

Fall 2018 ASL Newsletter. This issue:

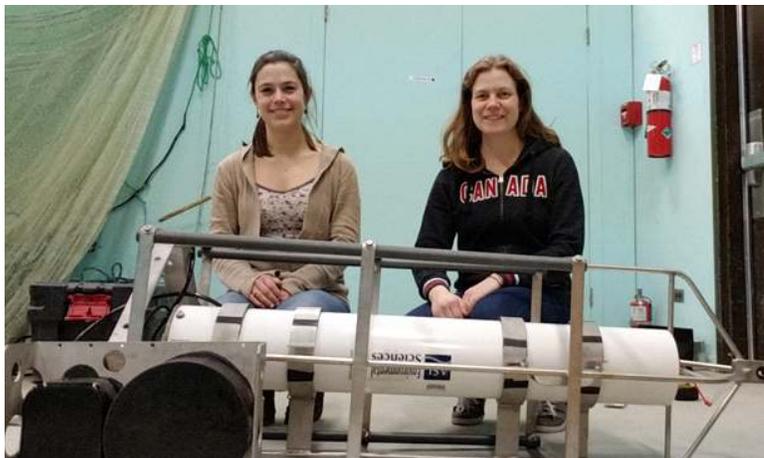
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AZFP Food Web Study of Keystone Arctic Marine Species

The Central and Arctic Division of Fisheries and Oceans Canada deployed an array of multi-frequency (38, 125, 200 and 455 kHz) Acoustic Zooplankton Fish Profilers (AZFPs—manufactured by ASL Environmental Sciences) in the Amundsen Gulf in October 2018. Data retrieved from the array will be used in conjunction with winter and summer net sampling programs to better understand the early life history of Arctic cod (*Boreogadus saida*) and the zooplankton copepod *Calanus spp.*, both of which are keystone species in the Arctic marine food web. Because the instruments are battery powered and enclosed in pressure cases, they can be deployed and record data continuously for a year. These long-term data sets will allow for the detection of fish and zooplankton movements during the data-poor winter spawning season.

Two AZFP moorings with CTDs were successfully deployed at Cape Bathurst in 2017 at depths of 50 and 300 m. The AZFP and CTD data from these moorings were recovered this summer, and the moorings were redeployed. A third mooring was added at 350 m offshore of Pearce Point, to the northeast of Darnley Bay. In addition to the multi-frequency AZFPs, the new moorings are equipped with CTDs, hydrophones and receivers to record the presence of tagged fish.

Prior to the Cape Bathurst deployments, a newly purchased AZFP was tethered to the ice near the Canadian Forces Station Alert, Nunavut, Canada (latitude $\sim 82.5^{\circ}\text{N}$) for a short-term (four week) deployment. This instrument was oriented to look downwards from the ice to detect the presence and movement of fish and zooplankton below multi-year sea ice. This instrument has been recovered successfully.



Ashley Stasko and Andrea Niemi with their newly purchased AZFP, ready for an ice-tethered deployment.



Photo credit: Christian Katlein
Alfred-Wegener-Institut

Ice-tethered AZFP deployment under multi-year sea ice in the Canadian high Arctic.

Acoustic Zooplankton Fish Profiler Used to Detect Fish and Plankton Movement Between Arctic Marine and Lagoon Environments

The North Slope Borough Department of Wildlife Management (NSB-DWM) deployed a multifrequency (38, 125, 200 and 455 kHz) [ASL Environmental Sciences' Acoustic Zooplankton Fish Profiler \(AZFP\)](#) in the nearshore Beaufort Sea at an Arctic lagoon pass near Utqiagvik/Barrow, Alaska (USA), in July 2018. The data retrieved from the AZFP will be used to determine the presence of fish and plankton under ice and their movements between the marine and lagoon environments especially during freeze-up and break-up seasons. Jigging and net sampling will be conducted to collect fish and plankton samples throughout the year in order to verify acoustic targets and to determine if the nearshore environment is an important overwintering habitat for Arctic cod (*Boreogadus saida*) and neritic plankton which are critical components of the Arctic marine food web.

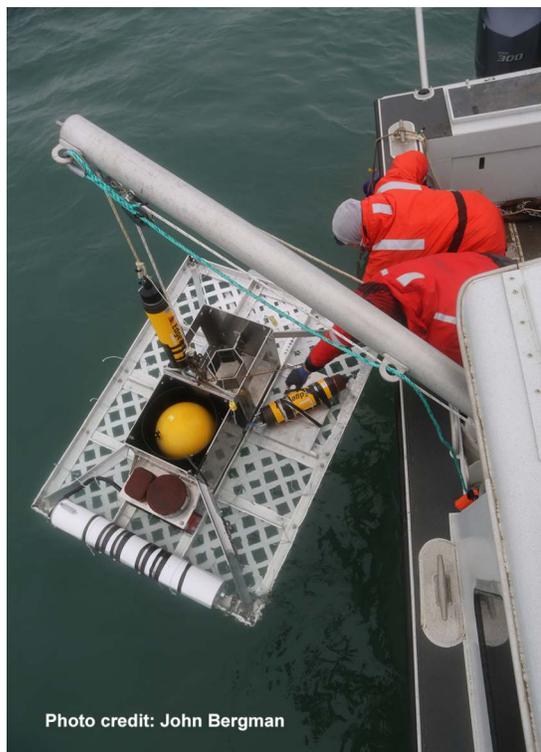


Photo credit: John Bergman

Jeremy Lawrence (ASL) deploying the AZFP at Plover Point, nearshore Beaufort Sea in July 2018.

The AZFP was mounted on a low profile mooring frame and oriented to look upwards. It will record data continuously for a year and it is also equipped with a CTD and an adjacent current meter. These data will help detect the habitat parameters that may be associated with changes in fish and plankton distribution in the nearshore environment.



Photo credit: John Bergman

Dr. Leandra de Sousa and Dr. Todd Sformo (NSB-DWM) - AZFP deployment at Plover Point, nearshore Beaufort Sea in July 2018.

Equipment Leasing

ASL Environmental Sciences has the largest [lease pool](#) of metocean equipment in Canada and we lease worldwide. We offer ADCPs (2MHz to 75 kHz), CTDs, acoustic releases, acoustic profilers including the Ice Profiling Sonar (IP5) and the Acoustic Zooplankton Fish Profiler (AZFP), wave and tide gauges, pingers and transponders, mooring cages and frames, flotation, drogued drifters, sediment grab samplers and traps, and water quality sensor/loggers (DO, Tu, Chlorophyll). We have over 60 ADCPs. Two new 6000 m rated ADCPs were recently added: TRDI 300 and 600 kHz. Both have high accuracy bottom-tracking for deep turbidity flow studies. They can also be used for deep ocean mining.



ASL Announces Its 2018 Acoustic Zooplankton Fish Profiler (AZFP) Award Winner

ASL Environmental Sciences is pleased to announce the winner of the third annual [Acoustic Zooplankton Fish Profiler \(AZFP\)](#) award. Dr. Lilian Lieber, Research Fellow at Queen's University Belfast, has been selected to receive the use of one of ASL's four frequency (38/125/200/455 kHz) AZFPs for her proposal entitled *Drivers of Predator–Prey Coherence in Energetic Environments*. With this award comes the free of charge use of a four-frequency AZFP including batteries and a mooring cage for a deployment period of up to three months. Also included with this award is support from ASL's team of experts.

As marine renewable energy projects have led to a rapid increase in the installation of tidal turbines in coastal channels, it is increasingly important to understand the bio-physical mechanisms driving predator–prey interactions in these highly dynamic environments.

Dr. Lieber will be conducting her study in the Narrows, an energetic tidal channel located in Strangford Lough, Northern Ireland, UK. At this site, a novel quarter-scale tidal turbine developed by Minesto called the [Deep Green](#) tidal kite is currently being tested. Hydroacoustic monitoring using multibeam sonar and acoustic Doppler current profilers is already under way as part of the EU-funded [PowerKite](#) project to assess animal–kite interactions. The project also aims to understand tidally-driven processes that may result in foraging opportunities for top predators (seals and seabirds) which can be exploited over several hours within a tidal cycle. For instance, during peak flows, prey may be transported to the surface by bathymetry-induced turbulence, making prey available to surface-feeding seabirds.

To do this, an integrated suite of hydroacoustic instruments are deployed to create three-dimensional visualisations of animals, debris and turbulent features at the site. By adding the awarded AZFP to this suite, Dr. Lieber hopes to utilize the AZFP's multi-frequency capabilities to enable broad categorization of prey as well as information on prey vertical distribution and abundance. To complement the suite of underwater instruments, a holographic camera capable of directly imaging particles (e.g. plankton, flocs, suspended sediment and bubbles) will be used to ground-truth the multi-faceted acoustic data. Interactions of surface-feeding seabirds will concurrently be assessed using vantage point studies and drone transects over turbulent features.



Dr. Lilian Lieber, Research Fellow,
Queen's University, Belfast.



Walter's Rock, a bathymetric feature in the Narrows tidal channel is predictably being used by surface-feeding seabirds (tern and gull species).

New Application of Acoustic Zooplankton Fish Profiler to Examine the Onset of Hypoxia Using Cyanobacteria as a Marker

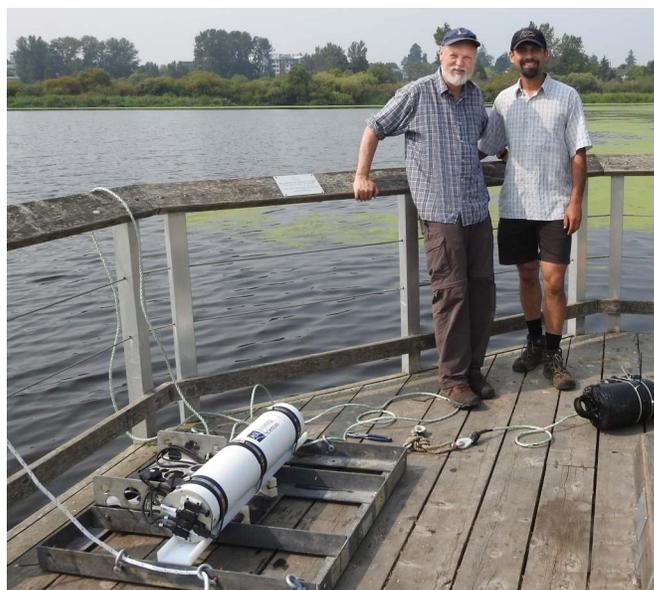
Urban freshwater environments are often being exposed to nutrient loading through groundwater movement and runoff of potent fertilizers. These nutrients impose imbalances that influence biological and chemical processes. The impacts are generally negative, causing onsets of algal blooms and widespread fluctuations in oxygen levels. Through an ongoing monitoring program, Rob Bowen of Diversified Scientific Solutions has been conducting surveys of dissolved oxygen, pH, oxidation-reduction potential, temperature, nitrogen and phosphorous at Swan Lake, in Victoria, BC, Canada.

Cyanobacteria play a key role in the oxygen production in this system as there is an abundance of the species *Aphanizomenon flos-aquae*. Over the last three years, it has been observed that the lake experiences a dramatic collapse of oxygen in the late summer leading to hypoxia and fish kills. Using a drop-down camera, pre-hypoxic conditions have shown an abundance of *Aphanizomenon flos-aquae* throughout the water column. Once hypoxia is established, *Aphanizomenon flos-aquae* are no longer visible within the water column.

In this study, an [ASL Environmental Sciences' Acoustic Zooplankton Fish Profiler \(AZFP\)](#) was deployed over the late summer to collect data during this transitional period. There are a growing number of successful ocean deployments for this instrument to detect zooplankton and fish presence and abundance. Because *Aphanizomenon flos-aquae* are relatively large acoustic targets, it is hopeful that this new application of the AZFP will provide valuable insights into the dynamics of this freshwater system.



Underwater drop-down camera view of abundant suspended *Aphanizomenon flos-aquae*. Image taken approximately 0.75 m below surface. Filaments are typically about 1 cm in length.



Rob Bowen with Jay Rastogi (Swan Lake and Christmas Hill Nature Sanctuary site manager) and AZFP (photo credit Matt Stone).

New ASL Personnel



Dr. Steve Pearce, Acoustics Scientist

ASL is happy to announce the appointment of **Dr. Steve Pearce** to the position of acoustics scientist. Dr. Pearce brings over a decade of experience in underwater acoustics R&D to the ASL team. He earned his Ph.D. at Simon Fraser University in 2014, where his studies focused on sidescan sonar signal processing to suppress multipath interference in the context of a multi-angle swath bathymetry array. The key contributions of his thesis were the introduction and analysis of simple and effective beamforming methods applied in a novel context. These methods are designed to attenuate multipath interference while preserving the seafloor return, and the effectiveness of these methods was established through theory, simulation, and numerous field studies.

Prior to joining ASL, Steve was a System Engineer at Kongsberg Mesotech and managed projects relating to singlebeam and multibeam sonar systems. At Mesotech, Steve gained valuable experience in many aspects of the product lifecycle, including requirements gathering and refinement, hardware and software design, design verification and field testing, as well as manufacturing and customer support.

In his new role at ASL, it is expected that Steve will become the Product Manager for the Acoustic Zooplankton Fish Profiler (AZFP) and will accept the responsibilities that are presently fulfilled by David Lemon. As part of this role, Steve will assist with data processing and will coordinate customer support inquiries. Additionally, Steve will be involved in the design of new underwater acoustics products for ASL.

Dr. Thomas Tolhurst, Remote Sensing Analyst



We are happy to announce the appointment of **Dr. Thomas Tolhurst** to the position of Remote Sensing Analyst at ASL Environmental Sciences. Dr. Thomas Tolhurst received his Ph.D. from the University of Saskatchewan in 2017, where his research focussed on material characterization using soft x-ray and optical spectroscopy, as well as mathematical modelling. His thesis contributed to the understanding of the mechanisms for fluorescence in modern high-efficiency LEDs, as well as the development of several analysis techniques for soft x-ray spectroscopy. These analysis techniques have opened opportunities for measuring key characteristics of several industrially relevant material classes. Prior to joining ASL, Thomas was a Remote Sensing Analyst at MacDonald Dettwiler and Associates (MDA). At MDA he worked on the development of their synthetic aperture radar (SAR) processing software, applications of machine learning methods to SAR imagery, as well as customer support.

In his new role at ASL, Thomas will contribute to the ongoing development of an automated change detection and land cover classification system, focusing on multi-source data integration for classification, target and anomaly detection. Thomas will be a valuable addition to ASL's remote sensing group that has an established reputation and internationally recognized expertise in hyperspectral remote sensing and its applications for environmental, mining, and defense sectors. Thomas will also lead ASL's increasing research and development efforts on the applications of artificial intelligence, both for remote sensing and generally across ASL's consulting services.

New ASL Personnel (continued)

Sasha Nasonova, Remote Sensing Analyst



We wish to welcome **Ms. Sasha Nasonova** to ASL Environmental Sciences for the position of Remote Sensing Analyst. Sasha holds an MSc. degree in Geography from the University of Victoria where she focused on understanding sea ice evolution using satellite remotely sensed imagery from synthetic aperture radar and multispectral sensors, as well as airborne observations from LiDAR and electromagnetic induction instruments. She has conducted field work out of Cambridge Bay, Nunavut which consisted of geophysical sampling and community engagement. Her thesis focused on establishing quantitative relationships between winter sea ice thickness and summer melt pond extent, as well as assessing the utility of the upcoming RADARSAT Constellation Mission compact polarimetric parameters for sea ice type classification during the melt season. Sasha's thesis resulted in two manuscripts which were accepted for publication in the Remote Sensing Journal and the Canadian Journal of Remote Sensing.

Prior to joining ASL, Sasha was a Research Assistant at the University of Victoria and a Remote Sensing Analyst with the Pacific Forestry Centre. As a Research Assistant she mainly focused on using open-source Sentinel-1 imagery for understanding the dependence of texture features on radar incidence angle and automation of workflows in Google Earth Engine for community applications. In partnership with the Firelight Group, she has also created Microwave Remote Sensing educational material for distribution to colleges in the Canadian North. As a Remote Sensing Analyst at the Pacific Forestry Centre, Sasha worked on creating analysis ready products for the Petawawa Research Forest from multispectral, synthetic aperture radar and LiDAR datasets. Sasha's undergraduate training is in Earth and Ocean Science, Remote Sensing and Geographic Information Systems and she has experience in the mineral exploration industry, including conducting field work in remote areas of the Yukon.

As a Remote Sensing Analyst at ASL, Sasha will be involved in the development, testing and implementation of new workflows using synthetic aperture radar, multispectral, and hyperspectral datasets. She will focus on image processing, classification, target and anomaly detection, as well as time series and geospatial statistical analyses.

International Conferences

Recently Attended

- CMOS 2018 (Canadian Meteorological and Oceanographic Society) June 10–14, 2018 Halifax, Nova Scotia
- ASLO 2018 Summer Meeting (Association for the Sciences of Limnology and Oceanography) June 10–15, 2018 Victoria, BC
- 39th Canadian Symposium on Remote Sensing, June 19–21 2018, Saskatoon, SK
- ISOPE 2018 (International Society of Offshore and Polar Engineers) June 10–15, 2018 Sapporo, Japan
- Cold Harvest 2018 (Aquaculture Conference) Sept 26–28, 2018, St. John's NL
- 41st AMOP Technical Seminar on Environmental Contamination Oct 2–4, 2018 Victoria, BC

Upcoming

- Oceans 2018 MTS/IEEE Oct 22–25, 2018 Charleston, North Carolina
- 176th Meeting of the Acoustical Society of America, Nov 5–9, 2018 Victoria, BC
- Asian Fisheries Acoustics Society (AFAS 2018) Nov 13–15, 2018 Jeju, South Korea
- Alaska Marine Science Symposium (AMSS) 2019 Jan 28–Feb 1, 2019 Anchorage Alaska
- Working Group on Fisheries Acoustics Science and Technology (WGFAST) 2019 April 29–May 3, 2019 Galway, Ireland
- Ocean Technology Conference (OTC) 2019 May 6–9, 2019 Houston, Texas