Move-over parrot fish – coral embryos make next-gen mucous cocoon

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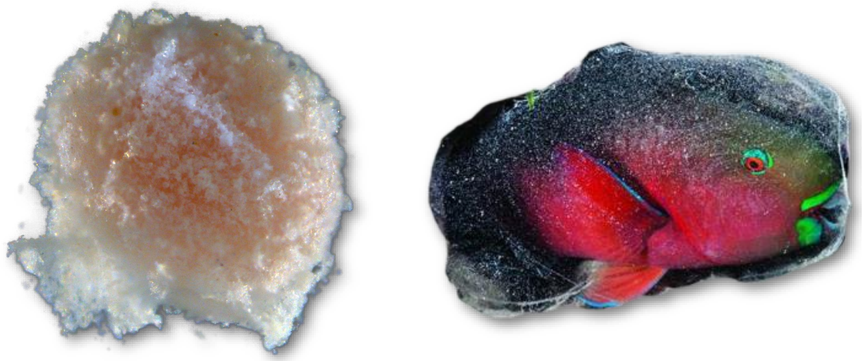
Summary

Corals are known to use a variety of mechanisms for sediment removal. Here we report a previously undescribed mechanism of mucous cocooning in embryonic corals. Given the recent surge of interest surrounding coastal development and dredging, it is important to understand methods corals can cope with increases in turbidity and sedimentation.



Mucous cocoons offer protection in some marine organisms. Coral embryo (left), parrot fish (right).

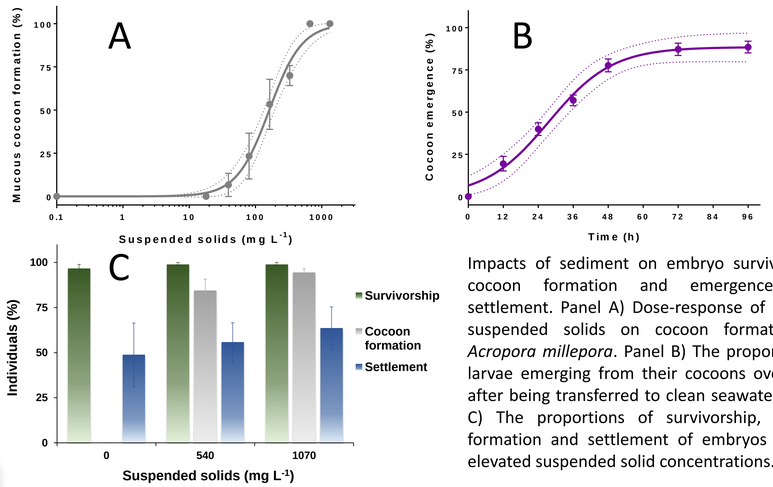
Key Points

- Cocooning observed in as low as 30 mg L^{-1}*.
- Cocoon composed of mucous and incorporated sediment.
- Once ciliation occurred, cocooning was rare.
- Newly ciliated larvae ripped open and exited cocoons through gyration.
- Inshore (mineral-rich) sediment caused greater cocooning than offshore (calcium carbonate) sediment.
- Observed in *A. millepora and A. tenuis.*

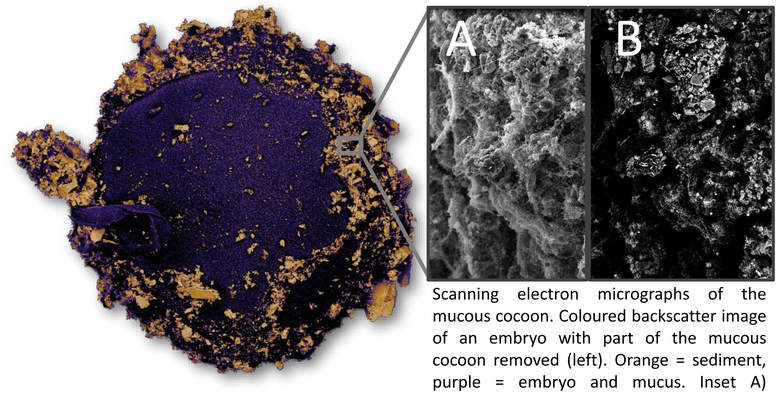
*typical of suspended solids recorded during a windy day

Design

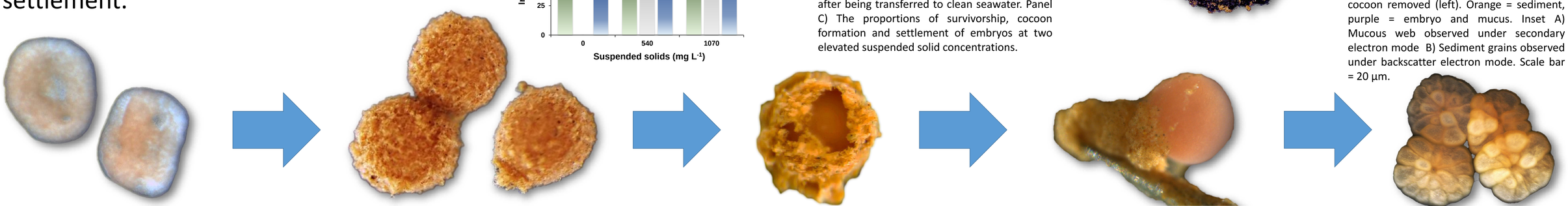
In a series of experiments, embryos of various ages (3-72 h) were exposed for 12 h periods to elevated suspended solids using inshore and offshore sediments. Embryos and larvae were assessed for survivorship, cocoon formation, cocoon emergence and settlement.



Impacts of sediment on embryo survivorship, cocoon formation and emergence, and settlement. Panel A) Dose-response of inshore suspended solids on cocoon formation of *Acropora millepora*. Panel B) The proportion of larvae emerging from their cocoons over time after being transferred to clean seawater. Panel C) The proportions of survivorship, cocoon formation and settlement of embryos at two elevated suspended solid concentrations.



Scanning electron micrographs of the mucous cocoon. Coloured backscatter image of an embryo with part of the mucous cocoon removed (left). Orange = sediment, purple = embryo and mucus. Inset A) Mucous web observed under secondary electron mode B) Sediment grains observed under backscatter electron mode. Scale bar = 20 µm.



‘Prawn chip’ embryos (12 h old) | Mucous cocoons after 12 h sediment exposure (24 h old) | Mucous cocoons open and larvae spin inside (30-36 h old) | Larvae escape cocoon (~36-48 h old) | Larvae undergo settlement (4-6 d old)

Photo credits: Mikaela Nordburg (offshore sediment cocoon, ripped cocoon and settlers) and NOAA Images (parrotfish).

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