Pteropods tougher than thought[1]

Elegant little sea butterflies, more technically known as pteropods, are important members of the marine ecosystem because they are so abundant and are a food source for other marine organisms, especially whales.

Recently, questions have been raised about the vulnerability of pteropods to ocean acidification. But new research by Dr Liz Harper of the Department of Earth Sciences and colleagues from Philadelphia and the British Antarctic Survey in Cambridge shows that pteropods are much more resilient to the increase in ocean acidity than previously feared.

Ocean acidification

The acidification of ocean waters is a climate driven process, which is currently of great concern to marine scientists. The protective carbonate shells of many economically important sea creatures is particularly vulnerable to dissolution by acid waters. Damage to the shells may lead to premature death and problems with reproduction, which could drastically reduce global stocks.

Pteropods

Scientists have been trying to assess the vulnerability of some of the key marine organisms such as pteropods to ocean acidification. Pteropods are small but often highly abundant marine snails, around 10 mm long, with delicate shells, which can actively swim in surface waters in pursuit of their microscopic prey in the plankton. Pteropods can be so abundant that their shells form ocean floor sediment known as pteropod ooze.

There is growing evidence that delicate pteropod shells are already showing signs of damage by acid etching. Such damage could compromise the animal's ability to regulate its buoyancy and leave the body vulnerable to infection and predation However, the shells of molluscs, such as pteropods also have an organic coating, known as a periostracum. And, there has been a debate about the protective role of the periostracum. Like paintwork, which protects a steel car body from corrosion, the periostracum protects the pteropod shell from dissolution unless it has been damaged by a predator.

The possibility has been raised that acid dissolution might occur despite the presence of the periostracum but recent evidence shows that dissolution only occurs where the periostracum has been damaged.

Research results

The new research compared images of pteropod shells from light microscopic, scanning electron microscopic (SEM) and computer tomographic (CT) scans. This has revealed a range of shell damage but

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also varying stages of repair. Even where there is localized loss of the entire thickness of the shell, specimens of the polar pteropod Limacina helicina manage to maintain shell integrity by thickening the inner shell wall. It seems that the multitudes of sea-butterflies may be more resilient to ocean acidification than previously thought. But at a cost to those individuals who have to expend extra resources on repairing the damage. The long term effects of these costs are as yet unknown.

Douglas Palmer, Sedgwick Museum

Ref: Peck, V.L; Oakes, R.L.; Harper, E. M.; Manno, C. and Tarling, G.A. 2018. Pteropods counter mechanical damage and dissolution through extensive shell repair. Nature Communications, 9: 264. DOI: 10.1038/s1467-017-02692-w

The see-through shell of a tiny pteropod. ©Alexander Semenov, White Sea Biological Station, Moscow State University