Ocean acidification boosts algal growth but impairs ecological relationships

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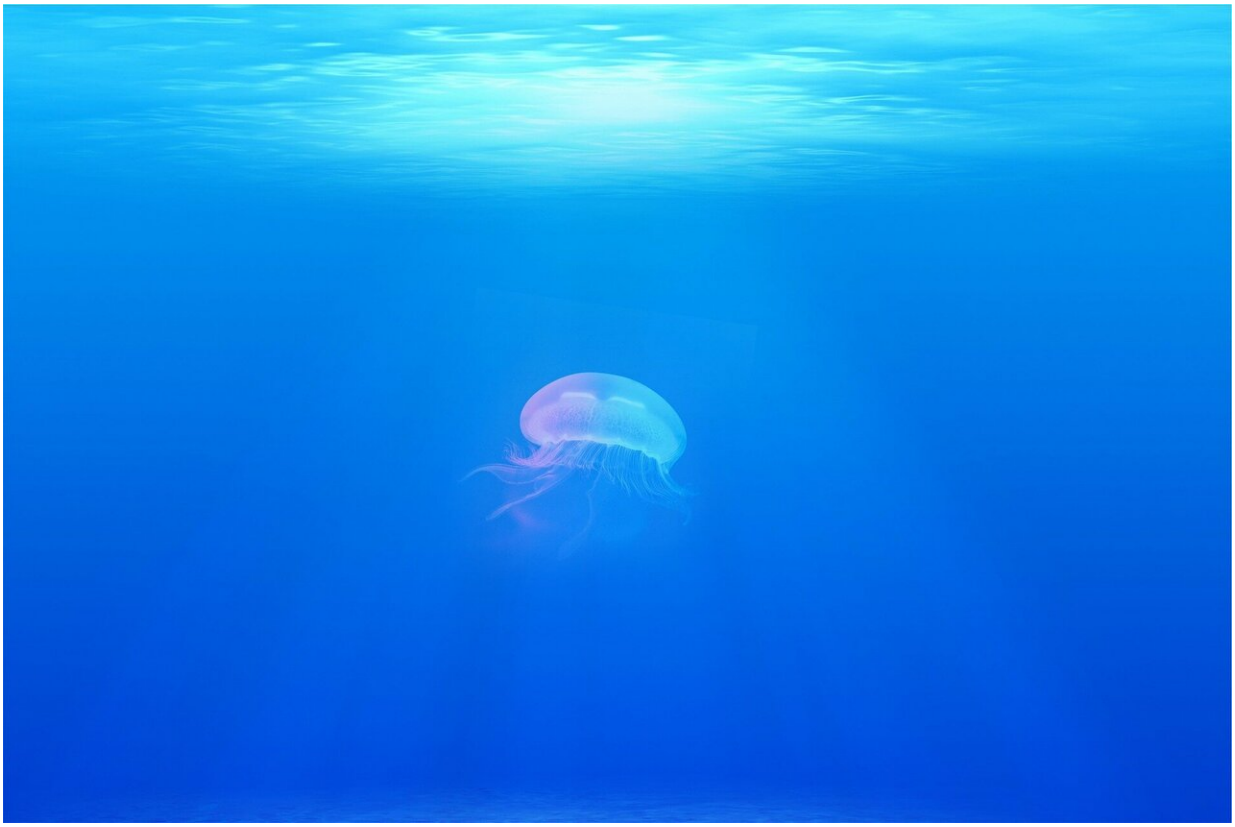

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Shrimp fed on marine algae grown in acidic water do not undergo a sex change that is a characteristic part of their reproductive life-cycle, report Mirko Mutalipassi and colleagues at Stazione Zoologica Anton Dohrn in

Italy in a study publishing June 26 in the open-access journal *PLOS ONE*.

The marine shrimp *Hippolyte inermis* lives in coastal meadows of the seagrass *Posidonia oceanica* and it has two breeding seasons a year, with some males born in spring developing rapidly and turning into females that produce eggs the following autumn. This sex change depends on a bioactive compound produced by microalgae present in their spring diet (*Cocconeis scutellum parva*) that triggers male endocrine cells to die. To investigate the impact of ocean acidification on this unusual reproductive cycle, the researchers fed shrimp on algae grown in waters at either pH 8.2 representing current conditions, or pH 7.7 representing forecasted levels of ocean acidity by 2100.

They found that the growth of algae was correlated with the amount of carbon dioxide dissolved in the water, with four times more algal cells in acidic waters compared with current ocean conditions. However, populations of *H. inermis* shrimp fed on algae grown at normal pH were 63% female, while those that received a diet of algae from an acidic environment contained 36% females—similar to the sex ratio of control populations of shrimp that were fed none of the compound-producing algae in their diet. This indicates that in acidic conditions the algal compound was not produced or it was not effective in triggering a sex change, suggesting that the autumn breeding season may be dampened by predicted decreases in ocean pH over the next century. These findings demonstrate how acidifying oceans under climate change could disrupt delicate ecological relationships that have evolved over millions of years, sometimes with idiosyncratic consequences.

More information: Mutalipassi M, Mazzella V, Zupo V (2019) Ocean acidification influences plant-animal interactions: The effect of Cocconeis scutellum parva on the sex reversal of Hippolyte inermis. *PLoS ONE* 14(6): e0218238. doi.org/10.1371/journal.pone.0218238