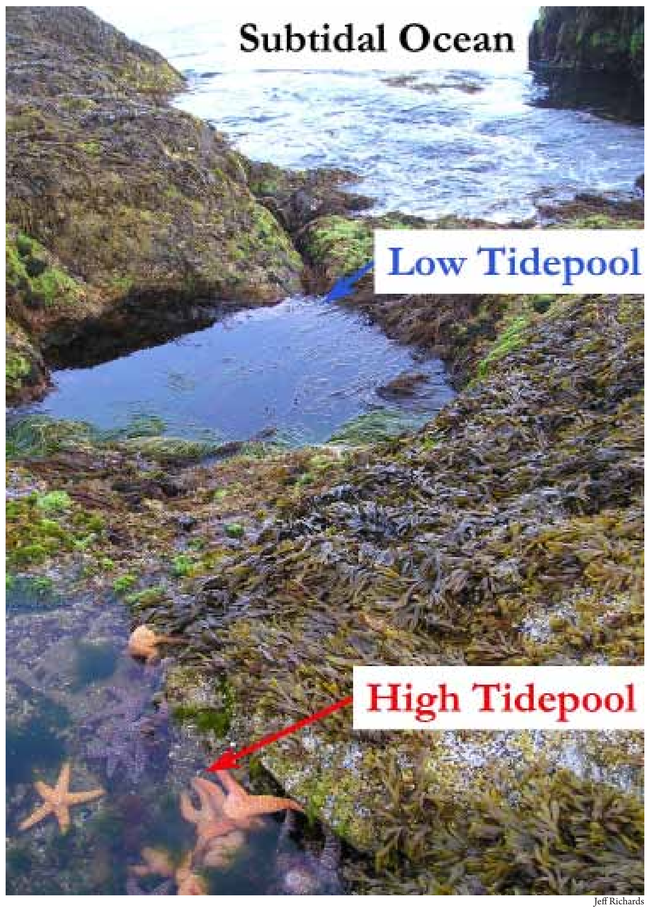
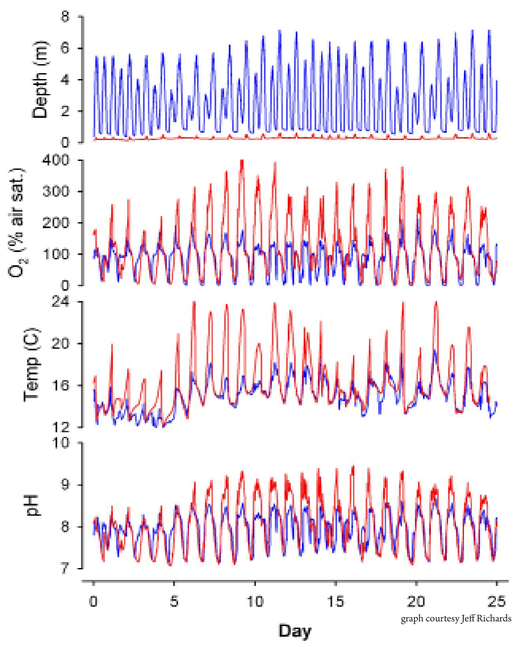


Jeff Richards



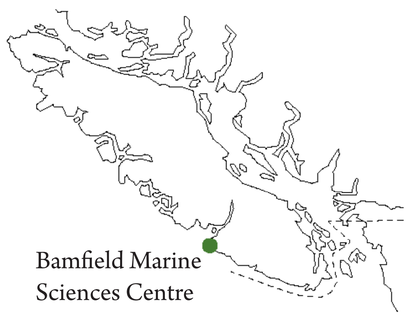
Changes in water depth, oxygen level, temperature, and pH in low (blue) and high (red) tidepools over a 25-day period.

As coastal tidepools heat up and lose oxygen, how do the fish trapped within them cope?

A tidepool is an incredible place to discover the diversity of fish, algae, and marine invertebrates that live on the shore. But if you're a fish, like a sculpin, the rising temperatures, evaporation of water, and consumption of oxygen by other organisms means that conditions might soon become challenging for survival.

British Columbia's coastal waters are home to many types of sculpins. Some live deeper in the water, below the level of low tide in the subtidal zone. Others live in the intertidal zone, between low and high tides, and spend part of their lives in tidepool environments. So what makes some sculpins suited for life in the intertidal?

Milica Mandic set out to answer this question at the Bamfield Marine Sciences Centre. In the lab, she found that sculpins from the intertidal have a greater surface area of their gills; the structures fishes use to extract oxygen from the water. She also found that hemoglobin in the blood from intertidal fish had a greater affinity for oxygen, allowing them to capture more oxygen from the water.




b.
Anne Todgham


a.
Ben Speers-Roesch


c.
Milica Mandic

British Columbia's rocky coast features many tidepools, home to intertidal species of sculpins like the red Irish lord (a). When captured (b), sculpins were put in artificial tidepools (c) where the oxygen levels could be manipulated.

In addition to these physiological adaptations, a fish's behaviour may also help it to survive. When exposed to low-oxygen conditions, Milica found that intertidal fish are more likely to move closer to the surface of the water, where there is more oxygen. They may also come out of the water briefly to access oxygen from the air. At the cellular level, greater capacity for energy production in the brains of intertidal fish help them survive in the low-oxygen environments.

But where do these adaptations come from? Milica and her colleagues are currently probing the genetic roots of several sculpin species. They are finding major differences in how genes are controlled and the processes involved in the basic functions of a living organism. Like the ocean, the answers to some questions go very deep.