

that the changes will apply to future students, too.

The university declined to give more details of the findings of the investigation. In its statement, it said: “We are providing further information only where we are satisfied that the privacy of individual students and staff would not be compromised and the necessary consents have been obtained.”

On 19 September, after Leverhulme’s decision to revoke Longrich’s grant, a university spokesperson told *Nature*: “We respect this decision by the Leverhulme Trust and appreciate the fact they will continue to support the existing PhD students.”

The spokesperson added: “All staff and students have a right to be treated, and have an obligation to treat others, with dignity and respect. The University has previously issued a statement about the result of a disciplinary hearing. We have been supporting students and staff throughout this period.”

*Nature* has asked Longrich for comment on the revocation of his grant and the investigation conducted by his university, and is awaiting his response.

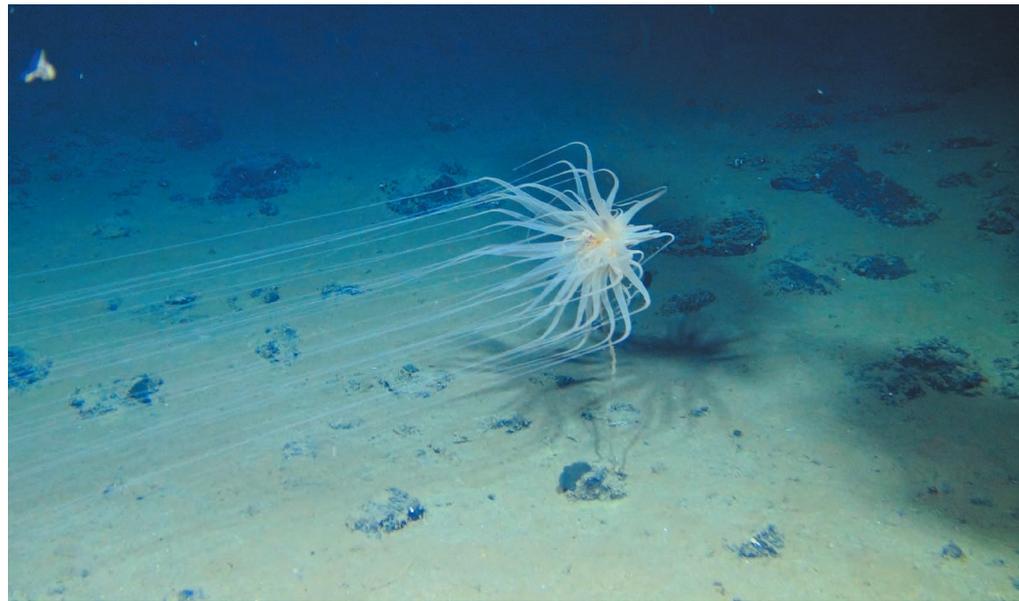
#### A STRING OF ALLEGATIONS

The news follows two other inquiries into bullying at prominent UK research institutions in the past month, one of which also led to a grant being revoked.

On 17 August, the Wellcome Trust, one of the world’s largest research-funding charities, announced that it would revoke a £3.5-million (\$4.5-million) grant from leading cancer geneticist Nazneen Rahman, after allegations that she had bullied scientists and other staff members when she worked at the Institute of Cancer Research (ICR) in London. The ICR concluded that there was enough evidence for some of the allegations to be considered at a disciplinary hearing, but Rahman resigned and the disciplinary hearing did not take place.

And at the end of August, the Wellcome Sanger Institute in Hinxton, UK, confirmed that it was investigating allegations of bullying there. ■

1. Martill, D. M., Tischlinger, H. & Longrich, N. R. *Science* **349**, 416–419 (2015).
2. Longrich, N. R. *J. Paleontol.* **84**, 681–694 (2010).



A new species of sea-anemone-like *Relicanthus* clings to a sponge stalk on Pacific Ocean floor.

#### ECOLOGY

# Deep-sea mining zone thrives with life

*Discoveries come as nations prepare to mine sea bed.*

BY AMY MAXMEN

**D**eep in the eastern central Pacific Ocean, on a stretch of sea floor nearly as big as the continental United States, researchers are discovering species faster than they can name them. And they are exploring newfound fossil beds of whales that lived up to 16 million years ago.

The findings — many reported for the first time last week at the Deep-Sea Biology Symposium in Monterey, California — have come as a shock. Some scientists had thought these vast underwater plains, 4,000–5,500 metres below the ocean surface, were relatively lifeless. But that is changing just as nations and corporations prepare to mine this patch of the Pacific sea bed for cobalt, manganese and other elements for use in technologies

such as smartphones and electric cars.

Researchers are now pushing the International Seabed Authority (ISA), the body that oversees mining in international waters, to limit environmental damage from future activity. The ISA, which is developing rules for mining in the ocean, is accepting comments on a draft plan until 30 September. Its goal is to release final rules by 2020, clearing the way for mining to start.

“What we do right now is going to have huge implications for decades,” says Diva Amon, a deep-sea biologist at the Natural History Museum in London. “We have a chance to do things as rigorously and responsibly as we can.”

The ISA began issuing contracts to explore the Clarion–Clipperton Zone (CCZ), a 6-million-square-kilometre swathe of the Pacific Ocean floor that stretches from ▶

D. J. AMON & C. R. SMITH

  
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#### NATURE PODCAST



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► Hawaii to Mexico, in 2001. The agency has given 29 companies permission to explore mining in international sea beds, including at 17 sites in the CCZ. Those companies, and the nations sponsoring them, must produce environmental assessments of their plots to satisfy the ISA's mandate to enable mining while preserving the ocean environment.

Sea-floor surveys are just beginning to map the vibrant life in areas marked for mining. Craig Smith, an oceanographer at the University of Hawaii at Manoa in Honolulu, helped lead expeditions in 2013 and 2015 to a territory in the eastern CCZ claimed by the United Kingdom. He was surprised to find hills and mountains rising across deep under-sea plains, and life more diverse than that seen at similar depths elsewhere.

Seventy per cent of the 154 marine worm species found by Smith's team seem to be unknown to science. The researchers discovered sea cucumbers they call "gummy squirrels", and a new member of the order *Relicanthus* that is related to sea anemones. The species attaches itself to the stalk of a sponge and extends its tendrils into the current. The team also saw rare worms that resemble squid.

Adrian Glover, a deep-sea biologist at the Natural History Museum in London, has found that potato-sized nodules of manganese and other metals in the eastern CCZ harbour

geometric sponges and other tiny, rarely seen invertebrates. And swathes of the sea floor are covered with enigmatic xenophyophores — ornate single-celled creatures that can be larger than a softball, and that exude slime as they feed. Most of the xenophyophores that scientists have found in the area were previously unknown, expanding the number of recognized species by about 30%.

But the wave of discoveries in the eastern CCZ is not limited to living species. Amon

**“What we do right now is going to have huge implications for decades.”**

stunned the audience at the deep-sea symposium with photos of fossilized whale skulls encrusted in metallic residues. Her preliminary analyses suggest the bones belong to perhaps 6 extinct species of whale that died between 1 million and 16 million years ago. A study published in August suggests that modern beaked whales feed on the sea floor in the eastern CCZ (L. Marsh *et al.* *R. Soc. Open Sci.* 5, 180286; 2018). The authors speculate that the whales ingest metallic nodules to regulate their buoyancy under water.

Amon is among the scientists who argue that their findings should prompt the ISA to conserve a section of the eastern CCZ. In

2012, the agency set aside nine preserves in the CCZ, relying largely on satellite images showing the density of plankton in the sea. But none of these areas is in the east, where researchers have begun to document surprisingly complex sea-floor ecosystems.

And Smith is pushing the ISA to support research in the open waters above sea-floor mining zones. He and his colleagues say that silt and toxins discharged by mining could prevent some marine organisms from breathing and eating, block bioluminescent light that some use to attract prey and find mates, and pollute the food web.

Researchers will never know everything that lives on the deep-sea plains, so they must plan around this uncertainty as they advise the ISA, says Malcolm Clark, a marine scientist who sits on the agency's legal and technical commission. “Scientists have to recommend a course of action that includes a learning process, so that if things start to go off the rails we can get back on course,” he says.

In the meantime, the ISA is under pressure to finalize its mining regulations by 2020 so that large-scale operations can begin. Japan began extracting deep-sea minerals late last year at a test site near the island of Okinawa. And a Belgian company, Global Sea Mineral Resources in Ostend, plans to test its equipment in the CCZ next year. ■

## POLICY

# NSF rolls out stringent anti-harassment policy

*National Science Foundation mandates that institutions report infractions by grant holders.*

BY ALEXANDRA WITZE

The US National Science Foundation (NSF) has unveiled its long-awaited policy to fight harassment by the scientists whose research it supports. Starting on 21 October, institutions that receive NSF grants must notify the agency of any finding related to harassment — including sexual harassment or sexual assault — by principal investigators (PIs) or co-PIs. Actions that must be reported include putting a scientist on leave during an investigation.

The rule will apply to all new grants and any extensions to existing grants made on or after that date. The NSF first proposed the policy in February, and received nearly 200 public comments on its initial draft.

It is the strictest action yet by a US research-funding agency on the topic of sexual

harassment. On 17 September, the National Institutes of Health said that it would introduce a centralized system for reporting harassment, but it has not imposed any new conditions on the grants it hands out.

Experts say that the NSF policy is a good first step, but far from a final one. “This rule is wonderful news, and goes beyond what I expected,” says Jane Willenbring, a geologist at the Scripps Institution of Oceanography in La Jolla, California, who has worked to improve safety at NSF-funded field sites, such as those in Antarctica. But she says that the NSF should consider investigating harassment complaints itself, rather than relying on the alleged perpetrator's academic institution to do the job.

Erika Marin-Spiotta, a geoscientist at the University of Wisconsin–Madison, says that she would have liked to have seen the NSF

policy apply to current grants, not just those awarded or extended after 21 October. The new rule, she says, “is the bare minimum requirement” of what is needed.

NSF director France Córdova says the rule will not be the agency's final action against harassment. “NSF does not consider its work in trying to address harassment finished,” she says.

## MANDATORY DISCLOSURE

The rule will require an institution to notify the NSF within ten business days if it finds that a PI or co-PI on an NSF grant has committed harassment. Institutions are also required to report when they take any administrative action related to a harassment finding or investigation, such as putting a PI or co-PI on leave. The NSF policy does not, however, require institutions to notify the agency when they