ASL Environmental Sciences

Solutions Newsletter

Spring 2021

Spring 2021 ASL Newsletter. This issue:

ASL Environmental Sciences and DASCO Equipment Enter Product and Service Partnership

ASL Environmental Sciences Inc. is pleased to announce its product distribution and service partnership with DASCO Equipment Inc. DASCO is the Canadian representative for several leading international ocean technology manufacturers, most notably Teledyne Marine, and has predominantly operated in eastern Canada. ASL is a leading manufacturer and service firm in the ocean technology and oceanographic marketplace with its head office in Greater Victoria, BC. ASL is looking to DASCO to support a growing presence in eastern Canada for both its product sales division as well as its environmental consultancy business.

With this partnership, clients have access to over 75 years of oceanographic experience offering a complete range of oceanographic instruments and services under one umbrella. Below are some of the organizations represented.

TELEDYNE MARINE Everywhereyoulook™

Trimble

EOM Offshore

Hemisphere

DeepWater BUOYANCY

VALEPORT

WERA

Each company will promote these product lines in their respective regions—ASL in BC, Alberta, Saskatchewan and Manitoba and DASCO in Nova Scotia, New Brunswick, PEI, Newfoundland, Quebec and Ontario. This is true of their respective services and collective lease pools. This partnership strengthens our ability to serve the marine science community in fields such as physical and biological oceanography, ice studies, fisheries and aquaculture, hydrography and navigation, defense and security, and the energy sector. With our combined marine resources, we hope to provide a comprehensive set of equipment, expertise and services for your next marine science project.

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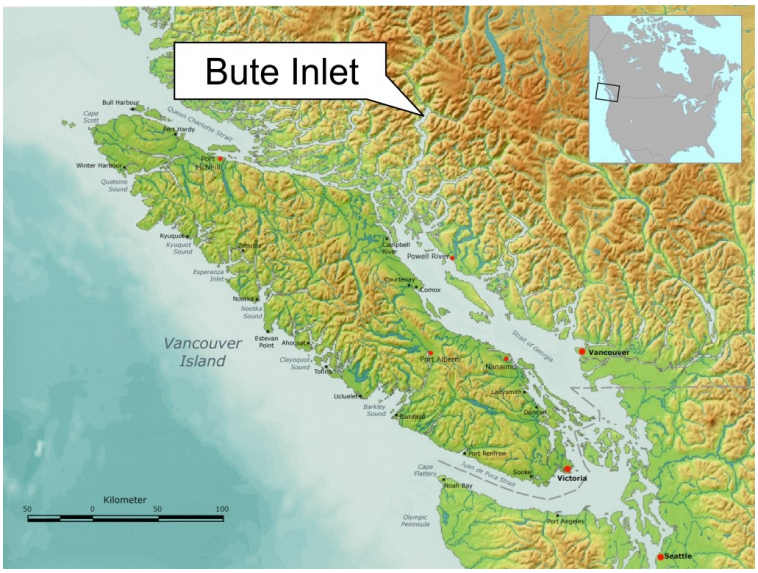
Rush Mobilization of ADCP Mooring for Bute Inlet for Dr Gwyn Lintern of NRCan



A slope failure occurred last November just above Elliot Lake, BC. It reportedly caused a large landslide with runout that flowed into Bute Inlet.

In January, Dr. Gwyn Lintern at NRCan in Sidney, BC had a last-minute opportunity to join a Coast Guard vessel heading for Bute Inlet to do some survey work.

Planning began on a Friday, with the vessel leaving Victoria later the following week. Gwyn had to scramble to get the necessary equipment together, including deck gear, a sounder and piston cores. Gwyn also wanted to deploy an ADCP current profiler but lacked the resources to get a mooring together in time.

He approached ASL Environmental Sciences who were able to mobilize and configure his ADCP as well as assemble a mooring ready to deploy, delivering it to the vessel in Victoria just prior to its sailing. Gwyn deployed the mooring in 600 m water depth, with the ADCP looking downward to hopefully capture some turbidity flows. Gwyn is currently on a follow-up cruise to turn around the mooring and deploy a second ADCP mooring for his UK collaborators. ASL assisted with preparations for both, again on short notice. Gwyn hopes this data will help answer questions such as where the sediment ended up in Bute Inlet, and whether these exceptional flows are more efficient in their carbon transport.

ADCP mooring ready for deployment in Bute Inlet.
Photo courtesy Dr. Gwyn Lintern, NRCan

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The Use of Mooring-based Measurements for Marine Polar Ecosystem Research

(David Fissel, Keath Borg, Matthew Asplin and Rick Birch, 2020. *ECO Environment Coastal & Offshore Magazine*)

Marine Polar Ecosystem Research is challenging due to the remoteness of the study areas and the presence of sea ice, impeding ship operations throughout most of the year. Because of this, basic scientific understandings of the ecosystem in polar areas have lagged behind that of more temperate and tropical waters. In these areas, especially in the Arctic, the physical and biological regimes are changing faster than all other portions of the world's oceans. As the physical regime changes, e.g., regional air temperatures increase and sea ice retreats, there are major impacts on the biological regime due to habitat changes, most notably in the threats to natural species as well as the introduction of invasive species.

Methods for conducting marine ecosystem research in remote polar regions include satellite-based observations, drifting buoy platforms including ice-tethered buoys, coastal-based instruments, ship-based measurements and subsurface mooring-based instruments. Satellites, drifters, and coastal platforms provide extensive measurements at the ocean surface, but only ship-based measurements and mooring-based instruments provide detailed measurements over the full ocean depths. Because of the limitations of ship operations during the ice season, subsurface mooring systems operated over a full year provide the best temporal measurement coverage of the interior of the ocean. In the Arctic, the value of Northern indigenous communities cannot be overstated, not only in their capabilities to contribute to the operation of these data collection methods, but also in their traditional environmental knowledge of the marine system derived from their cumulative experience in hunting marine species in the Arctic environment over many past generations spanning the last millennia.

A recent example of a marine polar ecosystem research study is the Marine Arctic Ecosystem Study (MARES) which was conducted by a consortium of government, university, and private sector organizations in the continental margin of the Beaufort Sea in the Western Arctic Ocean. The overarching goals of MARES are "*to better understand the interrelationship of the physical, biological, chemical, and human systems, including traditional knowledge, of the Beaufort Sea and to advance scientific prediction capabilities for linkages between marine life, human uses, sea ice, atmospheric and oceanic processes and river discharge.*"

MARES moorings were deployed and recovered from the Canadian Coast Guard Ship (CCGS) *Sir Wilfrid Laurier*, during yearly cruises to the study area in 2016–2019.

For the full article please click here

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EcoLight AZFP Buoy to Monitor Light and Under-ice Zooplankton

An international team of scientists led by Dr. Giulia Castellani of the Alfred Wegener Institute (AWI) and Dr. Jeremy Wilkinson of the British Antarctic Survey (BAS) have developed a project called *EcoLight* which uses an Autonomous Biological Echo Sounding Buoy (*ABES*) to continuously measure changes in the light field and associated biological responses under sea ice. The buoy is designed to be frozen into the ice and drift for deployment periods of one to two years collecting data on a pan-Arctic scale. Its payload of instruments includes a holistic array of sensors to measure sea ice, snow, the physical properties of seawater and the biological communities beneath the ice. Fundamental to these biological communities is the availability, timing and duration of light. With climatic changes occurring in polar regions, the overall goal of the *ABES* buoy deployments is to demonstrate how Arctic ecosystems may change as snow, ice type and thickness change in the future. Changes in the light field under the ice affect large-scale ecosystem structure and biochemical functioning of the Arctic marine environment. The consequences of changes in light penetration impact phytoplankton blooms and in-ice algal growth and this, in turn, impacts feeding opportunities throughout the food web.

A key instrument integrated into the *ABES* is an ASL Environmental Sciences Acoustic Zooplankton Fish Profiler (AZFP) . This instrument provides high spatial and temporal resolution and can monitor the presence and abundance of zooplankton and fish within the water column by measuring acoustic backscatter returns at multiple ultrasonic frequencies.

The buoy has solar panels and a set of rechargeable and non-rechargeable backup batteries. In the summer, when there is abundant solar power, the buoy will sample for 20 minutes every two hours, limited by the amount of data that can be transferred via the Iridium satellite modem connection. In the winter, the buoy will sample for six minutes every three hours, limited mostly by available backup battery capacity. This satellite link is bi-directional allowing for the downloading of data as well as the ability to reconfigure instrument parameters remotely.

Others involved in this project include Dr. Lovro Valcic (Bruncin Observation Systems), Dr. Julienne Stroeve (University College London), Dr. Michael Karcher (Ocean Atmosphere Systems—OASys), Dr. Hauke Flores (AWI), Dr. Gaëlle Veyssiere (BAS), Dr. Marcel Nicolaus (AWI), Dr. Frank Kauker (OASys), Dr. Mario Hoppmann (AWI) and Dr. Joo-Hong Kim and Dr. Eun-Jin Yang (Korean Polar Research Institute—KOPRI).

The *ABES* buoy immediately prior to deployment. Photo by Dr. Lovro Valcic.

AZFP zooplankton sensor in its frame, attached to the buoy hull before deployment next to the prepared deployment hole in the sea ice.

Photo by Dr. Lovro Valcic.

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ASL Equipment Used to Monitor Algal Blooms in Eutrophic Lake

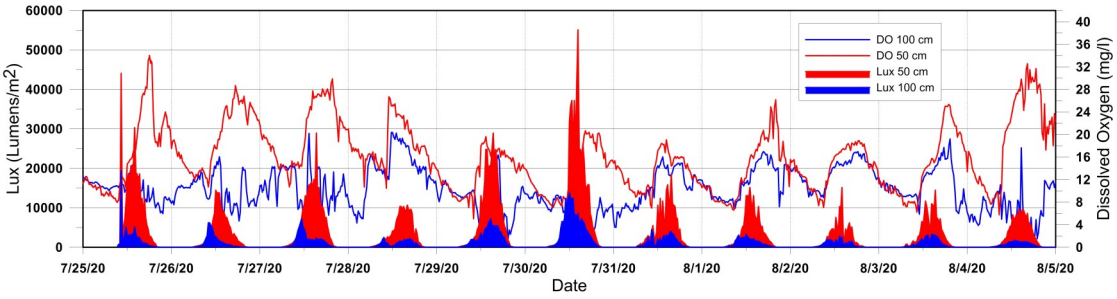
Rob Bowen conducting dissolved oxygen profiles in May 2020 at Swan Lake, Victoria, BC. Inset shows algal bloom in August 2020.

Over the last three years, ASL Environmental Sciences has provided data loggers to a study being conducted at Swan Lake in Victoria, BC. In an ongoing monitoring program, Rob Bowen of Diversified Scientific Solutions has been looking at the relationships between dissolved oxygen, nutrients and cyanobacteria blooms.

In 2018, an ASL Environmental Sciences multi-frequency Acoustic Zooplankton Fish Profiler (AZFP) was used to examine the vertical migration of the cyanobacteria *Aphanizomenon flos-aquae* as this species has the ability to self-regulate its position in the water column by inflating or ballasting elongated gas vacuoles to control buoyancy.

This dominant species was largely responsible for dissolved oxygen production through photosynthesis. Time series of the AZFP acoustic data demonstrated a predictable diurnal pattern that strongly correlates with light penetration and nutrient availability. During this deployment, a late summer hypoxic event was observed which resulted in a fish kill. Leading up to this fish kill, both phosphate and dissolved oxygen (DO) concentrations collapsed and the AZFP saw a rapid diminishing of acoustic volume backscatter. The explanatory power of combining DO loggers, the AZFP with its ability to track position and abundance of cyanobacteria, as well as nutrient testing, gives valuable insights into the dynamics that led up to this fish kill, a problem that's on the rise globally.

More recently, over the last two years, ASL DO loggers have recorded high amplitude diurnal DO cycling between algal photosynthesis and respiration. By continuing this monitoring program, time series of DO, pH, oxygen reduction potential and nutrients are revealing seasonal patterns and possible explanations of the interrelationship of these parameters and the timing and severity of algal blooms. Lux loggers were installed this year to measure light penetration. These loggers were deployed within the photic zone and placed at the same depth as the DO loggers with coincident sampling rates of 20 minutes (see plot below). Such research is necessary background to provide a science-based approach to improving the health of urban eutrophic lakes.



Comparison of dissolved oxygen diurnal cycling with light penetration data from lux loggers.

A more comprehensive article was written for the *Environmental Science and Engineering* magazine. Read article here.

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Rhonda Reidy Awarded NSERC Grant in Partnership with ASL to Measure Baleen Whale Prey in British Columbia

The University of Victoria Ph.D. candidate Rhonda Reidy has recently received funding for her project "Modifying an Acoustic Zooplankton and Fish Profiler for Quantitative Spatial Sampling of Baleen Whale Prey in British Columbia," co-supervised by Dr. Laura Cowen and Dr. Stephane Gauthier. This funding comes from an NSERC Alliance grant awarded to Laura Cowen. Reidy studies baleen whale foraging dynamics. North Pacific humpback whales, in particular, are increasing in abundance and, in BC, are increasingly struck by vessels and entangled in fishing gear. New tools are required to observe their interactions including collecting data on the humpback whale diet. The goal of a partnership between Reidy and ASL Environmental Sciences (ASL) is to collaborate on a modified ASL Acoustic Zooplankton and Fish Profiler (AZFP). The AZFP is an autonomous and calibrated scientific echo sounder, designed for long-term environmental monitoring of the water column from a stationary mooring on the seafloor. In a bottom-mounted, upward-looking orientation, the AZFP monitors the presence of zooplankton and fish by measuring acoustic backscatter returns at multiple ultrasonic frequencies.

One great interest to the marine conservation community in BC is to develop reliable measurement methods for the evaluation of baleen whale diet over time. The objectives of this project are to (i) modify the AZFP for efficient use on small boats and (ii) evaluate the performance of the AZFP regarding its utility for collecting high-resolution prey data near feeding baleen whales. Reidy's research will employ the AZFP in a vessel-mounted, downward-looking orientation from the sea surface which requires modifying the AZFP's external hardware and developing custom software. Advantages of this modification include ruggedized portability of the instrument, expedited deployments and ease of use by non-physical oceanographers. In contrast to ship-based surveys or stationary moorings on the seafloor, portability provides high resolution data collection at low cost as well as rapid visualization and evaluation of results.

Rhonda Reidy preparing the AZFP for prey mapping
(photo credit: Jessica Qualley).

ASL will incorporate Reidy's feedback into the modified system. Examples include a new AZFP interface unit for above water operation on a moving platform and less complicated software for expediting system deployments. The "new" AZFP will enable enhanced spatial surveys that are economical, quantitative, and repeatable and that are conducted over a significantly shorter duration than a six- or twelve-month fixed deployment on the seafloor.

ASL will contribute to this project through a cash contribution and through in-kind contributions. Engineering expertise is in collaboration with Dr. Stephane Gauthier, an acoustics scientist with Fisheries and Oceans Canada who will offer use of an AZFP purchased by DFO as well as his expertise using the AZFP data. Dr. Laura Cowen is an ecological statistician who will be providing statistical support. ASL staff will assist with the project—Jan Buermans will oversee ASL's participation, Matt Stone will install the modified AZFP on the field boat and Rene Chave will be responsible for implementing software updates and troubleshooting. Dr. Steve Pearce, ASL's AZFP product manager with expertise in applied sonar systems, will be the liaison between ASL and the Cowen laboratory, assisting in all aspects of the partnership.

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ASL Environmental Sciences Presents ClearSignal Antifoulant Coating by Severn Marine Technologies

Biofouling in marine environments is one of the primary limiting factors that will determine the deployment duration of platforms and instrumentation and dictate the service schedule that is required. ClearSignal, manufactured by Severn Marine Technologies, is a clear, non-toxic coating that resists biofouling. The product acts as a durable, permanent, foul-release coating that is designed to last the life of the equipment it is protecting. Its effectiveness is a result of the non-stick properties of the materials in the proprietary coating. Unlike traditional antifouling systems which rely on active biocides and whose effectiveness degrades with time, ClearSignal retains its effectiveness over time.

For over a decade, Severn has installed the ClearSignal coating on platforms and instruments deployed around the world from a large number of leading marine product manufacturers. ASL has used this product to coat several of our Acoustic Zooplankton and Fish Profiler (AZFP) instruments on behalf of customers who anticipate deployment in waters known for significant biofouling. We have also been using ClearSignal for ten years of continued deployment on Teledyne RDI Horizontal ADCPs with great success in a challenging biofouling environment.

Through thorough testing, ASL and other manufacturers of underwater acoustic instruments have found that the ClearSignal coating does not significantly affect the signal strength of the device. Furthermore, the coating acts to protect the transducers from damage due to biofouling and extends the lifespan of the instrument. The use of antifoulants can increase deployment times and reduce the required frequency of service due to biofouling. It will also greatly reduce the effort and downtime that is required to clean the equipment and return it to service.

ASL has a long history with Severn Marine Technologies and is proud to act as the designated representative for the ClearSignal product across Canada.

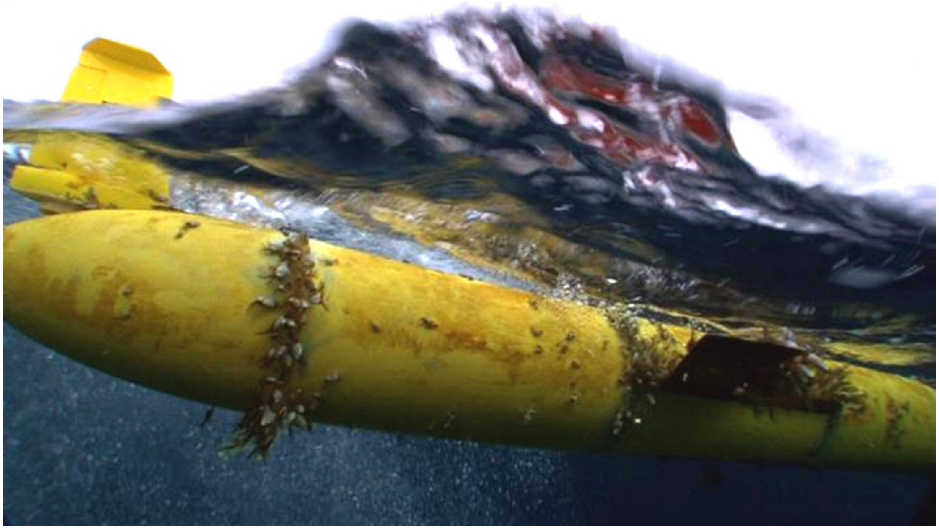

Photo of the Rutgers University's Scarlett Night Glider on its historic Atlantic crossing. Image shows barnacle-free areas where ClearSignal had been applied along with adjacent areas not treated. These non-treated areas at the seams of the glider's modular segments had, over time, bio-accumulations of barnacles.

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ASL's David Fissel Chosen for Board of New Marine Innovation Hub in Victoria

David Fissel has been selected as a member of the board of directors for the new Marine Innovation Hub in Victoria. The hub will support businesses in commercializing products and services, developing new technologies and growing into new markets. Amenities will include research and manufacturing facilities for what is expected to grow into a large marine industry. Focus will be on marine research and hopes to create as many as 1,000 new jobs. Its goals over the next decade include enhancing 50 established Canadian companies and developing another 50 start-ups, along with a nationwide venture fund with $250 million in assets under management to support the ocean tech economy.

David will serve as vice-president. Other senior board members include president Ken Armour, a retired public servant, treasurer Emilie de Rosenroll of the South Island Prosperity Partnership, and secretary Lisa Helps, Victoria's mayor.

For more details click here

New Additions to the Metocean Equipment Lease Pool

We continue to add to our inventory of metocean equipment for lease. Most recently we purchased two model XMi-11k XEOS Iridium satellite beacons. These are generally used to alert us if a mooring surfaces prematurely. We have both XMi-11k and Kilo models in the lease pool.

We have added more 4-frequency Acoustic Zooplankton Fish Profilers (AZFP) to the lease pool. We now offer both 70-125-200-455 kHz, and 125-200-455-769 kHz models. These are used to study both plankton and fish distributions and can be used in real-time or self-contained modes. Recent studies have used them to map distributions of both eulachon and herring. The large alkaline battery pack allows for lengthy deployments of several months depending on the sampling strategy used.

Through our partner DASCO, we can now offer a Teledyne RDI Q-boat fitted with a RiverPro ADCP. This remotely-controlled boat can reduce your survey time, keep people safe during difficult conditions, or access hard to reach locations. The ADCP has a profiling range of 12cm–25m.

Teledyne RDI Q-boat fitted with a RiverPro ADCP.

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ASL's Third Annual Beach Cleaning Event

ASL continued its beach cleaning efforts this year conducting its third annual event on Saturday November 28 at Mount Douglas beach in Victoria, B.C. Approximately ten kg of debris were removed including such items as plastics and styrofoam despite COVID. In these clean-up events, one never knows what you'll find. Of interest this year was an umbrella and some clay figures.

Conferences

Upcoming Conferences

International Conference on Ocean Energy
April 28–30, 2021
Virtual Conference
ASL is joining the Marine Renewables Canada Trade Mission

American Fisheries Society (AFS) Western Division Meeting
May 10–14, 2021
Virtual Conference

Canadian Meteorological and Oceanographic Society (CMOS)
May 31–June 11, 2021
Virtual Conference

Acoustical Society of America
June 7–11, 2021
Virtual Conference

Port and Engineering under Arctic Conditions (POAC 2021)
June 14–18, 2021
Virtual Conference

ASLO 2021 Aquatic Sciences Meeting
June 22–27, 2021
Virtual Conference

Offshore Technology Conference 2021
August 16–19, 2021
Virtual Conference

Past Attended Conferences

Alaska Marine Science Symposium (AMSS)
January 26–28, 2021
Virtual Conference

International Conference on Pattern Recognition (ICPR 2020)
January 10–15, 2021
Virtual Conference

ArcticNet ASM 2020
December 7–10, 2020
Virtual Conference

Conference on Neural Information Processing Systems (NIPS)
December 7–12,2020
Virtual Conference

IEEE International Geoscience & Remote Sensing Symposium (IGARSS)
September 26–October 2, 2020
Virtual Conference

Canadian Meteorological and Oceanographic Society (CMOS)
May 31–June 12, 2020
Virtual Conference

AGU Ocean Sciences Meeting
February 16–21, 2020
San Diego,CA