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The scaly-foot snail (*Chrysomallon squamiferum*) coats its shell and tiny plates on its foot with iron from the surrounding seawater.

ENVIRONMENT

Snail is first ocean creature endangered by mining

Valuable metals and minerals in the animal's habitat have drawn commercial interest.

BY JONATHAN LAMBERT

A snail that lives near hydrothermal vents on the ocean floor east of Madagascar has become the first deep-sea animal to be declared endangered because of the threat of mining.

The International Union for Conservation of Nature (IUCN) added the scaly-foot snail (*Chrysomallon squamiferum*) to its Red List of endangered species on 18 July — as companies rush to apply for exploratory mining licences.

“This is an important step towards alerting policymakers to the potential impacts

deep-sea mining may have on biodiversity,” says Lisa Levin, a biologist at the Scripps Institution of Oceanography in La Jolla, California.

The scaly-foot snail is found at only three hydrothermal vents in the Indian Ocean and occupies a total area roughly the size of two American football fields, says Julia Sigwart, a deep-sea biologist at Queen's University Belfast, UK.

Two of those three vents are currently under mining exploration licences, says Sigwart, who co-authored a commentary on the snail's listing in *Nature Ecology & Evolution*, published on 22 July (J. Sigwart *et al. Nature Ecol. Evol.*

<http://doi.org/c8ps; 2019>).

Even one exploratory mining foray into this habitat could destroy a population of these snails by damaging the vents or smothering the animals under clouds of sediment, says Chong Chen, a deep-sea biologist at the Japan Agency for Marine-Earth Science and Technology in Yokosuka and a commentary co-author.

For decades, mining companies have sought to extract valuable minerals and metals that form near hydrothermal vents. When the hot, mineral-laden water from a vent mixes with cold seawater, it deposits metals, such as manganese and copper, on the ocean ▶

► floor. Collecting these deposits was once considered too difficult and expensive. But technological advances are now making it economically feasible.

Full-scale mining can't begin in international waters until the International Seabed Authority (ISA) — a United Nations agency tasked with regulating sea-bed mining — finalizes a code of conduct, which it hopes to do by 2020.

Levin cautions that it's not yet clear what effect the presence of an endangered species would have on the regulation of mining activities (see News Feature, page 465). "The [ISA] regulations are still being drafted, and there's currently debate over whether environmental guidelines will be mandatory or just recommended," she says.

Sigwart and Chen say that now is a good time to raise awareness of the vulnerability of hydrothermal-vent ecosystems. Getting the scaly-foot snail on the Red List is the first step. "Being on that list means something to policymakers and ordinary people," says Chen.

The biggest challenge to determining

whether the snail warranted inclusion on the Red List was figuring out how to assess the extinction risk for animals that live in one of the weirdest habitats on Earth, says Elin Thomas, a graduate student in Sigwart's lab and a commentary co-author.

When the IUCN considers whether to include an organism on the Red List, specialists examine several factors that could contribute to its extinction. They include the size of a species' range and how fragmented its habitat is.

But hydrothermal vents naturally occupy relatively small areas of the sea floor, says Thomas. And they occur only where ocean water that has percolated into Earth's crust can shoot back out into the deep sea, resulting in a spotty distribution.

After discussions with the IUCN and other researchers, Sigwart and her team settled on two criteria to assess extinction risk for

hydrothermal-vent species: the number of vents where they're found, and the threat of mining.

In addition to the scaly-foot snail, the researchers are assessing at least 14 more hydrothermal-vent species for possible inclusion on the Red List later this year.

Chen is optimistic that Red List status will dissuade investors from pursuing projects that could harm endangered species. He points to organizations, such as the World Bank, that require groups applying for grants to consider the effects that their projects could have on Red Listed species.

But Holly Niner, who studies ocean environmental policy at Aalborg University in Denmark, says it's too soon to know how the presence of endangered animals will affect deep-sea mining activities. Hopefully, regulatory officials and industry will direct mining operations to less sensitive habitats, she says.

"It's not like we researchers can start a breeding programme for deep-sea-vent creatures," says Sigwart. "We can only try to protect what's there." ■

"Being on that list means something to policymakers and ordinary people."

NEUROSCIENCE

Depression researchers rethink mouse swim test

Animal-rights group campaigns to end test that some scientists say is overused.

BY SARA REARDON

Nearly every scientist who has used mice or rats to study depression is familiar with the forced-swim test. The animal is dropped into a tank of water while researchers watch to see how long it tries to stay afloat. In theory, a depressed rodent will give up more quickly than a happy one — an assumption that has guided decades of research on antidepressants and genetic modifications intended to induce depression in lab mice.

But mental-health researchers have become increasingly sceptical in recent years about whether the forced-swim test is a good model for depression in people. It is not clear whether mice stop swimming because they are despondent or because they have learnt that a lab technician will scoop them out of the tank when they stop moving. Factors such as water temperature also seem to affect the results.

"We don't know what depression looks like in a mouse," says Eric Nestler, a neuroscientist at the Icahn School of Medicine at Mount Sinai in New York City.

Now, the animal-rights group People for

the Ethical Treatment of Animals (PETA) is jumping into the fray. The group wants the US National Institute of Mental Health (NIMH) in Bethesda, Maryland, to stop supporting the use of the forced-swim test and similar behavioural assessments by its employees and grant recipients. The tests "create intense fear, anxiety, terror, and depression in small animals" without providing useful data, PETA said in a letter to the agency on 12 July.

The animal-rights group also singled out NIMH director Joshua Gordon for using the forced-swim test in the early 2000s at Columbia University in New York City.

"The National Institute of Mental Health has for some time been discouraging the use of certain behavioral assays, including the forced swim and tail suspension test, as models of depression," Gordon said in a statement. But he added that the tests are still "crucial" for some specific scientific questions, and that the NIMH will continue to fund such studies.

"People get their grants based on this test, they write papers based on the test."

The PETA campaign dovetails with scientists' growing concern about the quality of data produced by forced-swim tests, says Hanno Würbel, a behavioural biologist at the University of Bern. "The point is that scientists shouldn't use these tests anymore," he says. "In my opinion it's just bad science."

Scientists developed the forced-swim test in the 1970s. One of its earliest applications was in studying the efficacy of drugs known as selective serotonin reuptake inhibitors (SSRIs) — a class of antidepressants that includes Prozac (fluoxetine). Mice and rats that received SSRIs swam for longer periods than animals that did not.

The test's popularity grew in the early 2000s, when scientists began modifying mouse genomes to mimic mutations linked to depression in people. Many of these researchers adopted the forced-swim test as a "quick and dirty" way to assess their ability to induce depression, even though it was not designed for that purpose, says Trevor Robbins, a neuroscientist at the University of Cambridge, UK.

By 2015, mental-health researchers were publishing an average of one paper a day that used the procedure, according to an analysis by