Coral embryos clone themselves

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Plate coral (Fungia sp.). The picture was taken in Papua New Guinea. Credit: Wikipedia.

Forming a unique part of the animal kingdom, corals have built the only living entity visible from space; the Great Barrier Reef. Scientists from the Australian Institute of Marine Science (AIMS) have recently discovered a previously unknown reproductive strategy in corals, adding another dimension to our understanding of their complex life cycles.

A study published today in journal *Science* shows for the first time that coral offspring have the unique ability to form genetic clones of themselves before they settle and develop into adult corals.

Coral 'offspring' are usually the result of sexual reproduction - eggs are

fertilised either before or after being released by the parent coral into the surrounding water. These fertilised eggs are carried by ocean currents before settling at new locations.

Coral "clones", on the other hand, are genetic replicas of the parent coral. For example, if waves generated in a storm break up a coral colony, the remnant parts may continue to survive as independent but genetically identical individuals; a faculty that most animals do not possess.

Dr Andrew Heyward and Dr Andrew Negri suspected that fertilised coral eggs (embryos) might also break up because, unlike most animal embryos, coral embryos lack a protective outer-layer or membrane; they are so called 'naked' embryos.

"As the early stage embryo develops it divides into a cluster of cells," explains Dr Heyward, "because this ball of cells lacks a protective outer-layer we wondered whether subjecting them to a little turbulence might cause them break up."

It did, but what happened next was even more astonishing.

"To our surprise many of the fragmented coral embryos later began to develop and settle in just the same way as their siblings that had remained intact," continues Dr Heyward. "Interestingly, these fragmented embryos became smaller versions of baby corals than the complete embryos". The scientists were able to create these turbulent conditions in the laboratory simply by pouring embryos floating in seawater over a vertical distance of 30 cm.

"This effectively mimics the kind of wave height generated by moderate wind speeds where small breaking waves, commonly called whitecaps, occur. That sort of weather is often encountered during a night of coral

spawning on the Great Barrier Reef," says Dr Negri. "So it's highly likely that this fragmentation occurs regularly on nights when corals release their eggs.

"It appears that the lack of protective membrane is no accident. Almost half of all these naked embryos fragmented in our experiments, suggesting that this has long been part of the corals' repertoire for maximising the impact of their reproductive efforts".

Dr Heyward explains why discovery of this novel reproductive strategy is so significant. "This mixed breeding system means colonising corals benefit simultaneously from the advantages of both sexual and asexual reproduction.

"Much like humans, it's important that the offspring of corals have genetically distinct parents, but these embryos also readily clone to form multiple versions of themselves, and helps to explain how coral maximise their chances of finding a suitable habitat in which to settle and survive.

In human terms this is the equivalent of giving birth to identical twins, triplets, quadruplets and so on.

"This is another example of the complexity of these incredible animals and suggests that there may be more to learn about the lives of corals and their interaction with the environment."

More information: "Turbulence, Cleavage, and the Naked Embryo: A Case for Coral Clones," by A.J. Heyward et al. *Science* (2012).

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