Scientists reacted swiftly to Singh's comments, launching an online petition asking the minister to retract his claims. Such comments harm the scientific community's efforts to propagate scientific thoughts and rationality through education and research, the petition said, and also diminish the country's image internationally. The petition had collected more than 3,000 signatures when its creators closed it after Javadekar responded to the situation, according to Mukund Thattai, a computational cell biologist at the National Centre for Biological Sciences in Bangalore who signed the petition. "There is strong support for science in India from government departments. But public attitudes can be swayed if people in responsible government positions make such statements," he says.

Soumitro Banerjee, general secretary of the advocacy group the Breakthrough Science Society in Kolkata, thinks that Singh's comments might already have done damage. "The seed of doubt has been planted in the minds of the common people that Darwin's theory of evolution may, after all, be incorrect," says Banerjee, a physicist at the Indian Institute of Science Education and Research in Kolkata.

The minister's comments also prompted a statement from three Indian science academies. "It would be a retrograde step to remove the teaching of the theory of evolution from school and college curricula or to dilute this by offering non-scientific explanations or myths," they said.

Singh's remarks come as India faces a rising tide of pseudoscience. Last year, the Breakthrough Science Society urged researchers to refute unscientific ideas after an astrology workshop was planned at the prestigious Indian Institute of Science in Bangalore. The event was later cancelled.

Vidita Vaidya, a neurobiologist at the Tata Institute of Fundamental Research in Mumbai, says the latest incident highlights the growing gap between the Indian scientific community, policymakers and the public. "It is the responsibility of the scientific community to engage much more actively to ensure that science education and research in this country continue to thrive," she says. ■

CHINA DAILY/REUTERS

Flames envelop the *Sanchi* oil tanker in a picture taken on 13 January.

ENVIRONMENT

Spill in East China Sea raises big questions

Never before has so much light crude oil poured into the ocean.

BY CALLY CARSWELL

When the Iranian oil tanker *Sanchi* collided with a cargo ship, caught fire and sank in the East China Sea in mid-January, an entirely new kind of maritime disaster was born. Two weeks later, basic questions remain unanswered about the size of the spill, its chemical make-up and where it could end up. Without that crucial information, scientists are struggling to predict the incident's short- and long-term ecological consequences.

"This is charting new ground, unfortunately," says Rick Steiner, a former University of Alaska professor in Anchorage who has studied the environmental impacts of oil spills and consulted with governments worldwide on spill response. "This is probably one of the most unique spills ever."

The infamous spills of the past — such as the Deepwater Horizon disaster in the Gulf of Mexico in 2010, or the *Exxon Valdez* tanker rupture in Alaska's Prince William Sound in 1989 — involved heavier crude oil. That oil can remain in the deep ocean for years, and it has chronic impacts on marine life. The *Sanchi* carried a little more than 111,300 tonnes of natural-gas condensate, a lighter, more volatile petroleum product that doesn't linger as long in the environment. Condensate has never before been unleashed into the sea in large quantities.

Unlike heavy crude, condensate doesn't accumulate in shimmering slicks on the sea surface, which makes it difficult to monitor and contain. Neither does it sink to the ocean floor, as do some heavier constituents of crude over time. Rather, it burns off, evaporates or dissolves into the surface water, where some chemical components can linger for weeks or months.

"Most oil spills have a chronic toxicological effect due to heavy residuals remaining and sinking over time," says Ralph Portier, a marine microbiologist and toxicologist at Louisiana State University in Baton Rouge. "This may be one of the first spills where short-term toxicity is of most concern."

A significant, but unknown, portion of the *Sanchi*'s condensate probably fuelled the fires that followed the collision. In the waters immediately surrounding the tanker, Portier says, ▶

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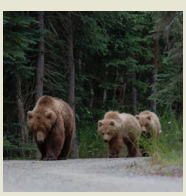

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the conflagration and gaseous fumes would have killed off or injured phytoplankton, along with birds, marine mammals and fish that were caught in the vicinity when the tanker ignited.

UNCHARTED TERRITORY

Moving beyond the fire, the impact of the accident becomes harder to discern. That's because the exact chemical composition of the condensate has not yet been made public, Steiner says, and because no one knows how much of the condensate dissolved into the water.

"The part I'm most worried about is the dissolved fraction," Steiner says. Toxic chemicals in the condensate could harm plankton, fish larvae and invertebrate larvae at fairly low concentrations at the sea surface, he says. Fish could suffer reproductive impairments as long as chemicals persist in the water, and birds and marine mammals might experience acute chemical exposure. "In a turbulent, offshore environment, it dilutes fairly quickly," he says. "But it's still toxic."

Because this type of spill is new, Portier says, scientists don't yet understand the ultimate consequences of acute exposure to condensate in the sea, or where it's breaking down and dispersing. "That's really where the science is missing," he says.

Researchers are also scrambling to assess where pollutants from the *Sanchi* could travel. Groups in both China and the United Kingdom have run ocean-circulation models to predict the oil's journey, and the models agree that much of the pollution is likely to end up in a powerful current known as the Kuroshio, which flows past southeastern Japan and out to the North Pacific. The European models suggest that chemicals from the *Sanchi* could reach the coast of Japan within a month. But the Chinese models indicate that they are unlikely to intrude on Japanese shores at all.

Katya Popova, a modeller with the National Oceanography Centre in Southampton, UK, isn't sure why the models disagree on this point. But, she says, the discrepancy points to the importance of forging international collaborations to increase confidence in model projections during emergencies: "This is something that the oil industry should organize and fund to improve preparedness."

Fangli Qiao, an oceanographer at China's State Oceanic Administration in Qingdao, says his group's models indicate that the pollution's probable path overlaps with Japanese sardine and anchovy fisheries. Still, Popova cautions that the models are imprecise indicators of potential harm to fisheries or coastlines.

"All we're saying is, if something is spilled here at this time, we can give you the most probable distribution," she says. "We don't know what type of oil or how much." Those are crucial details because condensate components could degrade or evaporate before reaching important fisheries or shores. "A monitoring programme is the most pressing need right now," Popova says, "to see where it goes and in what concentration."

Yet Steiner says that comprehensive environmental monitoring doesn't seem to have started. Official Chinese-government statements have included results from water-quality monitoring at the wreckage site, but none from the downstream currents that could be dispersing the pollution.

"Time is of the essence, particularly with a volatile substance like condensate," Steiner says. "They needed to immediately be doing plankton monitoring, and monitoring of fish, seabirds. I've seen no reports of any attempt to do that." ■

CORRECTION

The News Feature 'The dark side of light' (*Nature* **553,** 268–270; 2018) erred in saying that differing levels of skyglow had no effect on algae. In fact, it was zooplankton that were analysed. It also cited the wrong journal in reference 9: it should have referred to *Proc. R. Soc. B.*