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## **Active brood care in *Cancer setosus* (Crustacea: Decapoda): the relationship between female behaviour, embryo oxygen consumption and the cost of brooding**

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### **Abstract:**

- 1.** Previous studies have shown that oxygen is limiting in embryo masses of marine invertebrates. It has been suggested that several behaviours found in brooding females of brachyuran crabs are used to ventilate and provide oxygen to the embryo masses.
- 2.** The relationship between female brooding behaviour, oxygen consumption of embryos and oxygen provision to the brood mass for embryos at different developmental stages was studied, using the marine crab *Cancer setosus*. The changes in oxygen consumption of brooding females associated with changes in oxygen provision to the brood were also estimated.
- 3.** Brooding females of *C. setosus* behaved differently from non-brooding females. Abdominal flapping was associated with an increase in oxygen availability in the centre of the brood mass; the frequency of abdominal flapping increased with embryonic development, as oxygen demand of crab embryos increased. Oxygen consumption of brooding females also increased throughout embryonic development. The difference in oxygen consumption between brooding and non-brooding females was used as an indicator of the cost of oxygen provision (brooding).
- 4.** These results provide the first evidence – among crabs and other marine invertebrates – of a direct link between active brood care and oxygen provision. It is possible that parental care in marine invertebrates is strongly linked to oxygen provision, since oxygen limitation has been reported for several brooding taxa. The simple physiological constraint of oxygen provision in marine invertebrates may have important ecological and evolutionary consequences.

Key-words: Embryo mass, metabolic cost, oxygen provision, parental care