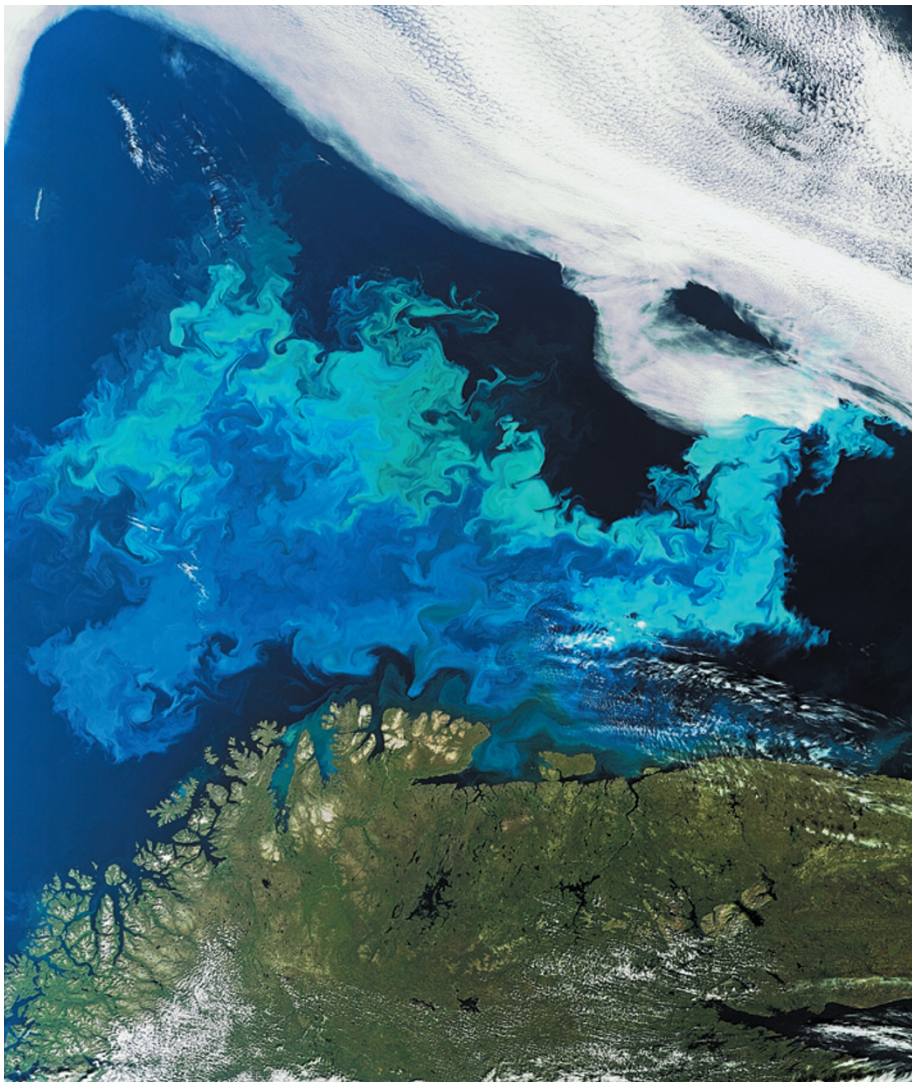
NEWS IN FOCUS

ESA



Envisat's MERIS instrument could monitor toxic algal blooms, such as these swirling in the Barents Sea.

ENVIRONMENTAL MONITORING

Europe loses sight of Earth

Envisat crisis rekindles row over funding for its successors.

BY GEOFF BRUMFIEL

With hopes fading fast for the crippled Earth-observing satellite Envisat, researchers are warning that delays to its replacements will leave Europe lacking vital monitoring data for years to come.

Launched in 2002, Envisat is the largest environmental satellite ever built and the mainstay of the Earth-observing programme for the European Space Agency (ESA). The 8.2-tonne satellite has 10 instruments with which to take the planet's pulse, including radars, infrared and optical imagers, and spectrometers.

Controllers at ESA unexpectedly lost contact with the €2.3-billion (US$3-billion) behemoth on 8 April. Failure of either the satellite's main computer or its power system is thought to be to blame, according to Manfred Warhaut, head of ESA's mission operations department in Darmstadt, Germany. "It's not looking promising," he says.

Envisat's data have been used in more than 2,000 scientific publications, according to ESA, and the satellite also supports a plethora of political, commercial and humanitarian efforts. Its altimeter is crucial for ocean-wave forecasts used by the shipping industry, for example, says Erland Källén, director for research at the European Centre for Medium-Range Weather Forecasts in Reading, UK. And the satellite's ozone measurements have been vital in showing the success of the Montreal Protocol in controlling ozone-damaging pollution, says John Burrows, a physicist at the University of Bremen in Germany, and principal investigator on Envisat's SCIAMACHY instrument, which tracks atmospheric pollution. "It's an absolute disaster for all sorts of reasons," Burrows says.

SCIAMACHY also had a limited ability to measure carbon dioxide in the atmosphere, which became crucial after the 2009 launch failure of NASA's Orbiting Carbon Observatory. Envisat's silence leaves only one satellite capable of measuring CO_2 throughout Earth's atmosphere: Japan's Greenhouse Gases Observing Satellite.

The loss of Envisat has also stoked a row about funding for its successors. ESA plans to launch five Sentinel satellites during the coming decade to both improve on and replace Envisat's capabilities, with the first three scheduled to launch over the next two years. Although Envisat had already exceeded its anticipated five-year operational lifetime, researchers had hoped that it would last ▶

long enough to overlap with at least some of the Sentinels, allowing for cross-calibrations of instruments and continuous data-taking. "Continuity for a climate record is extremely important," says Fred Prata, a climate scientist at the Norwegian Institute for Air Research in Kjeller. Given Envisat's troubles, he says, "Europe should really be fast-tracking ESA's Sentinel programme".

But the European Commission does not want to allocate €5.8 billion of its 2014–20 budget to the programme that would operate the satellites, the Global Monitoring for Environment and Security (GMES). Instead, the commission says, member states should make additional contributions to finance the programme — something that is unlikely to happen in the current fiscal climate (see *Nature* **480,** 19–20; 2011). ESA, meanwhile, says that it will not launch the first Sentinel without being certain that its operating costs will be covered.

Volker Liebig, director of ESA's Earth-observing programme, accuses the commission of using GMES as a bargaining chip in broader budget negotiations. "They are taking this as a tactical hostage to get more money from the member states," he says. Carlo Corazza, a spokesman for the commission, denies this, insisting that his organization is only trying to ensure that the GMES programme receives adequate funding.

With the negotiations dragging on, Liebig says that he is running out of time to make arrangements with the French spaceflight company Ariannespace in Evry-Courcouronnes, which will provide the rocket to launch Sentinel 1. That deal must be in place by June if the satellite is to fly by mid-2013. Corazza says that discussions are continuing fast enough to keep Sentinel on track.

Not everyone believes that the situation poses a significant problem for Earth observation. Other satellites, such as NASA's Aqua and Terra missions, can replace Envisat's capabilities, says Ranga Myneni, an environmental scientist at Boston University in Massachusetts. Indeed, satellites launched by NASA freely provide their data in formats preferred by many scientists, and are thus more widely used than Envisat.

But Envisat had some functions that cannot be replaced. In addition to its ability to measure CO_2, the satellite's Advanced Along Track Scanning Radiometer was, Prata says, the world's best instrument for measuring sea surface temperatures. It was also part of a €2-million project to improve the forecasting of volcanic ash clouds, such as the one that belched from Eyjafjallajökull in Iceland and disrupted transatlantic air traffic in 2010. The failure — together with the gap in observations — means that the project will have to look to NASA instruments instead.

Michel Verstraete, a climate scientist at the European Commission's Joint Research Centre in Ispra, Italy, points out that Envisat's synthetic aperture radar was particularly good at spotting standing water, even under heavy cloud cover. "If tomorrow there is a flood, people will ask, 'Where are the data?'" he says. Europe needs its own robust capabilities to monitor weather and crops, Prata adds. "If you have control of your own satellites, you don't have to ask your friends or your enemies," he says.

With a financial impasse on one side and a moribund satellite on the other, researchers are left with few options, Burrows says. "We're praying that Envisat might come back. I'm going to church again." ■

GENOMICS

A bloody boon for conservation

Leeches provide traces of DNA from other species.

BY EWEN CALLAWAY

Bloodsucking leeches are offering the best hope of finding one of the world's rarest animals. The saola (*Pseudoryx nghetinhensis*) was first described from skulls found in a Vietnamese forest reserve[1], but the elusive antelope has rarely been seen alive. Little is known about its range or population, which probably numbers in the low hundreds.

Conservationists are now planning to trawl tropical leeches for saola DNA. Prompted by research published this week[2] showing that the bloodsuckers can store DNA from their meals for several months, the saola search is at the vanguard of an approach to gauging biodiversity that could prove much more efficient than conventional methods. Rather than setting out camera traps, the idea is to collect and sequence DNA left in the environment, in everything from soil to leeches' stomachs.

"I am almost sure that in ten years all the research on biodiversity will be done with DNA, because it will be so easy to get this type of information and the cost is not very high," says Pierre Taberlet, a geneticist at Joseph Fourier University in Grenoble, France, and co-editor of the April issue of *Molecular Ecology*, which is devoted to the emerging field of studying environmental DNA.

Bloodsuckers feast on the forest's rare delicacies.

W. KOLVOORT/NATUREPL.COM

The saola is so elusive that it has been dubbed the Asian unicorn. It hadn't been spotted for a decade until 2010, when villagers in the Laotian province of Bolikhamxay caught one alive, only for the animal to die after a few days in captivity.

In 2011, Vietnam established a small saola reserve in the animal's only known habitat, the Annamite mountains that straddle the country's border with Laos. A more precise estimate of the antelope's range would help to target conservation efforts, says Nicholas Wilkinson, a Vietnam-based wildlife ecologist at the University of Cambridge, UK, who is working with the conservation group WWF. Their team failed to find the saola using camera traps and considered bringing in trained dogs to help the hunt, at an estimated cost of US$400,000. "I, to a large extent, had given up on finding a survey method that would be useful in time to save the species," Wilkinson says.

But last year, he received an e-mail from geneticist Thomas Gilbert at the University of Copenhagen, describing his experiments with leeches. Gilbert, his colleague Mads Bertelsen and their team had fed goat blood to medicinal leeches (*Hirudo* spp.) — something that is "a lot harder than it sounds", says Gilbert. The team resorted to tempting the creatures with blood-filled condoms warmed under a heat-lamp, and putting the leeches into syringes attached to blood-filled test tubes sealed by a thin film. After killing the leeches over the course of several months, the team identified goat DNA in every one of them.