"One Fish, Two Fish, Red Fish, Blue Fish"

This famous line from Dr. Seuss is about to take on a whole new meaning for a team of VIMS scientists and their colleagues who are combining high-resolution side-scan sonar, sophisticated image analysis, and robotics to identify and count fish.

New technology, which is being developed and tested by Dr. Mark Patterson, Dept. of Biological Sciences, Dr. Roger Mann, Dept. of Fisheries Science along with Dr. Zia-ur Rahman, Dept. Computer Science, William and Mary and VIMS graduate student Daniel Doolittle promises to provide a more comprehensive and accurate view of fish population dynamics. The research, which utilizes recent advances in sonar, underwater vehicles, and computer software, is being developed and tested by Drs. Patterson and Mann and other scientists at VIMS, along with colleagues at the College of William and Mary and partners in the marine technology industry.
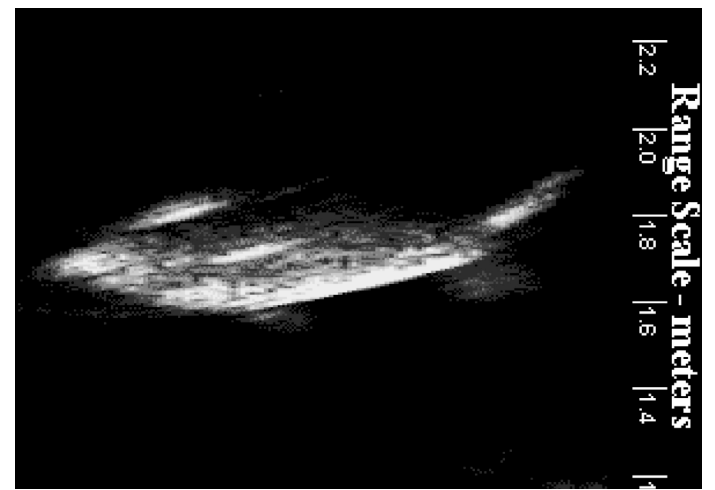
The team has mounted a sonar device on a miniature submarine called an AUV (Autonomous Underwater Vehicle). The sonar unit, which was developed by a team led by Marty Wilcox of Marine Sonic Technology Ltd. in Gloucester, resembles the "fish finders" used by anglers, but provides images of such high resolution that the shapes of individual fish can be clearly discerned. The unit produces images by emitting sound waves and recording the echoes produced when the waves reflect off underwater objects. The remotely controlled AUV, developed by

Tarpon *(Megalops atlantica)* at close range on 600 kHz side scan.

Autonomous Underwater Vehicle built by Sias-Patterson, Inc.

(labels: Strobe/Antennae Tower, SensorCone™, Fetch!, Hull opens here)

Sias Patterson, Inc., can dive to depths of 1,000 ft and stay submerged up to 4 hours.

With the support and cooperation of the Virginia Marine Science Museum in Virginia Beach, the team is beginning their work in the Norfolk Canyon and Chesapeake Bay aquariums located at the museum by gathering images of selected fish species. Next, they will "train" a computer so that it can, when fed a digital sonar image, quickly count and measure individual fish of selected species based on their shape. To ease the computer's task, the team plans to enhance the sonar images prior to analysis with a state-of-the-art image-processing system developed by Dr. Rahman. This includes adjusting the image so that the shape analysis is not confounded by the orientation of the fish relative to the sonar unit.

Marty Wilcox of Marine Sonic Technology, Ltd, said, "We have observed single fish and schools of fish while developing and using our high-resolution sonar, but this is taking the technology in a whole new direction. We are very excited to be a part of this very innovative and ultimately very beneficial application of our technology."

To effectively manage commercial and recreational fisheries, regulatory agencies need to know the populations of different fish species and how they vary through time. But accurately counting fish isn't easy. Traditional methods, in which scientists count fish caught in a net or on a line, only provide a "snapshot" of a population at a specific time and place. Such data are less than ideal, particularly in estuaries like the Chesapeake Bay, where fish populations vary tremendously from day to day, year to year, and place to place.

If the team is successful, assessment of fish stocks in the Chesapeake Bay and other estuaries will never be the same, as a fleet of instrumented AUVs augment the use of trawl nets and long lines, and help to meet the growing need for improved fisheries data.
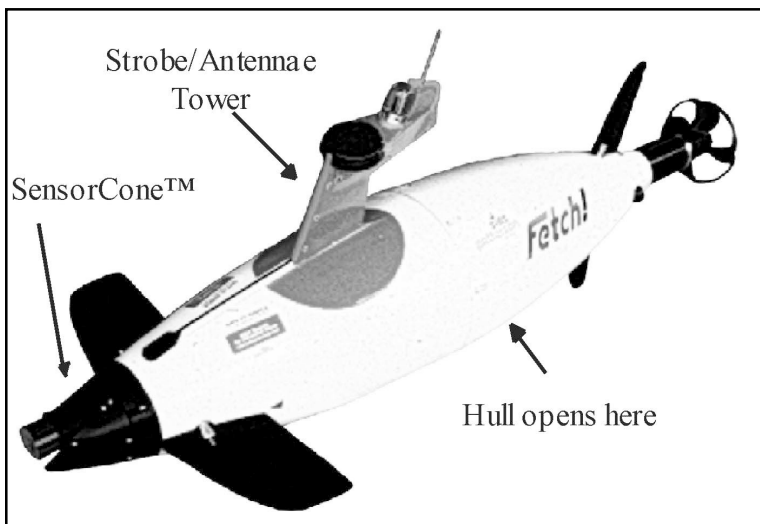
Kelley Watson Fellowship

The first Kelley Watson Fellowship was awarded to Wes Dowd, M.S. student, Dept. of Fisheries Science. The fellowship, which provides tuition and a stipend, is awarded on the basis of outstanding academic merit in the first year core courses. The fellowship was established in the spring of 2001 in memory of Masters student Kelley Watson. Fellow students and faculty recognized in Kelley an unusual degree of enthusiasm and commitment to marine science. "It is a great honor to have received a fellowship bearing Kelley's name, yet simultaneously I am saddened to know that Kelley likely would have earned the fellowship because she exhibited all the attributes I aspire to in my scientific career," says Dowd. Dowd is currently developing plans to conduct the bulk of his thesis research during the summer and fall of 2002. He will be addressing the role of the seasonal summer population of juvenile sandbar sharks in the Chesapeake Bay ecosystem from a bioenergetic modeling approach. His thesis will focus on assessing the metabolic requirements (via oxygen consumption measurements) and daily ration necessary to support observed growth rates and activity of this predator in the Bay region.

Wes Dowd on longline cruise.

VIMS Annual Fund Board Hosts Donor Day

Donor Day at the Virginia Institute of Marine Science was a day of celebration and recognition. On Saturday, September 22, VIMS Associates gathered in McHugh Auditorium. Dean and Director L. Donelson Wright welcomed the group and thanked them for their "continuing support and involvement." He announced receipt of approximately $1.2 million in gifts from corporations, foundations, and individuals in FY 2001. "These gifts are critical to our mission to support research, education, and advisory services in marine science," Wright said.

Annual Fund Board President John Dayton awarded the first VIMS Associates Scholarship to Lawrence Carpenter, a Ph.D. student. Carpenter spent 20 years as a professional fire fighter in London, before retiring after an injury. After a year of intensive college science courses, he began his study of Marine Biology at the University of Newcastle upon Tyne. In September of 1999, he came to VIMS as a Ph.D. student. Carpenter is especially interested in the study of deep-sea equipment. In February, he will be in the Antarctic working with underwater high-tech video production and he hopes to investigate internal waves in the Gulf of Maine in 2002.