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The *Ostrea chilensis* pallial cavity: nursery, prison and time machine

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Abstract:

Brooding in bivalves is a reproductive strategy that benefits larvae by protecting them from predators and adverse ambient conditions. Recent studies on brooding oysters (*Ostrea* spp.) have shown, however, that chemical conditions in the pallial cavity, in which the brood is held, rapidly decline soon after valve closure, representing an inescapable prison for larvae. Conditions in the pallial cavity among open, ventilating females are less well understood. This study examined how conditions in the pallial cavities of non-brooding *O. chilensis* females respond to prevailing environmental conditions and female valve gaping and respiration. Two separate microsensors (O₂ and pH) were placed in the pallial cavities of 12 non-brooding females while valve gapes were recorded. The experiments were carried out in December 2019 using oysters collected from the Quempillén estuary in southern Chile (41° 52' S, 73° 46' W). As in previous studies, pallial cavity conditions were influenced by ambient O₂, pH, and temperature. There were clear, quantifiable relationships between valve movement, respiration, and pallial cavity pH. Even among ventilating oysters, the pallial cavities can acidify the fluid bathing larvae. Thus, there is the potential for larvae in brooding females to be exposed to carbonate conditions predicted for the future—hence a time machine. These data suggest that brooding can apply evolutionary pressure on larvae to develop traits that help them cope with conditions in the pallial cavity, which may also be exapted to confer fitness under ocean acidification.

Keywords: *Ostrea chilensis*, pallial cavity, female effects, acidification, valve gape