

**DIVERSITY AND DISTRIBUTION OF SHALLOW
WATER MARINE MOLLUSCS OF SABAH, WITH A
FOCUS ON MORPHOLOGICAL AND ECOLOGICAL
DIFFERENTIATION OF TURBINIDAE / GENUS
*TURBO/LUNELLA***

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PERPUSTAKAAN
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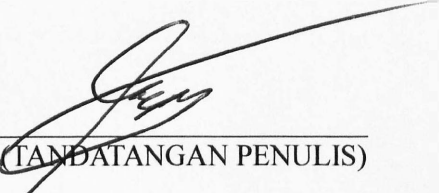
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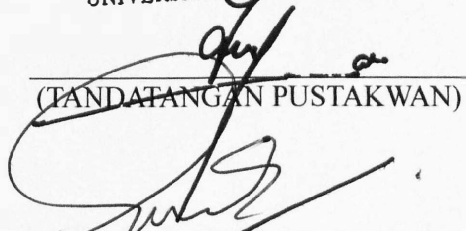
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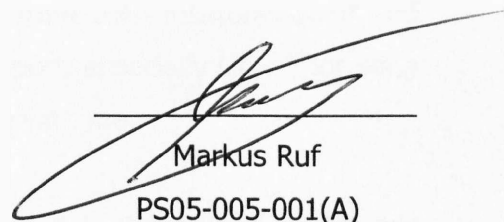
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DECLARATION

I hereby declare that the material in this thesis is my own except for quotations, excerpts, summaries and references, which have been duly acknowledged.

January 2010



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ABSTRACT

DIVERSITY AND DISTRIBUTION OF SHALLOW WATER MARINE MOLLUSCS OF SABAH, WITH A FOCUS ON MORPHOLOGICAL AND ECOLOGICAL DIFFERENTIATION OF TURBINIDAE, GENUS TURBO / LUNELLA

This study examined the biodiversity and distribution of shallow water marine molluscs in the near shore and shallow waters of Sabah, Malaysian Borneo and surrounding areas. The main focus of this study is on Gastropoda and to a lesser degree also on Bivalvia. Although other classes (Cephalopoda, Aplacophora, Opisthobranchia, Scaphopoda, Polyplacophora and Monoplacophora) were occasionally collected, they are excluded from this thesis based solely on time and logistical constraints. One of the main goals of this research is not only to determine the distribution and diversity of mollusks, but also to establish the first reference-collection for molluscs in the State of Sabah to be located at UMS in the "BORNEENSIS" Biodiversity collection. Sampling of specimens was conducted at various points along the Sabah coastline, using various collecting methods. At 174 locations, a total of 2,772 sample transects, 45 market investigations, 32 sand samples and 54 hours of trawling produced 890 species out of 284 genera and 75 families of gastropods along with 261 species out of 131 genera and 42 families of bivalves. Altogether 10,345 specimens and shell fragments were collected and where possible identified. The gastropod families with more than ten species per family comprised the Buccinidae, Bursidae, Cassidae, Cerithiidae, Columbellidae, Conidae, Cypraeidae, Ellobiidae, Fasciolariidae, Hipponicidae, Mitridae and Costellariidae, Muricidae, Nassariidae, Naticidae, Neritidae, Olividae, Ovulidae, Ranellidae, Strombidae, Terebridae, Trochidae, Turbinidae and the Turridae. The bivalve families with more than ten species per family comprised the Arcidae, Cardiidae, Mytilidae, Ostreidae, Pectinidae, Spondylidae, Tellinidae and the Veneridae. Several rare and one "lost" species (*Cyclina orientalis*, Sowerby, 1852) were discovered but no endemic molluscs were found. Each of the habitats examined had a unique mollusc fauna compared with other habitats. As an example of further, more detailed analysis of the local mollusc fauna and as a benchmark for future studies, one mollusc family (the Turbinidae, Vetigastropoda) was selected for more detailed morpho-spatial examination. The analysis of morphological differences was performed for six preselected species to show their morphological and ecological differentiation such as the variation in biometrics, habitat ranges and preference, as well as the analysis of the radulae, micro habitats and observed behaviors. Results from this study indicate that Sabah has an extremely diverse marine mollusc fauna, several orders of magnitude greater than previous published accounts, and it is suggested measures should be taken to protect this valuable natural resource. The results from the Turbinidae study revealed that the six species show substantial biometric and morphological differentiation. No previously unrecognized cryptic species were found, but strong ecological differentiation could not be detected. This thesis should inspire students and malacologists alike to further expand on this list of local mollusc fauna, with a view to developing a comprehensive, family-wide coverage of the Gastropoda of Sabah; and to easily identify molluscs in combination with the above mentioned reference collection.

ABSTRAK

Kajian ini memeriksa biodiversiti dan taburan molluska marin cetek sekitar pinggir laut Sabah, Malaysia. Tumpuan utama diberikan kepada Kelas Gastropoda, diikuti oleh kelas Bivalva. Kelas lain dari Filum Molluska seperti Cephalopoda, Aplousobranchia, Scaphopoda, Polyplacophora and Monoplacophora tidak termasuk dalam kajian ini. Tujuan utama kajian ini adalah untuk mengumpul data biodiversiti dan taburan, di samping menubuhkan koleksi rujukan pertama molluska marin di BORNEENSIS, Universiti Malaysia Sabah yang merupakan yang paling lengkap di Negeri Sabah. Pensampelan dijalankan dengan menggunakan beberapa cara yang berbeza termasuk 2772 transek sekitar pinggir laut Sabah, 45 peninjauan di pasar basah, 32 sampel pasir dan 54 jam penunda kapal perikanan. Sebanyak 10345 spesimen Berjaya dikumpul yang terdiri daripada 75 famili, 284 genus dan 890 spesies untuk Kelas Gastropoda; dan 42 famili, 131 genus dan 261 spesies untuk Kelas Bivalva. Famili yang mempunyai record lebih daripada sepuluh spesies adalah seperti berikut: Buccinidae, Bursidae, Cassidae, Cerithiidae, Columbellidae, Conidae, Cypraeidae, Ellobiidae, Fasciolaridae, Hipponicidae, Mitridae and Costellariidae, Muricidae, Nassariidae, Naticidae, Neritidae, Olividae, Ovulidae, Ranellidae, Strombidae, Terebridae, Trochidae, Turbinidae dan Turridae untuk Famili Gastropoda. Untuk Famili Bivalva yang mempunyai lebih daripada sepuluh spesies adalah Arcidae, Cardiidae, Mytilidae, Ostreidae, Pectinidae, Spondylidae, Tellinidae dan Veneridae. Beberapa spesies yang jarang dijumpai telah direkod dan satu spesies yang telah "hilang" (*Cyclina orientalis*, Sowerby, 1852) sebelum ini telah ditemui semula. Walaubagaimanapun, tiada molluska yang endemic direkod. Komposisi molluska sesuatu lokasi adalah berkaitan dengan habitat lokasi tersebut. Untuk menunjukkan betapa kekurangan maklumat terperinci untuk marin molluska di Sabah, salah satu famili (Turbinidae, Vetigastropoda) untuk dipilih untuk menjadikan contoh. Analisis morfologi, kelakuan dan ekologi famili ini telah memberikan informasi yang amat unik dan berguna. Hasil kajian ini telah membuktikan Sabah amat kaya dengan marin molluska dan melebihi kesemua rekod yang pernah diterbitkan sebelum kajian ini. Dengan demikian, langkah-langkah perlu diambil untuk melindungi khazanah semulajadi ini. Hasil dari kajian Turbinidae menunjukkan keenam species tersebut agak beza dari segi morfologi tetapi perbezaan ekologi yang kurang jelas. Dengan penghasilan tesis dan koleksi rujukan, adalah diharapkan ia akan menggalakkan pelajar dan penyelidik molluska untuk meneruskan kajian ini dengan penambahbaik data diversiti dan taburan.

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