Trilobites

You Can’t Escape Lice, Even 6,500 Feet Below the Ocean

By Priyanka Runwal, Aug. 26, 2020, The New York Times, Science

A species of insect tags along with elephant seals as they spend months at sea, enduring the crushing pressure changes of the mammals’ dives.

Lepidophthirus macrorhini lice dwell on the rear limbs of southern elephant seals, which spend nearly 10 months of the year in Antarctic waters and may stay under for nearly two hours at a time.

Darling, it’s better under the sea, unless you’re an insect. You might find some bugs skimming the surface of a pond or even creating their own scuba bubble to dive beneath the surface of inland lakes. But insects are virtually absent from the open ocean.

If you look at the hind flippers of southern elephant seals, however, you will find some insects that have made their way to a partially aquatic life. Lice of the species *Lepidophthirus macrorhini* dwell on the rear limbs of the large aquatic mammals, which spend nearly 10 months of the year in Antarctic waters and dive up to 6,500 feet below the surface in search of food and may stay under for nearly two hours at a time.

These lice could be the deepest surviving insects in marine ecosystems, according to a study published in July in the Journal of Experimental Biology. By enduring such extreme environments, elephant seal lice can help scientists unravel the mystery of why so few insects have made a home in the ocean’s vastness.

L. macrorhini are parasitic, bloodsucking lice that burrow into the seal’s top skin layer to feed. In 2015, María Soledad Leonardi, a marine biologist at the Instituto de Biología de Organismos Marinos in Argentina, found live lice on male elephant seals that surfaced to breed on King George Island off the coast of Antarctica.

“You can see them with your naked eye,” she said. “They look like miniature crabs.”

To her, the presence of lice on adult seals emerging from lengthy offshore excursions suggested that the insects could survive the deep dives and steep climbs of the seals’ aquatic journeys. And that meant the lice might be able to endure the crushing pressure of the ocean’s depths.

Catching 8,000-pound seals at sea to check if lice braved these extreme conditions would be very tricky, Dr. Soledad Leonardi said. So, her team decided to bring the lice to the lab.

Using tweezers, they pulled the insects from the hind flippers of 15 elephant seal pups born on the beaches of Península Valdés in Argentina. The pups harbor adult lice that are transferred from their mothers’ bodies within a few days of birth. The lice quickly reproduce, taking advantage of the initial weeks that the pups are confined to land, as their eggs don’t hatch underwater.

In the lab, the team immersed the lice in individual flash-drive-size chambers filled with seawater that connected to a scuba tank. Then, they exposed each louse to a range of water pressures, as much as 200 times greater than that at the sea surface and equivalent to depths ranging between 980 and 6,500 feet. After experiencing 10 minutes of this deep-sea environment, 69 of 75 lice emerged alive.

“It was fascinating for me to see that they survived the high pressure,” said Claudio Lazzari, an insect physiologist at the University of Tours in France and a co-author of the study. “It shows that these lice can cope. We can exclude that they just die.”

The researchers then exposed surviving lice to a water pressure higher or lower than what they were subject to earlier.

“The idea was to reproduce the situation that lice would experience when their host dives through

different pressure levels," Dr. Lazzari said. All of the lice were able to tolerate the quick pressure change, with adults recovering faster and exhibiting mobility after the experiment, as compared to the nymphs.

Stuart Humphries, an evolutionary biophysicist at the University of Lincoln in England, called the study "neat," but also said that "it'd be interesting to know how the lice do it."

So far, the researchers don't know if seal lice have special adaptations. "My guess is that these guys just shut down and lock their tracheal system," Dr. Humphries said, meaning that the lice could hold their breath in deep water.

The researchers are now looking to conduct experiments to see if these insects arrest their activity and energy expenditure in the deep sea or if they continue breathing.

"Understanding how this group of insects manages to survive underwater will be the key to understanding why other groups couldn't," Dr. Lazzari said.

But some scientists think the lice could be a unique case.

"Seal lice are a specialized case; they only live attached to their host in marine environments and reproduce when the seals are on land," said Lanna Cheng, an emeritus marine biologist from Scripps Institution of Oceanography in San Diego. "Whether or not they have the ability to survive as free-living insects at those depths, we have no idea."