

**OXIDATIVE STRESS RESPONSES OF BIVALVES  
FROM SETIU WETLAND**

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# **OXIDATIVE STRESS RESPONSES IN BIVALVES FROM SETIU WETLAND**

**By**

**Nor Fairuz Nadhirah Binti Ruslan**

**Research Report submitted in partial fulfillment of  
the requirements for the degree of  
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***PENGAKUAN DAN PENGESAHAN LAPORAN***

It is hereby declared and verified that this project report titled **Oxidative Stress Responses of Bivalves from Setiu Wetland** by **Nor Fairuz Nadhirah Binti Ruslan, UK34728** have been examined and all errors identified have been corrected. This report is submitted to the School of Marine and Environmental Sciences as partial fulfillment towards obtaining the **Bachelor of Science (Marine Science)** from School of Marine and Environmental Sciences, Universiti Malaysia Terengganu.

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DECLARATION

I hereby declare that this dissertation **Oxidative Stress Responses of Bivalves from Setiu Wetland** is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at UMT or other institutions. This report is submitted to the School of Marine and Environmental Sciences as partial fulfillment towards obtaining the **Bachelor of Science (Marine Science)** from School of Marine and Environmental Sciences, Universiti Malaysia Terengganu.

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## LIST OF ABBREVIATIONS

×g	-	times gravity
μg	-	microgram
μL	-	microliter
BSA	-	Bovine serum albumin
CAT	-	catalase activity
CDNB	-	1-chloro-2, 4-dinitrobenzene
DNA	-	deoxyribonucleic acid
EDTA	-	ethylenediaminetetraacetic acid
GPx	-	glutathione peroxidase
GR	-	glutathione reductase
GSH	-	glutathione
GSSG		oxidised glutathione
GST	-	glutathione S-transferase
HCl	-	hydrochloric acid
ml	-	millilitre
mM	-	miliMolarity
nm	-	nanometer
PMS	-	post-mitochondrial supernatant
PMSF	-	phenylmethylsulfonyl fluoride
ppt		part per thousand
ROS	-	reactive oxygen species
SD		standard deviation
SOD	-	superoxide dismutase

## ABSTRACT

Oxidative stress refers to situations that occur when there is an imbalance of production and neutralization of reactive oxygen species (ROS) by antioxidants caused by excessive generation of ROS and/or loss of antioxidant that can cause oxidative damage and glutathione reductase (GR) is used as biomarker that acts as protector in the mechanism against that damage. Bivalves are the bio-indicator in this study because they are widely used in environmental toxicology studies that capable to show a rapid antioxidant response towards pollutant and as a human food sources. This study focus on oysters (*Crassostrea iredalei*) and mussels (*Anadara ovalis*) which are the common species that mostly found in Setiu Wetland, Terengganu. The samples were analysing on tissues-specific relation of oxidative stress to GR by measuring the reduction of NADPH at 340nm. Before that, protein mass determination using Bradford method is needed to estimate the specific activity of the GR. The outcome shows that the GR activities in gills for both species are greater than digestive glands. These findings confirmed that the role of GR in the protection of tissues-specific against ROS especially in the gills (feeding organ) where this tissue is important site for drug detoxification. However, there is no other study conducted in Malaysia regarding the biological responses (oxidative stress) to the environmental pollution by using the biomarker by representing it as oxidative enzyme activity. Thus, this baseline study could be a reference for future study in order to gain additional understanding about the importance of oxidative stress towards the environment.

# TINDAK BALAS TEKANAN OKSIDATIF DWICENGERANG DARI TANAH BENCAH SETIU

## ABSTRAK

Tekanan oksidatif merujuk kepada keadaan yang mana terdapat ketidakseimbangan pengeluaran dan peneutralan spesies oksigen reaktif (ROS) dengan antioksidan dan disebabkan oleh penghasilan ROS yang berlebihan dan/atau kehilangan antioksidan yang boleh menyebabkan kerosakan pada oksidatif dan 'glutathione reductase' (GR) digunakan sebagai bio-penanda yang bertindak sebagai mekanisme pelindung kerosakan itu. Dwicengkerang digunakan sebagai bio-penunjuk kerana ia telah digunakan secara meluas dalam kajian toksikologi alam sekitar yang berkebolehan untuk menunjukkan reaksi antioksidan terhadap pencemar dan sebagai makanan manusia. Kajian ini memberi tumpuan kepada tiram (*Crassostrea iredalei*) dan kupang (*Anadara ovalis*) iaitu spesis yang kebiasaannya terdapat di tanah lembap Setiu, Terengganu. Analisa ke atas organ yang berbeza terhadap tekanan oksidatif kepada glutathione reductase (GR) dengan mengukur pengurangan NADPH pada 340 nm. Sebelum itu, penentuan jisim protein dengan kaedah Bradford adalah perlu unyuk menentukan aktiviti khusus buat GR. Hasilnya, aktiviti GR di dalam insang buat kedua-dua spesis adalah lebih besar daripada kelenjar pencernaan dengan. Penemuan ini membuktikan bahawa peranan GR bagi melindungi setiap organ terhadap ROS terutamanya di dalam insang (organ pemakanan) yang mana organ ini adalah penting untuk detoksifikasi dadah. Walau bagaimanapun, di Malaysia tiada kajian lain berkaitan dengan penggunaan bio-penanda dengan mewakili aktiviti enzim oksidatif untuk menentukan tindak balas biologi (tekanan oksidatif) kepada pencemaran alam sekitar. Oleh itu, kajian asas ini boleh dijadikan sebagai rujukan untuk kajian pada masa hadapan dalam usaha untuk menambah pemahaman tentang kepentingan tekanan oksidatif terhadap alam sekitar.