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Taxonomic Study of Edible Bivalve from Selected Division of Sarawak, Malaysia

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ABSTRACT

The diversity of edible bivalve was conducted from August 2010 to July 2011 covering eight Divisions i.e., Kuching, Sarikei, Sibul, Mukah, Bintulu, Miri, Limbang and Lawas of Sarawak, Malaysia. Samples were collected from native market and fishing village during the study period. All edible bivalves inhabit either in brackish or marine environment and comprised 19 species from 10 families namely *Meretrix meretrix*, *M. lyrata*, *Paphia undulata*, *Circe scripta*, *Solen regularis*, *Solen lamarckii*, *Pharella acutidens*, *Amusium pleuronectes*, *Anadara granosa*, *Pholas orientalis*, *Gluconome virens*, *Placuna placenta*, *Crassostrea lugubris*, *Isognomon ephippium*, *Polymesoda erosa*, *P. bengalensis*, *P. expansa*, *Anodonta woodina* and *Pilsbryconcha exilis*. The diversity of edible bivalves was found highest in Kuching and Bintulu compared to other Divisions studied in Sarawak. The bivalve species at Sarawak could have economic potentiality in terms of protein source, livelihoods of local tribes and economic value. Study suggests that if the high conservation and management of edible bivalve diversity could establish in the coastal and wetland area of Sarawak, a remarkable and vast economic return could achieve.

Key words: Distribution, edible bivalve, habitat, economy, Sarawak

INTRODUCTION

The state of Sarawak, Malaysia comprise of vast amount of wetlands which include brackish water area, coastal marine and mangrove area, seagrass bed, salt and fresh water marsh land, freshwater pond, lake and peat swamp forests. This state contains 1.24 million ha of wetland which covers 13% of the state's total land area (Page, 2011). This wetland supports itself as the habitat for huge number of floral and faunal biodiversity. Among the faunal composition available in the wetland of Sarawak, the diversity of edible bivalves is one of the most important items. Generally, in Sarawak, a large number of bivalve species which derived from wetland are consumed by the local people. These bivalves provide an essential part of protein in the diet of local communities and some species add an important role in fishery economy of the state.

The contribution of edible bivalves in the local economy in the entire region of Sarawak is high, notwithstanding, this wetland resource is yet to be documented well. However, a number of published documents relating to the bivalves of Malaysia are to our knowledge (Idris *et al.*, 2011; Abdullah *et al.*, 2007; Nakao *et al.*, 1989; Sallih, 2005; Abu Hena *et al.*, 2004) so far. In fact, it is rather tricky to present an accurate figure of edible bivalve species in Sarawak since local people

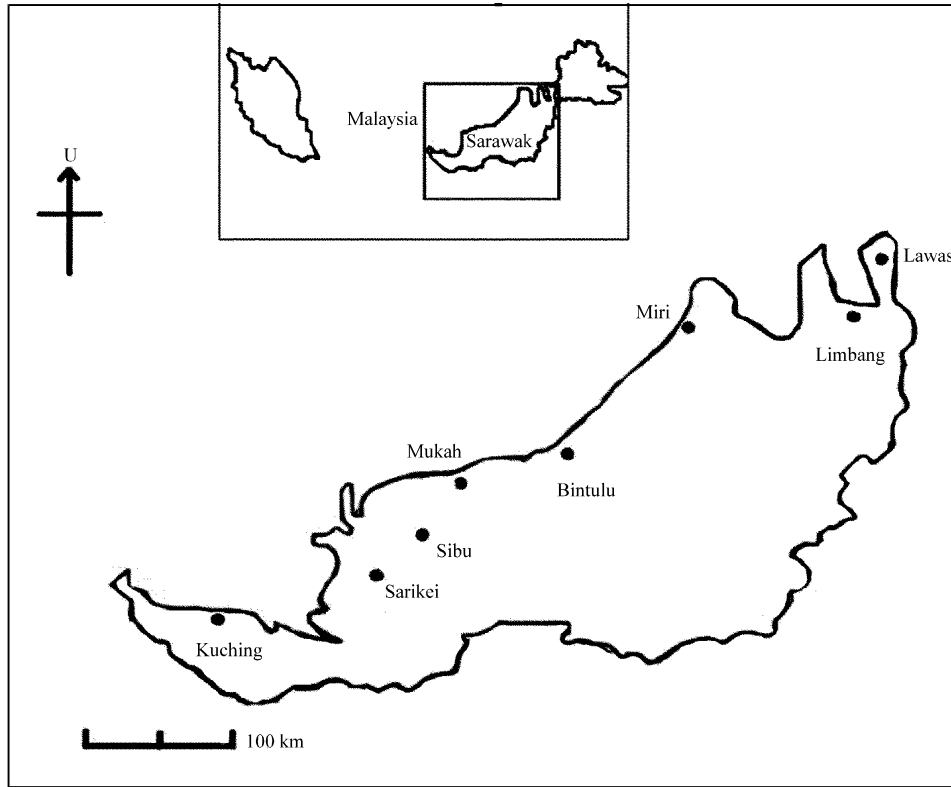


Fig. 1: Location of the study area showing the sampling areas in Sarawak, Malaysia

may consume most of the species of bivalves they locate. Despite their importance, there is few distribution record of edible bivalve in this tropical region in Thailand (Nateewathana, 1995) and little is known of the edible bivalve in Sarawak, Malaysia. To assist fill this gap in our information, the present paper look into the diversity, morphological characteristic, habitat and aquaculture potentiality of edible bivalve in the selected Division of Sarawak, Malaysia.

MATERIALS AND METHODS

Samples were collected from native market and fishing village from August 2010 to July 2011. Study area was located at eight Divisions i.e., Kuching, Sarikei, Mukah, Sibuh, Bintulu, Miri, Limbang and Lawas of Sarawak, Malaysia (Fig. 1). Most of the collected bivalve was bought within Ringgit Malaysia (RM) 2 to RM 20 kg⁻¹. The collected samples were preserved under freeze point and were brought to laboratory for species identification. Species identification was done based on Poutiers (1998), Mass *et al.* (1999) and Chiu *et al.* (2002). Shell length (L), shell width (W) and shell height (H) was determined using digital vernier caliper at ± 0.01 mm. Each sample was photographed by digital camera and redraw to reveal any dim characters on the shell. The specimens are deposited in the Laboratory of Aquatic Biology, Department of Animal Science and Fishery, Universiti Putra Malaysia Bintulu Sarawak Compus, Malaysia.

RESULTS

A total of 19 species from 10 families were recorded from eight Divisions of Sarawak (Table 1 and Fig. 2). Most of the edible bivalves were from the wetland land, freshwater, brackish and marine area (Table 2). Collected species comprise of Veneridae, Solenidae, Pectinidae,

Table 1: Checklist and distribution of edible bivalve species from eight different Divisions in Sarawak, Malaysia

Family	Species	Kuching	Sarikei	Sibu	Mukah	Bintulu	Miri	Limbang	Lawas
Veneridae	<i>Circe scripta</i>	-	-	-	-	+	-	-	-
	<i>Paphia undulata</i>	-	-	-	+	-	-	-	-
	<i>Meretrix meretrix</i>	-	-	-	-	+	-	-	-
	<i>Meretrix lyrata</i>	+	-	-	-	-	-	-	-
Solenidae	<i>Solen regularies</i>	+	-	-	-	-	-	-	-
	<i>Solen lamarckii</i>	+	-	-	-	-	-	-	-
	<i>Pharella acutidens</i>	+	-	-	-	-	-	-	-
Corbiculidae	<i>Polymesoda bengalensis</i>	+	+	+	-	+	+	+	-
	<i>Polymesoda erosa</i>	-	-	+	+	+	+	+	+
	<i>Polymesoda expansa</i>	-	-	-	-	+	+	+	+
Unionidae	<i>Anodonta woodiana</i>	-	-	-	-	+	+	-	-
	<i>Pilsbryconcha exilis</i>	-	-	-	-	-	+	-	-
Arcidae	<i>Anadara granosa</i>	+	-	-	-	+	-	-	-
Myoida	<i>Pholas orientalis</i>	+	-	-	-	-	-	-	-
Gluconomidae	<i>Gluconome virens</i>	+	-	-	-	-	-	-	-
Pectinidae	<i>Amusium pleuronectes</i>	+	-	-	-	+	-	-	-
Placunidae	<i>Placuna placenta</i>	-	-	-	-	+	-	-	-
Ostreidae	<i>Crassostrea lugubris</i>	-	-	-	-	+	-	-	-
Isognomonidae	<i>Isognomon ephippium</i>	-	-	-	-	+	-	-	-

(+) = Present, (-) = Absent

Table 2: Habitat and morphological characteristics of edible bivalve recorded from the selected Division of Sarawak, Malaysia

Species	Local Name	Habitat	Characteristic
<i>Solen regularies</i>	Ambal biasa	Marine	Fragile, sub-cylindrical, short, light brown
<i>Solen lamarckii</i>	Ambal	Marine	Fragile, sub-cylindrical, long, light brown
<i>Pharella acutidens</i>	Sula	Brackish water	Fragile, sub-cylindrical, eroded umbo, dark yellow
<i>Anadara granosa</i>	Kerang	Marine	Thick strong, strong riblet, transverse tooth, white
<i>Pholas orientalis</i>	Manik	Marine	Fragile, elongate posteriorly, three adductor mnscl, whitish
<i>Gluconome virens</i>	Kupang	Marine	Small and fragile, ovate, elongate posteriorly, greenish
<i>Circe scripta</i>	Kakas	Marine	Hard and strong, trigonal ovate, dim radial riblet, pale gray,
<i>Anodonta woodiana</i>	Lokan sungai	Freshwater	Big and strong, oval-sub-trapezoidal, dark brown
<i>Paphia undulata</i>	Lala	Marine	Hard, elliptical ovate, anterodorsal curve, undulate groove, light purple
<i>Amusium pleuronectes</i>	None	Marine	Thin and fragile, rounded, wing like dorsal, brown and white
<i>Meretrix meretrix</i>	Kunau	Marine	Hard and thick, trigonal ovate, smooth and glossy, brown
<i>Meretrix lyrata</i>	Kepah	Marine	Hard and thick, trigonal ovate, concentric grooves, whitish
<i>Placuna placenta</i>	Siping	Marine	Thin and fragile, rounded, V shape tooth, white
<i>Crassostrea lugubris</i>	Tiram	Marine	Hard and thick, not eqnivalve, one adductor mnscl, whitish
<i>Isognomon ephippium</i>	Tiram	Marine	Thin, rounded, Dorsal straight, brownish
<i>Polymesoda bengalensis</i>	Lokan bakau	Brackish water	Hard and thick, sub-trigonal, eroded umbo, dark green,
<i>Polymesoda erosa</i>	Lokan apung	Brackish water	Hard and thick sub-rhomboidal, eroded umbo, green
<i>Polymesoda expansa</i>	Lokan selam	Brackish water	Hard and thick, trigonal ovate, eroded umbo, yellow
<i>Pilsbryconcha exilis</i>	Beluyan	Freshwater	Small, oval shape, elongate posteriorly, brownish

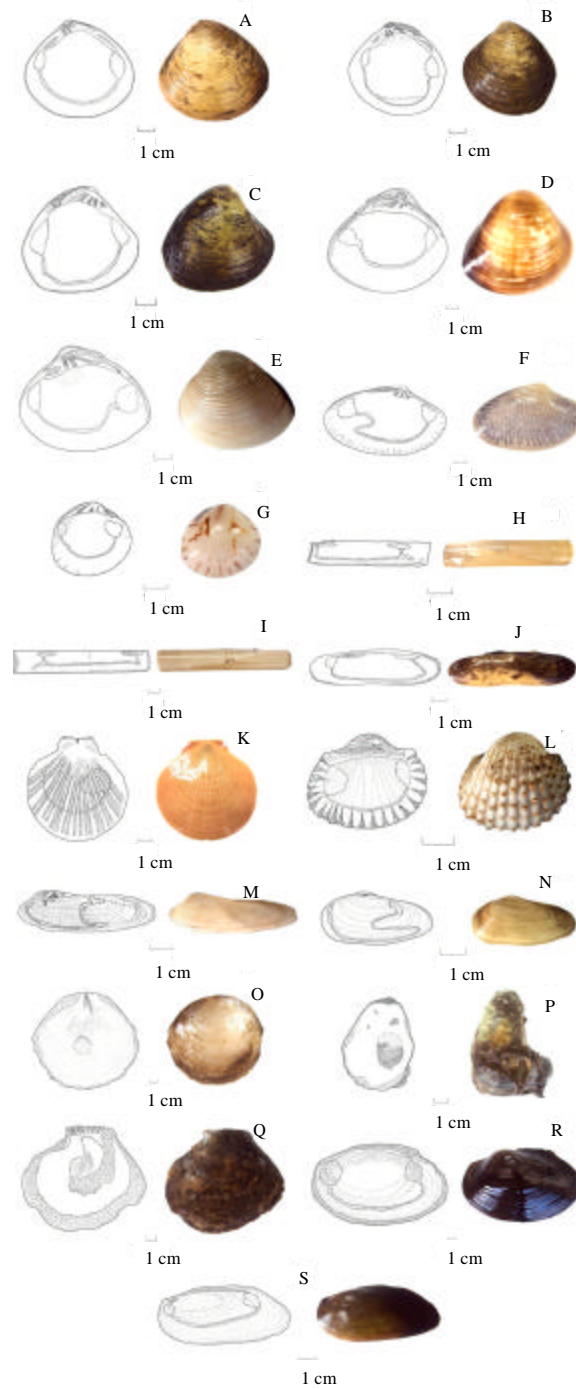


Fig. 2(A-S): Edible bivalve species recorded from Sarawak: (A) *Polymesoda expansa*, (B) *Polymesoda erosa*, (C) *Polymesoda bengalensis*, (D) *Meretrix meretrix*, (E) *Meretrix lyrata*, (F) *Paphia undulata*, (G) *Circe scripta*, (H) *Solen regularies*, (I) *Solen lamarckii*, (J) *Pharella acutidens*, (K) *Amusium pleuronectes*, (L) *Anadara granosa*, (M) *Pholas orientalis*, (N) *Gluconome virens*, (O) *Placuna placenta*, (P) *Crassostrea lugubris*, (Q) *Isognomon ephippium*, (R) *Anodonta woodiana* and (S) *Pilsbryconcha exilis*

Arcidae, Myoida, Gluconomidae, Placunidae, Ostreidae, Isognomonidae, Corbiculidae and Unionidae family. Among the collected edible bivalve twelve species namely *Meretrix meretrix*, *M. lyrata*, *Paphia undulata*, *Circe scripta*, *Solen regularies*, *S. lamarckii*, *Amusium pleuronectes*, *Anadara granosa*, *Pholas orientalis*, *Gluconome virens*, *Placuna placenta*, *Crassostrea lugubris* and *Isognomon ephippium* were from marine, four species namely *Polymesoda erosa*, *P. expansa*, *P. bengalensis* and *Pharella acutidens* were from brackish water and two species namely *Anodonta woodiana* and *Pilsbryconcha exilis* were from freshwater habitat.

The diversity of edible bivalve was found highest in Bintulu and Kuching compared to other Divisions studied while lowest was from Sarikei, Sarawak. The genus from Corbiculidae family was recorded from all Divisions (Table 1) which were *Polymesoda erosa* (Lawas, Limbang, Miri, Bintulu and Sibul), *P. bengalensis* (Limbang, Miri, Bintulu, Sibul, Sarikei and Kuching) and *P. expansa* (Lawas, Limbang, Miri and Bintulu).

DISCUSSION

Edible bivalve play an important economic role in Sarawak. However, the aquaculture production of bivalve is less in this region. Mangroves clam *Polymesoda* spp., *Meretrix* sp. and *Anadara* sp. were the most important taxa of edible bivalve. Nineteen species of edible bivalve was recorded in the present study which distributed miscellaneously in the entire Division of Sarawak. Of these, 2 species were from freshwater, 4 species were from brackish water and 13 species were from marine water. The species i.e., *Meretrix meretrix*, *M. lyrata*, *Paphia undulata* and *Circe scripta* from Veneridae family (mainly from marine) was dominant in present study. Han *et al.* (2003) recorded at least 20 species from Veneridae family which is the largest in Leizhou Peninsula, China. In Thailand, Veneridae family encompasses 13 species which are mostly from coastal and marine habitats (Natewathana, 1995).

The genus (*Polymesoda* spp.) from Corbiculidae family was found widely distribution in the maximum Divisions of Sarawak. This could probably due to the existence of wide mangroves and muddy area in this region that supports the suitable habitats for this type of bivalve. Generally, Sarawak covers about 173792.00 ha of mangrove forest excluding other muddy area. Tan and Kastoro (2004) reported that *Barbatia foliata* and *Atactodea striata* the most widespread bivalve species at Anambas and Natuna Island, Indonesia. However, edible bivalve species *Perna viridis* that is highly distributed along the coast of Malacca Straits, east coast of peninsular Malaysia and Sabah (Ong *et al.*, 2009) but not recorded in this present study. Probably the habitats and water quality of Sarawak do not support the existence and production of this species in natural condition. Laxmilatha *et al.* (2007) reported that Malabar region produce 65% of *Perna viridis* in total bivalve production while fishing of bivalve usually depends on season and fluctuates through out the year (Kripa and Appukuttan, 2003). In Malaysia, major production of edible brackish water bivalves is 54% followed by shrimp, 17.3% and marine fish 6.3% (FAO, 2011). Since bivalve culture categorized as aquaculture sector, it is become priority sector according to the Third National Agriculture Policy (DPN3).

Mangrove clams, bloody clam and other types of bivalve comprise a cheap protein source for the people of Sarawak. Therefore, they are the vital edible mollusc food, in addition to fresh and marine items. This study revealed that apart for those commercially valuable bivalves, the rest of species are mostly utilized for local consumption and not extensively disseminated in the big commercial markets.

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REFERENCES

- Abdullah, M.H., J. Sidi and A.Z. Aris, 2007. Heavy metal (Cd, Cu, Pb, Zn) in *Meretrix meretrix* Roding, Water and Sediments from Estuaries in Sabah, North Borneo. Int. J. Environ. Sci. Edu., 2: 69-74.
- Abu Hena, M.K., O. Hshamuddin, K. Misri, F. Abdullah and K.K. Loo, 2004. Benthic faunal composition of *Penaeus monodon* fabricius culture pond in west coast of Peninsular Malaysia. J. Biological Sci., 4: 631-636.
- Chiu, Y.W., H.C. Chen, S.C. Lee and C.A. Chen, 2002. Morphometric analysis of shell and operculum variation in viviparid snail, *Cipangopaludina chinensis* (Mollusca: Gastropoda), in Taiwan. Zool. Stud., 41: 321-331.
- FAO, 2011. National aquaculture sector overview: Malaysia. Food and Agriculture Organization, http://www.fao.org/fishery/countrysector/naso_malaysia/en
- Han, W.D, J.K. Lui, X.L. He, Y.Y. Cai, F.L. Ye, L.Q. Xuan and N. Ye, 2003. Shellfish and fish biodiversity of mangrove ecosystems in Leizhou Peninsula, China. J. Coast. Develop., 7: 21-29.
- Idris, M.H., A. Arshad, S.M.N. Amin, B.J. Sidik and S.K. Daud *et al.*, 2011. Age, growth and length-weight relationships of *Pinna bicolor* Gmelin (Bivalvia: Pinnidae) in the Seagrass Beds of Sungai Pulai Estuary, Johor, Peninsular Malaysia. J. Applied Ichthy., 10.1111/j.1439-0426.2011.01807.x
- Kripa, V. and K.K. Appukuttan, 2003. Marine Bivalves. In: Status of Exploited Marine Fishery Resources of India, Joseph, M.M. and A.A. Jayaprakash (Ed.). CMFRI, Cochin, pp: 211-220.
- Laxmilatha, P., M.P. Sivadasan and V.G. Surendranathan, 2007. Bivalve resources and its exploitation in Malabar. Mar. Fish Inform. Service Tech. Extension Series, 192: 6-9.
- Mass, P.A.Y., G.D. O'Mullan, R.A. Lutz and R.C. Vrijenhoek, 1999. Genetic and morphometric characteristic of mussels (Bivalvia: Mytilidae) from Mid-Atlantic hydrothermal vents. Bio. Bull., 196: 265-272.
- Nakao, S., H. Nomura and M.K.B.A. Satar, 1989. Macrobenthos and Sedimentary Environments in a Malaysian Intertidal Mudflat of the Cockle bed. Bul. Facult. Fish. Hokkaido Univ., 40: 203-213.
- Nateewathana, A., 1995. Taxonomic account of commercial and edible molluscs, excluding cephalopods, of Thailand. Phuket Mar. Biol. Cent. Spec. Publ., 15: 93-116.
- Ong, C.C., K. Yusoff, C.K. Yap and S.G. Tan, 2009. Genetic characterization of *Perna viridis* L. in peninsular Malaysia using microsatellite markers. J. Gen., 88: 153-163.
- Page, S., 2011. Biodiversity information on Peat swamp forest in S.E. Asia. University of Leicester, UK. <http://www.strapeat.alterra.nl/download/6%20biodiversity%20information.pdf>.

- Poutiers, M., 1998. The Living Marine Resources of the Western Central Pacific. In: FAO Species Identification Guide for Fishery Purpose, K.E. and V.H. Niem (Eds.). Vol. 1. Food and Agriculture Organization of the United Nations, Rome, Italy, pp: 363-386.
- Sallih, K., 2005. Mussel farming in the State of Sarawak, Malaysia: A feasibility study. Fisheries Training Programme, Malaysia, pp: 44.
- Tan, K.S. and W.W. Kastoro, 2004. A small collection of gastropod and bivalves from the Anambas and Natuna Islands, South China Sea. The Raffles Bulletin of Zoology, Supplement No. 11, pp: 47-54.