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Checklist and Habitat Descriptions of Edible Gastropods from Sarawak, Malaysia

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ABSTRACT

Sarawak comprises of vast areas of wetland which is the habitat of huge number of edible gastropods. Among the wetland faunal composition, the edible gastropod is one of the important sources of animal protein for the local communities. This diversity of edible gastropod was studied from seven Divisions of Sarawak namely Kuching, Sibuan, Mukah, Bintulu, Miri, Limbang and Lawas. Samples were collected from the wet market and catches from local fishermen. A total of 21 species representing 11 families and 16 genera of edible gastropods were identified from Sarawak. *Cerithidea* spp. was represented by three species while both *Nerita* and *Pomacea* were made up of three and two species each. Others were each represented by one single species. Six edible gastropod species belonged to the freshwater habitat while seven and eight species were recorded from brackish and marine habitats, respectively. *Cerithidea* and *Pomacea* showed wide geography amongst the Division and also highly distributed. Edible gastropods have high market value in the state of Sarawak and contribute significantly to the livelihoods of the certain indigenous communities in the state.

Key words: Edible gastropod, diversity, habitat, wetland, Sarawak, Malaysia

INTRODUCTION

Gastropods are univalve mollusks that are widely distributed in both freshwater and marine environments. The monsoonal season at Southeast Asia provide nutrients enriched environment for these organisms which help to sustain the number of gastropod in this area (Vermeij, 1978). Rich number of gastropod provides as an important source of protein for human besides fish. Many of the Sarawak species are edible and well liked by the local people hence they are widely sought after and this has led to the dwindling status of these species.

The state of Sarawak with diverse ecological habitat is hypothetically inhabited by many aquatic gastropod species. Several studies found that the diversity, abundance and distribution of gastropod at different habitat influence by physicochemical parameters, climatic condition and soil. Gastropod diversity is also influenced by habitat characteristics especially on sediment moisture and

organic content (Armitage and Fong, 2004). Furthermore, rough habitat like intertidal area, acidic, high temperature and rich sulphide environment are only suitable for certain gastropod species (Metabos *et al.*, 2008).

Sarawak has been recognized as one of the important center of biodiversity hotspot in Southeast Asia. Despite several studies of the Malaysian gastropods ecology and diversity, it is still inadequate when compared with others region. There are few studies on gastropod nursery habitat (Cob *et al.*, 2010), diversity (Schilthuizen *et al.*, 2003; Supian and Ikhwanuddin, 2002; Abu Hena *et al.*, 2004) in Malaysian wetland habitats. On the other hand, the published information on edible gastropod is not well documented in Sarawak. Hence, the aim of this study was to identify the edible gastropod species, record the distribution and habitat where they dwelled in the eight Divisions of the state of Sarawak.

MATERIALS AND METHODS

Study area: Gastropod samples were collected from native wet market and fishing villages from seven different Divisions of Sarawak, East Malaysia namely Kuching, Mukah, Sibü, Bintulu, Miri, Limbang and Lawas (Table 1, Fig. 1). Samples were collected from August 2010 to July 2011. Habitat area was recorded according to information survey from the local fishermen. All collected samples were kept in the icebox and transferred to the laboratory for taxonomic identification.

Species identification: Gastropod species identification was made according to Poutiers (1998), Nateewathana (1995), Mujiano (2009), Perez *et al.* (2004), Kohler and Glaubrecht (2001) and Tan and Clements (2008). Important morphological parameters such as shell length and width were

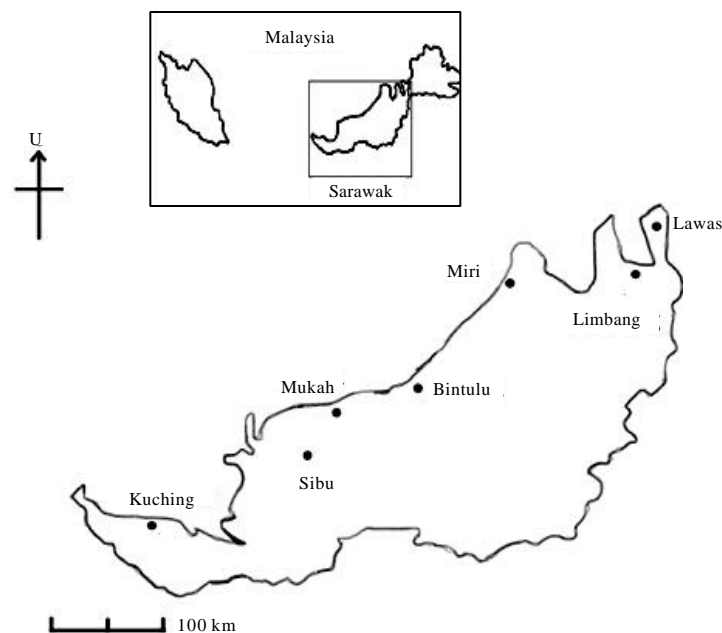


Fig. 1: Sampling area location showing seven divisions at Sarawak, Malaysia

Table 1: Sampling sites and total number of gastropod species recorded in Sarawak region, Malaysia

Sampling site	Habitats	Coordination	No. of species
Kuching	Brackish and freshwater	N 01°33.094'-E 110°20.256'	6
Sibu	Brackish water	N 02°17.335'-E 111°49.756'	3
Mukah	Brackish water	N 02°58.837'-E 112°05.751'	3
Bintulu	Marine and fresh	N 03°10.25'-E 113°02.393'	13
Miri	Brackish water freshwater	N 03°23.526'-E 113°59.142'	3
Limbang	Brackish and freshwater	N 04°46.864'-E 115°02.539'	3
Lawas	Brackish water	N 04°54.902'-E 115°13.506'	2

measured using digital vernier caliper at ± 0.01 mm. Each of samples was photographed by digital camera and redrawn to perfection. Conspicuous and distinctive morphological characteristics were also recorded.

RESULTS AND DISCUSSION

The mollusk existence in Sarawak showed variety of edible gastropods which has high market demand and popular to the local people as food. These edible gastropods were found in broad range of habitats such as freshwater, brackish and marine. This study found that more than half of the edible gastropods inhabits in the wetlands of Bintulu. Moreover, the recorded species was distributed uneven within selected divisions. A total of 21 species of gastropod representing 11 families were identified (Fig. 2, Table 2) from the seven Sarawak's Division. Among the gastropod species, eight species were from marine, seven species from brackish and six species from freshwater habitat (Table 3). The common species was from the family Potamididae such as *Cerithidea rizophorarum* and *C. obtusa* and these two species were found in higher numbers at Kuching, Sibu, Mukah, Miri, Limbang, and Lawas. The highest species richness of the gastropods was found in Bintulu (13 species) and this was followed by collection from Kuching (6 species).

Other gastropod species viz. *Brotia costula*, *Melanoides costellaris*, *Pomacea bridgesii*, *Cerithidea quadrata*, *Telescopium telescopium*, *Clithon retropictus*, *Melo melo*, *Ellobium aurisjudae*, *Nerita chamaeleon*, *N. albicilla*, *Trochus radiatus*, *Planaxis sulcatus*, *Monodonta labio*, *Turbo crassus* and *Thais aculeata* were distributed irregularly in different Divisions of the state of Sarawak.

Potamididae was the most dominant species of gastropod found and this in agreement with the studies done by Aroon *et al.* (2004) in the eastern Thailand. Apart from this, these edible gastropods have had high market demand at Phuket Island, Thailand (Somchai, 1995).

Six species of gastropod belonging to three families (Ampullariidae, Thiaridae and Pachychilidae) were recorded from freshwater habitat in Kuching, Bintulu, Miri and Limbang. Previously, the freshwater gastropod species *Brotia* sp. was also reported from Malaysian Peninsular as well as from Sumatra, Java and Borneo (Kohler and Glaubrecht, 2002).

The edible gastropods from coastal and marine habitats were the more dominant group and firstly been reported from the six coastal waters Divisions of Sarawak. Studies on edible and non edible gastropods were recorded 384, 44, 22 and 15 species within Southeast Asia (Wong and Arshad, 2011; Ashton *et al.*, 2003; Matsuura *et al.*, 2000; Phuket Marine Biological Center, 2006).

Table 2: Checklist of gastropod species existing from seven different divisions in Sarawak

Family	Species	Kuching	Sibu	Mukah	Bintulu	Miri	Limbang	Lawas
Neritidae	<i>Nerita chamaeleon</i> (Linnaeus, 1758)	-	-	-	+	-	-	-
	<i>Nerita articulata</i> (Gould, 1847)	+	-	+	-	-	-	-
	<i>Nerita albicilla</i> (Linnaeus, 1758)	-	-	-	+	-	-	-
	<i>Clithon retropictus</i> (Von Martens, 1879)	-	+	-	-	-	-	-
Potamididae	<i>Cerithidea rizophorum</i> (A. Adams, 1855)	+	+	+	-	-	+	-
	<i>Cerithidea obtusa</i> (Lamarck, 1822)	+	+	+	-	+	-	-
	<i>Cerithidea quadrata</i> (Sowerby, 1866)	-	-	-	-	-	-	+
	<i>Telescopium telescopium</i> (Linnaeus, 1758)	-	-	-	-	-	-	+
Ampullariidae	<i>Pomacea bridgesii</i> (Reeve, 1856)	-	-	-	+	-	-	-
	<i>Pomacea canaliculata</i> (D'Orbigny, 1835)	+	-	-	+	+	+	-
Trochidae	<i>Trochus radiatus</i> (Gmelin, 1791)	-	-	-	+	-	-	-
	<i>Monodonta labio</i> (Linnaeus, 1758)	-	-	-	+	-	-	-
Pachychilidae	<i>Brotia costula</i> (Troschel, 1837)	-	-	-	+	-	-	-
	<i>Tylomelania helmuti</i> (Von Rintelen and Glaubrecht, 2003)	-	-	-	+	+	-	-
Thiaridae	<i>Melanoides costellaris</i> (Lea, 1850)	+	-	-	-	-	-	-
	<i>Blanocochlis glandiformis</i> (Schepman, 1896)	-	-	-	+	-	+	-
Planaxidae	<i>Planaxis sulcatus</i> (Born, 1778)	-	-	-	+	-	-	-
Turbinidae	<i>Turbo crassus</i> (Wood, 1828)	-	-	-	+	-	-	-
Muricidae	<i>Thais aculeata</i> (Deshayes and Milne Edwards, 1844)	-	-	-	+	-	-	-
Volutidae	<i>Melo melo</i> (Lightfoot, 1786)	-	-	-	+	-	-	-
Melampidae	<i>Ellobium aurisjudae</i> (Linnaeus, 1758)	+	-	-	-	-	-	-

+: Present, -: Absent

Table 3: Habitat and morphological characteristics of edible gastropod recorded from the selected division of Sarawak, Malaysia

Species	Local name	Habitat	Characteristic
<i>Nerita chamaeleon</i>	Tekoyong timba	Marine	Thick, globose, no spire, spiral cord, semicircular aperture, brownish
<i>Nerita articulata</i>	Tekoyong perempuan	Brackish water	Thick, globose, no spire, spiral cord, semicircular aperture, yellowish
<i>Nerita albicilla</i>	Tekoyong timba	Marine	Thick, globose, no spire, spiral cord, flat ventral, semicircular aperture, brownish
<i>Clithon retropictus</i>	Tekoyong bakau	Brackish water	Thick, globose, no spire, semicircular, smooth, aperture, brownish
<i>Brotia costula</i>	Tekoyong ulu	Freshwater	Thick, conical, spire and axial cord, rounded periphery, dark brown
<i>Melanoides costellaris</i>	Tekoyong sungai	Freshwater	Moderate thick, conical, tubercles rounded periphery, brown
<i>Tylomelania helmuti</i>	Tekoyong pusing	Freshwater	Thick, conical, spire cord at base, dark brown
<i>Blanocochlis glandiformis</i>	Tekoyong bulat	Freshwater	Thin, low conical, body whorl large, umbilicus, green
<i>Cerithidea rizophorum</i>	Tekoyong insap	Brackish water	Fragile, conical, axial cord, angle periphery, brownish
<i>Cerithidea obtusa</i>	Tekoyong insap	Brackish water	Thick, conical, axial and spire cord, rounded periphery, brownish and white
<i>Cerithidea quadrata</i>	Tekoyong siok	Brackish water	Thick, conical, axial and spire cord, angle periphery, brownish and white
<i>Telescopium telescopium</i>	Berongan	Brackish water	Thick, large, conical, flat base, oblique aperture, reddish brown
<i>Pomacea bridgesii</i>	Siput bo	Freshwater	Thin, low conical, body whorl big, rounded periphery, umbilicus, orange
<i>Pomacea canaliculata</i>	Kelembui	Freshwater	Thin, low conical, body whorl big, rounded periphery, umbilicus, dark brown
<i>Trochus radiatus</i>	Tekoyong siaong	Marine	Thick, conical, angular periphery, flat base, umbilicus pink
<i>Monodonta labio</i>	Tekoyong susu	Marine	Thick, globose, spiral beads, columella teeth, aperture rounded, light brown
<i>Planaxis sulcatus</i>	Tekoyong serai	Marine	Thick, large body whorl, spiral cord, folded columella, dark brown,
<i>Turbo crassus</i>	Tekoyong lagang	Marine	Thick, turbinate, spiral cord, large aperture, white and brown
<i>Thais aculeata</i>	Tekoyong beduik	Marine	Thick, conical, tubercles, medium siphonal canal, brown and white
<i>Melo melo</i>	Tekoyong	Marine	Large, globose ovate, spire shallow, no operculum, slippery, orange,
<i>Ellobium aurisjudae</i>	Tekoyong	Brackish water	Thick, elongate ovate, blunt apex, white brown

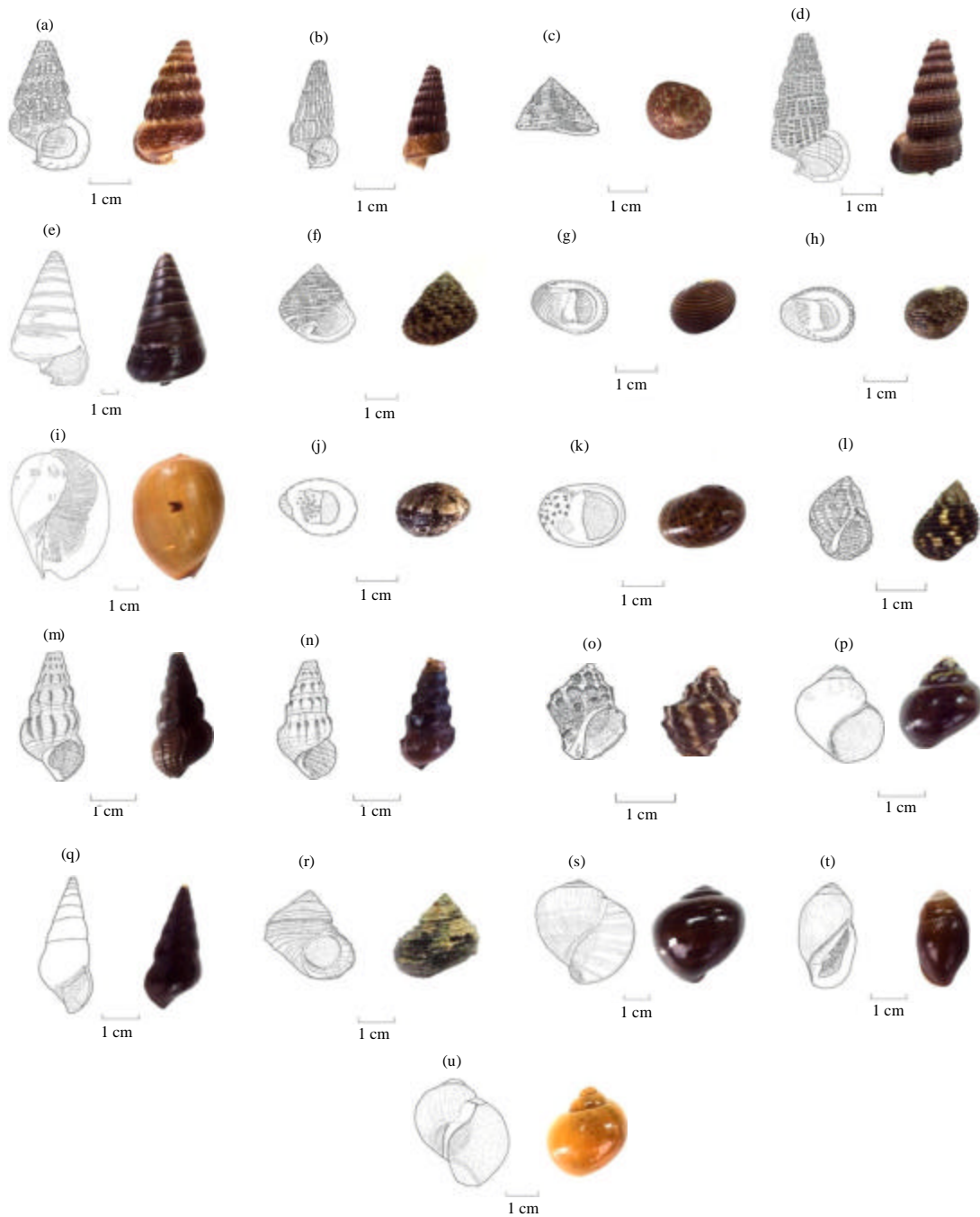


Fig. 2(a-u): Edible gastropods from Sarawak (a) *Cerithidea obtusa*, (b) *Cerithidea rizophorarum*, (c) *Trochus radiatus*, (d) *Cerithidea quadrata*, (e) *Telescopium telescopium*, (f) *Monodonta labio*, (g) *Nerita articulata*, (h) *Nerita chamaeleon*, (l) *Melo melo*, (j) *Nerita albicilla*, (k) *Clithon retropictus*, (l) *Planaxis sulcatus* (m) *Brotia costula*, (n) *Melanoides costellaris*, (o) *Thais aculeata* (p) *Blancocochlis glandiformis*, (q) *Tylomelania helmuti* (r) *Turbo crassus*, (s) *Pomacea canaliculata*, (t) *Ellobium aurisjudae* and (u) *Pomacea bridgesii*

The present study also found that the collected gastropod species have occupied and registered from the various fresh, brackish and marine aquatic habitats.

CONCLUSION

This study revealed 21 species of edible gastropod from the wetlands of Sarawak representing from 11 families and 16 genera. Six edible gastropods inhabit in freshwater habitat while others were from brackish and marine habitats. *Cerithidea* and *Pomacea* showed wide geography amongst the division and distributed widely. The present study provides new information on edible gastropods in Sarawak which could be helpful for future reference for scientists working on wetland gastropods.

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