Queen's launches unique lab

TRACKING FISH IN REAL TIME VIA THE INTERNET IS JUST ONE USE OF NEW ECOLOGICAL OBSERVATORY

By NANCY DORRANCE
News and Media Services

For the first time in Canada, fish will "report" their 3-D locations and other important data to an Internet-accessible tracking facility at Queen's this spring.

The university's new ecological observatory will be a world-class underwater acoustic telemetry facility, capable of continuously monitoring tagged fish in three dimensions. Researchers, students, and eventually, members of the public will be able to tap into this shared database through the World Wide Web.

The groundbreaking initiative is the result of a partnership between the Queen's University Biological Station (QUBS), the Geographic Information Systems (GIS) lab, and Lotek Wireless Inc., a Canadian-based company that designs and manufactures marine and wildlife monitoring systems.

"We're very excited to be launching this unique physical and virtual laboratory," says QUBS director Raleigh Robertson. The biological station was selected for a number of reasons, he notes. "Our large, self-contained facilities, links with fish biologists from across North America, excellent support staff, and the enthusiasm and quality of researchers at Queen's all combine to make this a desirable location."

The idea for the observatory was sparked two years ago when Lotek president Jim Lotimer asked the GIS Lab to improve the capabilities of their BIOMAP radio telemetry software. Brainstorming with Peter Anson and George Niezgoda of Lotek's research group, as well as with QUBS, led to a plan to build an underwater ecological observatory. As well as testing the latest underwater equipment, it would be used to demonstrate a "data commons" approach to research, and develop appropriate software.

In the initial phase last fall, tiny transponders (acoustic tags) were attached to 22 fish in a lake on the Pangman Conservation Reserve at QUBS, near Chaffey's Locks north of Kingston. Using an array of 16 underwater hydrophones, researchers conducting a number of international projects will be able to measure and analyze changing data about the fish and their environment.

The next step will be to provide web access to the database, and link what is happening ecologically in each of the lakes (for example, weather patterns and water temperatures).

"This isn't just a species-specific study," says Dr. Niezgoda, director of research for Lotek. "The observatory provides the means of ecosystem monitoring of multiple species, biological and environmental parameters. Scientists will have the opportunity to trade information and bring in people to correlate how all the information meshes."

Once the system is fully operational, researchers from different projects and disciplines will run their studies simultaneously. An historical archive will also be created, for use in public education as well as in research.

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>
> *Roly Tinline*

The director of the GIS Lab, Roly Tinline, calls the educational outreach role of the observatory "an amazing opportunity for students as well as researchers" and says that it fits with a growing notion of where research is heading: toward collectively gathered and shared information. "Not only does the observatory give Queen's a window on the world, it also provides the world a window on Queen's," says Dr. Tinline.

STEPHEN WILD

Hardware and software developer Hao Guan (standing) and applications developer Janelle Kennedy, both of Lotek Wireless Inc., monitor tracking data from the biological station facility. Below: Queen's University Biological Station (QUBS) manager Frank Phelan (left) with Lotek research director George Niezgoda (holding an acoustic tag) check 3-D locations of tagged fish on Dr. Niezgoda's laptop, at Pangman Conservation Reserve north of Kingston.

STEPHEN WILD

The "digital library" software associated with this project is being developed jointly with Lotek by the GIS Lab's associate director of information architecture, Rob Harrap, and its manager of applications development, David Ball.

"Our aim is to promote awareness and understanding of sustainable development in the broader community by giving people tools to make informed decisions," says Mr. Harrap, an expert in the application of GIS and visualization. Explaining that digital libraries are much more than a collection of resources available on the Internet, he adds: "It's a new concept of two-way communications with people from widely varying backgrounds, involving the humanities and medicine as well as sciences."

Lotek director of research, George Niezgoda, agrees. "This is part of a big change in the scientific world," he suggests. "It will bring together a community of researchers who typically don't operate in this kind of paradigm, and make their findings more accessible to the public. Queen's biological station is the ideal place to begin this journey."

Physiologist links Parkinson's Disease to environmental causes

By NANCY DORRANCE
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Tracking the fine-scale movements of white sucker fish at Queen's new ecological observatory is providing clues to potential environmental causes of a crippling human affliction.

Greg Ross (Physiology) studies the connections between toxicant exposure and diseases of the nervous system, such as Parkinson's, Alzheimer's and schizophrenia. Parkinson's, in particular, is characterized by movement disorders.

His earlier laboratory research shows that fish from "high risk" waterways have symptoms similar to humans with the disease.

The new observatory, located at Queen's University Biological Station (QUBS) north of Kingston, provides the perfect platform to test whether neurological deficits in wildlife could reflect a link between environmental toxins and human diseases, says Dr. Ross.

"A number of different environmental agents, such as pesticides and mine tailings, have been implicated in Parkinson's, but to date there has been no clear causal link," he explains. "We're interested in both what triggers this disease, and how it is distributed geographically."

In the Queen's study, fish caught in locations known to have high levels of contaminants in the water – such as mine sites or areas of heavy pesticide use – are transferred to the ecological observatory, where they are individually encoded and monitored against a control population. Since human viruses tend not to transfer to fish, viral causes can be eliminated, Dr. Ross adds.

Data recorded includes: how fast and how far the fish move in their general swimming patterns their ability to interact with each other; and what percentage of time is spent moving versus resting. A major advantage of the ecological observatory is that researchers from different projects share their data, says Dr. Ross. "People may be looking at something for a completely different reason, but since we're all working in biological systems the same data is often relevant for a wide range of studies."

The observatory provides a whole new technology and approach, allowing researchers to answer critical questions about fish in their natural environment, Dr. Ross continues. "We already had the maps, the pathology, the fish, the sites, and the risk factors. Now all the bits and pieces are coming together."

Funding for Dr. Ross's research has come from a number of sources, including the Canadian Institutes of Health Research (CIHR), Friends of Parkinson's Research, and the Department of Fisheries and Oceans.