

OCEAN TRACKING NETWORK NEWSLETTER

Volume 4 | Issue 1
Winter/Spring 2014

The Ocean Tracking Network is a global research and technology platform headquartered at Dalhousie University in Halifax, Nova Scotia, Canada.

OTN deploys Canadian acoustic receivers and oceanographic monitoring equipment in key ocean locations around the world.

These acoustic receiver lines are being used to document the movements and survival of marine animals carrying acoustic tags, and to document how both factors are influenced by oceanographic conditions.

OTN is tracking many keystone, commercially important, and endangered species, including marine mammals, sea turtles, squid, and fishes including sharks, sturgeon, eels, tuna, salmonids, and cod.

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'2015 ICFT' - SAVE THE DATE
OTN hosts the third International Conference on Fish Telemetry in Halifax, Canada

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Now accepting suggestions for the 2015 ICFT custom brew...
Email dubthedraught@gmail.com

SAVE THE DATE

OTN hosts the third **International Conference on Fish Telemetry**, 13-17 July 2015
Halifax, Nova Scotia, Canada

oceantrackingnetwork.org/ICFT

CELEBRITY SIGHTING! Cpt. Chris Hadfield gave a talk at Dalhousie while his cardboard cutout posed with the OTN Wave Glider. Wax-Bruce Willis dons an OTN ballcap next to OTN Brazilian collaborator, José Mulbert.



Partner profile: GLATOS Our partners at the Great Lakes Acoustic Telemetry Observation System (GLATOS) have amassed an impressive collection of tracking data—over 100 million detections between 2010 and 2013.

GLATOS is a network of researchers conducting acoustic telemetry research in the North American Laurentian Great Lakes. The Great Lakes form the largest group of freshwater lakes in the world and account for 21% of the world's fresh water.

GLATOS leaders Chuck Krueger and Chris Holbrook, along with OTN, are now exploring the potential to use autonomous vehicles to track the movements of acoustically tagged animals in the Great Lakes, and will organize sessions on tracking animals in fresh water for the 2015 International Conference of Fish Telemetry (ICFT). Chuck and Chris have also donated their time to the ICFT local organizing committee.

CONFERENCES & SYMPOSIA

Places where
we've been,
or will be,
represented

International Conference on Fish Telemetry

13-17 July 2015, Halifax, NS



NS Energy R&D Conference
21-22 May 2014, Halifax, NS

2nd International Conference on Research Infrastructures (ICRI2014)
2-4 April 2014, Athens, Greece

American Association for the Advancement of Science (AAAS)
13-17 February 2014, Chicago, IL



L-R: Martha Crago, VP Research Services (Dalhousie); Peter Harrison, OTN Council Chair (Queen's University); Kim Holland, OTN International Scientific Advisory Committee (University of Hawaii); Sara Iverson, OTN Scientific Director (Dalhousie); Fred Whoriskey, OTN Executive Director (Dalhousie); and Steve Cooke, OTN Scientific Advisory Committee Chair (Carleton University) attend the AAAS meeting in Chicago. OTN hosted *The Ocean Tracking Network: Global Innovation in Technology, Science, and Management* session during the Sustainability and Resource Management Symposium at AAAS.

48th Annual European Marine Biology Symposium
19-23 August 2013, Ireland

Ocean Tracking Network 4th annual symposium
3-5 June 2014, Ottawa, ON

Arctic Observing Summit
9-11 April 2014, Helsinki

Ocean Sciences Meeting (OSM2014)
23-28 February 2014, Honolulu, HI

ArcticNet
9-13 December, Halifax, NS

Canadian Healthy Oceans Network (CHONe), Vision2020
5-6 December 2013, Vancouver, BC

Oceans North Canada (Community-Based Monitoring)
19-21 November, Cambridge Bay, NU

International Council for the Exploration of the Sea (ICES) ASM
23-27 September 2013, Iceland

ERA-Can II 2013 Symposium on Arctic and Marine Research Infrastructure
19-20 September 2013, Rome

OTN-BR(BRAZIL)

A joint Brazil-Canada Brazilian Ocean Tracking Network – OTN-BR (“Rede de Rastreamento de Animais Oceânicos no Brasil – OTN-BR”) proposal was funded by the Brazilian government in 2013.

Under this proposal, the Universidade Federal do Rio Grande (FURG) and Dalhousie University are initiating the first Ocean Tracking Network arrays in Brazil. Along with the recent addition of OTN equipment to the multinational Prediction and Research Moored Array in the Atlantic (PIRATA; see next segment), the Brazil array will become the first OTN deployments in South America. This proposal will facilitate exchanges of graduate students between the two institutions for training and scientific purposes.

A second proposal was submitted to Brazil’s Science without Borders Program. This resulted in Dr. Sara Iverson, OTN Scientific Director, receiving Special Visiting Researchers status under the “Rastreamento

de animais marinhos no Brasil – RAM-BR (Tracking of Marine Animals in Brazil) program. The program allows co-supervision of graduate students and teaching short courses within existing graduate programmes in Brazil. The grant also ensures opportunities to publish manuscripts from OTN-related research.

INCT-Mar COI (the National Institute for Science and Technology for the Oceans) is an equipment grant under which animal-tracking stations may be procured. OTN would match these in additional receivers to install the first coastal acoustic arrays in Brazil.

Currently, OTN animal-tracking stations are deploying on southern Atlantic Ocean buoys, part of the PIRATA.

This past November, OTN deployed four VR2W acoustic receivers on PIRATA buoys

PIRATA is a joint France–U.S. (NOAA)–Brazil oceanographic monitoring program aimed at

understanding ocean-atmosphere variability and extreme weather events in the southern Atlantic Ocean.

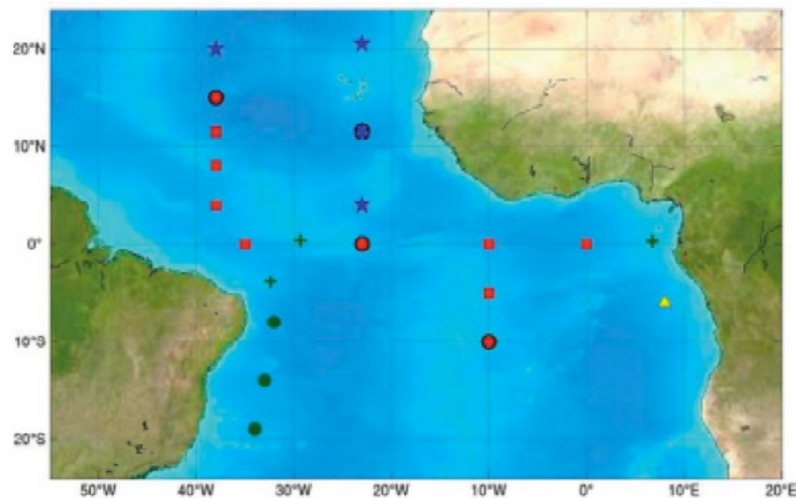
It uses ATLAS buoys, which are designed to measure wind speed, air temperature and humidity, and oceanographic variables to depths of 500 meters. Ocean-atmosphere variability dictates in-shore weather events, rainfall in particular, which impact the economies of Africa and northeast Brazil.

PIRATA now operates as part of the Global Ocean Observing System and the Global Climate Observing

System and contributes data to over five major monitoring networks.

Preparations are advancing with Brazilian and French partners to deploy on the rest of the PIRATA network to capture descriptions of movements, behaviour, and habitat use of large, highly migratory, tagged marine animals.

Integration with the PIRATA infrastructure provides an opportunity to acoustically track long-range migrations of species like sharks and tuna.



PIRATA’s ATLAS buoys (red squares and circles), Northeast Extension (blue stars), Southwest Extension (green circles), Southeast Extension pilot (yellow triangle), and island-based observation sites (green crosses).

[Read more about PIRATA](#)
[PIRATA data](#)

DATA DISCOURSE

OTN adds South Africa data node

OTN data managers (DMs) work with millions of oceanographic and animal-tracking records coming in from a growing number of research partners around the world. OTN's database now sits at 65 million animal-tracking records — double the number of records in 2013. As operations expand, DMs are reaching out internationally to broaden resources by creating data nodes hosted by our partners.

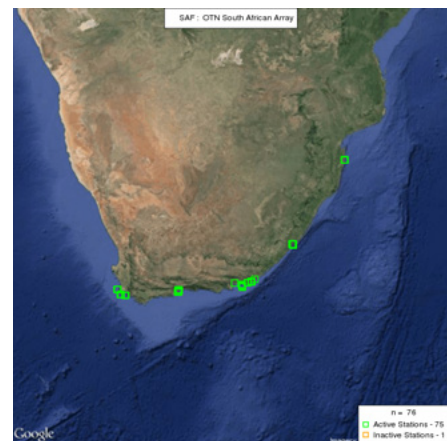
These nodes are modeled on and 100% compatible with the main OTN database. Currently, OTN animal detection data are stored and managed on the OTN database at Dalhousie University, and backed up on Canada's Department of Fisheries and Oceans network.

The South Africa node will be the first of OTN's internationally collected data to be hosted outside headquarters. Data from the OTN-South Africa array (acoustic receivers and tagged/detected animals) will be managed, loaded/offloaded, and kept up to date by partners, under the leadership of PI and International Scientific Advisory Committee member Paul Cowley, at the South African Institute of Aquatic Biodiversity.

The new OTN-South Africa node will be linked to via the [OTN global metadata atlas](#). The South African development builds on our first data node, which was a separate database created for the records of the Pacific Ocean Shelf Tracking Project. As this project wound down, OTN absorbed three of its key acoustic receiver lines used in OTN Pacific salmon tracking studies and created a data node to host its accumulated data. The latter is now called the Northeast Pacific Node, and proved the seamless integration of our node design.

The prime advantage of local data nodes is that researchers, addressing ocean-science questions related to their respective regions, more effectively QC their own data (e.g., flag an erroneous tag ID, delete a latitude/longitude error).

DMs from OTN and the Ocean Biogeographic Information System (OBIS) meet this spring in Belgium during the OBIS workshop to develop a data node for European telemetry studies. OTN operates telemetry studies in Norway (Hemnefjorden - Norwegian University of Science and Technology), Portugal (Azores - University of the Azores), and France (Réunion - Research Institute for Development) in the Indian Ocean, and hopes to establish longer-term capabilities in Spain (Strait of Gibraltar - University of Barcelona).



The OTN South Africa array includes deployments in Algoa Bay, Mossel Bay, False Bay, Port St. John's, and Port Alfred.

TRACKING WHITE SHARKS IN THE ATLANTIC



John Chisholm, MSRP

White sharks are found around the globe in temperate and tropical waters, but are most often associated with places like Australia, South Africa, California, and Guadalupe Island, Mexico. These ‘hotspots’ have something in common, they are home to colonies of large pinnipeds—seals, fur seals or sea lions—favorite prey for white sharks.

In the northwest Atlantic Ocean, the grey seal is a large resident pinniped. Although hunting and bounty programs historically dramatically reduced their numbers in the U.S., federal protection implemented in 1972 has allowed the population to rebound. This resurgence has not gone unnoticed. For nearly a decade, the [Massachusetts Division of Marine Fisheries Shark Research Program \(MSRP\)](#) has been collecting and documenting evidence of mounting grey seal predation by white sharks off the coast of Massachusetts.

Although white sharks have always been part of the marine fauna of the Northwest Atlantic region, their elusiveness has made them nearly impossible to study. Most of what we know about their biology has come from the study of dead specimens and anecdotal reports. Now, as they begin to concentrate around grey seal colonies,



A grey seal in Massachusetts with wounds from an attempted predation by a white shark.

there is an opportunity to capture and tag them, and begin studies on their ecology and life history in the Atlantic Ocean. To accomplish this, MSRP scientists have been tagging and tracking white sharks with satellite and acoustic tags. To date, a total of 34 white sharks have been tagged in the coastal waters off Cape Cod, Massachusetts, with a combination of pop-up satellite archival transmitting (PSAT) tags, acoustic transmitters, and smart positioning or temperature transmitting (SPOT) tags. Tagged sharks have ranged in size from 2.4 metres to 5.5 metres total length.

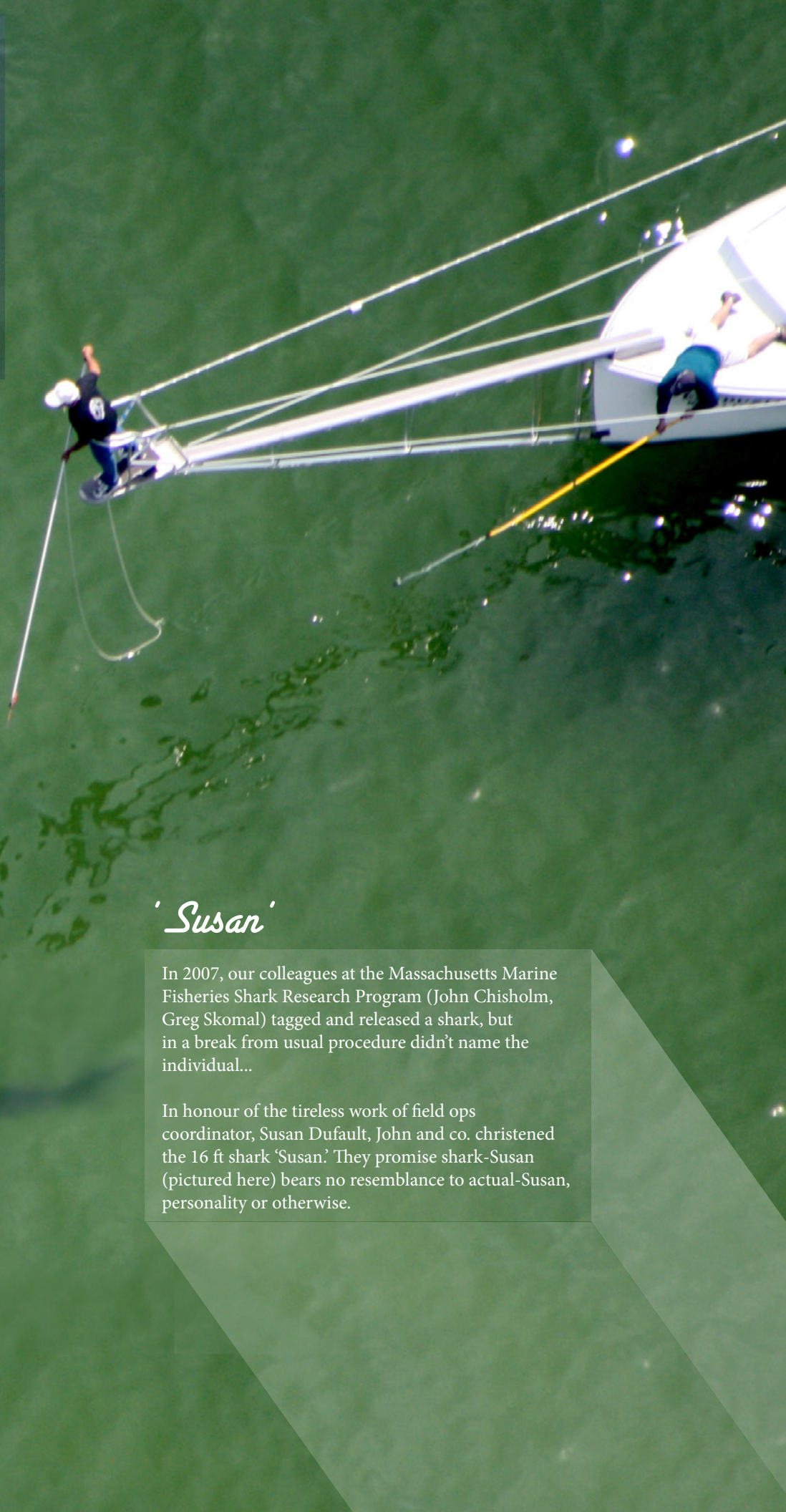
The majority of the animals tagged to date, 23, have been fitted with acoustic transmitters. These are letting the science team examine residency, site fidelity, and habitat use of these white sharks. The tagged sharks are being detected by an array of more than 40 acoustic receivers that has been deployed along the Massachusetts coast. In addition, broad-scale movement data have come from detections of these animals by receivers maintained by the Atlantic Cooperative Telemetry Network and the Ocean Tracking Network. Massachusetts tagged white sharks have been detected from Nova Scotia to Florida, including five different sharks detected on OTN receivers in the Bay of Fundy (MPS and NSP) and along the Halifax Line (HFX).

The take of white sharks has been prohibited from U.S. federal Atlantic waters since 1997 and in Massachusetts state waters since 2005. In Atlantic Canada, the species has been listed as endangered under the Species at Risk Act. Tagging data are helping to discern fine- and broad-scale movements as well as identifying, characterizing, and quantifying essential habitat.

More shark news on page 10...



Locations of acoustic detections of white sharks tagged by MA Division of Marine Fisheries scientists in the Atlantic Ocean.



'Susan'

In 2007, our colleagues at the Massachusetts Marine Fisheries Shark Research Program (John Chisholm, Greg Skomal) tagged and released a shark, but in a break from usual procedure didn't name the individual...

In honour of the tireless work of field ops coordinator, Susan Dufault, John and co. christened the 16 ft shark 'Susan.' They promise shark-Susan (pictured here) bears no resemblance to actual-Susan, personality or otherwise.



GLIDERPALOOZA

This fall, researchers from 11 institutions in Canada and the U.S. conducted a near simultaneous autonomous vehicle patrol of the Atlantic seaboard from Georgia to Nova Scotia. Thirteen Slocum gliders collected subsurface oceanographic information and acoustic telemetry data during September and October, peak storm season for the region.

The brainchild of Mike Crowley and Oscar Schofield (Rutgers University), Gliderpalooza was the largest coordinated ocean sampling effort by autonomous marine vehicles ever undertaken. Its purpose was to:

- provide a uniquely comprehensive data set of ocean conditions off the east coast during the peak storm season,
- provide a 3-D picture of the Mid-Atlantic Bight cold pool,
- systematically survey the continental shelf for acoustically

- tagged animals,
- demonstrate the potential of a national glider network,
- provide proof of data flow through the International Ocean Observing System (IOOS) and the National Data Buoy Center, and
- train students in the use of gliders and other methods for ocean observing.

The University of Massachusetts' glider, "Blue," and the Woods Hole Oceanographic Institute's glider, "Saul," were deployed first on September 6, kicking off the 'palooza. OTN followed up on September 10 launching one of its two gliders off of southern Nova Scotia. This mission followed a trajectory probing the Roseway Basin, one of two right whale seasonal feeding grounds, also a Marine Protected Area. Lack of right whale sightings during the summer of 2013 prompted biologists

to explore causes of their absence. Glider data from gliderpalooza provided important clues about environmental conditions that may have caused the whales to change their normal distributions. The second of OTN's gliders followed the Halifax acoustic telemetry line, providing environmental context for north-south animal migrations.

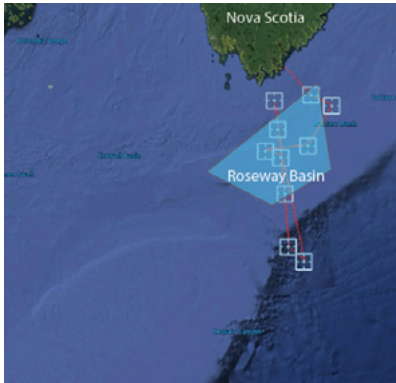
Eight gliders carried Vemco mobile transceivers (VMTs) during the 'palooza, enabling them to detect acoustically tagged animals. Six tagged animals, including two OTN-tagged blue sharks were registered by OTN and Rutgers' gliders.

OTN gliders were also recording primary productivity (fluorometry, backscattering, irradiance), and conductivity, temperature and depth (CTD). OTN gliders spent a total of 69 days at sea as part of Gliderpalooza.

The deployments finished in early November with incredible success (jury's out on whether or not a mild hurricane season is considered a success). All targets for the programme were met and the event sparked international media attention. Some lessons-learned included careful consideration of gliders' trajectories to avoid heavy tidal currents, and future involvement of ocean physicists and biologists in consideration of currents and animal migrations, respectively.

Our tremendous thanks to all participants, especially Mike and Oscar without whom it would not have been possible.

The Gliderpalooza scientists met during the Oceans Sciences Meeting in Honolulu in February for the planning of Gliderpalooza Part II: *Glide Harder*.



Left:
Right whale seasonal feeding grounds (credit: Woods Hole Oceanographic Institution Graphics; Data from North Atlantic Right Whale Consortium)

Right:
Roseway basin (blue) and OTN glider trajectory including waypoints (red lines/ white boxes)

Bottom:
Trajectory of participating gliders (credit: Rutgers via MARACOOS blog)



Participating Institutions:

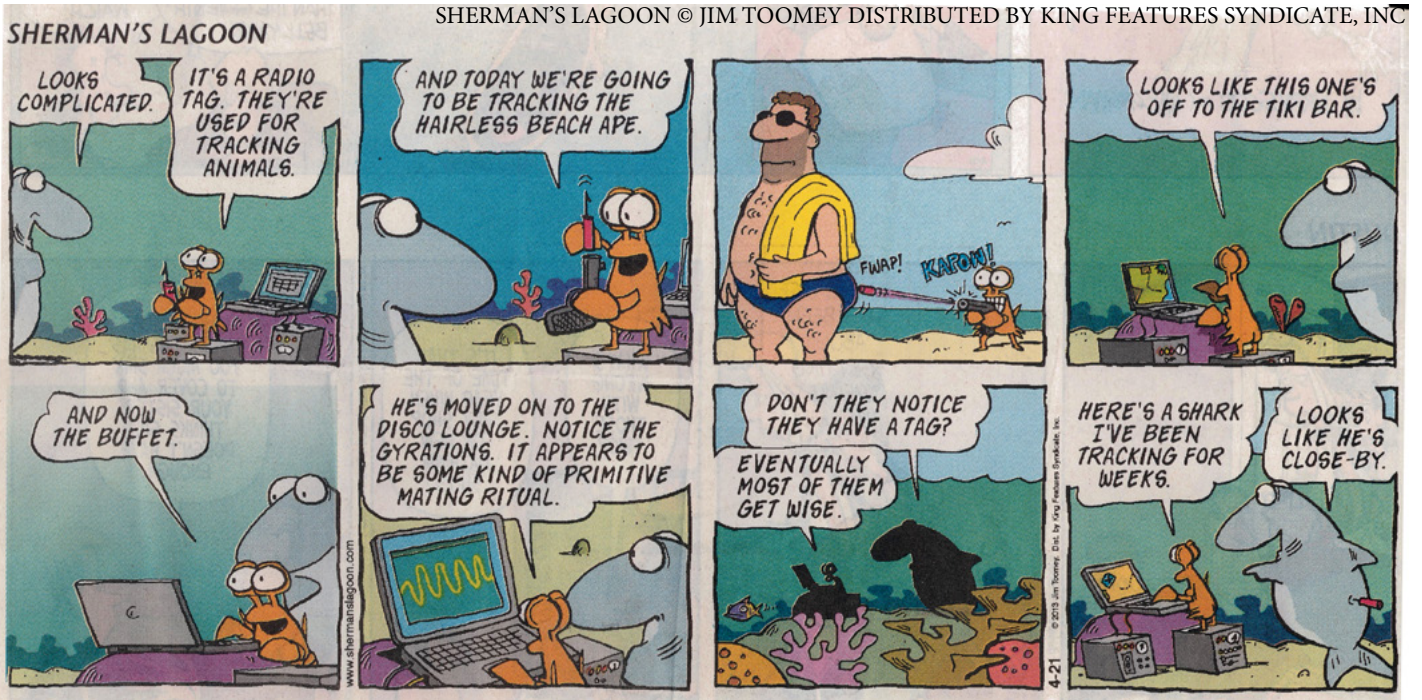
- University of Maine ('Penobscot')
- Ocean Tracking Network (OTN200, OTN201)
- Woods Hole Oceanographic Institute ('Saul')
- Teledyne Webb ('Darwin')
- University of Massachusetts ('Blue')
- Rutgers University (RU22, RU23, RU28)
- University of Delaware ('Otis')
- Virginia Institute of Marine Sciences ('Stewart')
- North Carolina State University ('Salacia')
- Skidaway Institute of Oceanography ('Modena')

Links

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Gliderpalooza in the press

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ECO-INDICATORS: TRACKING TOP PREDATORS

Tagging and tracking Nova Scotia's resident BLUE SHARKS

Encana Corporation's Deep Panuke Education & Training, Research & Development Fund is allowing OTN to study the movements and behaviour of blue sharks off the coast of Nova Scotia over the next two years.

Documenting the movements and habitat use of marine animals is critical for their management and conservation. Blue sharks are an understudied species at risk from offshore development and commercial fishing nets. OTN has launched a two-year study into the movements and habitat use of Nova Scotia's resident populations of blue sharks.

In summer 2013, the first year of study, 20 female juvenile blue sharks were carefully caught and acoustically tagged off of Eastern Passage. This work served as the field-work training component for the Biology and Conservation of Sharks, Skates and Rays class taught by Boris Worm and Brendal Davis at Dalhousie University whereby undergraduate students were trained in capture, handling, tagging, and tracking methods.

Following their release, all 20 sharks were detected on the Halifax acoustic telemetry line (HFX). The OTN Slocum glider also detected two sharks during Gliderpalooza (see Gliderpalooza brief). Another was detected on the new Sable Island receiver array, and at least one of our animals was unexpectedly in range of the Halifax Line in early January 2014.

Tagging immature sharks with six-year-battery-life tags will allow researchers to follow shifts in behaviour as the sharks mature.



Dalhousie University's new president, Dr. Richard Florizone (left), accompanies Dal biology students on a shark tagging mission in July.

Brendal Davis
(Dalhousie)
surgically
implants an
acoustic tag
into a blue
shark
(Credit: Jarrett
Corke, WWF)



Preliminary data from the inshore portion of HFX show that the sharks stayed close to their tagging location indicating site fidelity and a possible nursing ground in the vicinity of the tagging site. Over 4,000 total detections have been captured to date.

“Tagging juveniles could help us locate a nursery in the region and figure out if the nursing ground and behaviours are being unintentionally affected by human activity,” said Brendal Davis, Dalhousie biologist.

The study also gave young campers from the Indian Point Young Naturalists Club in Indian Point, Nova Scotia, an opportunity to catch and tag sharks with spaghetti tags. The camp, for which OTN HQP have previously led science demonstrations, gives campers ages 11 to 12 a chance to engage with researchers and conduct experiments.

Dalhousie’s newly appointed president, Dr. Richard Florizone, accompanied one group of university students on the shark tagging expedition, and caught one of the sharks that was tagged. Local media filmed the amateur shark wranglers from a second boat.

Encana Corporation, ExxonMobil, and StatOil have also allowed trial deployments of acoustic receivers on oceanographic and monitoring buoys associated with their offshore oil and gas platforms. By linking with industry, OTN can cost-effectively expand acoustic receiver coverage allowing blue shark and other species researchers to better understand animals’ movements and how the animals interact with offshore infrastructure.

Twenty more blue sharks will be acoustically tagged in late summer 2014.

[Read the full report on the OTN site.](#)

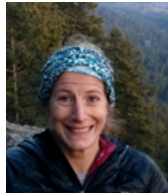
A female, juvenile blue shark caught off Eastern Passage, Nova Scotia, during one of three tagging missions. Our thanks to Art Gaetan of Blue Shark Fishing Charters for his help reeling ‘em in.

“If we are to maintain the health of ocean ecosystems, we have got to take care of the top predators. The unique partnership of this project is enabling research that will help us understand the needs of these animals, and ensure a future for them.” – Fred Whoriskey, OTN Executive Director and lead scientist on the OERA grant.



Coho salmon studies in the OTN Pacific Arena

How telemetry-based research can be applied to inform industry and management. Katrina Cook



In coastal British Columbia, purse seine fisheries are managed according to by-catch mortality estimates determined individually for each zone. Typically fishers are required to release by-caught species alive, however, some of these individuals will subsequently die from the stresses of having been captured.

Managers now use projections on the number of released fish that will die from stress to manage fisheries. Closures occur when the estimated number of mortalities will exceed predetermined limits for that zone; therefore, good management requires accurate mortality estimates for released fish whereby stocks of concern are sufficiently protected while maintaining economic opportunities for fishers.

Coho salmon are a bycatch species of conservation concern in British Columbia; numbers crashed in the 1990's and the Interior Fraser River stock grouping is listed as endangered by COSEWIC. In Area 20, offshore of western Vancouver Island, estimated mortality for coho released from purse seine fisheries is currently 70%, an estimate thought to be inaccurate by many user groups. Research was therefore initiated using acoustic telemetry in Area 20 to provide a reliable and scientifically defensible estimate of mortality and stock composition of coho salmon bycatch. A pink salmon purse seine fishery was simulated, whereby pink salmon were targeted, brailled, and sorted as would occur in an actual fishery. Coho salmon bycatch (n=220) were acoustically tagged, biopsied to determine stock origin, and released. The majority of study fish were from Puget Sound stocks (Washington State; 63%) and 8% were from the endangered Interior Fraser River stock grouping.

Overall mortality, to the first acoustic receiver line, approximately 40 kilometres from release, was 29%. Mortality estimates were consistent among stock groupings, with the exception of the Interior Fraser River group, which had 11% mortality. Although handling practices, and therefore mortality, will differ among vessels, these results suggest that the mortality estimate currently applied to coho salmon released from purse seine vessels in Area 20 should be revisited.

Katrina Cook is an MSc student studying coho salmon migration as part of OTN Pacific Arena studies on the Canadian west coast under PIs Scott Hinch and Steve Cooke.

OTN Arctic Arena engagement

Involving communities more meaningfully. Jean-Sébastien Moore



The Arctic is a rapidly changing environment, and no one has a better perspective to observe this change than the Inuit people who inhabit the North. With OTN ramping up its presence in the Arctic, involving Inuit experts in our work offers huge promises for

interactions that are mutually beneficial for scientists and communities alike. But involving northern communities in scientific work can often be challenging. This was the topic of the Community-Based Monitoring (CBM) workshop organized by Oceans North Canada that took place November 19-21 in Cambridge Bay, Nunavut. Post-doctoral fellow and arctic researcher Jean-Sébastien Moore represented the OTN at this meeting. The workshop offered an opportunity for people from different backgrounds—scientists, social scientists, and Inuit and Inuvialuit elders—to discuss tangible solutions to better link two knowledge systems and make them work alongside each other.

The discussion first focused on defining CBM. Despite varying opinions on what CBM actually is, no one disputed the fact that communities have much to contribute towards environmental monitoring. Local people are often present year-round in the “field” and have thousands of years of accumulated knowledge on the environment in which they live. Some scientists and policy-makers, however, are still reluctant to trust CBM data. Much discussion therefore focused on how to increase the stature of CBM. Ultimately, as one participant pointed out, we want to be able to use the best available evidence as opposed to choosing “one versus the other.”

Getting input from knowledgeable community members during the design phase of our arrays would be a good example of a mutually beneficial interaction between science and traditional knowledge.

We are also now discussing the possibility of running a study in parallel with our work on Arctic char migrations in Cambridge Bay to document relevant traditional knowledge. We are confident that this will offer much insight to inform our work and broaden its relevance.

Jean-Sébastien Moore is a PhD student studying Arctic char in Cambridge Bay, Nunavut, as part of OTN Arctic Arena research under PIs Aaron Fisk and Svein Vagle.