DALHOUSIE UNIVERSITY
Inspiring Minds

OCEAN TRACKING NETWORK Newsletter

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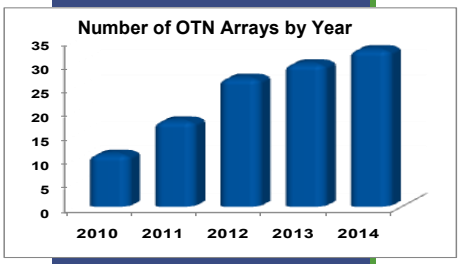


Message From OTN Executive Director

The Ocean Tracking Network (OTN) is a Canada Foundation for Innovation (CFI) global research and technology development project headquartered at Dalhousie University. Starting in 2008, OTN began deploying Canadian state-of-the-art oceanographic monitoring equipment and acoustic receivers to document ocean conditions and how they influence the movements and survival of marine animals. OTN deployments will occur in all of the world's five oceans, and span seven continents.

The Natural Sciences and Engineering Research Council of Canada (NSERC) supports OTN Canada, a national network of researchers that works with OTN infrastructure. Over 200 international researchers from 15 countries are currently participating in OTN. OTN hosts a data warehouse that serves as a repository for data collected by OTN researchers, and is developing interpretation and visualization tools for tracking data. It also operates three autonomous vehicles (Slocum gliders) in support of oceanographic and tracking research.

A network with global scientific connections is going to have to work hard at communications. It is our pleasure here to introduce you to one of the communication tools that we trust will keep everyone informed on what is happening within OTN.

We hope that the OTN newsletter will help keep both Network members and the public apprised of our activities and progress. It will be a timely vehicle for the members of the Network to share their experiences and results.

This makes us dependent upon you, the members, for your stories. So fair warning: we will be coming after you. We look forward in the future to reporting on your many successes.

Fred Whoriskey,
OTN Executive Director

OTN: Coming Soon to an Ocean Near You

By the end of 2010, OTN's first official year of operations, the Network had 11 active acoustic receiver arrays with 409 receiver stations. Great expansion is expected for 2011 and has already begun with the extension of the Halifax Line by an additional 35 stations in March, the deployment of the Vancouver Array in the Fraser River estuary of BC in May, and the deployment of OTN's second international array off South Africa by summer's end.

The scope of OTN now includes all three of Canada's ocean regions as well as both the East and West Indian Ocean and the Southeast Atlantic Ocean, and we've only just begun. Seven more arrays comprised of an estimated 268 stations are planned for deployment before the end of 2011, bringing the number of listening stations to >700. This will extend the global scope of OTN into the mid-Pacific Ocean with the Hawaii Array, the Mediterranean Sea–Northeast Atlantic Ocean with the Strait of Gibraltar Line, and the Southwest Pacific Ocean, with the Tasmania Array.

New in 2011

Array Name	Ocean
Vancouver	NE Pacific
South Africa	W Indian
Strait of Belle Isle	NW Atlantic
Hawaii	Mid-Pacific
Tasmania	SW Pacific
Prince William Sound	NE Pacific
Strait of Gibraltar	Mediterranean

Global Array Updates

Halifax Line

Thomas Fullager (Dominion Diving) set to deploy mooring assembly on Halifax Line

The Halifax Line is OTN's inaugural listening line, first deployed in April of 2008, with 29 mooring stations extending more than 20 km offshore. In April of 2010, the line was extended out to approximately 30 km with the addition of eight new stations. Most recently, in March 2011, 35 additional stations were added bringing the total to 72 stations. Also deployed at that time on one of the stations was a benthic pod, which will record oceanographic data including temperature, depth, salinity, and dissolved oxygen. Data from the Halifax Line are uploaded approximately every 6 months. Species detected so far are Atlantic salmon, Atlantic sturgeon, and Atlantic bluefin tuna from some half dozen different tagging projects.

The Halifax Line serves as a demonstration site where different mooring designs using components from various manufacturers (e.g. Teledyne-Benthos, ORE Offshore, Vemco, and Satlantic) are tested. Flotation collars from Romor Atlantic and Kintama were recently deployed with Vemco VR4 and VR3 acoustic receivers.

Principal Investigator:
Peter Smith

Partner Organization:
Fisheries and Oceans Canada Bedford Institute of Oceanography

Perth Line

The Perth Line was OTN's first international listening line, deployed in January of 2009, with 53 stations extending west from Perth, Australia to Rottnest Island and beyond, out to about 50 km offshore.

About half of the moorings on the Line consist of Vemco VR2W acoustic receivers mounted on shallow water moorings serviceable by divers, while the other half are located in deeper water and are each equipped with an 875t Teledyne Benthos release, VR2W, and air-filled floats.

The Perth Line is fully recovered, downloaded, and redeployed approximately once per year, with the latest complete rollover occuring in December 2010.

Species detected so far include southern bluefin tuna, great white shark, pink snapper, and tailor (known as bluefish in North America) from tagging projects at Western Australia Fisheries and the Australian Commonwealth Scientific and Industrial Research Organisation.

Principal Investigator:
Rory McAuley

Partner Organization:
Western Australia Fisheries

Nick Jarvis uses SCUBA to service receiver on shallow water mooring

Minas Passage Line

Unique mooring assembly designed to withstand extreme tidal currents in Passage (see Tech Talk p. 8)

In July of 2010, an acoustic curtain of 12 receiver stations was deployed across the narrowest portion of the Minas Passage, from Cape Sharp to Cape Split, at the northeastern end of the Bay of Fundy. The equipment was recovered in November 2010, after 5 months in the harsh conditions that the 12-knot tidal currents impose on the gear in the area.

The Minas Passage Line was redeployed in April 2011 at the same location. OTN partner Acadia University, in collaboration with OTN, also deployed a second array of 17 receivers across the Passage, west of the OTN Line, in April 2011.

Species detected so far are spiny dogfish, Atlantic sturgeon, American eel, and striped bass.

SUBS flotation from Open Seas Instrumentation has proven to be the ideal floatation system to tackle the extremely high currents in the Passage. Moorings are equipped with Vemco VR2W receivers and Teledyne Benthos 875t acoustic releases. Each mooring is weighed down with a 400-lb anchor.

Principal Investigator:
Michael Stokesbury

Partner Organization:
Acadia University

OCEAN TRACKING NETWORK

Global Array Updates

Cabot Strait Line

Phase 1 of the Cabot Strait Line began in October 2009, with the deployment of mooring stations extending northeastward from Cape North, Cape Breton Island, Nova Scotia, to St. Paul Island, a distance of approximately 25 km. In the fall of 2010, the line was extended to include three stations in the Canso Strait between mainland Nova Scotia and Cape Breton Island, effectively creating a curtain across this potential route between the Gulf of St. Lawrence and the North Atlantic Ocean. Plans are under way for Phase 2, which will see the line extended, as technological challenges are worked out, all the way across the Strait to Cape Ray, Newfoundland, a total distance greater than 100 km.

Species detected so far are Atlantic salmon, Atlantic cod, Atlantic sturgeon, and Atlantic bluefin tuna.

Simple air-filled flotation moorings are used in the shallower parts of the Strait, while a few deeper sites have benefitted this year from more sophisticated syntactic foam–filled instrument collars. Syntactic flotation moorings will eventually become ubiquitous for long-term deep deployments.

Principal Investigator:
Martin Castonguay

Partner Organization:
Fisheries and Oceans Canada
Maurice Lamontagne Institute

John Budge and Ambrose Dunphy prepare to deploy mooring assembly on Cabot Strait Line

Mooring assemblies ready for deployment in Cumberland Sound

Cumberland Sound Array, Canadian Arctic

The Cumberland Sound Array was first deployed as a double gate (staggered array setup) in August 2010 with 29 receiver stations extending into the Sound a few miles away from the small Inuit community of Pangnirtung on southern Baffin Island. Equipment will be recovered and data downloaded in the summer of 2011, and another 40 stations will also be deployed on the eastern side of Baffin Island.

OTN Canada researchers working in the area are examining the spatial, seasonal, and temporal interactions of fish and marine mammals in the Cumberland Sound ecosystem and have tagged Greenland halibut (turbot), Arctic skate, and Greenland shark, all of which are expected to interact with this array.

The Cumberland Sound array will allow insight into predator–prey interactions between acoustically tagged Greenland sharks and turbot. The double-gate setup will add directionality to the migration data.

Principal Investigator:
Aaron Fisk

Partner Organization:
University of Windsor

Lancaster Sound Array

Principal Investigator:
Terry Dick

Partner Organization:
University of Manitoba

Placed near Resolute, Nunavut, this array consists of a series of subarrays first deployed and subsequently recovered in August to September 2010 in Allen Bay. Data on cetacean occurrence (CPODs) as well as oceanographic data (conductivity, temperature, depth, carbon dioxide, and bathymetry) were also collected in the area. Species detected are Arctic cod, fourhorn sculpin, and shorthorn sculpin. The array makes use of Vemco's newer 180-kHz receiver technology and smaller V5 and V6 acoustic tags, and will be redeployed in 2011.

Deployment vessel with mooring assemblies ready for deployment

Other OTN Arrays Active in 2010

Project Name	No. of Stations
Antigonish Harbour, Nova Scotia, Trout Project	24
Nova Scotia Southern Upland Salmon Project	63
OTN Canada Sturgeon Project	10
OTN Canada Eel Project	39
OTN Canada Grey Seal Project	20

Message From OTN Canada Scientific Director

Welcome to the first edition of our OTN Canada newsletter! The OTN Canada Network was officially launched in January 2010 and I am happy to report that we hit the ground running (or the water swimming), with most field programs starting by summer 2010. In just over a year, our research programs in the Atlantic, Arctic, and Pacific are already well established and producing some exciting results. At last estimation we have some 30 graduate students and postdoctoral fellows and 10 undergraduates working directly on projects across Arenas, in addition to a number of field and laboratory assistants. Our Secretariat at Dalhousie is the communication centre for OTN Canada and has been an important part of bringing the OTN community together.

We held our first annual meeting of the Scientific Advisory Committee (SAC) in November 2010, at which all project annual reports were reviewed and approved. Since this first meeting, the SAC structure was changed to include two voting representatives from each Arena, rather than one, to spread out responsibilities and ensure smooth operations and communications within Arenas. At the recommendation of the SAC, we established two new subcommittees: a Technology Subcommittee, which will review, advise, and report to the SAC on equipment and technology issues, and a Project Reprofiling Subcommittee, which will review project issues and requests for budget changes (>20%) and report to the OTN Canada Scientific Director, who will then report on such decisions to the SAC.

Communications: in addition to OTN Canada research being presented at various national and international meetings over the past 1.5 years, our new website (otncanada.org) was launched earlier this year and continues to be updated. OTN Canada is being featured in a paper ("Ocean Tracking Network Canada: A network approach to addressing critical issues in fisheries and resource management with implications for ocean governance") accepted in the American Fisheries Society journal *Fisheries*, which is publishing a series highlighting Canadian Strategic Networks that are related to fisheries, aquaculture, and aquatic ecosystems. *Fisheries* has an extremely large distribution, is read by policy makers and managers around the globe, and in 2009 was ranked third among fisheries journals. OTN Canada Pacific researchers also published results of their groundbreaking research using genomic sequencing to assess spawning failure in wild Pacific salmon in *Science*.

Finally, our first OTN Canada-wide symposium and associated workshops will be held 1-3 June 2011 in Halifax. All PIs, students, and PDFs are invited and it looks like we will have a great turnout! An important focus and outcome of these meetings is the integration of our Network research and outcomes across all Arenas and Themes. In preparation for this, individual Arena-wide meetings were held to help jump-start these discussions. Our work with collaborating social and legal scientists continues and at the June meetings we will hold the second workshop on issues for ocean governance. We look forward to great interactions and exchange of ideas.

We wish to thank Dalhousie, partnering agencies, and especially NSERC for all their support and guidance in the initiation of this important and exciting Network.

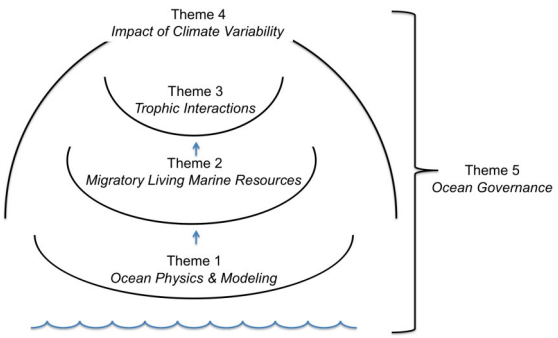
Sara Iverson,
OTN Canada Scientific Director

OTN Canada's Scientific Program

OTN Canada is a nationwide Strategic Network research program funded for up to 7 years by NSERC, with infrastructure support from CFI. Our network program is comprised of 26 principle investigators from 11 Canadian universities and their undergraduate and graduate students and postdoctoral fellows, as well as numerous collaborators from other institutions across Canada and internationally, but primarily the Department of Fisheries and Oceans Canada.

OTN Canada is organized around five key research themes within and across Canada's three Ocean Arenas (the Atlantic, Arctic, and Pacific).

We are focusing our investigations on key species of interest and on sharing and integrating research strategies, expertise, and emerging technologies to understand changing marine ecosystems across Canada. Our paramount objective is to better understand changing ocean dynamics and their impact on ocean ecosystems, animal ecology, and ocean resources, with the aim to address critical issues in resource management and implications for ocean governance.



Atlantic Arena Update

Sara Iverson

The Atlantic Arena was able to get a jumpstart on addressing and integrating research across all five OTN Canada Themes, given the large number of teams and wide range of projects involved in Atlantic programs. Because the Atlantic Arena has so many subprojects, it is not possible to describe and update all of them here, so only a few highlights are described.

Beginning in 2010, the oceanography group made substantial headway in collecting data on the physical and chemical properties on the Halifax Line, establishing infrastructure and testing procedures for ocean glider operations, and developing tethered accelerometer tags in captive fish trials to eventually link acceleration with fish body size and growth in the wild.

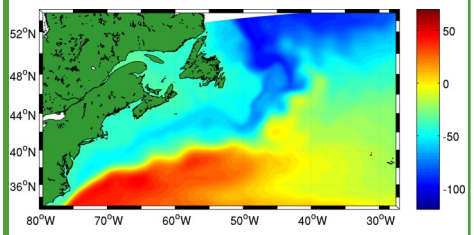


Figure 1. Mean sea level predictions in the Northwest Atlantic Ocean from newly developed ocean models

Advances were made to develop nested-grid, coupled, physical and biological models, which will be used to reconstruct time-varying, 3D conditions of the Northwest Atlantic Ocean. Effective and computationally efficient methods are being developed for assimilating physical, biological, and chemical data, collected by fixed and mobile observing platforms, into realistic models of the shelf and deep ocean on various time and space scales, with the aim to make better predictions of past and future ocean states (e.g. Figure 1) and eventually to link with marine animal movements and migrations being studied in other projects in the Arena.

In the projects studying migratory marine living resources and trophic interactions, a tracking program of migration routes was initiated in 2010 for Atlantic salmon smolts and adults from different regional groups in Nova Scotia rivers. Novel technologies are being used to document salmon behaviour at sea and to examine movements and associations with oceanographic conditions, as well as the life cycle of salmon in the Bras d'Or ecosystem. In 2010, studies of estuarine and oceanic migrations of the American eel (a species of special concern) were initiated, with four new acoustic receiver lines deployed in the St. Lawrence River and 92 eels tagged: 77% of the eels were detected along lines and in association with specific diurnal and tidal patterns. Studies were also initiated in 2010 on movement patterns of the threatened Atlantic sturgeon in the Saint John River, providing new insight on habitat selection and temporal patterns of movement. Studies were also initiated on the migratory behaviour and tidal power impacts of sturgeon in the Bay of Fundy.

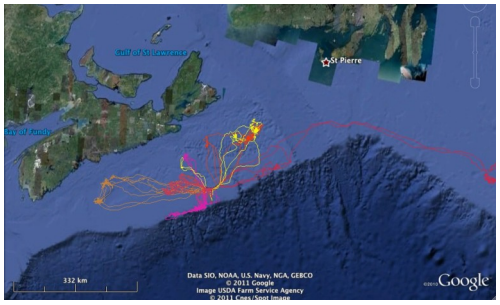


Figure 3. Movement tracks of adult male grey seals tagged in 2010/2011

A unique program initiated in the Atlantic is the use of novel Vemco Mobile Transceiver (VMT) tags to employ large predators themselves as samplers (or "bioprobes") of their ecosystems. VMTs are newly developed two-way coded acoustic tags that essentially act as miniature mobile receivers, functioning both as transmitters of the bioprobe carrying the tag (if it passes a fixed receiver array) and as archival receivers that record and store data from other tagged animals that the bioprobe encounters.

Figure 2. Adult male grey seal fitted with a VMT tag glued to back and a satellite-GPS transmitter glued to head

Grey seals breeding on Sable Island off Nova Scotia offer the unique opportunity to develop, test, and use VMT technology because individuals can be readily and predictably captured and recaptured after long-term (7-8 months) tag deployments, which thus allows retrieval of archived data. This potentially allows the study of the ecological function of an abundant large marine carnivore and its association with, and impact on, important prey populations, especially Atlantic cod stocks, which remain at severely depleted levels.

In 2009/2010, 35 grey seals from Sable Island were deployed with both VMTs and satellite-GPS (location) transmitters (Figure 2) and several hundred Atlantic cod were tagged with Vemco acoustic transmitters, primarily in the southern Gulf of St. Lawrence but also on the Eastern Scotian Shelf (SS). Although grey seals moved widely across the SS, they did not enter the Gulf (Figure 3), and in the initial year of work, did not reveal any encounters with tagged cod. However, as an interesting twist and proof of concept of the VMTs, all seals detected other seals (~4,000 detections recorded), in a manner that suggests potential patterns of social foraging interactions occurring among seals at sea. And interestingly, there was a single encounter between a grey seal and a bluefin tuna that was tagged by a US researcher — bioprobes indeed!

In May 2011 several hundred more cod will be tagged specifically in areas most frequented by tagged grey seals. Clearly the task at hand is to increase the number of tagged animals in the ocean.

OCEAN TRACKING NETWORK CANADA

Arctic Arena Update

Aaron Fisk, Terry Dick, Nigel Hussey, Steve Ferguson & Svein Vagle

Research in the OTN Arctic Arena in 2010 was focused on both fish and marine mammals in two distinct regions, Cumberland Sound in the eastern Arctic and Lancaster Sound in the high Arctic (Figure 1). Research activities were based upon collaborative efforts of several researchers from the Universities of Windsor, Manitoba, and Victoria, and Fisheries and Oceans Canada (Winnipeg and Victoria). Three graduate students started in 2010, two at the University of Manitoba (Jordan Matley and Dave Ovegaard) and one at the University of Windsor (Iva Peklova).

In Cumberland Sound, fish research was focused on the Greenland halibut (*Reinhardtius hippoglossoides*), the target species of both the traditional Inuit winter fishery through the ice and the developing summer commercial fishery, and the two principal bycatch species, Greenland shark (*Somniosus microcephalus*) and Arctic skate (*Amblyraja hyperborea*). The objectives of the study were to (i) determine if Greenland halibut consist of one management stock, which moves on a seasonal basis between regions, or if it is composed of two separate management stocks and (ii) to quantify the vertical movement and temperature preferences of these important commercial and by-catch species. In the summer of 2010, a curtain of acoustic monitors, along with temperature loggers, was deployed on a ridge that divides the two deep-water pockets that define the winter and summer fishing grounds of halibut. Acoustic transmitters (life span >5 years) were surgically implanted in Greenland halibut (Figure 2) and Greenland sharks, and pop-up archival satellite tags (MiniPATs) were deployed on halibut and skates. Preliminary satellite tag results indicate that the Greenland halibut remained on the summer fishing grounds between August and October at depths greater than 1000 m. Tags deployed on Arctic skate revealed that these animals also inhabit great depths, but Arctic skate moved into shallower waters within the Sound towards the end of the year (>800 m). These are the first documented high-resolution depth and temperature profiles for deep water Arctic fish species. The acoustic monitors deployed on the ridge will be retrieved and data downloaded in August 2011.

Figure 2. PDF Nigel Hussey (left) and MSc student Iva Peklova insert a V16 acoustic tag in a Greenland halibut aboard the *Stellie*, in Cumberland Sound in August 2010

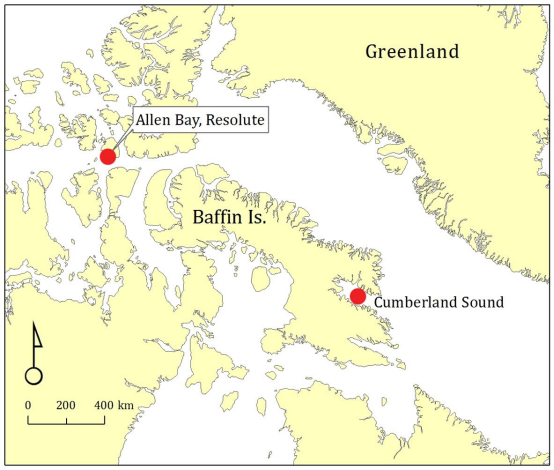


Figure 1. Locations of Arctic OTN research in 2011 (red dots) in Allen Bay (Lancaster Sound) and Cumberland Sound

Marine mammal boat-based surveys in the fjords of Cumberland Sound in 2010 revealed harp seals (*Pagophilus groenlandicus*) as the dominant marine mammal, consistent with work done in 2008, and suggesting a change from ringed seal (*Pusa hispida*) as the most commonly observed species in the summer.

C-PODs and AURALs, which record the sounds of marine mammals, were deployed in the north end of the Sound. Data retrieved indicated that beluga (*Delphinapterus leucas*) were feeding more at high tide and in the middle of the day, which may be related to Arctic charr (*Salvelinus alpinus*) movements.

In Lancaster Sound, research was focused on the movement and interaction of Arctic cod (*Boreogadus saida*), four-horned sculpin (*Myoxocephalus thompsonii*), and shorthorn sculpin (*Myoxocephalus scorpius*) and their interactions with seabirds and marine mammals. The Arctic cod is a keystone species in the Arctic, linking zooplankton production with fish, marine mammals, and seabirds; however, we know very little about this small (<30 cm) fish that is known to school in great numbers. Cod were successfully tagged for the first time using the new V5 180-kHz tags (Figure 3) and sculpins were tagged with V6 and V9-AP tags. Results of a high-resolution tracking system (VPS) showed that: cod and sculpin remained in the same area for three weeks, although cod were more mobile; sculpin may prey on cod; and cod are a key prey item of narwhal (*Monodon monoceros*), beluga, and seabirds based on visual observations and marine mammal stomach contents collected by the Inuit community.

Figure 3. PI Terry Dick (right) and MSc student Dave Ovegaard place a V5 acoustic tag in an Arctic cod near Allen Bay, Lancaster Sound in August 2010

Pacific salmon (*Oncorhynchus spp.),* and sockeye (*O. nerka*) in particular, are a focal group for the research activity in the Pacific Arena in collaborative studies primarily among the University of British Columbia, Carleton University, and Fisheries and Oceans Canada.

Starting in 2009, several studies were initiated to address issues associated with both ocean-bound smolts and homeward migrating adults. One of the first studies examined the effects of different sizes of acoustic transmitters and fish sizes on sustained swim speeds, metabolic rate, feeding, and survival in smolting sockeye salmon in both freshwater and saltwater environments. This was a lab-based study intended to refine 'best practices' in terms of sizes of transmitters that can be used in field telemetry studies on

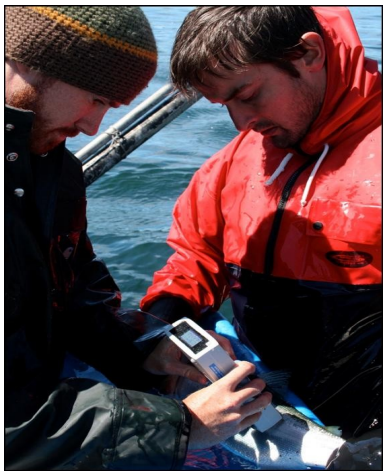


Figure 1. PhD student Matt Drenner (left) and research associate Tim Clark (right) measure energy content non-invasively on a tagged adult sockeye prior to its release

juvenile salmon that minimize effects of tag size on behaviour and survival, and in particular to assess new tag sizes recently brought onto the commercial market and ensure that tagged fish are representative of untagged conspecifics.

Knowledge emanating from that project was used to support the start of a tagging study focused on outmigration of individual smolts from Chilko Lake, a population situated 600 km inland from the ocean, the highest elevation rearing lake for sockeye salmon in Canada (Figure 2). This is the first ever tagging project of its kind on juvenile wild sockeye salmon. In spring 2010, 200 two-year-old juveniles were captured as they initiated their smolt outmigration and were surgically implanted with acoustic transmitters. Fish were tracked with acoustic stations to determine travel rates and locales and levels of mortality.

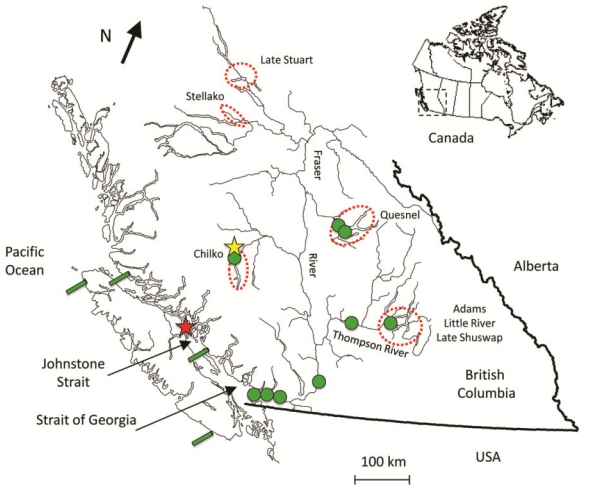


Figure 2. Map of southern British Columbia showing the Fraser River and its major tributaries, and acoustic receiver arrays (circles) and curtains (bars). Adult sockeye were tagged (red star) in coastal areas and tracked to major spawning locales (red dashed lines). Juvenile sockeye were tagged (yellow star) far inland and tracked towards the open Pacific Ocean

Preliminary results indicate that smolts are reaching the river mouth in about eight days with mortality rates of ~70%. Movement and survival rates, as they migrated along the coast towards the open ocean, were assessed with acoustic receiver curtains (the Pacific Ocean Shelf Tracking (POST) project, an OTN partner).

Smolts reached the northern end of Vancouver Island in about 60 days, after travelling about 1000 km, though suffering about 95% mortality since release.

Studies planned for future years will involve examining smaller fish with smaller transmitters and experimental manipulation of release locale and fish condition, to better identify the mechanisms associated with mortality.

In the summer of 2010, over 1000 adult sockeye were tagged in marine waters during their coastal approach to examine the oceanographic and physiological correlates (Figure 1) of behaviour and survival of migrating fish. Oceanographic surveys conducted in parallel with the release of tagged fish were used to characterize oceanographic conditions where fish were migrating.

Acoustic receiver curtains in the ocean associated with POST (Figure 2), and sentinel telemetry receivers situated throughout the Fraser River watershed, were used to assess speeds of travel and fate of fish. Included in the study was an examination of how different handling techniques influenced the fate of fish, serving to both inform researcher handling protocols and provide some preliminary data for future projects that will be focused on Pacific salmon catch-and-release issues in the recreational and commercial fisheries.

Data from studies of both smolts and adults are of direct relevance to management agencies that are struggling to understand the factors that influence the survival and behaviour of wild salmon. Indeed, low returns of sockeye salmon in 2009 triggered a judicial inquiry, and near record returns in 2010 emphasized how much there is to learn about the factors that influence survival of these wild fish in both freshwater and marine environments.

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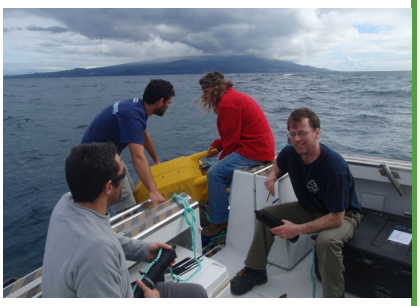
Tech Talk

The last six months have seen the OTN tech team busier than ever, with the deployment of more than 150 moorings in Canadian and international waters. Additionally, recent efforts on VR4 testing and high current deployments are drawing interest from the network.

Deploying VR2Ws in the fiercely tidal environment of the Bay of Fundy's Minas Passage, site of tidal power turbine experiments, has required a revolution in mooring design. The latest version encases the VR2W and acoustic release within a streamlined flotation device with just the hydrophone poking out the top (see photo in Minas Passage Line update, page 2). This design was a collaborative effort among industry, OTN technicians Duncan Bates and Stéphane Kirchhoff, and Acadia University student Jeremy Broome and technician Colin Buhariwalla.

The gear was apprehensively released into eddies and whirlpools as driving currents caused the surface of the water to boil around the boat. The successful 5-month deployment yielded a wealth of data with numerous species detected. Dalhousie, working together with Acadia University, is now in its second collaborative listening season out in the Passage.

Also for the benefit of the Network, the Institute of Marine Research at the University of the Azores - Department of Oceanography and Fisheries (IMAR-DOP/UAz) in Horta, Portugal played host to a successful round of deep (500m) VR4 communication and range tests. Against an impressive backdrop of volcanic Islands and azure skies, OTN and Vemco technicians joined IMAR-DOP/UAz in field trialing the latest receiver models, while discovering new challenges to this specific environment. It seems blue whales were also being drawn to the Azores by a thick layer of krill in the upper 100m of the water column. Despite this, very good VR4 communication and data offload were accomplished to depths over 1000 m.



Pedro Afonso, Gonçalo Graça, Norberto Serpa, and Duncan Bates conduct VR4 communication tests off the Azores Archipelago, Portugal

Data Discourse

The OTN data team is hard at work creating a standards-based, secure, globally accessible data warehouse. In 2010, we expanded to include a full-time database developer, database programmer, and portal manager, and logged more than 1,000,000 detection records for that year alone. Team members are working in close collaboration with industry partners to facilitate the identification of false detections, match detections with taggers, interpret tag sensor data, and acquire instrument metadata suitable for direct loading into the OTN data warehouse.

Since the first GoogleEarth (GE) "FlyBy" was presented at OTN's First Annual Conference in 2008 to show proposed locations of OTN receiver arrays globally, great progress has been made in developing GE data products. OTN's latest GE product, currently under development, will show the GPS location of each closed, active, and planned mooring, using various symbols and colours to indicate the status and type of each mooring station. Rollover popups will provide deployment, download, and recovery details taken directly from the OTN database.

OTN data visualization is poised to become a whole lot more sophisticated in the near future with the development of the Platform for Ocean Knowledge Management (POKM) visualization tool. A collaborative effort among the Computer Science, Oceanography, and Biology Departments at Dalhousie University, POKM is developing a high-end visualization interface that will allow researchers to simultaneously visualize combined oceanographic and tracking data as well as the results of behavioural models of animal movement patterns. Leveraged by the dedicated, high-speed fibre optic cable network CANARIE, POKM will allow researchers to share data among their colleagues globally in a secure environment.

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