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A trophic link between the cold-water coral *Desmophyllum dianthus* and filter-feeding bivalves?

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Cold-water corals play an important role …

… as ecosystem engineers by providing a three-dimensional habitat for a rich associated fauna (Fig. 1). In Chile, the cold-water scleractinian *Desmophyllum dianthus* populates steep walls of Comau Fjord [1,2] (Fig. 2), where its principal energy source, zooplankton, is less abundant in winter [3]. This coral is often associated with filter-feeders (Fig. 1), but the nature of this relationship remains enigmatic. Dense belts of the mussel *Aulacomya atra* and the brachiopod *Magellania venosa* thrive above and between *D. dianthus*, and both, visual observation and diver-operated push net samples revealed a rain of biodeposits (faeces and pseudofaeces) from the zone of filter-feeders to the zone dominated by corals.

Fig. 1: Cold-water coral *Desmophyllum dianthus* colonizing an overhang with its associated fauna: the mussel *Aulacomya atra* and the fish *Sebaster oculatus*.

This study aims to determine …

… if the conversion by filter-feeders of microscopic plankton, inaccessible to corals, to macroscopic strings of faeces and pseudofaeces, accessible to the corals' tentacles, may represent a so far overlooked trophic link channeling surface production to the corals.

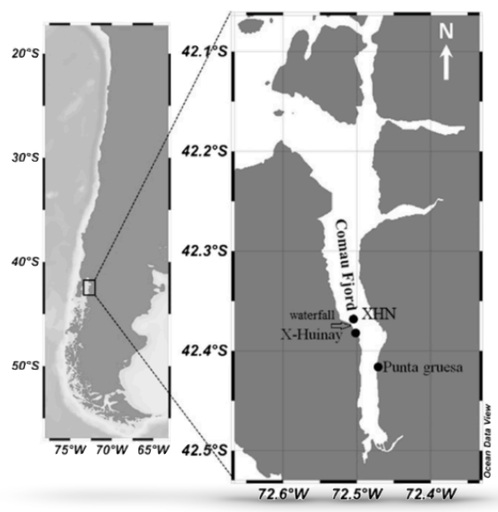

Fig. 2: Overview of Patagonia characterized by the rugged coastline along southern Chile. Comau Fjord enlarged at the right.

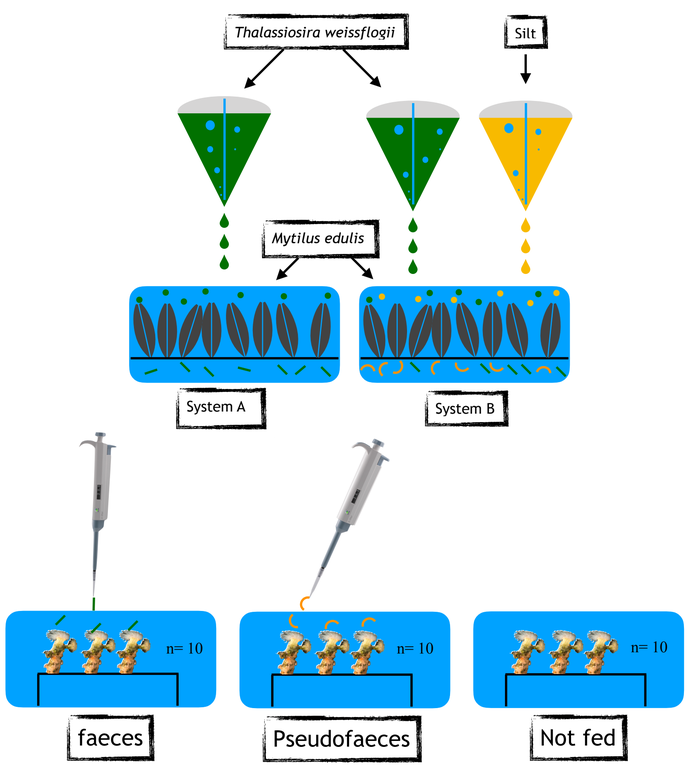

Fig. 3: Diagram representing the aquaria set-up for the feeding response experiment on *D. dianthus*.

Individuals of the mussel *Mytilus edulis* …

… were kept in two separate aquaria: in system A they were feed with the microalgae *Thalassiosira weissflogii* to produce faeces and in system B additionally with silt to produce pseudofaeces (Fig. 3). Ten corals were fed three times a week with pseudofaeces, ten with faeces and ten were not fed (Fig. 3). Corals were weight initially and after the experimental time (three months) using the buoyant technique [4]. Aquaria-conditions: temperature 12.5 °C, Salinity 32, pH 8, and Ω_{Arg} >1.

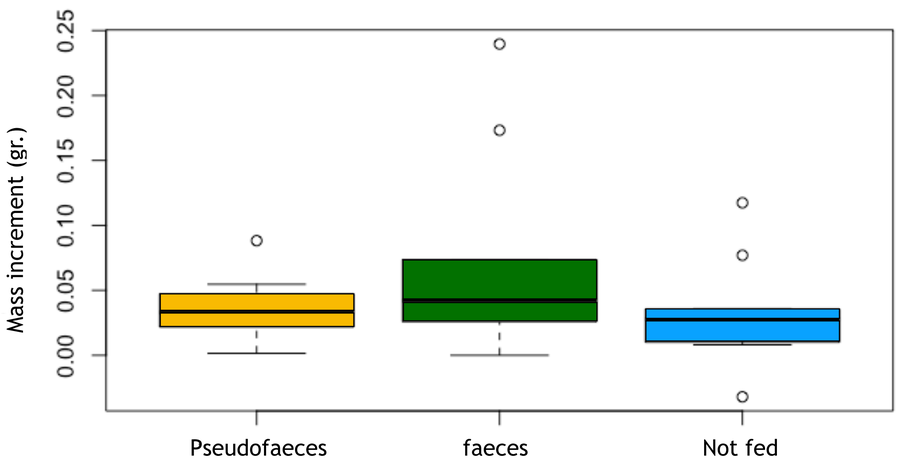

Fig. 5: Mass difference between the initial and final buoyant weight from the ten corals on each treatment.

Preliminary *in vitro* …

… experiments show that *D. dianthus* ingests biodeposits of the mussel *Mytilus edulis* (Fig. 4, A), but only after the consumption of juvenile krill (*Euphausia pacifica*) (Fig. 4, B). In addition, a greater mass increase was observed in the corals that were fed with faeces (Fig. 5). This indicates that biodeposits of active filter-feeders may play a role as a food supplement for corals. Follow-up experiments with biodeposits produced under natural conditions by the native filter-feeder community are expected to compound the evidence.

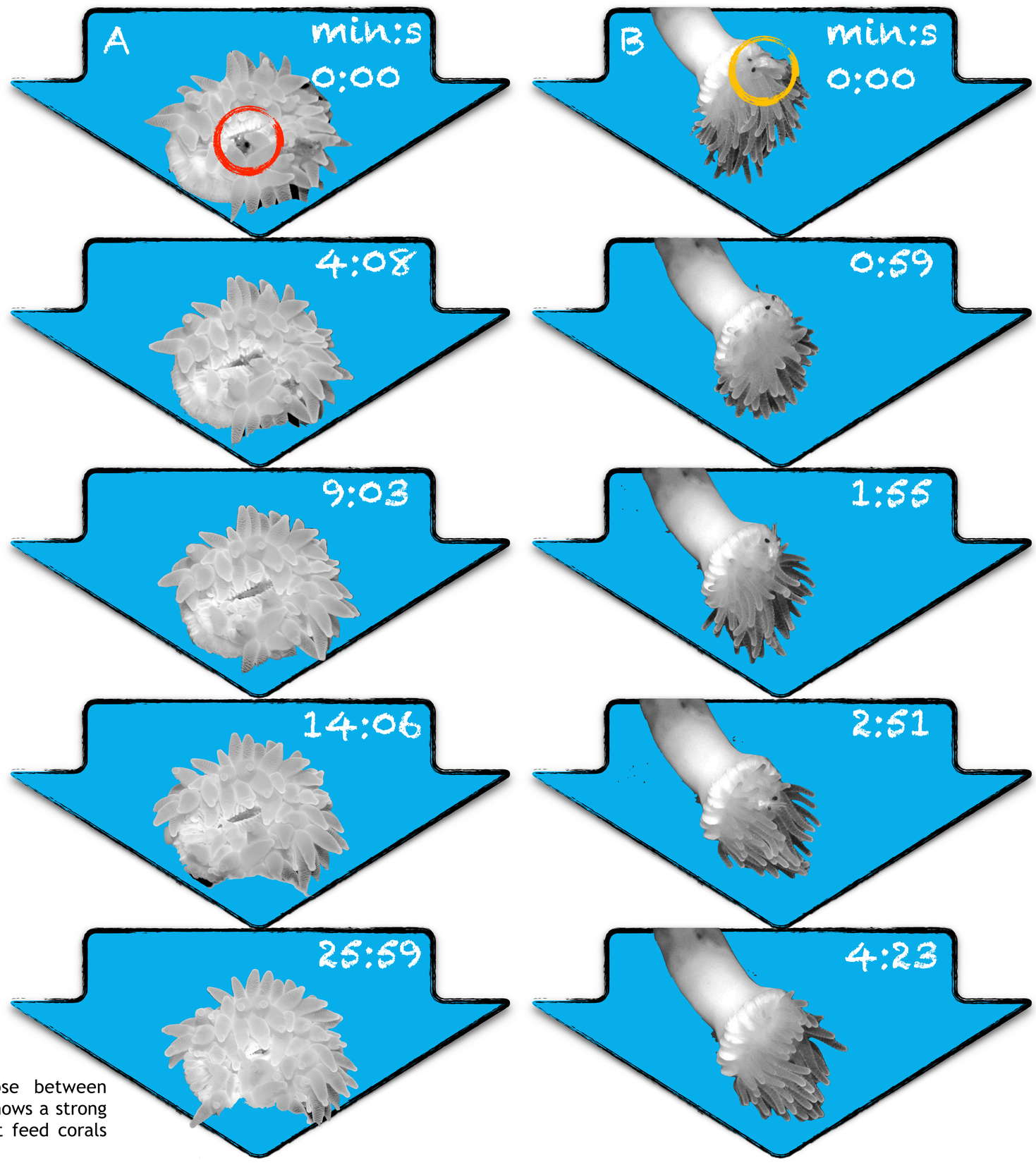

Fig. 4: Different feeding response recorded during a time-lapse between biodeposits (red circle) and krill (yellow circle). The krill fed corals shows a strong feeding response with contraction of tentacles, while the biodeposit feed corals shows a precarious stimulus.

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