

International Year of the Salmon: Wrap-up and its Final Year

By Camille Jasinski
IYS Communications Manager

The International Year of the Salmon (IYS) is a five-year (2018–2022) initiative governed by the North Pacific Anadromous Fish Commission (NPAFC) and North Atlantic Salmon Conservation Organization (NASCO). Since its inception, the IYS has been working tirelessly to set the conditions necessary to establish resilience between salmon and people in a rapidly changing world. As the IYS enters its last few months, it looks back on several extremely successful Signature Projects, and looks forward to a roadmap ensuring this resilience.

The year 2022 has been extremely busy so far, with the 2022 Pan-Pacific Winter High Seas Expedition wrapping up in April. Despite the arrival of a new strain of COVID-19 at the beginning of the year, and rising global political tensions, the IYS continues to collaborate internationally on its Signature Projects. The IYS is looking forward to hosting its wrap-up Synthesis Symposium in early October 2022 in Vancouver, BC. The IYS continues to build connections and leverage its opportunities by working in a virtual format.

2022 Pan-Pacific Winter High Seas Expedition

On February 3rd, 2022, the NOAA *Bell M. Shimada* picked up her full complement of scientists and made her way into the North Pacific Ocean (NPO) as the first vessel to launch the 2022 Pan-Pacific Winter High Seas Expedition. A few days later, the R/V *TINRO* left Vladivostok to make its way across the NPO. In late February, two Canadian vessels, the CCGS *Sir John Franklin* and the F/V *Raw Spirit*, left their ports in Victoria, BC, and Port Alberni, BC, respectively. This international fleet of fishing and research vessels embarked on the largest ever Pan-Pacific research expedition to study the winter ecology of salmon in the NPO. In early April, it was announced that a fifth vessel, the F/V *Northwest Explorer*, would join the 2022 Expedition fleet. Together, these five vessels spent 182 days at sea. Sixty-nine scientists from three NPAFC member countries performed research onboard these vessels, and their combined effort sampled 131 stations over approximately 2.5 million square kilometers in the Central and Eastern NPO. Together, these vessels caught 2,321 salmon and steelhead (1,341 sockeye, 687 chum, 111 coho, 107 pink, 57 steelhead, and 18 Chinook).



Camille Jasinski is the IYS Public Relations and Communications Manager for the International Year of the Salmon (IYS)—North Pacific Region. She is currently completing her master's degree in communications at SFU (Simon Fraser University), after which she hopes to pursue her PhD. Camille's graduate research interests include classical communication

theory, ideology, philosophy, surveillance culture, environmental communication, decolonization theory, and Indigenous rights. Camille currently sits as the Co-chair to the IYS Theme Council Group 4—Outreach and Communication. She is also a registered 200-hour yoga and fuse instructor.



IYS staff left to right: Caroline Graham (former IYS High Seas Expedition Coordinator), Mark Saunders (IYS Director, North Pacific Region), Camille Jasinski (IYS Communications Manager) at the media event for the return of the CCGS *Sir John Franklin* in Victoria, BC on March 25, 2022. Photo credit: Ron Sombillon



The NOAA Bell M. Shimada entering Kodiak, Alaska. Photo credit: Laurie Weitkamp



Jackie King with a sockeye salmon catch on the CCGS Sir John Franklin. Photo credit: Nicholas Ens

The objective of the 2022 Expedition was to demonstrate the utility of an international Pan-Pacific winter ecosystem survey to understand how increasingly extreme climate variability in the NPO and the associated changes in the physical environment influence the abundance, distribution, migration, growth, fitness, and survival of Pacific salmon and surrounding species. All five vessels successfully conducted ecosystem surveys across the NPO in the largest international effort combining such a wide geographical scope in the high seas during the least studied winter season. The vessels used a variety of approaches including sampling by trawl, gillnet, and three types of plankton nets, and a variety of research methods including oceanographic and hydrochemical sampling, hydroacoustic monitoring, macro-and-microplastic pollution observations, and a wide range of new and emerging technologies.

Four vessels deployed surface trawl nets and one vessel deployed gillnets and longlines to sample the distribution of salmon and associated species in the NPO. The vessel that deployed gillnets and longlines was the F/V *Raw Spirit*. Dr. Brian Riddell and Dr. Richard Beamish raised funds from donors in the U.S. and Canada to support the F/V *Raw Spirit's* participation in the expedition. Chrys Neville was Chief Scientist during the F/V *Raw Spirit's* participation in the expedition as it sought to use gillnets and longlines to test the salmon-catching efficacy of the surface trawl nets used by the other vessels. The F/V *Raw Spirit* set out to fish many of the same stations that the CCGS *Sir John Franklin* fished to provide a direct comparison of catches between gear types. Steelhead were the most abundant species caught by the gillnets, which is helping scientists shed further light on the puzzle of offshore distribution and ecology of steelhead trout,

which are thought to dwell within a thin surface ocean layer and may avoid pelagic trawl nets. Sockeye salmon were the most common species encountered, with most catches occurring in the Central North Pacific south of the Aleutian Islands, which is a well-known wintering area for sockeye stocks from Bristol Bay. The largest catch of salmon during the expedition was 683 fish—consisting mostly of sockeye—which occurred in the Central North Pacific. To our knowledge, this is the largest single catch of salmon sampled in a research area by trawl net during winter since 1986. Scientists are curious as to whether sockeye catches can predict sockeye returns. Scientists speculate the huge number of sockeye salmon caught in 2022 could be related to monster Bristol Bay returns (the highest ever) and low catches in 2019 and 2020 in the Gulf of Alaska from dismal Fraser River returns (the lowest ever recorded in both years).

Species abundance and distribution in the survey area can help scientists learn more about salmon predators and prey. Besides salmon, the main marine life encountered in the catches included jellyfish, squid, and lanternfish (myctophids). Several vessels also caught large numbers of threespine stickleback, which was surprising since these species are usually found much closer to shore. The abundance of threespine stickleback is growing in the Western North Pacific and Southwestern Bering Sea in summer and autumn, where this planktivorous species is considered a food competitor for juvenile salmon migrating oceanward.

A wide range of novel technologies such as gliders, environmental DNA (eDNA), and genetic stock identification were used to enhance research for the 2022 Expedition. In addition to the collected data, a wide array of biological and physical

samples, including hydroacoustic records and sea surface video recordings, are in several specialized laboratories for processing and supplementing the Expedition's output. During the 2022 Expedition, an autonomous underwater glider with hydroacoustic capabilities, *Gretel*, was deployed in the northern Gulf of Alaska to provide additional data on physical and biological conditions salmon face during winter. *Gretel* was launched from the mouth of Resurrection Bay in the northern Gulf of Alaska on February 12, 2022 and sampled in the southeast near the NOAA *Bell M. Shimada*. *Gretel* collects acoustic and environmental data from an array of sensors and can dive to depths of up to 100 meters. Acoustic data are collected and stored on board the glider with summary data exported to the acoustic brain for echometric computation in real time. These data products are then sent to shore via satellite. The successful deployment of *Gretel* the Glider is due to a collaboration between teams at the University of Washington, the University of Alaska Fairbanks, and the NOAA/National Marine Fisheries Service laboratory in Juneau, AK.

Additionally, a total of 942 eDNA samples were collected during the survey. eDNA is a cutting-edge technology allowing scientists to collect tiny quantities of DNA sloughed off by all organisms in the marine environment to determine what species were present in the survey area but were not caught using traditional sampling gear. This helps scientists detect predators and prey and can paint a larger picture of which species salmon are interacting with in the wider NPO. The eDNA collected during the 2022 Expedition presents a data set unprecedented in spatial coverage for the North Pacific Ocean. Samples are being analysed this summer.

During the 2022 Expedition, a huge communications effort was raised to ensure communication capabilities on all five vessels. Vessels were equipped with bandwidth and communication equipment to ensure effective ship-to-shore communication, and communications points of contact were tasked with recording photos and



Laurie Weitkamp (Northwest Fisheries Science Center, NOAA) and Jamal Moss (Alaska Fisheries Science Center, NOAA) on board the NOAA Ship *Bell M. Shimada*. Photo credit: Steve Lindley



Japanese gillnet on the Canadian F/V *Raw Spirit*. Photo credit: Chrys Neville



Conductivity, Temperature, and Depth sensor recovery on the NOAA *Bell M. Shimada*. Photo credit: Steve Lindley



Gretel the Glider being tested in Resurrection Bay, Alaska. Photo credit: UAF

videos and documenting life at sea. Live updates of photos, videos, and diary-like entries were uploaded to the [2022 Expedition Webpage](#) and shared on all IYS social media channels so that a wide range of audiences could follow along and get an inside look at what it's like to be a scientist on a research vessel. This proved to be an engaging and popular way to share details of the 2022 Expedition with a wide range of international audiences, who got a more personalized experience of the expedition outside of just the science. Perhaps the most popular aspect of the website was the live tracker for the research vessels. All of us shoreside followed the daily movements of the ships with great interest. We received many inquiries about the vessel operations as people wanted to know why vessels had changed direction or gone to port. The IYS Communications Manager is currently working on a post-cruise multimedia project as a legacy piece to highlight, in easy-to-understand language and visuals, the exciting work and massive international effort required to make the 2022 Expedition come to life.

The planning and execution of the 2022 Pan-Pacific Winter High Seas Expedition was not without its challenges. The unprecedented global COVID-19 pandemic continued to be an issue of concern as the expedition was about to launch, with the rise of the new Omicron variant rapidly tearing through communities at the start of 2022. Luckily, all vessels



IYS High Seas Coordinator, Aidan Schubert, testing a life raft before getting on the F/V Raw Spirit. Photo credit: Chrys Neville

had strict COVID and isolation protocols, and no positive cases of the virus were detected on any of the vessels while they were at sea.

There is a reason that very little research has been conducted in winter in the open North Pacific Ocean. All vessels experienced some very rough weather and the R/V *TINRO* endured some of the worst weather encountered at sea in decades. We commend all of the scientific crews for their effort and dedication in doing this difficult work.

On February 25th, 2022, chief expedition scientist Dr. Evgeny Pakhomov boarded the Russian R/V *TINRO* to join an all-Russian team of scientists and crew. Dr. Pakhomov was to be joined by an American scientist who was called on to abandon

the expedition mere hours before the vessel set sail. Once the vessel was at sea, Canada and the United States shut their borders to Russia, and there was fear the vessel would be forced to travel back to Vladivostok with Dr. Pakhomov, a Canadian citizen, on board. Against all odds, the ship continued to work and sample its planned stations outside of U.S. territorial waters, meaning roughly 30% of data that would have been sampled within the American exclusive economic zone (EEZ) was omitted from the survey. Because of political tensions around the border, Dr. Pakhomov had to be taken off the R/V *TINRO* by a private oceanic tugboat in U.S. waters and returned to Dutch Harbor. Despite the unprecedented geopolitical situation taking place in Russia and Ukraine, Dr. Pakhomov was grateful for the kindness and professionalism of his colleagues on board the R/V *TINRO*, and believes international collaboration and effort are needed to obtain and process all the data properly. Unbelievably, the Secretariat staff and NOAA/National Marine Fisheries Service staff were also able to arrange a charter for the F/V *Northwest Explorer*—in less than two weeks—to continue the work in the central North Pacific that the R/V *TINRO* was unable to complete in the U.S. EEZ. Dr. Jim Murphy led a scientific team on the F/V *Northwest Explorer* that included NPAFC U.S. Commissioner, Mr. Tommy Sheridan.

Scientists continue to work on data and samples from the expedition, and lab work is ongoing as we prepare for a High Seas Expedition Results Meeting in Vancouver, BC at the beginning of October 2022. A science team will come together for a preliminary review of expedition findings and research plans.

There is an ongoing international effort to synthesize datasets for the best results to help us better understand the mechanisms regulating salmon abundance, distribution, and survival during winter in the North Pacific Ocean. The 2022 Pan-Pacific Winter High Seas Expedition hopes to advance oceanographic research and use salmon data and research to inform key ocean and climate science through data and beyond, leaving an important mark on the legacy of the IYS.

IYS Synthesis Symposium

On October 4–6, 2022, the NPAFC and NASCO will be hosting the IYS Synthesis Symposium at the Westin Bayshore in downtown Vancouver, BC. As the IYS enters the final stretch of its last year, it will bring together a wide range of participants from academia, government, industry, NGOs, and Indigenous organizations to consider the progress made by the IYS and discuss the actions necessary to enable progress towards rapidly changing climate conditions over the next decade. The IYS Synthesis Symposium—*Salmon in a Rapidly Changing World: Synthesis of the International Year of the Salmon and a Roadmap to 2030*—is a culmination of over 13 workshops and symposia, three historic High Seas Expeditions, and over 80 associated events across the North Atlantic and North Pacific basins.

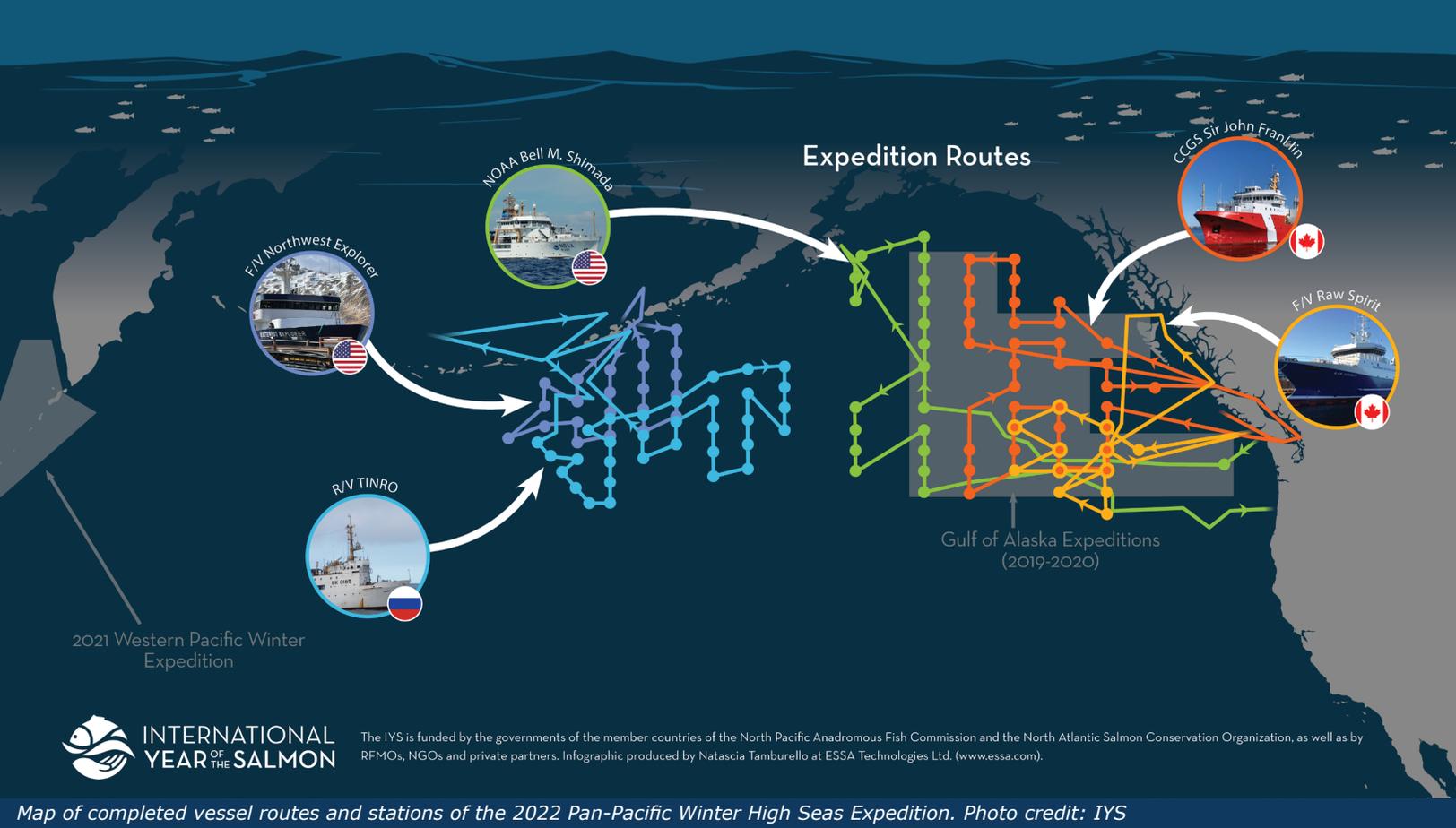
The [IYS Synthesis Symposium](#) will have a strong focus on forward-looking perspectives, with the ultimate goal of developing a Roadmap for the resilience of salmon and people through to 2030. Presentations will be organized under five of the IYS



Science crew on the Northwest Explorer. Photo credit: Tommy Sheridan



Evgeny Pakhomov with his colleague on board the R/V TINRO. Photo credit: Aleksey Somov



The IYS is funded by the governments of the member countries of the North Pacific Anadromous Fish Commission and the North Atlantic Salmon Conservation Organization, as well as by RFMOs, NGOs and private partners. Infographic produced by Natascia Tamburello at ESSA Technologies Ltd. (www.essa.com).

Map of completed vessel routes and stations of the 2022 Pan-Pacific Winter High Seas Expedition. Photo credit: IYS

themes: Status of Salmon, Information Systems, Salmon in a Changing Salmosphere, New Frontiers, and Human Dimensions. Synthesis papers and presentations given during the Symposium will be used to identify critical knowledge or method gaps and potential solutions that will inform a Roadmap, which will be published in the NPAFC Bulletin, along with the Symposium proceedings.

The Symposium will involve a mixture of concurrent sessions, during which presentations on specific sub-themes under each of the IYS themes will be given, as well as plenary sessions, which will be primarily focused on synthesis and discussion. Synthesis papers for the Symposium sub-themes are in development, with area experts from across the Northern Hemisphere collaborating to provide high-level overviews of the state of the art for each given topic and recommended future directions for research over the next decade. These papers will be presented during the Symposium. Registrations for the Symposium close on **August 31, 2022**.

Data Mobilization

The IYS is continuing its work with data scientists from the Hakai Institute to mobilize data from the 2019 and 2020 International Gulf of Alaska Expeditions, and the 2022 IYS Pan-Pacific Winter High Seas Expedition using Global Ocean Observing System (GOOS) protocols, as well as a federated

approach to standardize the data so they can be rapidly discovered and synthesized. Available metadata from the 2019, 2020 and 2022 Expeditions can now be found in the [IYS Metadata Catalogue](#), with many datasets from these expeditions being made publicly available. A list of published data sets and their Digital Object Identifiers (DOI) can be found here. The long process of developing and implementing data management plans for the 2022 Expedition is beginning to bear fruit as researchers begin accessing data from all three expeditions for their research.

IYS Secretariat staff and Hakai Institute data scientists continue to meet regularly with partners from across the Northern Hemisphere to discuss shared challenges and potential solutions related to data mobilization. This group is contributing a synthesis paper to the IYS Synthesis Symposium for the sub-theme, "Towards a Data driven Future: Progress and Future Requirements for Data Mobilization across the Salmosphere." Additionally, this group collaborated over a paper recently published in the journal Ecological Informatics. The paper describes the Atlantic Salmon Trust's Central Data Resource data mobilization tool and its broader relevance to salmon research and management throughout the Northern Hemisphere. See [here](#) for the link to the paper and below for the citation:

Diack, G., Bull, C., Akenhead, S.A., van der Stap, T., Johnson, B.T., Rivot, E., Patin, R., Hervnann, P.Y., Schubert, A., Bird, T., Saunders, M., and Crozier, W. 2022. Enhancing data mobilisation through a centralised data repository for Atlantic salmon (*Salmo salar* L.): Providing the resources to promote an ecosystem-based management framework. *Ecological Informatics*, 70, p.101746.

BECI—Basin-Scale Events to Coastal Impacts

In 2021, the United Nations Decade of Ocean Science and Sustainable Development (UNDOS) endorsed BECI: Basin-Scale Events to Coastal Impacts. BECI will develop a new, collaborative, international ocean intelligence system for a rapidly changing world. An integrated and intelligence-based approach to understanding and beginning to adapt management regimes to changes occurring in climate, oceans, and fishery resources across basins will help us prepare for an increasingly volatile marine environment.

Currently, management systems are unable to respond properly to a rapidly changing climate. Many marine stocks are in decline or experiencing increasing variability, and species distributions in oceans are changing. Additionally, predictions based on historical data are failing, and these factors make it difficult for managers and decision makers to adapt to these changes. As scientists, governments, and organizations work to try and reverse the effects of climate change, a more resilient management system to address the increasing variability of climate conditions for marine species in the North Pacific Ocean is crucial. BECI is a response to increasingly catastrophic impacts of a

changing climate on fish and people, which demands a more collaborative approach to understanding and predicting the impacts of these changing conditions.

Recognizing the need to adapt decision-making processes to the realities of climate change, BECI builds on proof-of-concepts projects developed for Pacific salmon such as the Salish Sea Marine Survival Project and the 2022 Pan-Pacific Winter High Seas Expedition and is convening scientists and academics to provide input into a high-level science plan to present to the North Pacific Marine Science Organization (PICES) in 2023. In 2022 so far, BECI launched its brand-new website (<https://beci.info/>) and conducted a 4-part workshop series which will provide important input into the BECI science plan. The 2022 BECI Workshop Series identifies four workshop themes to identify present capabilities, gaps, and approaches to data synthesis.

The first workshop in the series, *Climate and Ocean Ecosystem Modelling: Predicting the State of Oceans and Fisheries in the North Pacific and the Bering Sea*, looked at downscaling and appropriate climate change and fishery ecosystem models to apply to the BECI science plan. The second workshop, *Linking Ocean Processes and Ecosystem Changes to Fish Production*, examined approaches to monitoring and understanding biological production of the Northeast Pacific ecosystems, and how these may affect the production of Pacific salmon and other species. The third workshop, *Technology and Tools for Monitoring and Data Synthesis*, included an overview of new technologies such as gliders, drones, buoys, satellites, fish tags, eDNA, and data systems. The fourth workshop focused on data synthesis. Summary blog posts encompassing



important points from all sessions will be shared on the website to engage a larger audience with the outcomes of these workshops and their relevance to building out a science plan for BECI.

Over the course of the Ocean Decade (2021–2030), BECI will develop a new collaborative ocean intelligence system. This system will provide predictions based on new downscaled ecological forecasting models using data derived from technologies ranging from satellites to uncrewed autonomous vehicles. These data will eventually inform analytic and modelling approaches that help support a spectrum of management decision-making processes—from regional high-seas international treaty-based organizations to the managers of localized subsistence fisheries.

International Indigenous Salmon Gathering

The IYS began working with colleagues from Norway in 2021 to help plan an event bringing together Indigenous peoples from across the Northern Hemisphere to discuss their experiences in salmon management systems. The International Indigenous Salmon Gathering is an Indigenous-planned and led event which will be taking place in Vancouver, BC, on the unceded territory of the Musqueam Nation in early October 2022. This event will convene Indigenous peoples who work with salmon and/or salmon management systems to share their stories and experiences with one another. The gathering will be composed of two and a half days, including a half day for the ceremony, a full day of experience sharing, and an academic component led by Indigenous academics. The IYS has been helping a smaller planning team consisting of Indigenous and non-Indigenous partners from BC, the Yukon, and Norway to help put this gathering in motion.

Northern Hemisphere Pink Salmon Experts Meeting

The Northern Hemisphere Pink Salmon Experts Meeting will take place on October 2 and 3, immediately preceding the IYS Synthesis Symposium. This small meeting will involve scientists from the Pacific and Atlantic basins coming together to examine the benefits, priorities, and opportunities for international collaboration related to the study and management of pink salmon. This group will also provide a synthesis presentation on

pink salmon to be presented at the IYS Synthesis Symposium under the sub-theme: "Changing Climate, Changing Status: Understanding Shifts in Salmon Distribution, Productivity, and Abundance Under Climate Change."

IYS Communications and Outreach

The IYS has been building its communications strategy for over three years in order to expand its outreach to a wide range of audiences. As the IYS enters its final stretch, it leaves behind a legacy which engaged audiences ranging from scientists to the informed public, to the wider public and youth. The IYS has sought to engage these audiences with knowledge about the state of salmon in a rapidly changing world as it allowed audiences to participate in its various signature projects through online social media networks such as Twitter, Instagram, and Facebook. Since 2019, the IYS has grown its online following on Twitter to over 1,400 users; on Instagram, to over 1,000, and on Facebook, to almost 1,000. The IYS has seen consistently above average engagements rates on Twitter and had extremely high engagement on all social media platforms during all three High Seas Expeditions.

Communicating the status of salmon in a rapidly changing world is important in painting a larger picture of how the planet, particularly our oceans, is changing under global warming and climate change. These are complex subjects which take a great degree of understanding to fully grasp, and one of the goals of the IYS communications strategy was to make these concepts simpler and easier to understand for those outside the scientific community. There is a tendency for audiences to tune out news and information about climate change, but linking the significance of salmon as a keystone species to ecosystems and communities helps ground this knowledge in a way that makes it more approachable. The IYS has built its website, various workshops and symposia, blogs, articles, media releases and press conferences around this principle, making information about salmon, their complex life cycle, and how they are adapting to increasingly volatile ecosystems more visual and accessible.

We look forward to the fall and learning more about the results from the 2022 Expedition and working towards a post-IYS time for NPAFC that is informed and inspired by the success of the IYS.