

COMMISSION OF THE EUROPEAN COMMUNITIES  
INSTITUT FÜR KONTAKT- UND REIBUNGSFORSCHUNG

RESEARCH REPORT

MECHANICAL SCIENCE DEPARTMENT  
FACULTY OF ENGINEERING AND TECHNOLOGY  
UNIVERSITY OF SHEFFIELD

2005



**GONYAULACALES (DINOPHYTA) CYSTS IN THE SURFACE AND  
SUBSURFACE SEDIMENTS OF SUNGAI GETING IN TUMPAT, KELANTAN**

**By**

**RATHI SAI D/O MUNIANDY**

**Research Report submits in Partial Fulfillment of  
The requirement for the Degree of  
Bachelor of Science (Marine Biology)**

**Department of Marine Science  
Faculty of Science and Technology**

**2006**

**1100042418**



JABATAN SAINS SAMUDERA  
FAKULTI SAINS DAN TEKNOLOGI  
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA

**PENGAKUAN DAN PENGESAHAN LAPORAN  
PROJEK PENYELIDIKAN 1 DAN 11**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

**Gonyaulacales (Dinophyta) Cysts in The Surface and Subsurface Sediments of Sungai Geting In Tumpat, Kelantan** oleh **Rathi Sai Muniandy** No Matrik **UK 8118** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Samudera sebagai memenuhi sebahagian daripada keperluan memperoleh **Ijazah Sarjana Muda Sains (Biologi Marin)**, Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

Disahkan oleh,

*Christine A. Orasco*

Penyelia Utama

Nama: Dr Siti Aishah Abdullah

Cop Rasmi: **DR. SITI AISHAH ABDULLAH** @  
**CHRISTINE A. OROSCO**  
Pensyarah  
Jabatan Sains Samudera  
Fakulti Sains dan Teknologi Malaysia  
(KUSTEM)  
21030 Kuala Terengganu.

Tarikh: 26/4/2026

## ACKNOWLEDGEMENTS

First, I would like to express my gratitude to God, as without His blessings I would not have done my final year project successfully and complete my requirement for Bachelor's Degree in Science (Marine Biology). I would like to express my love and appreciation to my family members, especially my parents for their moral and financial support to make this thesis a success.

Secondly, is to my supervisor, Dr. Siti Aishah Abdullah, for her invaluable advice, comments, guidance and encouragement throughout this final year project. Her comments and advices played a very important role in the success of this thesis and also my academic performance. Not also forgetting Mr Chan and, Miss Fong, who have gave me lots of advices and guidelines during my project. Without their help and guide I would have not been done my project on my own.

My special thanks go to the laboratory assistants of Biodiversity laboratory, Mrs. Kartini, En. Zam and En Jalal who had helped me a lot in the laboratory during my project sample analysis. Also, to Oceanography Lab assistants who had helped me during my sample preparation for my project. Finally, I would also like to thank my beloved friends, who have helped me in many ways and encouraged me throughout my project.

## TABLE OF CONTENTS

<b>CONTENTS</b>	<b>PAGE</b>
1.0 INTRODUCTION	1
2.0 LITERATURE REVIEW	5
2.1. Taxonomy of dinoflagellates	5
2.2. Life cycle of dinoflagellates	6
2.3. Cysts of dinoflagellates	9
2.4. Importance of cyst studies	10
2.5. Gonyaulacales cysts	10
2.6. Cyst taxonomy identification	12
2.7. HAB and PSP Incidence in Malaysia	13
3.0 MATERIALS AND METHOD	15
3.1. Experimental design	15
3.2. Description of study area	16
3.3. Methods	19
3.3.1. Sample collection	19
3.3.2. Sample preparation	29
3.3.3. Palynological technique	23
3.3.4. Identification of Gonyaulacales cysts	24
3.3.5. Species composition, abundance and distribution analysis	25

## TABLE OF CONTENTS

<b>CONTENTS</b>	<b>PAGE</b>
4.0 RESULTS	27
4.1. Cyst species composition	27
4.2. Abundance and distribution of cyst	29
4.2.1. Water content analysis	29
4.2.2. Cyst abundance and distribution	31
5.0 DISCUSSION	33
5.1. Water content analysis	33
5.2. <i>Spiniferites</i> sp. cysts	33
5.3. Cyst concentration in surface and subsurface sediments	36
5.4. Cyst distribution pattern	37
6.0 CONCLUSION	40
REFERENCES	41
APPENDICES	45
1. Weight of sediment sample used in Palynological Technique	45
2. Water content analysis	46
CURRICULUM VITAE	47

## LIST OF TABLES

TABLE NO	TITLE	PAGE
4.1	Water content in sediment sample in percentage at every stations for surface and subsurface sediments in Sungai Geting, Kelantan	30
4.2	Abundance of cyst at every station in surface and subsurface sediment in Sungai Geting, Kelantan as cyst per gram dry weight of sediment	32



## LIST OF FIGURES

FIGURE NO	TITLE	PAGE
2.1	Life cycle of dinoflagellate	8
3.1	Map of the state of Kelantan showing the location of Tumpat	17
3.2	Image of Sungai Getting, Kelantan showing the four sampling stations	18
3.3	TFO gravity corer (A); enlargement of the top of the corer (B)	21
3.4	TFO gravity corer being released into the water	22
4.1	<i>Spiniferites</i> sp. cyst in Station 1 (ii)	28
4.2	<i>Spiniferites</i> sp. cyst in Station 3 (i)	28

## LIST OF ABBREVIATIONS

### ABBREVIATION

HAB	Harmful Algal Bloom
PSP	Paralytic Shellfish Poisoning
TFO	Tokyo University of Fisheries Oceanography Lab
rpm	rounds per minute

## LIST OF APPENDICES

APPENDIX NO	TITLE	PAGE
1.	Weight of sediment sample in wet condition used in Palynological Technique	45
2.	Water content analysis	46

## ABSTRACT

Paralytic shellfish poisoning (PSP) is an incident where toxin producing shellfish is eaten by warm blooded animals. In September 2001, PSP for the first time occurred in Sungai Geting, Kelantan caused by *Alexandrium minutum* Halim. This dinoflagellate is capable of producing resting cysts that could germinate and form blooms. Therefore, determining the species composition, abundance and distribution of resting cysts under Order Gonyaulacales in the surface and subsurface sediments of Sungai Geting would provide information on the presence of Gonyaulacales cysts there since the PSP incident. This information would indicate potential risks of harmful blooms in Sungai Geting. However, only *Spiniferites* sp. cyst was found in Sungai Geting. Cyst was more abundant in the innermost part of Sungai Geting than at the river mouth. Cyst abundance was low ranging from 0 to 6 cysts.g<sup>-1</sup> dry weight sediment where 6 cysts.g<sup>-1</sup> dry weight sediment was found in station 1 at subsurface sediment and 1 cyst.g<sup>-1</sup> dry weight sediment found in surface sediment of station 3. *Spiniferites* sp. is a toxin-producing species; there is the potential risk of cysts of *Spiniferites* sp. to form massive blooms resulting in toxin contamination of shellfish and fish mass mortality in Tumpat, Kelantan. Therefore, monitoring should be done to examine the water quality and toxicity to prevent PSP occurrence in Sungai Geting in the future. More specific methods for cyst examination and identification need to be used to identify other dinoflagellate cysts in Tumpat, Kelantan.

## ABSTRAK

Keracunan parolitik kerangan (PSP) adalah satu peristiwa di mana kerangan yang menghasilkan toksin dimakan oleh haiwan berdarah panas. Pada September 2001, PSP berlaku pada pertama kalinya di Sungai Geting, Kelantan disebabkan oleh *Alexandrium minutum* Halim. Maka, dengan menentukan komposisi species sista, kelimpahan dan pengagihan sista dorman di bawah Order Gonyaulacales pada sedimen di permukaan dan sub-permukaan di Sungai Geting akan memberikan maklumat mengenai kehadiran sista Gonyaulacales semenjak peristiwa PSP. Maklumat ini akan memberi petanda risiko kejadian perkembangan alga merbahaya (HAB) di Sungai Geting. Hanya sista *Spiniferites* sp. dijumpai di Sungai Geting dalam bilangan yang rendah. Kelimpahan sista adalah tinggi di kawasan paling dalam di Sungai Geting daripada mulut sungai tersebut. Kelimpahan sista merangkumi 0 to 6 sista.g<sup>-1</sup> berat kering sedimen di mana 6 sista.g<sup>-1</sup> berat kering sedimen dijumpai di stesen 1 pada bahagian sub-permukaan dan 1 sista.g<sup>-1</sup> berat kering sediment di stesen 3 pada bahagian permukaan. *Spiniferites* sp. berupaya menghasilkan toksik apabila ianya terbentuk. Terdapat potensi bagi sista *Spiniferites* sp. untuk membentuk peristiwa berbahaya seperti pencemaran toksik dalam kerangan dan perkembangan alga besar- besaran dengan kematian ikan secara apabila sista terbentuk di Tumpat, Kelantan. Maka, pengawasan perlu dijalankan bagi mengawasi kualiti air dan tahap toksik air untuk mengelakkan peristiwa PSP pada masa akan datang. Selain itu, kaedah spesifik bagi pengecaman sista dinoflagelat lain di Tumpat, Kelantan.