

The Living Fossil (Horseshoe crab)

Kamaruzzaman Yunus

Akbar John

Ahmed Jalal Khan Chowdhury

Zaleha Kassim



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

The Living Fossil (Horseshoe crab)

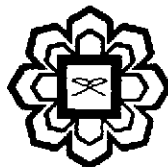
Editors,

Kamaruzzaman Yunus

Akbar John

Ahmed Jalal Khan Chowdhury

Zaleha Kassim



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
© IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Kamaruzzaman Yunus
The Living Fossil (Horseshoe crab)
Kamaruzzaman Yunus
Include index
Bibliography: p.
ISBN

ISBN: 978-967-418-042-3

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

Table of Contents

Chapters	Titles	Page No
1.	Global distribution and Taxonomy of extant horseshoe crabs..... (5410/18557)	1
2.	Limiting factors on the global distribution of horseshoe crabs..... (5410/18558)	11
3.	Site selection and nesting behaviour of horseshoe crabs with special reference to <i>Limulus polyphemus</i> (3575/18560)	19
4.	Distribution of horseshoe crabs at their nesting grounds, East coast of Peninsular Malaysia..... (5410/18560)	27
5.	Hydrology of horseshoe crab nesting ground at Pahang coast –Part 1..... (3575/18563)	35
6.	Hydrology of horseshoe crab nesting ground at Pahang coast –Part 2..... (3575/18566)	47
7.	Physicochemical parameters relationship at the horseshoe crab nesting grounds of Pahang coast, Malaysia..... (5410/18567)	57
8.	Macrobenthic diversity at the Horseshoe Crab nesting ground, Balok station, Pahang, Malaysia – Part 1 (3575/18568)	69
9.	Macrobenthic diversity at the Horseshoe Crab nesting ground, Balok station, Pahang, Malaysia – Part 2 (3575/18570)	83
10.	Macrobenthic diversity at the Horseshoe Crab nesting ground, Pekan station, Pahang, Malaysia – Part 1 (5410/18571)	95
11.	Macrobenthic diversity at the Horseshoe Crab nesting ground, Pekan station, Pahang, Malaysia – Part 2 (3575/18573)	109
12.	Influence of physicochemical parameters on the macrobenthic diversity and abundance in horseshoe crab nesting grounds, East coast of Peninsular Malaysia. (5410/18574)	127
13.	<i>In-vitro</i> study on the effect of salinity on the hatching success of Malaysian Horseshoe crab eggs..... (3575/18575)	137
14.	Effects of salinity on the early growth of <i>Tachypleus gigas</i> larvae - An <i>In-vitro</i> study..... (3575/18577)	147

15. Sediment characteristics of horseshoe crabs nesting ground at Balok station, Pahang, Malaysia	(5410/18579)	155
16. Sediment Profiling of the Estuarine Nesting Ground of Horseshoe Crabs at East Peninsular Malaysia	(3575/19587)	165
17. Bioaccumulation of some essential metal concentration in Malaysian horseshoe crabs (<i>Tachypleus gigas</i>).....	(5410/18584)	175
18. Cu and Cd Bioaccumulation in Malaysian Horseshoe Crab	(5410/18585)	183
19. Metal concentration in horseshoe crab nesting ground along Pahang coast, Malaysia.....	(5410/18586)	193
20. Bionomics of Malaysian horseshoe crabs <i>Tachypleus gigas</i>	(5410/19718)	203
21. Feeding Ecology of Mangrove horseshoe crab <i>Carcinoscorpius rotundicauda</i>	(5410/19717)	213
22. Emerging interest on DNA barcoding technology and its application for high-tech biodiversity studies using COI gene as a reference sequence	(3575/19716)	225
23. Can DNA barcode accurately delineate living fossil (Horseshoe crab) and its different developmental stages?.....	(5410/19715)	237
24. Revision on the molecular phylogeny of horseshoe crabs – Part 1.....	(5410/19717)	251
25. Revision on the molecular phylogeny of horseshoe crabs – Part 2.....	(5410/19720)	267
26. Genetic Diversity of <i>Tachypleus gigas</i> Population from West coast of peninsular Malaysia	(3575/19727)	275
27. Does continental drift influence in the genetic variability among the horseshoe crab population?	(3575/19727)	287
28. Evolution of horseshoe crabs – paleontological and Molecular viewpoint.....	(3575/19731)	297
29. Factors involving in the clot formation of horseshoe crab blood.....	(5410/19711)	307
30. Methods for bacterial endotoxin quantification in reference to horseshoe crab blood studies	(5410/19740)	317
31. ENDO SENSOR (TAL) production from Malaysian Horseshoe crab blood.....	(5410/19744)	325
32. Characterization of <i>Tachypleus</i> Amebocyte Lysate (TAL).....	(3575/19759)	333

33. Environmental and Pharmaceutical applications of Amebocytes Lysate (LAL/TAL) from Horseshoe crabs	(5410/19751)	343
34. <i>Tachypleus gigas</i> mortality due biomedical bleeding process	(3575/19756)	351
35. Conservation measures on horseshoe crab population – A global view.....	(5410/19759)	359
Glossary.....		369

CHAPTER – 17

Bioaccumulation of some essential metal concentration in Malaysian horseshoe crabs (*Tachypleus gigas*)

Kamaruzzaman, B.Y., Aqilah, M., Akbar John, B.

Institute of Oceanography and Maritime studies (INOCEM), Kulliyah of Science,

International Islamic University Malaysia, Jalan Sultan Ahmad Shah,

Bandar Indera Mahkota, 25200. Kuantan Pahang, Malaysia

Abstract

We examined the selected essential metals (Fe and Zn) accumulative concentrations in different body parts of Malaysian horseshoe crabs [*Tachypleus gigas* (Muller, 1785)]. Metal accumulation levels were determined using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Average concentration ($\mu\text{g g}^{-1}$ wet weight) of iron (Fe) and Zinc (Zn) were observed in gill tissue (1336.73 ± 2.08 ppm) and apodeme (921.11 ± 8.12 ppm) respectively. The lowest concentrations of metals were observed in gut (Fe = 556.61 ppm) and mouth (Zn = 605.36 ppm) tissue portions. Results clearly showed that bioaccumulation of both the essential metals were higher in the body parts but lower than the maximum permissible limit set by the national and international consortia. Statistical predictions revealed that bioaccumulation of metals were not significantly influenced by weight, total length and carapace width of the animal.

Key words: Bioaccumulation, Essential metals, horseshoe crabs, Nesting ground, apodeme.

Introduction

Horseshoe crabs are one of the unique creatures living on earth by remarkably retaining their genetic makeup unchanged for more than more than 200 million years (Walls *et al.*, 2002; Hurton and Berkson, 2004). Only 4 species of horseshoe crab are distributed throughout the planet earth among which 3 species such as *Trachypleus gigas*, *T. tridentatus* and *Carcinoscorpius rotundicauda* inhabit south East Asian countries. *Limulus polyphemus* distribution is more restricted towards America especially their abundance were noted in Mexican coast, Daleware bay (Walls *et al.*, 2002). More interestingly, among the 4 extant