

Short Communication:

Molluscan diversity (Gastropoda: Neogastropoda) in the intertidal zone of Nguyahan Beach, Gunungkidul, Yogyakarta, Indonesia

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Abstract. Prasetya TA, Nazira FK, Millaty INK, Zulfikar WG, Nazara FA, Trijoko. 2017. Molluscan diversity (Gastropoda: Neogastropoda) in intertidal zone of Nguyahan Beach, Gunungkidul, Yogyakarta, Indonesia. *Ocean Life 1*: 55-60. Neogastropod is a taxonomic order of sea snails which have a well developed siphonal canal on their shell. The order includes many families and the highest diversity species can be found in tropical seas. Nguyahan Beach is a tropical beach located in Kanirogo, Sapto Sari, Gunungkidul, Yogyakarta, Indonesia. The beach is still natural and the substrates are dominated by fine sand and coral reef flats. The aim of this research was to understand the diversity of Neogastropod in the intertidal zone of Nguyahan Beach, Gunungkidul, Yogyakarta. The research was conducted on March - May 2017. The ecological parameters recorded were 27°C for water temperature, 3.4‰ for salinity, and 7 for pH. Sample collection was conducted using purposive sampling method. The result of this research shows 5 families of Neogastropod order, they were Muricidae, Nassaridae, Conidae, Columbelloidea, and Mitridae, while the most diverse family was Muricidae with 3 genera.

Keywords: Diversity, intertidal, neogastropod, Nguyahan

INTRODUCTION

Indonesia is geographically located in the strategic area for biogeography and biodiversity studies. Two oceans and two continents encircle it and naturally consists of 17,508 islands with length about 81,000 km (Clark and Rowe 1971). As an archipelagic country surrounded by ocean, Indonesia has a very high diversity of marine biota. One of the interesting regions to study the diversity of marine biota is the intertidal zone of the beaches in Gunungkidul, especially in Nguyahan Beach. Nguyahan Beach is a famous beach in Gunungkidul, Yogyakarta. The beach is still natural and the substrates are dominated by fine sand and coral reef flat.

Coral reefs which are quite extensive are found along the coast. These conditions allow the discovery of various fauna, one of them neogastropod molluscs. Neogastropod is a taxonomic order of sea snails which have a well developed siphonal canal on the shell. The elongated trunk-like siphon is an extensible tube, formed from a fold in the mantle. It is used to suck water into the mantle cavity. At the base of the siphon is the bipectinate (branching from a central axis) osphradium, a sensory receptacle, and olfactory organ, that is more developed than the one in the Mesogastropoda. They achieved important morphological changes including the elongation of the siphonal canal (Cunha et al. 2009).

Some Mollusca belong to the order of neogastropods among others is Conidae (Cone snails), Muricidae (Purple dye snails and Oyster drill snail), Mitridae, Costelariidae,

Olividae (Olive snails), Fasciolaridae (Tulip Shells), and Buccinidae (Whelks), are a carnivorous group. These types of the order are specialized in hunting prey; they are dominant members of the benthic community and are at the top of the food chain (Modica and Holford 2010). While other species are carrion eaters, such as the Nassaridae tribe and the eat everything (omnivore) like Columbelloidea (Poutiers 1998). Neogastropods are part of an important group of molluscs in preparing the aquatic ecosystem. Smaller neogastropods can be a food for fish or other carnivorous marine animals. The presence of this group of gastropods can be used as an environmental indicator such as indicating levels of pollutants (Rosenberg and Resh 1993; Rachmawaty 2011). The condition of the coastal waters is good with the various organisms living in it may affect the presence of neogastropod species. The more diverse organisms that are prey (food), then the opportunity to obtain species of neogastropod with a high diversity also increases. Almost all neogastropods living along the coast in tidal areas (intertidal zones) adapt to the onslaught of waves by attaching themselves to the substrate or within crevices. The condition of different coastal substrates will cause different gastropod diversity (Islami 2012). The information on the diversity of Class Neogastropods Mollusc in the intertidal zone of Nguyahan Beach is still lacking and information regarding this animal group are poorly studied in this area. The aim of this research is to understand the diversity of Neogastropod in the intertidal zone of Nguyahan Beach, Gunungkidul, Yogyakarta and the factors that are affecting it. So, it can be used as a

reference data for further research and for the local communities and also can be used as a reference for developing management policy of Nguyahan Beach and for the development, utilization and sustainable management of the coastal area.

MATERIALS AND METHODS

Study area

The study was conducted in the intertidal zone of Nguyahan Beach, Gunungkidul, Yogyakarta, Indonesia during March-May 2017. Nguyahan Beach located at 8°07'07"S, 110°30'10"E, and is characterized by fine sand and coral reef flats. The determination of the research location also sees how the diversity of the Neogastropods (Figure 1).

Procedures

The samples were collected using purposive sampling without transect. Sampling was conducted during the night (nocturnal sampling). All specimens that were found were placed in a bucket and brought to the seashore to be preserved and identified. The obtained samples were preserved by using dry preservation. The specimens were soaked in boiled water, then cleaned.

Data analysis

The specimens were photographed on millimeter block paper and then identified by morphological characteristics and morphometric analysis using taxonomic classification keys as a guide based on Poutiers (1998).

RESULTS AND DISCUSSION

Results

There were three genera of Family Muricidae that were found in Nguyahan Beach, *Thais*, *Morula* and *Purpura*. One genus of Family Nassaridae can be found in Nguyahan Beach, *Nasarius*. One genus of Family Conidae, *Conus*. One genus of Family Columbelloidae, *Columbella* and also, one genus of Family Mitridae, *Mitra* (Table 1, Figure 2-8). The research was held when ecological parameters were 27°C for water temperature, $\pm 3.4\%$ for salinity, and 7 for pH (Table 2).

Table 1. Diversity of Neogastropoda in Nguyahan Beach, Yogyakarta, Indonesia

Family of Gastropoda	Genus
Muricidae	<i>Thais</i> <i>Morula</i> <i>Purpura</i>
Nassaridae	<i>Nasarius</i>
Conidae	<i>Conus</i>
Columbellidae	<i>Columbella</i>
Mitridae	<i>Mitra</i>

Table 2. Ecological parameters in Nguyahan Beach, Yogyakarta, Indonesia

Ecological parameters	
Water temperature	27°C
Salinity	$\pm 3.4\%$
pH	7



Figure 1. Map showing research site in Nguyahan Beach, Gunungkidul, Yogyakarta, Indonesia.

Discussion

Table 1 shows that there are five families of neogastropods found in Nguyahan Beach: Muricidae, Nassariidae, Conidae, Columbellidae, and Mitridae. These five families have distinctive characteristics from each other; the most apparent is their body shape. The genera found in Nguyahan Beach are *Thais*, *Morula*, *Purpura*, *Nassarius*, *Conus*, *Columbella*, and *Mitra*.

Genus *Thais* is known by the common names dog winkles or rock shells, and is a genus of medium to large predatory sea snails. This animal has a small bulge that curls up to the apex on its shell with red color. There are also white spots on the shell with the legs ventral to the body. It has an aperture with a lighter color than its shell color, which has a circular direction to the right (Tan and Sigurdsson 1990). *Thais* has the largest population in the tropics, especially the estuary, marine biome, rocky sea. Living between depths of 0-6,5 m at a temperature of 28.3 - 28.3 °C. Salinity 33.84 PSU (Alison 2001).

Morula or also commonly called Drupes are rock-shell. The size is between 11 mm and 35 mm. They usually have thick shells and thick operculum made of a horn-like material, like *Thais*. Drupes live on the rocks and are predatory molluscs that bore into other shelled creatures. To bore a hole through the shell of their prey, a drilling snail softens the shell with a weak acid secreted by a special gland on the underside of its foot. They are distributed across the Pacific. The species is founding along South East Africa and Japan. Recently, drupes have become useful as bioindicator of pollutants in the environment, such as for anti-fouling chemicals used to prevent encrusting animals from growing on ships and other installations in the sea.

Purpura is a part of Order Neogastropods that characterized by an oblong-oval shell, the last whorl is large; and the spire is short; aperture is large, ovate, ending in short, oblique canal or notch; columella is flattened; outer lip simple; operculum horny. This genus is carnivorous. Twice a day for several hours these molluscs are left out water. They are amphibious, as well as carnivorous and well protected by strong shells to prevent injury from the waves and predators. Genus *Purpura* lives in the tidal zone. Distributed worldwide across North America, Asia, and Peru (Rogers 2014).

Nassarius individuals are generally less than 20 mm in length, they are common to abundant in intertidal sandy and muddy habitats, but with some species occurring subtidally and a few extending to abyssal depths. They occur in tropical, temperate and cold waters, but are most common in the tropics.

Nassarius are generally carrion feeders and are equipped with a very long proboscis for reaching food in cracks or crevices and have a good chemical sensory mechanism. A few species ate found only in North America which occurs in the tropical Indo-West Pacific and are at the southern limit of their distribution. About half of the local species occur intertidally or in the shallow subtidal, so are frequently found washed up on beaches, but the rest occur in deeper water, one species being recorded down to 2100 m (Cernohorsky 1972).

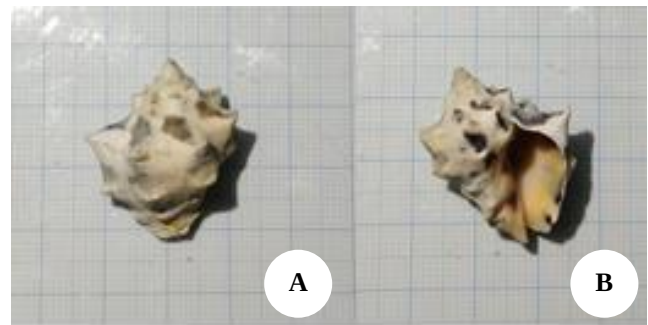


Figure 2. *Thais*: dorsal view (A) and ventral view (B).



Figure 3. *Morula*: dorsal view (C) and ventral view (D).

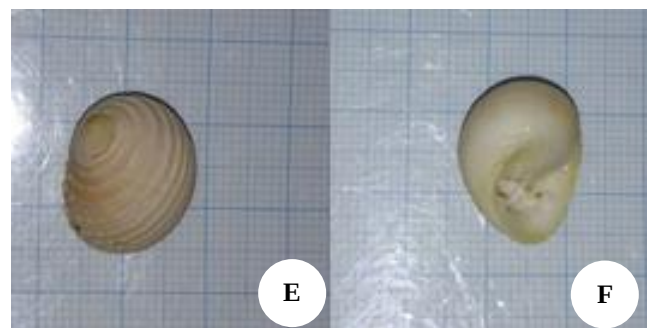


Figure 4. *Purpura*: dorsal view (E) and ventral view (F)

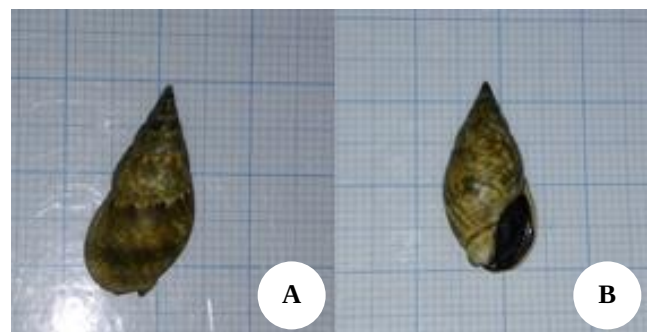


Figure 5. *Nassarius*: dorsal view (A) and ventral view (B)

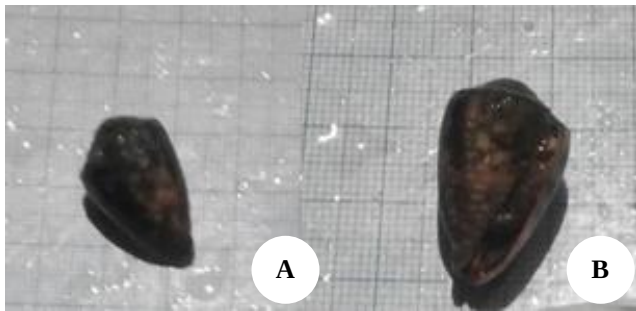


Figure 6. *Conus*: dorsal view (A) and ventral view (B)

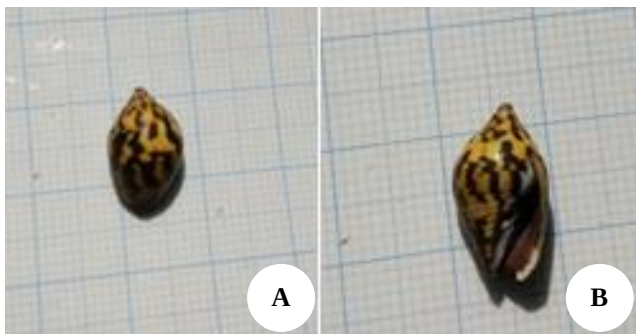


Figure 7. *Columbella*: dorsal view (A) and ventral view (B)

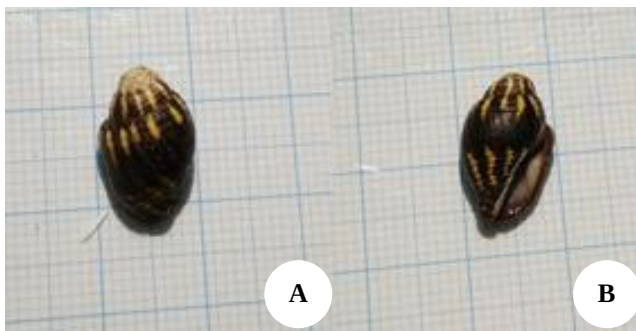


Figure 8. *Mitra*: dorsal view (A) and ventral view (B)

The thick shell of species in the genus *Conus* sensu stricto, is obconic, with the whorls enrolled upon themselves. The spire is short, smooth or tuberculated. The narrow aperture is elongated with parallel margins and is truncated at the base. The operculum is very small relative to the size of the shell. It is corneous, narrowly elongated, with an apical nucleus, and the impression of the muscular attachment varies from one-half to two-thirds of the inner surface. The outer lip shows a slight sutural sinus. Species in the genus *Conus* can be found in the tropical and subtropical seas of the world, at depths ranging from the sublittoral to 1,000 m. They are very variable in some of their characteristics, such as the tuberculation of the spire and body whorl, striae, colors and the pattern of coloring. Many fossil species have been described; they are extensively distributed, and first appear in Cretaceous strata (Tyron 1884).

Columbella is a genus of small sea snails, marine gastropod molluscs in the family Columbellidae (dove snails). *Columbella*'s shell can reach 16.7 mm. *Columbella* has a narrow shell and a long narrow aperture, a thick outer lip, toothed and has a very small operculum (Oldroyd 1978). Genus of *Columbella* almost oliviform, thick-shelled and porcellaneous, with a very weak columellar groove and columellar denticles (DeMaintenon 2008).

This genus can be found in rock crevices. *Columbella* is widely distributed, India, the Galapagos Islands, California, Mediterranean, China, Japan, Philippines, Australia, and Polynesia. Living at a depth of 0.3 - 226.71 m at a temperature of 16.85 - 26.4 °C. Salinity 36.06 - 37.24 PSU. Habitats of this genus exist in coastal, marine, and marine biomes (Alison 2001).

Mitra is a large genus of medium to large predatory sea snails, marine gastropod molluscs in the family Mitridae, the miter shells or miter snails. The shells are solid, and elongate, somewhat fusiform, with a high spire. The aperture is elongate and narrow, and the outer lip is smooth and not lirated (grooved). These sea snails are often colorful. The radulae of *Mitra* are of the rachiglossate type, with 3 teeth per row, formula 1-1-1. lateral teeth (formula 0-1-0). The length of the radular ribbon fluctuates from 3% to 21% of shell-length, and the number of rows of teeth per 1 mm of ribbon length vary from 5 to 190mm. *Mitra* lives in warm and temperate waters of both hemispheres, extending from latitude 42°N to 42°S. The majority of *Mitra* however, inhabit tropical seas, and most species live in the Indo-Pacific region (Rosenberg and Resh 1993).

Neogastropods are gastropods that having different dietary and eating behaviors compared with mesogastropods and subclasses of Opisthobranchia (Barnes 1987). Neogastropods are mostly carnivores, with varying levels of predatory activity and active prey. Most Muricidae eat live biota such as bivalves, gastropods, polychaetes, bryozoans, sipunculids, barnacles, and small crustaceans, but there are also some species that eat carcasses. Selection of preferred food sources depends on the type of molluscs that exist, so prey availability can be an important factor associated with the level of density (Islami 2012). This condition indicates that the type of Muricidae tribe has flexibility in determining the target food or its prey. The presence of the family Muricidae is closely related to the ability of the species to adapt to the environment where he lived. This species lives on the sand microhabitat to the rocky sands in the middle of the intertidal region (Poutiers 1998).

Generally, Neogastropod species richness is affected by many interconnected factors, particularly by environmental quality. Environmental quality is influenced by the pressure level undergone by the environment and its surroundings (Arbi 2011). The level of Mollusc species richness in the rocky substrate is also influenced by surrounding ecosystem conditions, which are still in good shape, hence they are important in providing food, shelter, and any other kinds of life.

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