THE UNIVERSITY OF HULL

# PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF *Crassostrea gigas* TO EMERSION

Being a thesis submitted for the Degree of Doctor of Philosophy in the University of Hull

BY

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(M.Sc)

July 2006

# UNIVERSITY OF HULL

BIOLOGICAL SCIENCES DEPARTMENT


**DOCTOR OF PHILOSOPHY**

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## ABSTRACT


The relationships between the physiological and biochemical responses of *Crassostrea gigas* to emersion duration were studied with the aim of simulating better current systems for the live marketing of these oysters. The results showed that *C. gigas* has evolved a variety of strategies that make it a very emersion tolerant species. All of the oysters used survived >12 d under emersion at 2 different temperatures (4 and 10°C). Gross weight loss was positively and linearly related to emersion duration and their shell-buffering capacity helped stabilise internal pH and minimised acidification at the gill surface. Such acid-base balance adjustments stabilised the mantle cavity fluid (MCF) pH after ~24h of emersion. A continuous efflux of ammonia into the haemolymph and MCF occurred under emersion. An altered behaviour to include intermittent valve-gaping and a release of ammonia to the external medium occurred within 1 min after re-immersion.

The haemolymph FAA pool comprised principally taurine and valine and both decreased significantly ($p < 0.05$) during the first 24h under emersion. Alanine showed no significant change under emersion but succinate levels showed significant increases initially but, as emersion lengthened, returned to original levels. Many intermediates or end-products may accumulate and are therefore responsible for a part of the consumed fuel substrates.

The polyamines, spermidine, spermine and the diamines, putrescine and cadaverine were found in all samples and *Enterobacter cloacae* was isolated, identified and found to produce considerable amounts of cadaverine and putrescine.

This subject area appears to be one that has been relatively little studied in comparison with the wealth of other physiological studies made on bivalves. Recent developments in analytical methods which allow accurate analyses of very small volumes of biological fluid have facilitated such studies which have shown that a complex of emersion-induced changes confer an emersion tolerance that equips *C. gigas* to live in habitats that experience periodic or episodic severe hypoxia. This ability and the ability to recover rapidly upon re-immersion have important commercial implications for the development of efficient systems suitable for the live marketing of this valuable species.