Abstractions

BRIEF COMMUNICATIONS AUTHORS

There is plenty of evidence that fish stocks in coastal areas have been depleted. But little is known about fish that live in deeper waters. Many deep-sea species, although they live longer than shallow-water fish, also take longer to reach maturity. As a result, these species might have a harder time bouncing back from fishing. Jennifer Devine, a PhD student at Memorial University in St John's, Newfoundland, and her adviser Richard Haedrich, along with their colleague Krista Baker (not pictured) surveyed five deep-sea species, and concluded that all are endangered (see page 29). Haedrich and Devine discussed the implications with *Nature*.

Why did you take on this study?

Haedrich: We've been interested for a while in Newfoundland with what's going on in fisheries, but we also see this as a very large-scale ecological experiment.

How did you choose the five species that you studied (roundnose grenadier, onion-eye grenadier, blue hake, spiny eel and spinytail skate)?

Devine: These are some of the more abundant deep-water species, and the data are there for them.

Haedrich: We needed to measure declines over three generations, but those data are generally lacking. We know that declines in other species are taking place, but we don't know the baseline or the generation time.

You call for urgent action to address the depletion of these species. What specific policies would you recommend?

Devine: Implementing marine protected areas — setting aside particular habitats or areas where these species spawn. Also, more informed catch quotas. Right now, the catch quotas aren't based on anything biological.

How do you think Canadian policy-makers will react to this study?

Haedrich: It takes a while for research to get into the system. If there is some awareness of problems, the wheels begin to turn slowly, and I suspect that there will be some impact on fishing practice. The government has tried to protect fish that live in shallow water, including cod. Policy-makers are in a tight place though, because lots of jobs depend on these fisheries. The point we are trying to make is that aggressive fishing affects not just species such as cod, halibut and redfish, but extends to other members of the fish community. ■

MAKING THE PAPER

Bruno Sicardy

Catching Pluto's moon Charon in an international network of telescopes.

Using a telescope to spot Charon, Pluto's moon, passing in front of a star is like trying to catch a fly with chopsticks. The satellite is tiny and rarely passes across a star bright enough to yield useful measurements.

But Bruno Sicardy, of the Paris Observatory, decided to attempt such a feat this year, in the hope of determining the satellite's radius. Before Sicardy's work, the best estimate of Charon's radius, calculated from models, was 600–650 km. "This translates into big errors on density," Sicardy says. The mass of Pluto and Charon are well known, he adds, but measurements of radii are needed to determine their density, and therefore composition.

Also, Sicardy wanted to see whether Charon has an atmosphere. As the satellite is about half the size of Pluto — which does have an atmosphere — Charon provides an opportunity to ask an interesting question, says Sicardy: "What is the lower size limit for a body to keep an atmosphere?"

The problem is that, for Earth-bound observers to measure Charon's radius, the satellite must pass directly between us and a star; such 'occultations' are rare. One, however, was scheduled for 11 July 2005. To make sure he seized the moment, Sicardy worked for a year forming alliances with both government and amateur astronomers, all of whom could, based on calculations of where Charon ought to be, point their instruments in its path.

And even making these predictions was tricky, as Pluto and Charon's orbit wobbles through the sky, creating minute changes in position that could defeat astronomers' efforts to take their measurements. Calculations from NASA's Jet Propulsion Laboratory helped to improve the odds. Charon was discovered in 1978; the most recent occultation occurred in 1980, and was observed from South Africa.

Sicardy eventually lined up about 15 telescopes of various sizes across six Latin American countries. "The idea was to catch Charon at different places, and then eventually reconstruct its size and shape," he says.

Organizing this mix of astronomers was half the fun, Sicardy says: "We've created a club. It's a very long process. It takes years." But visiting the members was enjoyable. "It's like eighteenth-century astronomy," he says. Just as Captain James Cook travelled halfway round the world to observe a transit of Venus, "we go and travel somewhere far away, where you can observe something hard to get elsewhere".

But the most important part was successfully seeing the star disappear behind Charon. There were problems: "Some of the observations were lost because of stupid things, such as data not being recorded on the hard disk," Sicardy says. But despite the glitches, the team got four solid occultations. "All four of these chopsticks were aligned with the trajectory of the fly."

The result, published on page 52, shows that Charon has a radius of 603.6 ± 1.4 km. This agrees well with measurements by a team at the Massachusetts Institute of Technology, made during the same occultation and published on page 48, of 606 ± 8 km. ■

QUANTIFIED **2005 PHYSICS**

A numerical perspective on *Nature* authors.

In 2005, the Year of Physics, *Nature* published more than 900 papers describing original research, of which 39% were in the physical sciences. The 2005 physics paper most accessed online described a new kind of 'bench-top' nuclear fusion (B. Naranjo *et al. Nature* **434,** 1115–1117; 2005).

The second most accessed paper shows that the potential destructiveness of hurricanes has increased since the mid-1970s, and suggests that future global warming may increase hurricanes' destructiveness still further (K. Emanuel *Nature* **436,** 686–688; 2005). And the third reveals that the climate of the past 2,000 years was more variable than we thought, although the 1990s remain the warmest decade on record (A. Moberg *et al. Nature* **433,** 613–617; 2005).

34,108 downloads have been made of the paper by B. Naranjo *et al.* since its publication in April 2005.

42 countries hosted authors contributing to *Nature*'s physics papers in 2005.

2,469 authors contributed to research in the physical sciences published in *Nature* in 2005.

5 is the median number of authors per *Nature* paper published in the physical sciences in 2005.