ACOUSTICS

Sounding Off

LAWSUITS BLOCK SCIENCE OVER FEARS THAT SONAR HARMS WHALES **BY KRISTA WEST**

The new year didn't start off so well for conservation biologist Peter L. Tyack of the Woods Hole Oceanographic Institution. In January a judge stopped his tests of a new, high-frequency sonar system intended to act as a "whale finder," for fear that the bursts of sound might harm gray whales migrating close by.

The decision is the latest in a rash of court cases in which public concern for marine mammals has stopped acoustic research. Last October a judge halted seismic operations in the Gulf of California after whales became stranded nearby, and in November a court order limited the U.S. Navy's sonar tests, citing multiple suspicious strandings in years past. Yet the recent rulings have nothing to do with any new science; sound has been used to explore the seas for decades. Rather the national media have tuned in, and the subsequent legal activity is putting scientists in a catch-22: the laws need to be improved to protect marine life from harmful acoustic research, but more acoustic research is needed to determine what is harmful to marine life so that the laws can be improved.

Tyack's experience this winter is a perfect example of the circular debate. His project off the coast of California was intended to help marine mammals by giving boats a tool to detect the sea creatures and thereby avoid exposing them to potentially harmful man-made noises. Tyack's whale finder got the legal go-ahead from the National Marine Fisheries Service (NMFS) for testing. Then an attorney representing six environmental groups convinced a San Francisco judge to stop the research. The judge ruled that the NMFS must go back and com-

JOE MOBLEY

WHALE SURVEYS, which spotted this sperm whale in 2002, were done near North Pacific Acoustic Laboratory operations to see if sound affected the mammals.

plete an environmental impact assessment, even though fish finders (to which Tyack's whale finder is similar) do not require such approval and are unregulated.

Joel Reynolds, an attorney with the Natural Resources Defense Council, says Tyack and his team were "hung out to dry" by the NMFS, which did not adequately complete its part of the permit process. And although Reynolds is a staunch defender of the current system, calling U.S. marine laws among the strongest in the world, he says they are not perfect. The permit process can be expensive and slow, and it is not always applied equally to academic research, industry and the military.

One of the earliest tussles between academics and whale defenders involved the Acoustic Thermometry of the Ocean Climate (ATOC) project. In 1995 acoustic sources off the coast of Kauai, Hawaii, and Point Sur, Calif., began transmitting low-frequency sound waves across the North Pacific to measure large-scale changes in ocean temperature. The ATOC, now known as the North Pacific Acoustic Laboratory (NPAL), transmitted sound for several years before stopping in 1999 for the renewal of marine mammal permits; operations resumed in Hawaii last year.

Using aerial surveys to better understand marine life near NPAL operations, researchers counted significantly more marine mammals in 2002, when the sound was on, compared with 2001, when the sound was off. Good ocean conditions and an increase in humpback whale populations probably explain the increase in sightings. NPAL transmissions have not had any obvious effects on marine mammals, remarks NPAL's Peter Worcester of the Scripps Institution of Oceanography. (As for the experiment itself, Worcester is excited about finally obtaining temperature data: "The Pacific north of Hawaii is warming, but between Hawaii and the mainland it's cooling.")

More specific knowledge about how sound affects marine mammals may come this summer, when Tyack will team up with researchers from Columbia University's Lamont-Doherty Earth Observatory to measure the effect of sound on sperm whale behavior. One ship will fire an array of airguns, and the research vesssel *Maurice Ewing* will tag and track the response of the whales.

Perhaps not surprisingly, Tyack's group may find itself in another bind. Operations of the *Maurice Ewing,* long regarded as one of the quietest in the fleet, were stopped last October after two beaked whales were stranded in the Gulf of California near the vessel. The pending legal action against the *Maurice Ewing,* says Maya Tolstoy, a lead researcher at Lamont-Doherty, may threaten work planned for this season.

Krista West, based in Las Cruces, N.M., wrote about Ted Turner's conservation efforts in the August 2002 issue.

THE NAVY AGAINST THE LAW

The U.S. Navy is one of the oldest and loudest producers of sound in the sea and has been testing high-frequency sonar systems designed to detect enemy vessels for decades. In 1994 attorney Joel Reynolds of the Natural Resources Defense Council discovered that the navy was testing sonar without the required sound permits and has been engaged in litigation with it ever since.

Most recently, the navy proposed changing the legal definition of marine mammal harassment to encompass only "significant" changes in behavior. The NRDC is fighting this proposal because, Reynolds says, it could greatly reduce the effectiveness of current laws by making them subjective rather than objective. At the end of 2002 a federal judge restricted navy sonar testing to a relatively small swath of the Pacific, where operations continue today.

ASTRONOMY

Interstellar Pelting

EXTRASOLAR PLANET AND CLIMATE CLUES FROM ALIEN MATTER

BY GEORGE MUSSER

For quite the longest time, astronomers thought of the galaxy as a kingdom of independent principalities. Each star held sway in its own little area, mostly cut off from all the others. The Milky Way at large determined the grand course of cosmic history, but the sun ran the day-to-day affairs of the solar system. Gradually, though, it has dawned on researchers that the sun's sovereignty is not so inviolable after all. Observations have shown that 98 percent of the gas within the solar system is not of the solar system—it is foreign material that slipped through the sun's Maginot Line. One of every 100 meteoroids entering Earth's atmosphere on an average night is an interstellar intruder.

"When I was an astronomy grad student in Berkeley in the late '60s, interstellar matter was what you observed towards other stars," says Priscilla C. Frisch of the University of Chicago, a pioneer in this subfield of astronomy. "No one dreamed that it was inside of the solar system today." Telescopes have cobbled together a map of our neighborhood;