

## ABSTRACT

Biological consequences of aerial exposure of the mangrove oyster *Crassostrea rhizophorae* (Guilding, 1828)

(MOLLUSCA: Bivalvia)

*Crassostrea rhizophorae* were allowed to grow subtidally and intertidally until approximately 6 months old. Subtidal oysters were aurally exposed at one of six exposure regimes or not at all during the growth period. Growth, survival, marketability, the numbers of mudworm casts and the cover of fouling were also determined. Thermal, desiccation and respiratory stress were investigated, particularly as they relate to behavioural responses in air.

Subtidally cultivated mangrove oysters show improved shell and tissue growth when exposed most frequently. Aerial exposure improved oyster growth in the presence or absence of biofouling. When allowed to accumulate, biofouling was limited by aerial exposure. Greater frequency of exposure resulted in greater mudworm infestation and may have been due to an increased silt load associated with the oysters.

Mid-intertidally hung oysters grew faster and survived better than those hung in the low intertidal zone in the presence or absence of biofouling. These findings contradict the hypothesis that continued immersion leads to greater growth. It is argued that high temperatures experienced during exposure facilitate a more efficient assimilation of energy but such an energy supplementation would be limited by period of exposure as ingested food becomes depleted.

The oyster has a high aerial temperature tolerance.  $LT_{50}$  in air was 48.5°C, 43.5°C and 37.5°C for 2 h, 5 h and 24 h exposure periods. Air-gaping has been demonstrated and quantified at different aerial temperatures. The behaviour appears to regulate aerial oxygen consumption ( $\dot{V}O_{2AIR}$ ) which was approximately half the aquatic rate ( $\dot{V}O_{2WATER}$ ) at 25°C over 2 h of emersion. Air-gaping facilitates temperature regulation through evaporative cooling, reduces the fall in extrapallial fluid (EPF) pH and allows a rise in EPF  $pO_2$ . These behavioural and physiological adaptations may help the oyster both to survive and benefit from periodic exposure.