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Sea Squirts Are a Nuisance on Georges Bank

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Contact Information:

U.S. Department of the Interior, U.S. Geological Survey
Office of Communication
119 National Center
Reston, VA 20192

Ellen Mecray, USGS - emecray@usgs.gov
Phone: 508-457-2213

Terri Frady, NOAA Fisheries - teri.frady@noaa.gov
Phone: 508-495-2239

Todd McLeish, URI - tmcleish@uri.edu
Phone: 508-874-7892

Woods Hole, MA—Researchers have just completed a field survey of the invasive sea squirt colony on the Georges Bank, first discovered in 2003. A wider area was searched for the sea squirt this year, and it was mapped over about twice the area observed in 2004. Results show that the species is present in two adjacent areas totaling 88 square miles in U.S. waters near the U.S.-Canada boundary. The very large mat-like colonies observed in 2004 have been replaced by fewer smaller ones. The Georges Bank occurrence is the largest known infestation of colonial sea squirts in a major offshore fishing ground.

Scientists from the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), and the University of Rhode Island (URI) conducted the survey aboard the NOAA Ship *Delaware II* during the last two weeks of August 2005. In the 2004 survey, the sea squirt colony was mapped over 40 square miles before weather truncated the cruise. This year's wider survey showed it to be present over at least 67 square

miles of the same general area. Scientists also discovered an additional infestation of 21 square miles, possibly in an early stage, that lies 10 miles to the east of the original observations, in an area now closed to fishing.

The research team also surveyed three sites in Canadian waters where seabed conditions are similar to those on the U.S. part of the bank and found no evidence of the sea squirt.

The mats were observed on gravel substrate that is highly productive for fish and sea scallops on the northern edge of Georges Bank. Video and photo transects made using the USGS seabed observation and sampling system (SeaBOSS) documented the distribution of the colonies in water depths of 45 to 65 meters (145 to 213 feet).

Scientists will analyze data collected on the cruise to determine if the tunicate invasion has the potential to alter seabed communities that sustain commercial fish species. There is concern that the sea squirt mats could form a barrier between fish and their prey that live in the seabed. Moreover, as no organisms have been observed to grow on the mats, it is possible that the tunicates would be an unfavorable surface for the settlement of scallop larvae and larvae of other species. Samples of the tunicate will be evaluated to determine its nutritional value to predators, and to confirm identification of the species through DNA analysis.

Sea squirts are tunicates, a type of sea life with a primitive spinal cord in the larval stage and a firm, flexible outer covering in the adult stage called a "tunic," from which the name derives. The Georges Bank occurrence is of the genus *Didemnum*. They form dense mats, made of thousands of minute individuals, by attaching to firm substrates such as gravel, sea scallops, mussels, docks and other structures, and even seaweed. Tunicates can overgrow sea scallops and mussels, and they may affect other species of clams and worms that live in the seabed below the tunicate colony. Invasive species are plants or animals that move into new areas and displace native species, or native species that overgrow and damage an ecosystem.

This tunicate can reproduce and spread either sexually or asexually (by budding.) The free-swimming tadpoles produced by sexual reproduction live only a few hours before attaching to the seabed and forming new colonies. By contrast, fragments of colonies are long-lived and can be spread by tidal and storm currents. Controlled experiments in Cape Cod waters by USGS and Woods Hole Oceanographic Institution scientists have shown that small pieces removed from sea squirt colonies increase dramatically by budding in a matter of weeks. Thus, fragmentation of tunicate mats could promote the spread of the species.

The species is known to thrive in marine environments that lie within its preferred temperature range (28 to 75 degrees F) and that have firm substrates and plentiful food, conditions that are widespread off the coasts of New England and Atlantic Canada. The presence of tunicates could change gravel habitats that lie along the northern edge of Georges Bank, and immobile sand habitats characteristic of southerly Bank. *Didemnum* cannot survive on habitats of moving sand, and therefore much of the shallow Bank crest is not threatened. It is not yet known to occur on mud habitats that are typical of the deep basins of the Gulf of Maine.

This species of squirt also occurs along the coasts of the Netherlands and France. In North America, it has been documented in waters from Long Island, New York to Eastport, Maine on the U.S.-Canadian border; California coastal waters; in Puget Sound, Washington; and along the coast of British Columbia. The same species (or a close relative) is present at several localities in New Zealand.

For images and pictures see: <http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/index.htm>

Caption for Image DSCF1762. Tunicate colony of *Didemnum* sp., with a typical lumpy surface, encrusting and cementing pebbles and a razor clam shell that form the seabed. Small pebble in lower center of image is 0.5 inches (1.2 cm) long. Northern Georges Bank (41 deg 51.658 min N lat, 67 deg 25.672 min W long). Water depth 58 m (190 ft). August 2005. Width of specimen shown is 5.3 inches (13.5 cm). Collectors: Page Valentine (USGS), Jeremy Collie (URI), and Robert Reid (NOAA). Photo credit: Dann Blackwood, U.S. Geological Survey.

Caption for Image DSCF1770. Close up of the surface of *Didemnum* sp. showing small yellow individual sea squirts arranged along common canal systems. Small pebble is 0.5 inches (1.2 cm) long. Northern Georges Bank (41 deg 51.658 min N lat, 67 deg 25.672 min W lon). Water depth 58 m (190 ft). August 2005. Collectors: Page Valentine (USGS), Jeremy Collie (URI), and Robert Reid (NOAA). Photo credit: Dann Blackwood, U.S. Geological Survey.

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