

Such new ventures have taken place against a dramatically changing summer environment in the region.

A new study examining satellite images of the Barents Sea, located north of Scandinavia, over the past 26 years has shown that the ice edge here has recently been retreating in the face of rising surface temperatures. Jennifer Francis of Rutgers University, reporting in *Geophysical Research Letters*, showed that warming waters in the Barents Sea — which had risen by 3°C since 1980 — are likely to blame for the reduction in winter ice cover.

Two factors appear to be in play; warming Atlantic waters funnelled by the Gulf Stream and solar heating of the open ocean as ice melts in the summer, both of which make it harder to form sea ice in the winter.

Julienne Stroeve of the NSIDC used satellite data that tracked the movement of the sea ice over the past 30 years to estimate the age of the ice. Newly formed ice (about one or two years old) will only be about one metre thick, whereas older ice will be thicker. Ice thickness is key to its survival because thinner ice vanishes much faster during the summer.

For animals that depend on ice and seclusion from humans, such as polar bears, the changes present a growing threat to their future. But for marine organisms, the greater area of sea surface extends their range. Seals and whales have been seen further north than previously. Sightings of the legendary narwhal, with its extraordinary unicorn-like tusk have been more widespread as their fish prey have also moved further north.

But environmentalists worry that in the longer term things may change for the worse if larger predators, such as orca, extend their competition with the narwhals, and long-established krill feeding grounds are disrupted. There are already worries that the traditional Arctic feeding grounds of grey whales may be failing as emaciated individuals have been returning to Pacific breeding grounds.

But these environmental and commercial changes, linked to climate change through ever-growing atmospheric greenhouse gas concentrations, appear to be doing little to galvanise efforts to curb emissions.

The UN held a summit late last month in New York to try to move forward agreement on limits to greenhouse gas emissions after the end of the current Kyoto protocol in 2012. Leaders and ministers from more than 150 nations attended as UN Secretary General Ban Ki Moon gave an impassioned speech: “Today the time for doubt has passed,” he said, “The time for action is now.”

But by the end of the session, commentators believed the delegates had come little nearer to negotiating a more complete successor to Kyoto.

It's now 20 years since the issue of climate change was first raised at the UN's General Assembly by Malta, 15 years since the Earth Summit in Rio de Janeiro and 10 years since the Kyoto agreement.

It was widely observed that the essential deadlock that has held up stronger international action on climate change — striking an acceptable balance of responsibilities between developed and developing countries — remains unbroken, and there was little evidence in New York that would change before the next major UN climate conference in Bali, later this year.

UN efforts were also stymied by the absence of the US. President George Bush was instead heading

for a different meeting later that week, involving representatives from the major carbon-emitting countries — including India and China — invited to the White House to discuss long-term goals on climate action.

Administration officials insisted the two meetings were complementary, but, as the US continues to push for mostly voluntary measures to reduce emissions, while the Kyoto Protocol is based on mandatory cuts, contradiction appears inevitable.

One of the problems is that the Kyoto Protocol requires emission cuts from the developed countries that ratified the treaty, but places no demands on developing countries, such as the fast-growing India and China.

“We only have two years to reach an agreement on post-Kyoto, and only three years to prepare the ground”, says Achim Steiner, executive director of the UN Environment Programme.

But one key American politician who did attend the UN meeting was California governor, Arnold Schwarzenegger. The governor backed a 2006 California law to reduce state greenhouse gas emissions by 25 per cent by 2020 — exactly the sort of mandatory cut President Bush refuses to consider. “The consequences of global climate change are so pressing, it doesn't matter who was responsible for the past”, he said. “What matters is who is answerable to the future. And that is all of us.”

Cell searching

The UK government has given a cash boost to the three Rs, namely Replacement, Refinement, and Reduction of the use of animals in research. **Michael Gross** reports.

The United Kingdom boasts the most vibrant biotech scene in Europe. As an unwanted side effect, it also has the largest number of animal experiments, and the most active protest

against them. But can it continue to have the biotech without the animal troubles?

In 2004, the government announced the establishment of the National Centre for the Replacement, Refinement, and Reduction of Animals in Research, or NC3Rs for short. Now it has increased the research funds handed out via the NC3Rs to £2.4 million, in response to the number of high-quality grant applications received.

The boost to the NC3Rs comes at a time of considerable

tension between opponents of animal experiments and their defendants. Oxford University's new biomedical facility has been dogged by protests that have delayed its construction. But the tide turned somewhat last year when a student-led group, Pro-Test, led a march in support of the need for animal experiments. Researchers were keen to point out the benefits to human medicine that had come from such work. Laurie Pycroft, age 16, who founded the movement, supported the new Oxford facility and said: "I felt that it was about time to speak out in support of scientific research."

There is a wide range of research insights to be gained from the efforts to replace, reduce and refine the use of animals

While feelings still run high on these issues, all sides will welcome the funding boost for the NC3Rs. This is an independent organisation supported jointly by funding agents, including the Wellcome Trust and the relevant research councils, industry (including GlaxoSmithKline and Unilever), and the government.

The £2.4 million cash boost announced by science minister Ian Pearson represents an increase of £1 million over last year's grants and goes to 11 new projects, of which six are mainly aimed at replacement, four at refinement, and one at reduction. The centre has identified two priority areas, namely tissue engineering, where four of the grants were awarded, and refinement of the most harmful procedures (categorised as 'substantial severity'), which received three of the grants.

One of the largest grants, £364,044, goes to Jamie Davies at the University of Edinburgh, who is developing ways of



Ways out: The UK is looking to reduce the country's large number of animal experiments. (Photo: Mauro Fermariello/Science Photo Library.)

growing kidney tissues in the lab, in an effort to replace the mice currently used in kidney research. "Different types of cells will be developed to generate the different parts of a kidney in the laboratory and these will then be used in combination to try to recreate a whole kidney. The cultured kidneys will then be used to gain a better understanding of normal kidney development to aid the search for treatments," Davies said.

In similar projects, Donna Davies at Southampton is aiming at modelling the airways of asthma patients by tissue engineering, while William Hope at Manchester is recreating human alveoli *in vitro* to enable animal-free testing of antifungal therapies, and Peter Jones at King's College London develops *in vitro* systems to study beta cell dysfunction in diabetes.

The cheapest project on the list, at just £59,208, aims to avoid invasive procedures by making individual frogs identifiable by image-processing methods, similar to methods already used in

the observation of elusive wildlife, such as whale sharks (Curr. Biol. (2006) 16, R3). The fundamental conundrum that Matt Guille at the University of Portsmouth is going to address with his research is that frogs need to be kept in large groups so they can live their lives normally, but that they still have to be identified individually. While all existing methods of identification are invasive or harmful to some extent, Guille hopes to develop a method "which measures the pattern on the backs and feet of the animals using digital imaging and therefore is not harmful to the frog. If successful, this technique will be marketed commercially."

Thus, from modelling human disease through to keeping frogs happy, there is a wide range of research insights to be gained from the efforts to replace, reduce and refine the use of animals. Ultimately, there is bound to be more biotech gain with less animal pain, so everybody wins.

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