

## Checklist of Gastropods from the Exclusive Economic Zone (EEZ), Sarawak, Malaysia

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**Abstrak:** Kajian ini menyediakan senarai gastropod marin yang pertama dari perairan Zon Ekonomi Eksklusif (ZEE) Sarawak. Sampel gastropod dikumpul dari stesen yang terpilih di ZEE Sarawak. Operasi menunda menggunakan pukot tunda dengan saiz regangan 38 mm pada penghujung pukot. Operasi menunda dijalankan di kawasan melebihi 12 batu nautika dari pesisir pantai dan kawasan stesen dibahagi kepada tiga strata kedalaman iaitu, I) 20–50 m, II) 50–100 m dan III) 100–200 m. Sebanyak 23 spesies gastropod telah dikenalpasti sepanjang dua bulan kajian yang bermula dari 16 Ogos hingga 6 Oktober 2015 di mana ia terdiri daripada 8 superfamili, 15 famili dan 20 genus. Superfamili Tonnoidea diwakili 7 spesies, diikuti Muricoidea (5 spesies), Cypraeoidea (4 spesies), Buccinoidea dan Conoidea (2 spesies). Manakala lain-lain superfamili hanya diwakili satu spesies sahaja. Didapati hanya 3 spesies berada di 2 strata kedalaman iaitu *Melo melo*, *Murex aduncospinosus* dan *Tonna galea*. Selain daripada itu, didapati 9, 13 dan 4 spesies gastropod dijumpai masing-masing pada strata I, II dan III. Maklumat berkenaan taburan gastropod dengan perbezaan strata kedalaman di ZEE Sarawak sangat berguna dalam pengemaskinian pangkalan data diversiti spesies di Malaysia.

**Kata kunci:** Gastropod marin, Komposisi spesies, Strata kedalaman

**Abstract:** This study provides the first marine gastropod checklist from the Sarawak Exclusive Economic Zone (EEZ). Gastropod samples were collected from selected stations in the Sarawak EEZ using an otter trawl net with a stretched mesh size of 38 mm at the cod end. The trawling operations were conducted more than 12 nautical miles from the coast, and the area was divided into three depth strata: I) 20–50 m, II) 50–100 m and III) 100–200 m. A total of 23 gastropod species were identified during the two-month sampling period from 16 August until 6 October 2015, representing 8 superfamilies, 15 families and 20 genera. Superfamily Tonnoidea was represented by 7 species, followed by Muricoidea (5 species), Cypraeoidea (4 species), and Buccinoidea and Conoidea (both with 2 species). Other superfamilies were represented by a single species. Only 3 species were obtained in 2 depth strata, namely *Melo melo*, *Murex aduncospinosus* and *Tonna galea*. In addition, 9, 13 and 4 species of gastropods were found in strata I, II and III, respectively. The information on gastropod distributions at different depth strata in the Sarawak EEZ could be useful in updating the Malaysian species diversity database.

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**Keywords:** Marine gastropods, Species composition, Depth strata

## INTRODUCTION

The implementation of the Malaysian Exclusive Economic Zone (EEZ) in 1981 led to the extension of the fishing grounds beyond the traditional fishing area. The total EEZ area in Malaysia is 548,800 km<sup>2</sup>, and Sarawak, as the largest state in Malaysia, contains approximately 160,000 km<sup>2</sup> of the Malaysian EEZ (Jamil & Hadil 2012). The topography of the Sarawak seabed was identified in previous surveys and is composed of rocky bottoms and hard coral in addition to having sloping areas with a depth of more than 200 metres (Basir *et al.* 2012).

Mollusca is the second largest phylum, with approximately 200,000 living species that inhabit the land, mountains, rivers, seas and oceans (Ponder & Lindberg 2008). This phylum can be categorized into seven classes, and Gastropoda is the largest molluscan class (Aktipis *et al.* 2008). Gastropods are characterized by having a single shell with an operculum, but the shell is absent in some forms. Furthermore, they can be found in all marine environments, including extreme environments such as hydrothermal vents (Warén 2001).

Taxonomic studies of molluscs in Peninsular Malaysia and Sabah began in the early 1930s by the British. They recorded every gastropod that was collected from Batu Cave, Selangor (Laidlaw 1932), and Mount Kinabalu, Sabah (Laidlaw 1937). Furthermore, from 1973 to 1974, an intensive survey of marine mollusc diversity was conducted by Purchon on the east and west coasts of Peninsular Malaysia (Morris & Purchon 1981; Purchon & Purchon 1981; Way & Purchon 1981). This survey resulted in the collection of 301 specimens from the class Gastropoda, and these specimens are currently stored in the British Natural History Museum, London. Recently, several studies have been conducted on marine gastropods in Peninsular Malaysia by Aziz *et al.* (2001), Kee Alfian *et al.* (2005), Wong *et al.* (2008) and Siti-Balkhis *et al.* (2014). However, most of the recorded species were shown to inhabit the rocky shore, coral reefs and intertidal areas of an island, which are less than 3 nautical miles from the coast.

Meanwhile, in Sarawak, the taxonomic study of molluscs began in the early 1890s by the Dutch, and they collected gastropods inhabiting hills and rivers (Schepman 1895). There are a number of published studies on gastropods in Sarawak. For example, Hamli *et al.* (2013) reported that 21 species of edible gastropods are sold in wet markets around Kuching, Sibu, Mukah, Bintulu, Miri, Limbang and Lawas. In addition, gastropods living in coastal areas (Shabdin & Alfred 2007), mangrove forests (Shabdin & Hidir 2008) and intertidal habitat on island (Shabdin *et al.* 2014) have also been documented.

According to Wong and Arshad (2011), based on their collection of data from scientific writings, a total of 581 species of marine shelled Mollusca are listed in Malaysia (384 species from class Gastropoda). It seems that the number of species listed is far too small compared to other regions. In Japan, more than 6600 species of marine and brackish gastropods have been recorded (Poutiers 1998), while approximately 5000 to 6000 species of molluscs have been recorded for Panglao Island in the Philippines (Bouchet 2006). Although Malaysia