

# The Diversity and Distribution of Molluscs in Pulau Aur, Johor Darul Takzim

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## ABSTRACT

A study on the diversity and distribution of molluscs inhabiting the coral reefs of Pulau Aur, Johor Darul Takzim, has been conducted using wandering transects. Thirteen locations have been surveyed around the island, which comprised of Pulau Aur, Pulau Dayang, Pulau Lang and Pulau Pinang. The species of molluscs found were recorded according to habitat and depth. A total of 9 species from 8 genera and 7 families of gastropods and a total of 13 species from 9 genera and 6 families of bivalves were reported in this preliminary survey. The dominant gastropod family was Cypraeidae while the dominant bivalve family was Spondylidae and Pteriidae. The dominant gastropod species is *Cerithium echinatum* and *Lambis chiragra*. The dominant bivalve species is *Tridacna maxima* followed by *Pinctada margaritifera*. Pulau Dayang exhibited the highest diversity of gastropod while the highest diversity of bivalves was recorded in Pulau Pinang.

**Keywords:** *Diversity, distribution, molluscs, gastropod, bivalve, Pulau Aur*

## Introduction

Pulau Aur group is located approximately 67 km east of Mersing. Pulau Aur was declared a Marine Park in 1994. Pulau Aur is comprised of several islands namely Pulau Aur, Pulau Dayang, Pulau Pinang and Pulau Lang. Most of the rocky islands are well forested and have isolated coconut plantations. The main island is bordered by fringing reefs and the intertidal habitats are made up of rocky, patches of mangroves as well as sandy shores.

In terms of biodiversity, Malaysia is considered as one of the countries located at the hotspot of the richest region in the Indo-Pacific (Briggs, 1974). However, not

many studies have been conducted on the biodiversity of the islands around Malaysian waters. There have been several studies done on the marine macroinvertebrates fauna of the Pulau Aur group of islands but till present, not a single comprehensive paper yet been published on the full extensive lists of species found in the area.

## Materials and Methods

Thirteen reefs, which are located around Pulau Aur group were surveyed using the wandering transect method (Table 1 and Figure 1). The observation of molluscs species found in the study sites was done using SCUBA diving to depths of 30 m. The methods used were mainly qualitative. All the molluscs specimens found were described and identified. Underwater photographs were taken of all the molluscs specimens. Further identification was done based on the photographs taken using identification keys from Arnold and Britles (1989), Abbott (1974, 1991) and Natewathana (1995).

TABLE 1: The Latitude and Longitude of the Sampling Locations in Pulau Aur group, Johor Darul Takzim

| Code and Location name                                  | Latitude      | Longitude       | Maximum Dive Depth (m) |
|---------------------------------------------------------|---------------|-----------------|------------------------|
| D1-Pulau Dayang (Northwest)                             | 2° 28'54.0" N | 104° 29'55.8" E | 12.7                   |
| D2-Pulau Dayang (North)                                 | 2° 28'43.5" N | 104° 30'11.8" E | 12.0                   |
| D3-Pulau Dayang - Rayner's Rock                         | 2° 28'55.0" N | 104° 30'20.9" E | 18.4                   |
| D4-Pulau Dayang (North) - Teluk Jawa                    | 2° 28'42.2" N | 104° 30'15.3" E | 11.0                   |
| D5-Pulau Aur (North)                                    | 2° 28'20.2" N | 104° 30'42.3" E | 11.9                   |
| D6-Pulau Aur (North) - Teluk Kador                      | 2° 28'19.4" N | 104° 30'46.8" E | 11.6                   |
| D7-Pulau Aur (East)                                     | 2° 27'32.4" N | 104° 31'49.2" E | 12.0                   |
| D8-Pulau Pinang (West) - Tanjong Bercium                | 2° 26'17.6" N | 104° 32'38.6" E | 24.4                   |
| D9-Pulau Pinang (West)                                  | 2° 26'17.6" N | 104° 32'38.6" E | 19.6                   |
| D10-Pulau Pinang (Southwest)                            | 2° 28'02.2" N | 104° 32'39.3" E | 18.5                   |
| D11-Pulau Pinang - Pinnacles 1                          | 2° 25'09.0" N | 104° 31'59.9" E | 18.4                   |
| D12-Pulau Aur (Southwest) -<br>Dalam to Tanjong Jongkar | 2° 26'03.7" N | 104° 30'42.6" E | 18.0                   |
| D13-Pulau Lang -Tanjong Lang                            | 2° 27'39.9" N | 104° 29'08.1" E | 9.5                    |

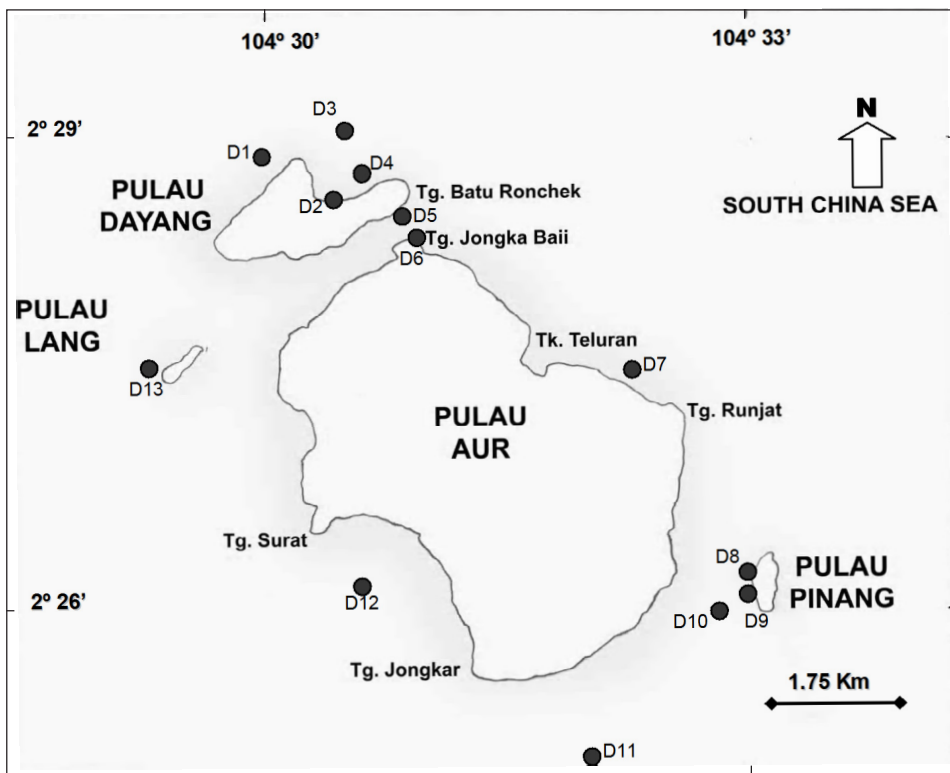


FIGURE 1: The Sampling Locations in Pulau Aur Group, Johor Darul Takzim.

## Results and Discussion

The results of the surveys are shown in Table 2 and 3. A total of 22 species, 17 genera and 13 families of molluscs were found in Pulau Aur group. Bivalves dominated the survey locations with 13 species, 9 genera and 6 families. The most dominant bivalve family found was Spondylidae and Pteriidae (3 species each) while the dominant gastropod family was Cypraeidae (2 species). The most common bivalve found in the islands was *Tridacna maxima*, which was recorded in 5 survey locations, followed by *Pinctada margaritifera* in 4 locations.

Seven families, 8 genera and 9 species of gastropod were recorded in the survey locations. The dominant gastropod family is Cypraeidae which comprised of two species, namely, *Cypraea cribraria* and *C. tigris*. The most abundance gastropod species are *Cerithium echinatum* and *Lambis chiragra*. Most of the species can only be found in only one of the survey locations in Pulau Aur except for the two gastropods mentioned earlier.

The higher diversity of bivalves recorded in this study compared to the diversity of gastropods may be due to the unavailability of the bivalves to move since most of

TABLE 2: List of Molluscs (Gastropoda) recorded in Pulau Aur group, Johor Darul Takzim

| Species                            |                      |                          | Location        |            |                    |               |                  |                  |           |                   |            |                |           |                               | Total sites per species |                |
|------------------------------------|----------------------|--------------------------|-----------------|------------|--------------------|---------------|------------------|------------------|-----------|-------------------|------------|----------------|-----------|-------------------------------|-------------------------|----------------|
|                                    |                      |                          | Pulau Dayang    |            |                    |               | Pulau Pinang     |                  |           |                   | Pulau Aur  |                |           |                               |                         | Pulau Lang     |
|                                    |                      |                          | North West (D1) | North (D2) | Rayner's Rock (D3) | Tk. Jawa (D4) | Tg. Bercium (D8) | South West (D10) | West (D9) | Pinnacles 1 (D11) | North (D5) | Tk. Kador (D6) | East (D7) | Tk. Dalam – Tg. Jongkar (D12) |                         | Tg. Lang (D13) |
| Cerithiidae                        | <i>Cerithium</i>     | <i>C. echinatum</i>      |                 |            | X                  |               | X                |                  |           |                   |            |                |           |                               |                         | 2              |
| Conidae                            | <i>Conus</i>         | <i>C. marmoreus</i>      |                 |            |                    |               |                  |                  |           |                   |            |                |           |                               |                         | 1              |
| Coralliophiliidae                  | <i>Coralliophila</i> | <i>C. neritoidaea</i>    |                 |            |                    | X             |                  |                  |           |                   |            |                |           |                               |                         | 1              |
| Cypraeidae                         | <i>Cypraea</i>       | <i>C. cribraria</i>      |                 |            |                    | X             |                  |                  |           |                   |            |                |           |                               |                         | 1              |
|                                    |                      | <i>C. tigris</i>         |                 |            |                    |               |                  |                  |           |                   |            |                |           |                               |                         | 1              |
| Muricidae                          | <i>Chicoreus</i>     | <i>C. insularum</i>      |                 |            |                    |               |                  |                  |           | X                 |            |                |           |                               |                         | 1              |
|                                    | <i>Habromorula</i>   | <i>H. spinosa</i>        |                 |            |                    |               |                  |                  |           | X                 |            |                |           |                               |                         | 1              |
| Ovulidae                           | <i>Pseudosimnia</i>  | <i>Pseudosimnia</i> sp.1 |                 |            |                    |               |                  |                  |           |                   |            |                |           |                               |                         | 1              |
| Strombidae                         | <i>Lambis</i>        | <i>L. chiragra</i>       | X               |            |                    |               |                  |                  |           |                   |            |                |           |                               | X                       | 2              |
| Total number of species per site   |                      |                          | 1               | 0          | 1                  | 2             | 1                | 0                | 0         | 2                 | 0          | 2              | 0         | 1                             | 1                       |                |
| Total number of species per island |                      |                          | 4               |            |                    |               | 3                |                  |           | 3                 |            |                |           | 1                             |                         |                |

TABLE 3 : List of Molluscs (Bivalvia) recorded in Pulau Aur group, Johor Darul Takzim

| Family      | Genus           | Species                            | Location        |            |                    |               |                  |                  |           |                   | Total sites per species |            |                |           |
|-------------|-----------------|------------------------------------|-----------------|------------|--------------------|---------------|------------------|------------------|-----------|-------------------|-------------------------|------------|----------------|-----------|
|             |                 |                                    | Pulau Dayang    |            |                    |               | Pulau Pinang     |                  | Pulau Aur |                   |                         | Pulau Lang |                |           |
|             |                 |                                    | North West (D1) | North (D2) | Rayner's Rock (D3) | Tk. Jawa (D4) | Tg. Bercium (D8) | South West (D10) | West (D9) | Pinnacles 1 (D11) |                         | North (D5) | Tk. Kador (D6) | East (D7) |
| Arcidae     | <i>Arca</i>     | <i>A. bourcardi</i>                |                 |            |                    | X             |                  |                  |           |                   |                         |            |                | 1         |
| Ostreidae   | <i>Lopha</i>    | <i>L. cristagalli</i>              |                 |            |                    |               |                  | X                |           |                   |                         |            |                | 3         |
|             | <i>Hyotissa</i> | <i>H. hyotis</i>                   |                 |            |                    |               | X                |                  |           |                   |                         |            |                | 2         |
| Pinnidae    | <i>Atrina</i>   | <i>A. pectinata</i>                |                 |            |                    |               |                  | X                |           |                   |                         |            |                | 3         |
|             | <i>Pedum</i>    | <i>P. spondyloideum</i>            |                 |            |                    |               |                  | X                |           |                   |                         |            |                | 3         |
| Pteriidae   | <i>Pinctada</i> | <i>P. margaritifera</i>            |                 |            |                    |               |                  | X                |           |                   |                         |            |                | 4         |
|             | <i>Pteria</i>   | <i>P. abicular</i>                 |                 |            |                    |               |                  | X                |           |                   |                         |            |                | 1         |
| Spondylidae |                 | <i>P. penguin</i>                  |                 |            |                    |               |                  | X                |           |                   |                         |            |                | 2         |
|             |                 | <i>S. barbatus</i>                 |                 |            |                    |               |                  |                  | X         |                   |                         |            |                | 1         |
|             |                 | <i>Spondylus</i> sp. 1             |                 |            |                    |               |                  |                  |           |                   |                         |            |                | 1         |
|             |                 | <i>Spondylus</i> sp. 2             |                 |            |                    |               |                  |                  | X         |                   |                         |            |                | 0         |
| Tridacnidae |                 | <i>T. squamosa</i>                 |                 | X          |                    |               |                  |                  |           |                   |                         |            |                | 3         |
|             | <i>Tridacna</i> | <i>T. maxima</i>                   |                 | X          |                    |               |                  |                  |           |                   |                         |            | X              | 5         |
|             |                 | Total number of species per site   | 1               | 2          | 2                  | 4             | 0                | 7                | 5         | 2                 | 0                       | 1          | 0              | 3         |
|             |                 | Total number of species per island |                 |            |                    |               |                  |                  | 10        |                   |                         |            |                |           |

the bivalves are sessile compared to the gastropods, which are able to crawl and hide. Most of the bivalves were found attached to rocks and gorgonians. Most of the gastropods were found crawling freely on the rocks and corals searching for food. Some of the gastropods were found hiding under the substrates for protection against predation.

Pulau Pinang exhibited the highest number of bivalve species per island (10 species) while Pulau Dayang exhibited the highest species of gastropods per island (4 species). The areas surveyed in Pulau Dayang are scattered with *Porites* sp. coral which is used as a hideout for the gastropods.

Due to limited amount of available information and no comprehensive surveys of molluscs in Malaysian waters, direct comparison on the diversity of molluscs is therefore impossible. However, the diversity of molluscs reported in this study was low compared to the survey carried out on the intertidal areas of Pulau Redang, where 48 species of gastropods and 9 species of bivalves were recorded (Arshad *et al.*, 2001). The differences in results are not surprising because the survey on intertidal rocky and sandy shores is not limited by time compared to subtidal survey using SCUBA diving.

The diversity of gastropods reported in Pulau Aur was also low compared to the survey at Pulau Gazumbo (Penang), a manmade island covered with seagrass communities. A total of 14 species from 12 genera and 9 families of gastropods. However, the diversity of bivalves in Pulau Gazumbo was lower compared to Pulau Aur, where a total of 8 species from 8 genera and 6 families of bivalves were reported at Pulau Gazumbo (Tan *et al.*, 2007)

This study may serve as an early effort in providing the diversity information of molluscs in Pulau Aur.

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## References

- Abbott, R.T. 1974. *American Seashells: The Marine Mollusca of the Atlantic and Pacific Coasts of North America*. 2<sup>nd</sup> Edition, Van Nostrand Reinhold Company, New York, pp. 663.
- Abbott, R.T. 1991. *Seashells of South East Asia*. Graham Brash, Singapore, pp. 145.
- Arnold, P.W. & Britles, R.A. 1989. *Soft-sediment Marine Invertebrates of Southeast Asia and Australia : A Guide to Identification*. Australian Institute of Marine Science, pp. 271.
- Arshad, A., Japar, S.B. & Zakaria, M. 2001. Checklist of the shallow water intertidal invertebrates of Redang Island. Proceedings of the National Symposium on Marine Park and Terengganu Islands – Towards Sustainable Usage and Management of Islands. 2001, February 12-13, Kuala Terengganu, p. 18.

- Briggs, J.C. 1974. *Marine zoogeography*. McGraw-Hill, New York, London, pp. 475.
- Nateewathana, A. 1995. Taxonomic Account of Commercial and Edible Molluscs, excluding Cephalopods of Thailand. Proceedings of the Fifth Workshop of the Tropical Marine Molluscs Programme. *Phuket Marine Biological Center Special Publication* **15**: 93-116.
- Tan, S. H., Nur-Najmi Basyeer, A.K. & Zulfigar, Y. 2007. Diversity of molluscs communities in the seagrass bed in Pulau Gazumbo, Penang, Malaysia. Paper presented at LIPI and JSPS Joint Seminar on Coastal Marine Science. Yogyakarta, 3-5 August 2007.

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