lens.

2.2.6 Measurement of environmental factor

Measurement instruments for seawater; temperature by using a thermometer, salinity by using a refraction

salinometer, dissolved oxygen by using DO meter and pH by using a pH meter.

2.2.7. Measurement of sediments or grain size

Approximately 20 g of sediment samples, which were dried at 105 °C for 24 hours, then sifted through a sieve size 2, 1, 0.5, 0.25 and 0.63 mm., respectively. The retained sediments on each sieve size were weighed and calculated as a percentage, then to compare the characteristics of the sediments by using Wentworth Standard Scale in Soil Sediment Classification.

3. Results

The total number of harpacticoid copepods 1,152 ind/10 cm² were found at Prasae Beach, Rayong Province as *Figure 3*. 7 families were found: family Harpacticidae (486 ind/10 cm²), was the most abundant, family Canuellidae (280 ind/10 cm²), family Tachidiidae (220 ind/10 cm²), family Ectinosomatidae (155 ind/10 cm²), family Longipediidae (8 ind/10 cm²), family Miraciidae (2 ind/10 cm²) and family Ameiridae (1 ind/10 cm²) *Figure 4*. The results of harpacticoid copepods families in percentage are as follows; (1) family Ameiridae 0%, (2) family Canuellidae 24%, family Ectinosomatidae 14%, family Harpacticidae 42%, family Longipediidae 1%, family Miraciidae 0%, and family Tachidiidae 19% respectively *Figure 5*. family Harpacticidae was the most abundant in this study area follow by family Canuellidae, Tachidiidae and Ectinosomatidae *Figure 6*. In terms of diversity, seven families, nine genera and nine species of harpacticoid copepods were found (*Figure 7 – 13*). They include: family Ameiridae (*Nitokra* sp.), family Canuellidae

(*Scottolana* sp.), family Ectinosomatidae (*Ectinosoma* sp. and *Halectinosoma* sp.), family Harpacticidae (*Tigriopus* sp.), family

Longipediidae (*Longipedia* sp.), family Miraciidae (*Shizopera* sp.), family Tachidiidae (*Neotachidius* sp.).

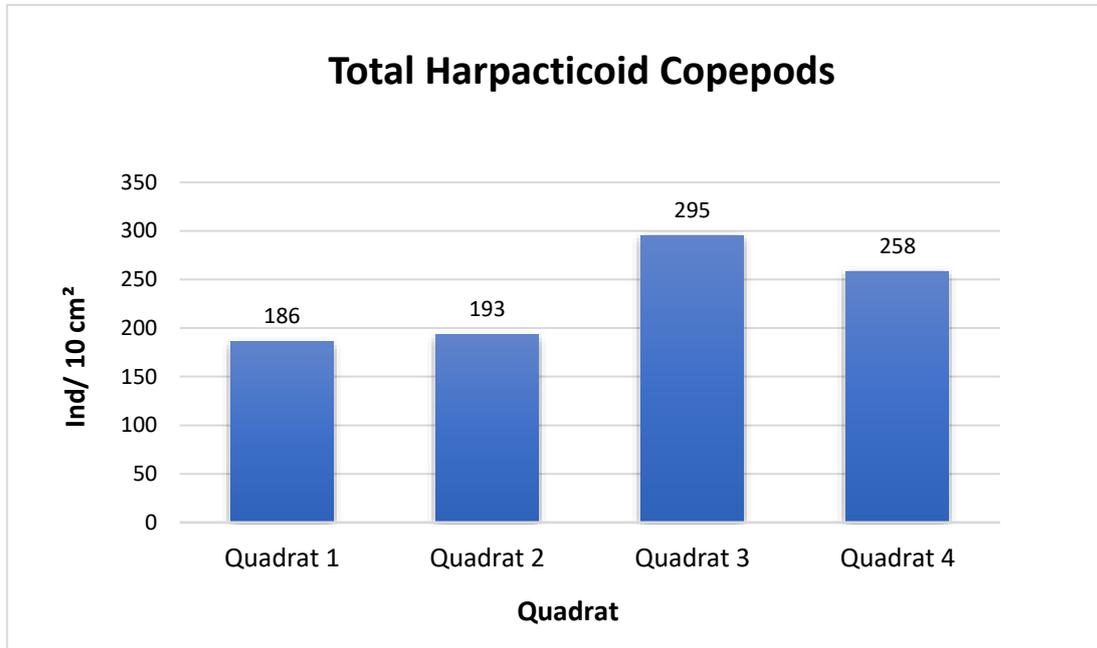


Figure 3. Total number of harpacticoid copepods in Prasae Beach

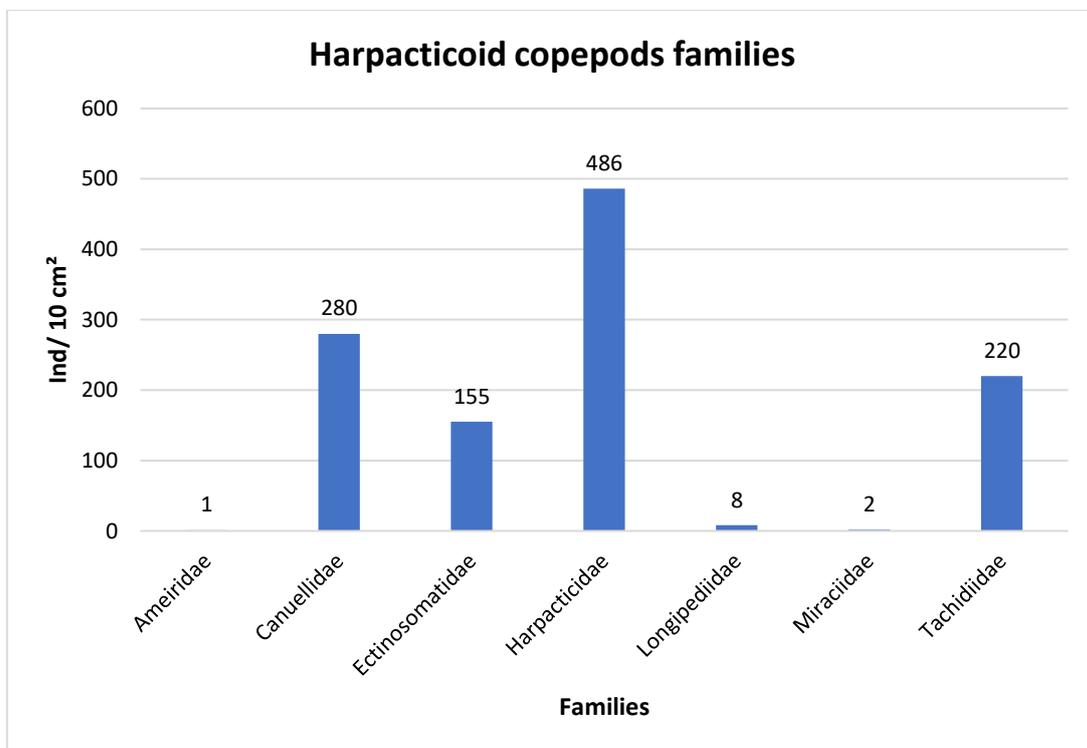


Figure 4. Total harpacticoid copepods families in Prasae Beach

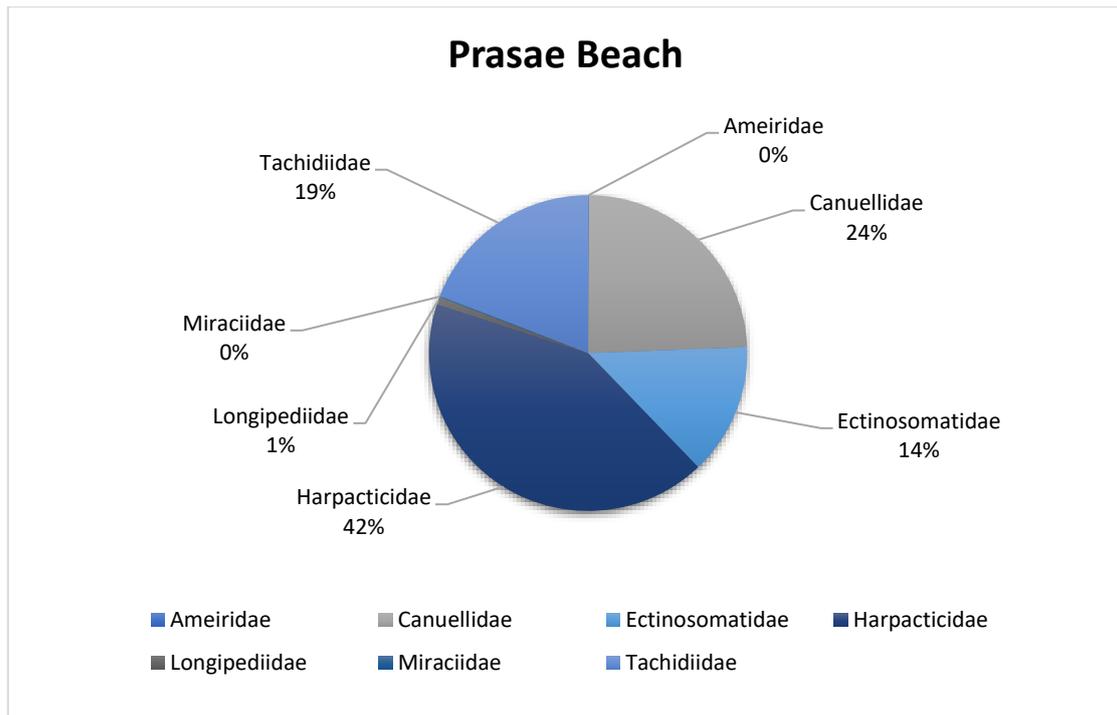


Figure 5. Percentage of harpacticoid copepods families in Prasae Beach

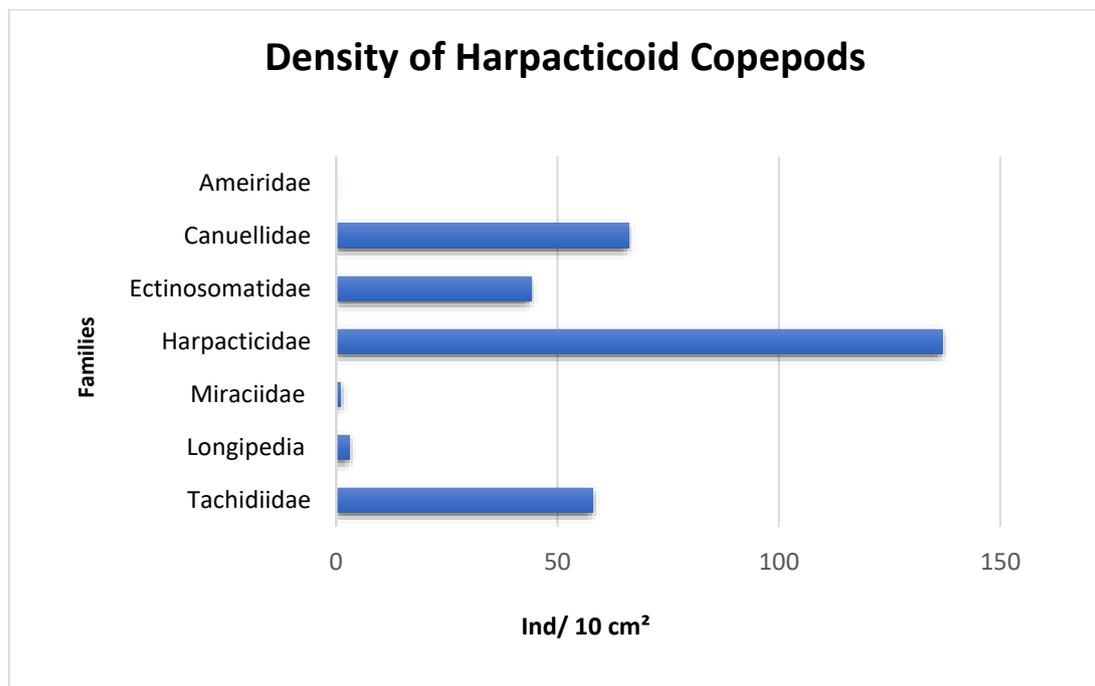
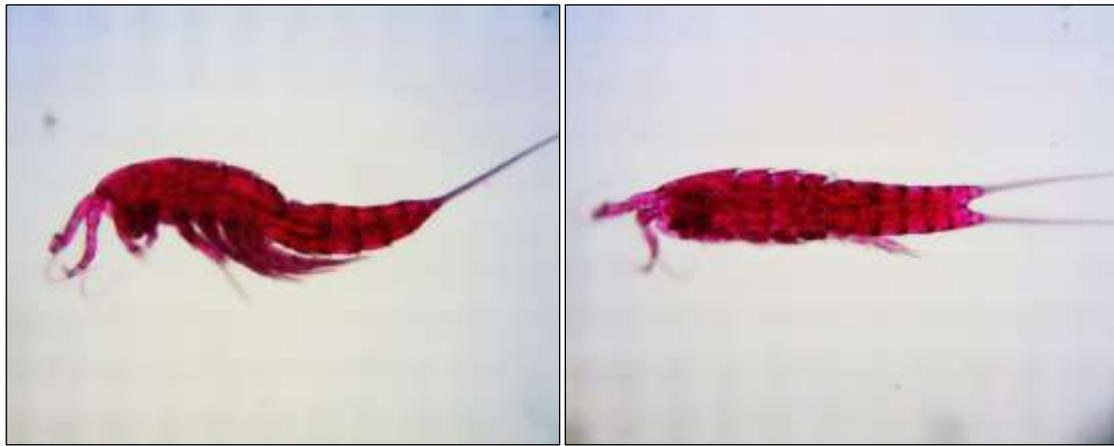


Figure 6. Abundance of harpacticoid copepods in Prasae Beach



A

B

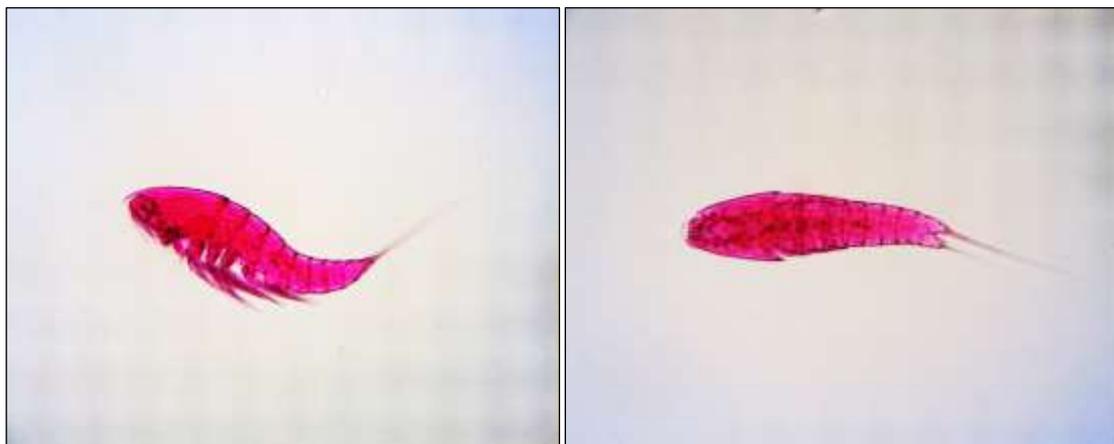
Figure 7. Family Ameiridae - *Nitokra* sp., A. lateral B. dorsal view



A

B

Figure 8. Family Canuellidae – *Scottolana* sp. A. lateral B. dorsal view



A

B

Figure 9. Family Ectinosomatidae- *Ectinosoma* sp. A. lateral B. dorsal view



A

B

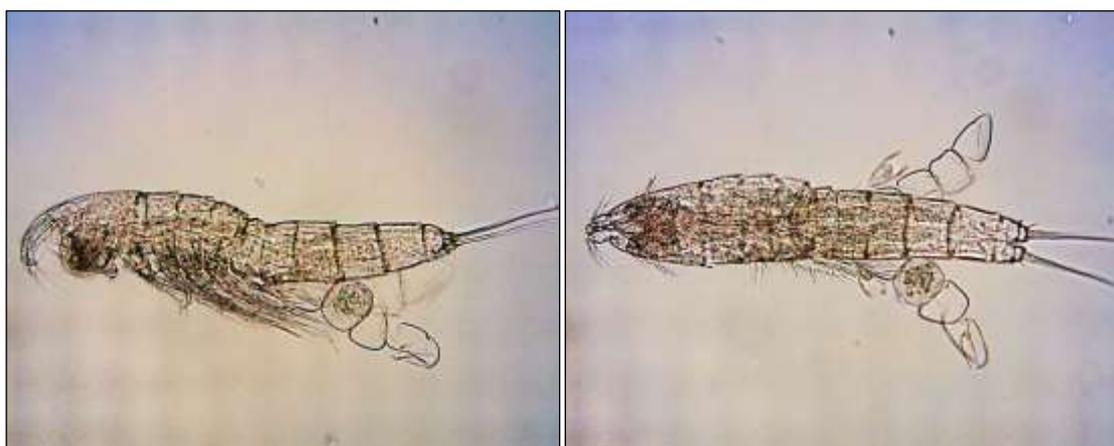
Figure 10. Family Harpacticidae – *Tigriopus* sp. A. lateral B. dorsal view



A

B

Figure 11. Family Longipediidae- *Longipedia* sp. A. lateral B. dorsal view



A

B

Figure 12. Family Miraciidae – *Shizopera* sp. A. lateral B. dorsal view



Figure 13. Family Tachidiidae – *Neotachidius* sp. A. lateral B. dorsal view

The result of environmental factors at Prasae Beach are as follows; Temperature = 28 °C, Salinity = 28 ppt, pH = 7.8 and Dissolve oxygen = 5.8 mg/l.

The results of grain size measurement from Prasae Beach, Rayong Province are as follows; size <0.063 micron = 0.02%, size 0.063 micron = 0.08%, size 0.075 micron = 3.03%, size 0.106 micron = 18.3%, size 0.15 micron = 70.38%, size 0.3 micron = 5.01%, size 0.425 micron = 1.22%, size 0.6 micron = 0.98% and size 1 micron = 0.98% respectively. Therefore, it can be concluded that in Prasae Beach having a very small sand sediments size average 0.15 micron.

4. Discussion

In general, the distribution and density of harpacticoid copepods tend to varies with the seasons. One time collected of sampling may therefore affect the species diversity and number of harpacticoid copepods. The family Harpacticidae was the most abundance in Prasae Beach, Rayong Province, with an abundance of 486 ind/10 cm², average of 42 % in the study area. In terms of biology, their behavior as a predator,

the movement was very fast and the high mobility in this study area as a tourist attractions area may therefore be the part of it to allow them well-adjust their living in this area. Prasae Beach in Rayong Province is very close to Bangkok and there is a popular tourist attraction area may cause more disturbance for the living of harpacticoid copepods and its effect to the survival rate. Therefore, the diversity of harpacticoid copepods families are not varieties in this area.

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