Looking Back on the International Year of the Salmon 2018–2022

By Camille Jasinski
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The International Year of the Salmon (IYS), a five-year (2018–2022) initiative governed by the North Pacific Anadromous Fish Commission (NPAFC) and the North Atlantic Salmon Conservation Organization (NASCO), has wrapped up its final year. Since its inception, the IYS has been working relentlessly to set the conditions necessary to establish resilience between salmon and people in a rapidly changing world. As the IYS closes its final chapter, it looks back on five successful years of international and multi-organizational partnerships, research, outreach, and Signature Projects. The IYS hopes to leave a legacy for future organizations and scientists to be inspired to take action to ensure salmon and the ecosystems and communities that depend on them stay resilient.

The final half of 2022 wrapped up with the IYS Synthesis Symposium, which successfully brought together partners from across the Northern Hemisphere to synthesize the important work done throughout the IYS initiative and to work on building a roadmap for the resilience of salmon and people throughout to 2030. As we leave the IYS behind, we look forward to new and exciting projects that can build off the work and research done during the IYS.

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The IYS Synthesis Symposium—Salmon in a Rapidly Changing World: Synthesis of the International Year of the Salmon and a Roadmap to 2030

From 4–6 October 2022, the NPAFC and NASCO held a synthesis symposium at the Westin Bayshore in the heart of downtown Vancouver, British Columbia, to synthesize the knowledge gained over the course of the IYS. This symposium welcomed over 200 participants from dozens of countries who came together to explore the conditions necessary for the resilience of salmon and people in a rapidly changing world. The IYS Synthesis Symposium 'Salmon in a Rapidly Changing World: Synthesis of the International Year of the Salmon and a Roadmap to 2030' was the 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. Additionally, the IYS held and participated in three significant events that occurred immediately before the Symposium in Vancouver: the IYS 2022 Pan-Pacific Expedition Preliminary Results Meeting, the Northern

Elder Larry Grant from Musqueam Nation, Silje Karine Muotka, president of the Sami Parliament of Norway, and Hugh Braker, President of the First Nations Fisheries Council (left to right) at the Synthesis Symposium opening ceremony. Photo credits for all images in this article: NPAFC Secretariat

Symposium audience and participants in the Stanley Park Ballroom.

The Symposium Steering Committee at the completion of the Symposium.

Hemisphere Pink Salmon Experts Meeting, and the International Gathering of Indigenous Salmon Peoples.

During the Symposium, salmon scientists, managers, and Indigenous knowledge holders from across the Northern Hemisphere presented live, recorded, and poster presentations which were organized under the five IYS research themes. Each IYS theme had an overarching objective and a range of sub-themes. The outcomes from these presentations and discussions will be synthesized into a comprehensive IYS Roadmap to 2030 which will provide advice that can be utilized by governments, academia, Indigenous communities, and private industry on salmon research and management in an increasingly uncertain future. The IYS Roadmap to 2030 will identify critical knowledge or method gaps and potential solutions based on the outcomes of the research themes and will be published in the peer-reviewed NPAFC Bulletin.

As collaborators across the Northern Hemisphere work on producing synthesis papers for Symposium sub-themes, the IYS has gathered preliminary key takeaways, highlights, and summaries from the rich Symposium's presentations and discussions. Participants were given the chance to review the five research themes and identify gaps and/or roadblocks to reaching the various theme objectives, as well as opportunities to overcome these gaps.

IYS Research Theme: Status of Salmon

The objective of the Status of Salmon theme is that the present status of salmon and their environment is understood. Reaching this objective requires the support of broad collaborations that increase and build on our current understanding of salmon and their environments, as well as the changes occurring to them. As indicated by the IYS High Seas Expeditions, the early life history and beginning of the ocean life stage of salmon is poorly understood, and scientists are still unsure of which salmon life history phase is experiencing the highest loss of fish. As urban development increasingly impacts saltwater environments, barriers to reliable predictions and forecasting are increasing. To have a complete understanding of salmon during each of their life history stages, it is important to try and link freshwater to ocean life stages and look at macro effects, including a multi-species point of view. It is also crucial to include multiple knowledge systems in this work.

Overcoming the gaps to understanding the complex status of salmon and their environment requires sustaining resourcing of long-term recovery, restoration, monitoring, and data repositories. Most importantly, we must determine what collaborations are needed, and which collaborations need support, and at what scope and scale.

IYS Research Theme: Information Systems

The objective of this theme is that freely available information systems contain historic and current data about salmon and their environment. Scientific surveys and research projects, which are run locally or nationally, are not always broadly available and some researchers still refuse to contribute large chunks of data. When information exists in silos, it creates gaps in effective collaboration and communication, we, therefore, require hemispheric-wide access to information and data that has already been gathered and learned in salmon science and related fields. This information needs to be shared with the right people and applied to different layers of knowledge, and, most importantly, needs to be shared with Indigenous knowledge holders and applied to advance Indigenous data sovereignty.

Although there is still a long way to go in advancing information systems, we have come a

long way. Novel technologies are allowing for near real-time monitoring to help improve management decisions, help disseminate data and allow for more effective communication.

IYS Research Theme: Salmon in a Changing Salmosphere

The objective of this theme is that the effects of natural environmental variability and human factors affecting salmon distribution and abundance are understood and quantified. This requires ecosystem-based and whole life cycle approaches to succeed. Similar to the IYS project the Likely Suspects Framework, which brought together partners from across the Northern Hemisphere to apply a holistic life cycle approach to inform annual forecasts, recovery planning, and management strategy evaluations to support resource management decisions and climate change risk assessments, there is a strong need for some kind of mechanisms that puts research and information together. There is growing urgency to better understand the effects of anthropogenic impacts on fish, and this IYS research theme could benefit from being combined with the Status of Salmon for clarity and effectiveness.

IYS Research Theme: New Frontiers

The objective of this theme is that new technologies and analytic methods are advanced and applied to salmon research, and that this research is carried out to fill gaps in poorly studied regions of the salmosphere. Stronger decentralization of specific fields of salmon science such as DNA is important, as few people have access to this kind of information. Better tools and methods are needed to both assess and address the limiting factors in these analytic methods, and effectiveness should be enhanced so that the process of filling these gaps can be sped up. It is crucial that we continue to fill in data gaps and illuminate the 'black boxes' in salmon research, such as the marine life history phase and ocean survival. Additionally, Indigenous communities and community stewards need better accessibility to new technologies and research, and information.

IYS Research Theme: Human Dimensions

The objective of this theme is that communities, Indigenous peoples, youth, harvesters, scientists, and resource managers across the Northern

Poster session on day one of the Symposium.

Symposium attendees at the Harbour Boat Cruise dinner.

Caroline Graham, former IYS High Seas Expedition Coordinator, Aidan Schubert, IYS High Seas Expedition Coordinator, and Polina Orlov, NPAFC Intern (left to right) at the Harbour Boat Cruise dinner.

Camille Jasinski, IYS Communications Manager, and Polina Orlov, NPAFC Intern (left to right).

Hemisphere share knowledge and collaborate in the development of new tools and approaches to restoring, managing, and sustaining salmon. Having multiple knowledge systems working together is the only way to solve a problem as complex as that of understanding salmon in a rapidly changing world.

Indigenous peoples and local communities need to be present in discussions around salmon research and management at every level, from government to private industry. Outreach and communication should be strengthened to broaden public awareness and support around salmon science and management outcomes. Effective communication encompasses both traditional outreach and strong communication between disciplines. This includes supporting various systems to collate relevant data and make this data accessible to managers, researchers, and communities—a running thread throughout the IYS theme outcomes. We need to determine at what scale and scope we should be targeting our communication strategies and creating the long-term platforms that will bring together the right people across the Northern Hemisphere

Conclusion

Over the course of the three-day IYS Synthesis Symposium, participants had a chance to network and engage with a wide range of topics related to the IYS research themes. During the final plenary discussion, there was a unanimous agreement that there is an urgency to this work which requires informed action. In order to achieve this, there is a strong need for collaboration of people, data, and effective communication, as well as a full recognition of Indigenous rights and ways of knowing that must serve as the foundation of Indigenous Peoples' involvement in salmon research and management.

BECI—Basin-Scale Events to Coastal Impacts

In 2021, the United Nations Decade of Ocean Science and Sustainable Development (UNDOS) endorsed the joint NPAFC and North Pacific Marine Sciences Organization (PICES) project 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 begin 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 currently in decline or experiencing increasing variability, and species

Demonstration on how to use virtual headsets for the Uninterrupted virtual reality presentation.

Symposium facilitators Tawney Lem and Mark LeBrie.

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 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.

BECI has successfully 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. Summary blogs and access to presentations from these workshops are available on the BECI website (https://beci.info/2022-beci-workshops/). Currently, BECI is working on organizing a workshop to bring together experts from across the Northern Hemisphere to work on a science plan that will be needed to secure approval for the project from the (PICES and the NPAFC.

The IYS Legacy

The IYS launched in 2018 with a vision to ensure salmon and people are resilient in a changing world.

Over the following five years, the IYS launched several Signature Projects and research expeditions unprecedented in scale and scope. The IYS made significant progress across all research themes and related Signature Projects. With a core team of just four employees (the IYS Director, the IYS Coordinator, the IYS High Seas Coordinator, and the IYS Communications Manager) and help from NPAFC staff and interns, the IYS successfully completed most of its workplan and created research, outreach, and partnerships that will last long into the future. The IYS Website will continue to be hosted on the NPAFC Webserver. The 2022 Pan-Pacific Winter High Seas Expedition ArcGIS Story Map project, which combines ArcGIS map technology and multi-media products to tell the story of the 2022 Expedition for wide audiences, will be available on the IYS Website and hosted on ESRI's server for the next 3 years.

The experience of the IYS contains important lessons and takeaways as we consider strategic priorities for future work. Here are the key takeaways from the IYS:

1. *Broad-scale collaboration to facilitate scientific research and management approaches is possible and essential*. No one country or agency can conduct the monitoring and research needed to address basin wide, climate-related issues. Through multilateral cooperation, countries can leverage investments, share knowledge and capacity, and, as a result, expedite effective management actions that build resilience into management systems. This is demonstrated by the success of IYS Signature Projects related to the High Seas Expeditions, Data Mobilization, and the Likely Suspects Framework

2. *Partnership works*. The IYS North Pacific Steering Committee (NPSC) was comprised of over 30 participant organizations, some of whom directly contributed cash funding, and others who provided in-kind contributions of time and expertise. The IYS benefitted from the expertise and problem-solving strategies of its partners, whose knowledge and support of IYS programs directly contributed to their success. Without question, the success of the 2022 Pan-Pacific Winter High Seas Expedition would not have taken place without our pan-Pacific partnerships.

3. *Intergovernmental Treaty Organizations share a common challenge in responding to climate change and can benefit by coordinating their efforts*. At present, efforts of Intergovernmental Organizations and Regional Fisheries Management Organizations overlap in spatial or contextual interests. While there is a history of cooperation on administrative issues, in-depth operational cooperation on science or management is limited. Given the severity of climate change impacts, these organizations could consider deliberative cooperative operational procedures to enhance their ability to adapt to climate change. BECI has the potential to develop and test such arrangements.

4. *Virtual meeting environments are extremely effective*. An unexpected benefit of the COVID-19 pandemic was that we now have a constituency that is fully trained in video conferencing and technology, and we are able to effectively conduct virtual meetings, workshops, and symposia. This is demonstrated by the IYS Seminar Series, the Conference on the Winter Ecology of Pacific Salmon, and virtual technical briefings and press conferences around the IYS Expeditions. Additionally, we effectively hosted a functional virtual secretariat office during the two years of the ongoing pandemic with considerable cost savings.

5. *The inability to mobilize data is arguably one of the most significant impediments to salmon science and management*. Much like the experience with COVID-19, well-informed and timely decisions, whether related to public health policy or salmon resource management, demand the ability to rapidly share data. Salmon data relevant to the NPAFC is housed in many formats held by the parties. Although some data are in well-documented and accessible repositories, we discovered some historic high seas data were at serious risk of being lost. Through our partnership with the Tula Foundation, we have learned how to apply current approaches to mobilize data such that it adheres to the FAIR data principles (data that are Findable, Accessible, Interoperable, and Reusable). The IYS will continue to mobilize expedition data from 2019, 2020, and 2022 as well as historic data. Climate and ocean data need to be incorporated into the study of the mechanisms affecting salmon productivity and ultimately to inform forecasts and vulnerability assessments for salmon. These data are historically independent of salmon data but our expedition data are

multidisciplinary, so we are learning to mobilize the full spectrum of ecosystem data. We have adopted a "federated" approach where countries can use their own data acquisition and storage systems but must publish the data sets online, providing metadata and data definitions to allow us to synthesize or combine data sets using a common template.

6. *Internal communications capacity is effective*. During the IYS, we established a wide range of audiences, from the informed public, to scientists, to the general public, using the IYS website, social media, presentations, and online seminars. The IYS has built a strong social media following and is a trusted source with a recognized brand and image, and is well-positioned to influence audiences into the future. Online communication technology has allowed for widespread reach of research and outreach. This was particularly significant during the 2022 Pan-Pacific Winter High Seas Expedition, when all five vessels were equipped with communications technology that allowed for real-time ship-to-shore updates that included photos and videos and were posted on the IYS website and throughout all IYS social media channels.

7. *Indigenous salmon management systems are underrepresented in Regional Fisheries Management Organizations*. Respectful and robust salmon management systems grounded in Indigenous rights and ways of knowing can foster sustainable outcomes for salmon and people. Indigenous knowledge and management systems have sustained salmon for thousands of years. Calls for greater Indigenous sovereignty over traditional resources, from the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), have provided the impetus for national and international regulatory bodies to recognize the need to share, if not devolve, responsibility for salmon and climate change management to Indigenous communities.

Rather than concluding the IYS and returning to business as usual, organizations such as the NPAFC and NASCO can build on the legacy of the IYS to build organizational resilience and relevance in responding to the challenges of climate change posed to salmon and people. The IYS hopes to inspire young scientists and other organizations in marine and environmental conservation to take bold steps to strengthen international collaboration, use novel technologies to advance salmon science, and continue exploring the High Seas.