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**Report of the 2020 International Year of the Salmon  
North Pacific Steering Committee Meeting**

by

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(CSRS)

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# Report of the 2020 International Year of the Salmon North Pacific Steering Committee Meeting

Vancouver, BC, Canada

February 26 & 27, 2020

International Year of the Salmon Working Group  
Committee on Scientific Research and Statistics

**Keywords:** international collaboration, Pacific salmon, High Seas Expedition, Gulf of Alaska, data mobilization

## Abstract

This report documents the proceedings of the 2020 meeting of the North Pacific Steering Committee (NPSC) that took place from February 26–27<sup>th</sup> in Vancouver, Canada, to provide direction to the IYS-Working Group (IYS-WG) regarding the implementation of the International Year of the Salmon (IYS). The NPSC is one of two basin-scale Steering Committees that provide direction to an IYS Coordinating Committee (CC) that in turn considers issues related to overall implementation of the IYS at the hemispheric scale. The agenda was supported by detailed discussion documents on overarching issues of concern to be considered at meetings of all three committees. The North Atlantic Salmon Conservation Organization (NASCO) has expressed an interest in participating in the IYS wrap-up symposium but will not be moving forward with an International Year of the Salmon Coordinating Committee (CC). This was the fourth meeting of the NPSC, and it was held during the same week as the IYS-WG meeting (February 25, 27 & 28, 2020). Due to the linkages between these two meetings, some information from the IYS-WG report can be found in this document. The NPSC will continue to meet and provide advice on the implementation of the IYS in the Pacific.

The meeting highlighted continued support for the IYS. The increase in engagement during the IYS 2019 focal year was reflected by the increased registration of events and projects on the IYS website, along with the growth of the IYS social media accounts, which NPSC members found to be a reflection of the exciting momentum of the IYS. Participants provided direction on ways to improve IYS communication and outreach, including the website and social medias, and provided feedback on Signature projects. The report on preliminary results from the 2019 High Seas Expedition was well received and provided new and potentially important information on salmon populations in the eastern North Pacific coming out of winter. There were presentations on planned and proposed IYS signature projects and very productive discussions on communications regarding the 2021 Pan Pacific High Seas Expedition planned to survey the breadth of the North Pacific. The NPSC reviewed the effectiveness and membership of the Theme Counsel Groups (TCG), which consist of up to 15 experts from the five member nations of the North Pacific Anadromous Fish Commission. The Terms of Reference (TOR) were reviewed and updated with the intentions of increasing the capacity of the TCG to assist with the IYS Signature Projects. To increase the effectiveness of the TCG, the IYS WG and NPSC agreed to amend the TOR so that there would be two Co-Chairs per TCG as opposed to a Chair and Vice-Chair. There was also discussion about the current workplan and budget, and participants suggested alternative fundraising opportunities and strategies.

## List of Acronyms

|         |   |
|---------|---|
| AAROM   | Aboriginal Aquatic Resource and Oceans Management             |
| ADFG    | Alaska Department of Fish and Game                            |
| BC SRIF | British Columbia Salmon Research and Innovation Fund          |
| CC      | International Year of the Salmon Coordinating Committee       |
| COFI    | Food and Agriculture Organization's Committee on Fisheries    |
| CSRS    | Committee on Scientific Research and Statistics               |
| DFO     | Fisheries and Oceans Canada                                   |
| EEZ     | Exclusive Economic Zone                                       |
| FNFC    | First Nations Fisheries Council                               |
| GOOS    | Global Ocean Observing System                                 |
| IASRB   | International Atlantic Salmon Research Board                  |
| INPFC   | International North Pacific Fisheries Commission              |
| IYS     | International Year of the Salmon                              |
| IYS-SG  | International Year of the Salmon Study Group                  |
| IYS-SSC | International Year of the Salmon Symposium Steering Committee |
| IYS-WG  | International Year of the Salmon Working Group                |
| NASC    | North Atlantic Steering Committee                             |
| NASCO   | North Atlantic Salmon Conservation Organization               |
| NCEAS   | National Center for Ecological Analysis and Synthesis         |
| NGO     | Non-Governmental Organization                                 |
| NMFS    | National Marine Fisheries Service                             |
| NOAA    | National Ocean and Atmospheric Administration                 |
| NPAFC   | North Pacific Anadromous Fish Commission                      |
| NPFC    | North Pacific Fisheries Commission                            |
| NPSC    | North Pacific Steering Committee                              |
| ONC     | Ocean Networks Canada   |
| PICES   | North Pacific Marine Science Organization                     |
| PBS     | Pacific Biological Station                                    |
| PSC     | Pacific Salmon Commission                                     |
| PSF     | Pacific Salmon Foundation                                     |
| RFMO    | Regional Fisheries Management Organization                    |
| TCG     | Theme Council Group   |
| TINRO   | Pacific Scientific Research Fisheries Center in Russia        |
| UBC     | University of British Columbia                                |
| USGS    | United States Geological Survey                               |

## **Background**

In 2012, a proposal was made to the NPAFC by Canada to establish a major research initiative based on the idea of an International Year of the Salmon (IYS) (Beamish 2012). The IYS was further developed through a host of workshops that occurred throughout 2013 – 2015. In 2016, the IYS Coordinating Committee was formed by NPAFC and NASCO, with their first priority being to finalize the IYS governance model. A review of the development of the IYS until its official launch in 2018, along with the previous NPSC meetings, can be found in NPAFC Doc. 1816.

In addition to making recommendations to the Coordinating Committee, the NPSC is responsible for coordinating the planning, implementation, and administration of the IYS in the North Pacific region. Activities of the NPSC include engaging core partners, identifying outreach and research priorities, reviewing outreach and research proposals, developing research plans, and coordinating fundraising for activities in the North Pacific. Additional duties included developing outreach activities, target audiences, and messages in this region.

The focal year of the IYS was 2019 and it was met with success in raising the profile of the IYS and attracted funding from numerous external sources. Substantial progress was made on the Signature Projects, in particular the High Seas Expeditions. The IYS focal year was a year of growth, outreach and increasing engagement from local to hemispheric scales, along with solidifying connections with our partners. The 2020 NPSC report will include a review of the 2019 focal year, along with the next steps for the IYS as discussed with the NPSC.

This report documents the fourth meeting of the NPSC that was held on February 26 & 27 at the Blue Horizon Hotel in Vancouver, Canada. The NPSC met to consider agenda items related to a review of the focal year of the IYS, communicate the preliminary results of the 2019 Gulf of Alaska (GoA) Expedition, an overview of the draft cruise plan for the 2020 GoA Expedition and to discuss the plans for the 2021 Pan-Pacific High Seas Expedition, along with the legacy of the IYS and plans for the 2022 Wrap-up Symposium and how the work of the IYS will be continued after its completion. The agenda was supported by detailed discussion/decision documents prepared for the NPSC by a subset of the NPSC (Mark Saunders, Vladimir Radchenko, with support from the IYS Secretariat including Laura Tessier, Stephanie Taylor, Camille Jasinski and Moronke Harris). The NPAFC-IYS team worked on developing the discussion documents and consulted with Seadog Communications on the social media, outreach and event planning. The overarching goal of this meeting was to create plans for the next steps of the IYS with the completion of the focal year and the upcoming Signature Projects.

## **February 26, 2020—Day 1 (9:00 am to 5:00 pm)**

### **Welcome, Agenda Review, and Introductions**

The 2020 North Pacific Steering Committee Meeting (hereafter, the meeting) was called to order by the IYS Director for the North Pacific Region, Mark Saunders (NPAFC Secretariat), at 9:00 am on February 26, 2020, at the Blue Horizon Hotel in Vancouver, BC, Canada. Welcome addresses were made by Chief Bill Williams of the Squamish Nation. The meeting was attended by 37 people in person and 1 via phone, including IYS-WG members and other invitees (Table 1). The meeting was facilitated by Mark Saunders, who began by leading roundtable introductions of participants. He then reviewed the meeting objectives, agenda (Appendix A) and NPSC Terms of Reference (TOR) (Appendix B). The NPSC TOR were revised to reflect changes to the IYS Coordinating Committee. There were no objections to the revisions made to the NPSC TOR.

### **Objectives**

The goals of the one and one-half day meeting were to:

- (1) Review progress on IYS implementation through 2019.
- (2) Engage NPSC partners in the coordination of IYS research and outreach activities.
- (3) Engage NPSC partners in the planning of the 2021 Pan Pacific High Seas Expedition
- (4) Engage NPSC partners in fundraising strategies in 2020.

### **Report on progress made on IYS implementation in 2019**

Mark Saunders presented an overview of the progress made to date on the IYS and activities that occurred in the last year, following the January 2019 NPSC Meeting. The activities described were the work of the IYS Secretariat and not those put on by external organizations. NPAFC and NASCO plan to review the focal year external activities as documented on the IYS website in a subsequent report. It was emphasized that along with being the focal year of the IYS, 2019 was a year with an extremely variable climate, which set the stage and tone for the importance of the Year of the Salmon. The projects and accomplishments of the IYS through 2022, along the collaborations and connections established during this time, will be used to inform management decisions on salmon in a changing world. For next steps, it was agreed that deliberate planning a legacy of alternative practices that sustain the connections and procedures developed to conduct collaborative research that supports management decisions in a rapidly changing world must be a high priority. Mark Saunders suggested that in order to realize the legacy, governments and partners should consider investing in the capacity of regional fisheries management organization's (RFMO) like NPAFC, NASCO and the Pacific Salmon Commission to maintain the level of partnership and engagement developed under the IYS. The cadre of young scientists and researchers gaining experience in high seas research through the IYS is very timely as the previous generation has retired and the number of active high seas researchers is very low, in particular in North America. Now is the time to add capacity to Universities and government laboratories to support understanding the mechanisms driving North Pacific ecosystems and their interactions with people. An inquiry was made into whether there is an active compilation of what the decisions for this are and what the decision makers (Atlantic, Pacific, international and local resource managers) require that could be better steered if informed by science and not scientists. For example—who **and** how will the science be used? Narratives will be further developed to support the IYS and Signature projects.

A list of IYS related activities can be found in Appendix C, and additional IYS-related events and projects organized by other organizations can be found on the IYS website at: [www.yearofthesalmon.org](http://www.yearofthesalmon.org). Some of the highlights included:

There were two separate IYS workshops held in Vancouver, BC in January 2019; one on Salmon Status and Trends (Tech. Report 13) and the other was the International Salmon Data Laboratory Workshop (Tech. Report 14). The 2019 International Gulf of Alaska Expedition held a number of events, which included a media event on February 16, 2019 aboard the Professor Kaganovskiy, a second media event on March 18, 2019 also aboard the Professor Kaganovskiy followed by a reception at the Vancouver Aquarium, and a reception at the Pacific Biological Station on March 19, 2019. The 2<sup>nd</sup> NPAFC-IYS Workshop: Salmon Ocean Ecology and a Changing Climate was held in Portland, Oregon on May 18-20, 2019 and was attended by over 150 international salmon experts and scientists. Workshop participants presented 55 oral talks and 24 posters addressing the following topics related to defined the 4 IYS research themes (Status of salmon, Salmon in a Changing Salmosphere, New Technologies, Management Systems):

1. Current Status of Salmon and their Environments,
2. Salmon in Changing Ocean Conditions, and
3. New Technologies/Integrated Information Systems for Salmon Research and Management.

The ICES Likely Suspects Workshop for North Atlantic Salmon At-Sea Mortality was held in Copenhagen, Denmark in June 2019. There were numerous IYS symposia, sessions and workshops in 2019 for the focal year of the IYS. NPAFC and NASCO assisting with organizing some of these events, such as the 2019 NASCO Symposium: Managing the Atlantic salmon in a Rapidly Changing Environment – Management Challenges and Possible Responses which was held in Tromsø, Norway in June 2019. The Pacific IYS Secretariat assisted with organizing a dedicated session (W16) to share preliminary 2019 Gulf of Alaska Expedition results at the North Pacific Marine Science Organization (PICES) meeting in October 2019. The United States Salmon Caucus was held in November 2019 in Washington, DC and invited the IYS to speak to United States members of the Salmon Caucus – Senators and Congress members from Salmon States. Some highlighted IYS activities and events include and American Fisheries Society Meeting in Reno NV, USA in September 2019, the First Nations Fisheries Council Meeting in Harrison BC, Canada in November 2019 and the Salmon migrations, ecology and management: 14<sup>th</sup> Annual Research Update and Workshop at the Pacific Salmon Ecology and Conservation Laboratory at UBC, Vancouver, BC in February 2020.

## **Overview of the IYS Signature Projects**

### **2019 Preliminary Results and 2020 Expedition Updates and Cruise Plan**

Richard Beamish of Canada, Emeritus Scientist at the PBS, gave an overview and update presentation on two IYS Signature Projects, the completed 2019 and planned 2020 International Gulf of Alaska Expeditions. In the opinion of Richard Beamish, these expeditions show promise as an early warning system for indicating salmon returns in a changing climate.

#### *2019 International Gulf of Alaska Expedition*

A significant contribution to the understanding of salmon production in British Columbia, the month-long trawl survey for overwintering Pacific salmon into the Gulf of Alaska included a total of 21 scientists from the five member countries of the NPAFC aboard the chartered Russian R/V *Professor Kaganovskiy*. The science team included experts in oceanography, chemistry, zooplankton, micronekton and fish biology. It was the first large-scale, integrated winter pelagic ecosystem research survey, with a particular focus on Pacific salmon. The expedition covered an area of approximately 700,000 km<sup>2</sup> between February 16 and March 18, 2019. Sourcing funding from both governmental organizations and private individuals,

the intent of the expedition was to demonstrate that international collaboration could be effective, to provide baseline measurements of major pelagic ecosystem components including abundance of Pacific salmon in the Gulf of Alaska in the winter season and to test key hypotheses on factors regulating salmon survival in the ocean during their seasonal activities. In total, 423 salmon (223 chum, 93 coho, 73 sockeye, 31 pink, and 3 Chinook salmon) were caught during trawl survey. NPAFC Doc. 1807 outlines cruise objectives and rationale, and NPAFC Doc. 1858 outlines a summary of preliminary findings.

The main objectives of the expedition were threefold:

- (a) to demonstrate that scientists from Pacific salmon producing countries could work collaboratively to investigate factors regulating marine survival of Pacific salmon in shared international waters;
- (b) to identify the stock specific rearing areas for all species of Pacific salmon, their abundances and their condition to test the hypothesis that the abundance of Pacific salmon is mostly determined by the end of first ocean winter; and
- (c) to obtain baseline measurements of environmental parameters and ecosystem components in the GoA during winter.

The overarching hypothesis of the cruise was that the first ocean winter is a critical period for salmon in the High Seas, and the different factors they are exposed to during this time will influence their returning abundance.

Salmon were caught at 48 of 58 stations, spanning multiple ocean age classes. Abundance calculations estimated a number of 55 million and biomass of 51,300 thousand tons for all 5 examined species (Table 2). Richard Beamish gave a summary for each species as follows:

#### *Chum*

- Highest catches in southern portion of study area but found in both southern warmer and northern cooler waters.
- Lowest condition factors and one of the highest ratios of empty stomachs observed for all salmon
- Relatively few Age 3 and 4 BC chum caught in the 2019 survey. This catch was found to be consistent with the poor adult returns in 2019.
- Relatively large abundances of Age 1 and 2 BC chum which may indicate better returns in 2020 and 2021.
- The 2020 International Gulf of Alaska Expedition should confirm if this interpretation is correct. If correct, stronger abundances of age 2- and 3-year BC Chum shall be observed.

#### *Sockeye*

- Found for the first time that juvenile sockeye in their ocean year migrate into the middle of the North Pacific. In all, 26% of sockeye caught were ocean age 1 and 90% of all of juvenile sockeye caught were in in the central Pacific, revealing that sockeye are not rearing in Gulf of Alaska as previously assumed.
- 2019 Expedition catches of Fraser River ocean age 2 sockeye were very poor, possibly an indication of the resulting historic low return.
- Low 2019 sockeye returns in the Columbia and Fraser rivers but record high returns in Bristol Bay indicate mechanisms at work still beyond human understanding. A possible factor may be the rearing location as Bristol Bay sockeye rear in the Bering Sea.
- Catches of Fraser River ocean age 1 were also poor, possibly indicating another impending poor return.

### *Pink*

- Only found in southern limit of survey within the warmest water, countering predictions.
- Also predicted to have been the dominant survey species, as they are 3 times more abundant than chum, but were not found to be represented in these proportions (N = 31). Reflective of this, returns for pink salmon were uncharacteristically low in 2019, except for within the Fraser River which displayed good returns. Poor 2019 Expedition catches could have been representative of the generally poor returns that followed.
- It is thought that Fraser River pink salmon returns were doing better perhaps because they are genetically programmed to feed in a different area than other pink salmon stocks.

### *Coho*

- More abundant in southern, warmer latitudes, with 95% caught south of 52°N.
- Catches higher than expected based on prior studies in region. Expected to be a minor contribution, however, was the second most common salmon species captured (N = 93).
- First at-sea genetic stock identification completed by Christoph Deeg of PBS. Coho originated from Alaska to Columbia River with no spatial separation by stock. DNA analysis indicated majority were North and Central BC and Puget Sound stocks.
- 2019 Expedition catches were the first evidence that coho migrate much farther offshore than expected. Coho, previously believed to be a more coastal species, were found in abundance throughout the survey area.
- Next steps involve understanding if this was an anomaly or if there a missing component in human understanding of the ocean ecology of coho salmon, as well as whether this is associated with the inability of interior Fraser River coho to rebuild following 21 years of fishing restrictions

### *Chinook*

- Catches of Chinook were the lowest in the expedition (N = 3) and found only in southern area of the survey.
- This is likely because Chinook salmon have the deepest distribution in the water column of any salmon and may not be effectively caught by the near-surface trawl.
- Catches of Chinook salmon were too low to produce reliable estimates of abundance across the study area.

A detailed description of the preliminary results of the 2019 International Gulf of Alaska Expedition can be found in Appendix D.

### *2020 International Gulf of Alaska Expedition*

To follow the 2019 GoA Expedition, a second International Gulf of Alaska expedition was officially announced in January 2020. The 2020 GoA Expedition is planned to depart from Vancouver, BC on March 11, 2020 and return on April 5, 2020. The research vessel will be the Canadian commercial trawler known as the *Pacific Legacy*. This vessel will accommodate up to 15 researchers, with participants from all five of NPAFC's member countries: Canada, Japan, Korea, the United States and Russia. A trawl net was custom built to match the specifications of the *Professor Kaganovskiy* from the previous year's expedition as closely as possible. The official cruise plan by Beamish and Riddell (2020) was submitted in January 2020 and accepted as NPAFC Doc. 1870.

Funding for the expedition was available through government organizations, foundations, the commercial fishing industry and private donations, the Pacific Salmon Foundation (PSF), NPAFC (trawl net), and the governments of Canada and the Province of B.C. (BC SRIF). As the supporting financial agency, the PSF

will manage the financial aspects. The expedition will be a contribution to the International Year of the Salmon and coordinated with the North Pacific Anadromous Fish Commission. We are confident that the results of both the 2019 and 2020 expeditions will continue to demonstrate the value of this research and the value of continuing these surveys to monitor ocean changes and impacts of rearing Pacific salmon.

- Deliverable:
  - IYS taking the lead on a voyage send-off media event on March 11<sup>th</sup> (Victoria, BC Point Hope Ship Yards)

#### *Citation*

Beamish, R.J., and B.E. Riddell. 2020. Preliminary cruise plan for the second Gulf of Alaska expedition. NPAFC Doc. 1870. 9 pp. Fisheries and Oceans Canada, Pacific Biological Station, and Pacific Salmon Foundation (Available at <https://npafc.org>).

#### *Question Period*

The discussion period following Richard Beamish's Signature Project presentations included the following:

Participants were interested in knowing whether low sockeye returns observed in 2019 were a result of rearing in the ocean before, during or after the marine heatwave colloquially known as the 'Warm Blob'. Richard Beamish stated that following the 2014 blob, there was an intense El Nino event which contributed to continued higher ocean temperatures. Secondly, additional warm water masses also formed, particularly in September 2019 when there was a larger and more intense surface-oriented blob that likely contributed to the conditions that caused the mortality of the fish. What is needed now is to determine what these conditions were, and in turn what are the mechanisms that remain to be discovered driving salmon productivity and allow salmon to be managed professionally in a future with changing ocean conditions. It is imperative to make discoveries that will allow humans to understand the fundamental mechanisms with salmon productivity during changing climates. Chrys Neville of DFO in Canada is currently examining sockeye otoliths for indications of poor growth rates which could be correlated to unfavourable ocean conditions.

Jacques White of Long Live the Kings inquired about the oceanographic and lower food web data that accompanies the expeditions and during the year or a portion of the year leading up to the expeditions, so that correlations to growth, survival and abundance to environmental data can be made. With ships of opportunity and satellites collecting environmental data, it was asked whether returns of salmon can be predicted based on environmental factors without having to physically collect the organisms. Additionally, Jacques White inquired how many repetitions of these experiments would be required before they are no longer necessary. Evgeny Pakhomov of the University of British Columbia (UBC) and biological oceanographer for the 2019 survey stated that compartments of food web were measured as much as possible during the 2019 Expedition (e.g. zooplankton and salmon diets). He also emphasized the importance of knowing stock-specific locations of salmon so that this can be linked to survival. Stable isotopes are currently being used to determine both foraging areas and isoscapes of the North Pacific on a monthly basis. Contributing information also involves measuring the proportion of juveniles for each stock dying off as they migrate out from coastal areas. All of these factors contribute to productivity and are used to determine which ones survive and what the drivers of mortality are. Brian Hunt of UBC and biological oceanographer for the 2019 survey added that knowing where the fish are is essential as they are not evenly distributed. He remarked on the disconnect between traditional methods and micronekton middle trophic levels are lacking, along with seasonal coverage.

Richard Beamish reinforced the idea that this is an international effort. Efforts are currently in place to

make the 2020 survey crew as multi-national as possible, but difficulty is added to this due to a limited bunk space of 12 on the *Pacific Legacy*, but confirmed it will be as representative as possible among Russia, Canada and US. Unfortunately, Japan and Korea were unable to send researchers for the vessel. He added to this by remarking that following suit with the 2019 Expedition, salmon will not be the sole focus of sampling. There will also be other species captured to get an overall picture of the salmosphere. Ideally, the entire system would be studied, however monetary limitations do not permit this. Brian Riddell of the Pacific Salmon Foundation (PSF) and co-organizer of the expeditions added to this by stating that a ‘Winter Ecology of Pacific Salmon in a Changing Ocean Ecosystem’ partner workshop may be held in St. Petersburg, Russia in September 2020.

### **Research Planning for 2021 Pan-Pacific High Seas Expedition**

To ensure all committee members are familiar with the progress of the 2021 expedition planning, IYS High Seas Expedition Coordinator Stephanie Taylor gave an overview presentation on the planned multi-vessel 2021 Pan-Pacific High Seas Expedition. This initiative will expand upon the preceding efforts of the 2019 and 2020 International Gulf of Alaska Expeditions, surveying the entire breadth of the North Pacific Ocean in winter of 2021 through cumulative collaboration among Canada, USA, Russia, Japan, and South Korea.

A Canadian research vessel, the R/V *Franklin*, has been confirmed, and requests are in for two Russian vessels and the R/V *Shimada*, an American research vessel. Japan and Korea are unable to provide dedicated vessels but will provide scientists for the winter expedition and conduct a Japan-Korea cooperative summer survey in the Bering Sea for following up the winter survey. Currently, the IYS team has secured funding for this project from BC SRIF to assist with the Canadian contribution to this project. The BC SRIF has supplied an investment of \$3.0M CAD over 3 years:

- Year 1 (\$320K) – Support for planning of development workshops: PICES 2019/ONC, Staff capacity: High Seas Coordinator (Stephanie Taylor) and Communications and Administrative Support positions; Contracts to assess data strategy, a contracted review of Steelhead ecology, a technical advisor, and the purchase of nets and a live tagging box
- Years 2-3 Support of Post Doctorates and Graduate students to conduct projects as part of Canada’s cadre of scientist at sea and in the lab: 1-2 positions are available for each of the 8 research areas (physical oceanography, biological oceanography, modelling, feeding ecology, distribution/abundance/migration, genomics-physiology-stock ID and microplastics)

Further funding to cover the charter of a fourth vessel and to assist in sample analysis and support for the other countries is still required. Planning for the 2021 Pan-Pacific High Seas Expedition began in October 2019 in Victoria, BC at a workshop held at Ocean Networks Canada’s (ONC) offices. Following the completion of this meeting, a set of draft hypotheses were created and a small group of experts from the NPAFC, Canada and the USA have met regularly to carry on survey planning. Milestones in planning thus far involve the purchasing of a trawl net for the R/V Franklin and continual expanding upon and refining of the hypotheses document.

#### *Survey Objectives*

Planned aspects of investigation fall under 3 main categories:

1. What is the distribution of Pacific salmon in the North Pacific Ocean in winter?
  - a) Where are the prey? Do the distribution of prey match the distributions of Pacific salmon?
  - b) Do shifts in prey distribution match shifts in Pacific salmon distribution?

- c) Has there been a poleward shift in distribution? If so, is it due to a change in preferred thermal habitat or thermal limit?
  - d) Are salmon found deeper in the water column when the surface layer is warmer?
  - e) Is there an optimal salinity range for Pacific salmon?
  - f) Does the place of origin dictate where Pacific salmon will migrate to in the North Pacific Ocean?
2. Do Pacific salmon congregate at convergent zones (fronts and eddies) where there is higher productivity?
- a) Historical records show that Pacific salmon in the open ocean should move across broad fronts – to the south and east in winter and spring. Does this still occur?
  - b) Are there high abundances of prey at convergent zones? If so, are salmon congregating at these areas with high prey abundance?
  - c) Do the convergent zones create trophic hotspots? If so, does this increase predation on Pacific salmon in these areas?

Pacific salmon, their prey, and their predators are more concentrated at convergent zones (fronts and eddies) in the North Pacific Ocean. What are the conditions under which predation will have the greatest impact? What are the conditions causing salmon to have the most interactions with predators? Do densities and interactions with predators differ depending on oceanographic conditions?

3. The number of convergent zones in the North Pacific Ocean may change from year to year. In years when there are fewer convergent zones do Pacific salmon occur at these areas in larger numbers?
- a) Do fewer convergent zones increase competition between Pacific salmon species in these areas?
  - b) In years with fewer convergent zones, is there increased predation on Pacific salmon?
  - c) In years when there are fewer convergent zones, is the importance of a second critical period for Pacific salmon increase?
  - d) Do Pacific salmon that congregate at convergent zones have increased growth rates and improved condition factors?

### *Survey Plan Elements*

The proposed survey plan calls for simultaneous seasonal (late winter/early spring) surveys within five regions of the North Pacific Ocean during 2021. The vision is to utilize 4 research vessels (3 vessels covering 1 region each and 1 vessel covering 2 regions) for 30 days at sea (60 days regarding the vessel performing a second leg). This survey effort equals 150 days at sea for the 2021 Expedition. Each region will be sampled systematically within a grid of survey stations along longitudinal transects that are spaced 60 nautical miles apart. Sampling will consist of surface trawls to capture salmon of all ages, CTD casts, plankton tows, and continuous sampling of ocean conditions (e.g. salinity, temperatures). Coordination of IYS 2021 high seas surveys will be through the NPAFC.

There will be a lead from each of the NPAFC member countries who will be involved in the development of the cruise plan & research protocol, and the overall chief scientist who has yet to be assigned. Following suit with the 2019 and 2020 Expeditions, the NPAFC is striving for maximum international collaboration. Each vessel will, to the greatest extent possible, have scientists from each of the 5 countries aboard.

As planning progresses, groups of experts in the expedition areas of study listed below will be convened with the assistance of the Theme Counsel Groups (TCG):

- a) Physical oceanography
- b) Chemical oceanography
- c) Modelling
- d) Salmon feeding ecology and energetics
- e) Salmon distribution, abundance, and migration
- f) Salmon genomics and stock ID
- g) Microplastics

A complete description of the TGC TOR can be found in Appendix E.

#### *Question Period/Discussion*

Evgeny Pakhomov emphasized the need to examine salmon prey items, and Richard Brodeur of NOAA added onto this with the mention of increased microplastics examination in the diets of salmon. The 2019 survey measured microplastics in the environment, which was found to be unexpectedly low in occurrence, but it was not examined within salmon stomachs. However, Evgeny Pakhomov mentioned that it is a possibility in the future.

The involvement of remote sensing data was a topic of interest for Jacques White. This would allow scientists to see the conditions the fish were exposed to a few months prior to the survey. Stephanie Taylor mentioned that this has been discussed especially within the convergent zones and that will be identified before and during the cruises.

Brian Riddell inquired about the feasibility of performing genetics and stock ID at sea in 2021. Given the number of vessels and collaborators, Mark Saunders remarked that this may not be possible the way it was during the 2019 survey as we will not have the capacity to do this across all vessels involved. However, October 2019 discussions in Victoria, BC at PICES 2019 and ONC mentioned that one vessel could be dedicated to finer scale data collection at the convergent zones. This should be considered in the cruise plan, along with different gear which can be specific to capturing prey not considered in the 2019 and 2020 Expeditions, such as micronekton (small fish, krill and squids).

An elaboration on incorporating some experts in modeling, perhaps with the recommendations of the Theme Counsel Groups (TCG) for the 2021 Expedition was requested. Mark Saunders defined this as ecosystem work that may be able to fit all aspects of the survey sampling, along with development of life history models to determine how high seas, coastal and freshwater observations fit together to test hypotheses and make comparisons during mortality events. This can lead to being able to determine who the survivors are. Additionally, inferences can be made based on the drivers of the life history models to understand bottlenecks where salmon mortality occurs.

Jackie King of DFO requested confirmation regarding the process NPAFC was undertaking to select academic involvement for the 2021 Expedition. Stephanie Taylor stated that post docs and graduate students studying at Canadian institutions will be sourced from BC SRIF funding. Year 2 of this funding begins April 1, 2020. The IYS will be identifying selected academic partners shortly and is currently awaiting proposals from UBC and IOS (Ocean Science) to begin co-developing the program together.

Suam Kim, NPAFC President, remarked that a multi-national survey will require standardization of sampling protocols, and potentially a workshop to bring people together and go over said protocols. Richard Brodeur suggested paired vessel intercalibration tows due to differences between noise and sampling methods which will not be the same from each vessel. Mark Saunders responded by pointing out that the NPAFC is decreasing variation between vessels by having specifications for the nets but

differences in vessel noise and sampling methods are still a potential issue. However, it would not be feasible to bring together all 4 vessels for this comparison in next year's survey.

John Field, Executive Secretary for the Pacific Salmon Commission (PSC), asked if there was a limit in place for funding and a particular deadline to be able to accept funds for the vessels. To this, Stephanie Taylor stated that NPAFC had not yet set a deadline for the receipt of funds, however Russia will need at least 6 months to commit a vessel in advance. A clear understanding of the survey areas is required for Russia. NPAFC will need to look for commitments by September regarding funds. John Field suggested that the Northern Endowment fund may be a potential funding source for the expedition, but the earliest it could issue funds would be in the fall of 2020. The High Seas Coordinator will consider preparing a submitting a proposal to this fund.

### **Breakout and Plenary Sessions**

Following the overview presentations from Richard Beamish and Stephanie Taylor, the NPSC members were split into 4 breakout groups to seek feedback for funding opportunities and strategies as well as outreach and communication ideas specific to High Seas cruises (Table 3). The first 3 of these groups were led by Stephanie Taylor, Laura Tessier, and Mark Saunders. The 4<sup>th</sup> group was jointly led by Moronke Harris and Camille Jasinski. The breakout groups were asked the following 3 questions, listed below, in order to provide feedback for the media events and other platforms used to raise awareness about the 2019 expedition and those planned for the 2020 expedition, and discuss the next steps to effectively promote 2021 Pan Pacific High Seas Expedition.

1. What are your thoughts on the media events and communications from the 2019 Expedition?
  - Were the communications effective?
  - Are there any suggestions to implement for 2020 and 2021?
2. As the 2021 Expedition is much larger than 2019 and 2020, are there any suggestions for developing a communications plan for the expedition?
  - Should there be one person on shore that communications from each vessel are sent to (a communications node)?
  - How do we effectively distribute information coming from all vessels in a timely and effective manner?
3. How can we raise funds for the charter of the second Russian vessel and post-cruise data analysis and sample processing support?
  - Can you provide any feedback for fund raising strategies, in particular in relation to the Nippon Foundation? Are there other foundations we should be considering applying to?

The breakout groups reconvened for a plenary session and to report out the results. A summary of the discussion follows:

Groups were impressed by the profile and reach of 2019 Expedition communications, however there was concern for the lack of networking and Indigenous engagement and First Nations perspective. It was also noted that coverage during the event was excellent, but what came before and followed the expedition required improvement so that consistent coverage was provided throughout. Additionally, increased involvement of organizations on the ground was proposed.

Suggestions for a 2021 communications plan involved the proposal of including dignitaries on each vessel, a youth engagement strategy to bring awareness to all age demographics of the population and bring forward informative presentations that are tailored to the audience. With the realization that the public is as much interested in process as they are in outcomes, we should strive to make the science and data more communicable with an emphasis on the connection of science and climate change. We should

also promote a historical perspective of winter expeditions to the North Pacific (i.e. previous Russian and Japanese efforts). Additionally, some or all vessels could contain experts in other non-scientific fields to expand the reach of the Expeditions (e.g., Artist-at-Sea programs). A more personal perspective to the efforts via stakeholder, scientist, and crew could be brought by biographical videos, blog posts, and articles, and coverage of video footage by documentary programs (e.g., Frontliner and Nova).

Bunk space limitations were a concern for allowing communications personnel on all ships, but if feasible it was proposed that each ship carry a journalist from each NPAFC member country to form a media network so that all languages and most effective communication platforms for each country are accessed. Internet access on all vessels would provide a harmonized internal communications program among journalists. Posting on the IYS website could facilitate translation of materials into native languages.

Finally, suggestions for raising funds for the second Russian vessel fell into 4 categories:

- a) Academic (applying for ship time through UBC);
- b) Organizational (PEW Foundation, Schmidt Family Foundation, Moore Foundation, commercial fisheries, Nippon Foundation, Bonneville Power Administration, Sitka, and PSC Endowment Funds);
- c) Crowd-sourcing (Go Fund Me);
- d) Unconventional (e.g. ‘Sponsor a Day at Sea’: in 21 days of science, the day sponsored would focus on a promotion of the sponsor organization/individual accompanied by a large media push).

### **Overview Presentation of the First Nations Fisheries Council (FNFC)**

Jordan Point, Executive Director of the FNFC, provided a presentation on plans to build a science capacity for the council, beginning with developing a charter for priorities to align matters of concern. The FNFC was established in 2007 to convene First Nations in BC on fisheries and aquatic resource management. The organization is comprised of 14 First Nations delegates from the diverse geographic regions of the province. It is not a holder of Aboriginal rights but works to identify and address issues of common interest to First Nations. The mandate of the FNFC is to work with and on behalf of BC First Nations to protect and reconcile Title and Rights as they relate to fisheries and the health and protection of aquatic resources:

- advance and protect Title and Rights related to fisheries and aquatic resources, including priority access for food, cultural and economic purposes;
- support First Nations to build and maintain capacity related to fishing, planning, policy, law, management, and decision-making at a variety of scales (local, regional, national and international); and
- facilitate discussions related to the development of a BC-wide First Nations-based collaborative management framework that recognizes and respects First Nations jurisdiction, management authority and responsibilities.

The original FNFC mandate was focused on development of structure and collaboration. However, over time the ability to engage and respond on the many issues requires in-house science capacity. Therefore, the FNFC will be looking to develop a human resource plan to contract science and data capacity in the upcoming focal year.

The FNFC has established stable, predictable funding and is starting to build an independent source revenue. The council has and formulated a plan aptly named the First Nation Fisheries Strategic Plan.

To implement the *Action Plan’s* 70 recommendations, the FNFC prioritizes activities and the division of labor. The 2019-2021 Strategic Plan focuses on 3 main categories of priority:

- Recognition, Respect and Implementation of Indigenous Rights

- Collaborating for Improved Management and Sustainable Fisheries
- Re-building First Nation Fisheries Economies

An important consideration in this exercise was financial resourcing. Collaboration with DFO to resource the FNFC was based on a “Commitment to Action Accord” (signed in 2010). These objectives are supported by DFO as collaborative objectives under AAROM contribution agreements.

Impediments to the plan involve the continually evolving ebb and flow of capacity and priorities, as well as coordination of differences in Nation priorities, goal hierarchies, and communication fragmentation. Through the proposed strategic plan, FNFC aims to work to build a united voice of First Nations on fisheries matters.

### **Coordination of 2020 Activities including IYS planning, workshops, meetings, and events**

#### **Review of Calendar Events**

The review of IYS calendar events was rescheduled for day two of meetings to keep day one within time restraints.

#### **Coordination of 2020 Activities: NPAFC-IYS Third Workshop**

*The event was postponed due to the global outbreak of COVID-19. The new dates will be announced no later than June 1, 2020.*

Shigehiko Urawa gave an overview presentation of the Third NPAFC-IYS Workshop on Linkages between Pacific Salmon Production and Environmental Changes that will take place on May 23-25<sup>th</sup>, 2020 in Hakodate, Japan. Pacific salmon face many challenges and uncertainties associated with environmental variability such as climate change affecting populations world-wide. The commercial salmon catch in Japan has been decreasing since it peaked in 1996, and 2019 was the lowest recorded catch in 40 years, causing concern with stakeholders, governments and partners who are now consulting scientists to determine what is happening to the salmon. The workshop stems from the need to promote new international cooperative research that provides better scientific information on the ecological mechanisms regulating production of anadromous populations and climate impacts in North Pacific marine ecosystems. This involves the need to assemble and integrate salmon data more efficiently. While data is the root of knowledge, there has been a poor effort to maintain and document the existing data, as well as identifying the uncertainty associated with the metadata. Major workshop topics include salmon production in changing environments, new technologies/integrated information systems for salmon research and management, and resilience for salmon and people: lessons from the Great East Japan Earthquake in 2011.

Workshop objectives are to:

- Improve knowledge of the migration, growth and survival of salmon and their environments;
- Increase understanding of the causes of variations in salmon production in changing environments;
- Anticipate future changes in salmon ecosystems and resulting changes in the distribution, survival and abundance of salmon;
- Discuss application of new and developing technologies and analytical methods to research and manage of salmon;
- Demonstrate integrated information/data management systems to support research, sustainable management, and understanding for the conservation of salmon; and
- Describe policies designed to ensure the resilience of salmon and people in changing environments.

The IYS provides an international framework for collaborative outreach and research. These efforts will raise awareness of the challenges salmon face for improved stewardship during this period of increased environmental variability. Additionally, the IYS is stimulating investment in research expected to provide a legacy of knowledge, data/information systems and tools, and help train a new generation of scientists better equipped to provide timely advice to improve stewardship of salmon. The IYS program is also connected to the 2016-2020 NPAFC Science Plan, whose research themes are (1) Status of Pacific salmon and steelhead trout; (2) Pacific salmon and steelhead trout in a changing North Pacific Ocean; (3) New technologies; (4) Management systems; and (5) Integrated information systems. Annual progress for each research theme is reviewed at a series of NPAFC-IYS workshops including the present one.

### **Overview Presentation of Hakai Institute/Tula Foundation (an IYS Partner)**

Eric Peterson, founder of the Hakai Institute, gave a talk concerning the involvement of his company with the data mobilization of NPAFC Signature Projects. The Tula Foundation/Hakai Institute's slogan is science on the coastal margin, they possess the ability to conduct science in remote locations on the coasts, working with partners from academia, First Nations and governments. These organizations are partnering with the NPAFC to create a shared data standard for the 2019 and 2020 cruise data. This data standard will be implemented across all vessels in 2021. The data standard will allow for the data to be collected on each vessel using the existing methods and systems, and the work being done on the previous cruise data will create a method of standardizing and sharing the data. The data will be entered into a node of the Global Ocean Observing System (GOOS) which will be called IYS-GOOS. What is created will be an integrated view of ocean data standardized and appropriately sorted for ease of discovery and access as a well-structured data-system. Eric also mentioned a need to discuss data ownership from the Expeditions as a non-technical layer to the problem. Though outside of Hakai's area of expertise, organizations will require permission for how the data is used and published in order to receive credit for the data that they have generated and recognize the students involved.

### **Discussion of Data Mobilization: Part 1**

Following Eric Peterson's presentation, the floor was opened for discussion. It was suggested that participants of the expeditions be brought together in an organized meeting to discuss how to solve issues related to standardization and combination of data systems. The IYS 2020 Gulf of Alaska Workshop 'Winter Ecology of Pacific Salmon in a Changing Ocean Ecosystem' in St. Petersburg, Russia in September 2020 was raised as a possible venue. This discussion was continued on the second day due to shortage of time. In preparation, participants were asked to give thought the following questions concerning consideration of the data mobilization issue:

1. Is there agreement on the importance of the issue and support for the overall approach to the data management plan proposed?
2. Are there approaches initiatives, or funding that we should be aware of?
3. Are present partners or partner organization interested in engaging in this work through direct involvement or informative updates?

### **Wrap-up of Day 1**

Mark Saunders concluded the meeting and noted that the main points from the meeting today would be compiled and presented the following morning.

## **February 27, 2020—Day 2 (9:00 am to 12:00 pm)**

### **Summary of Day 1**

Mark Saunders continued the second day of the 2020 NPSC meeting by providing a brief synopsis of the preceding day.

### **Data Mobilization Synopsis**

Mark Saunders continued the second day of the 2020 NPSC meeting by giving an overview of some of the issues the field of salmon research and conservation currently faces concerning timely data integration, and reviewing key outcomes from Eric Peterson's Hakai Institute/Tula Foundation presentation on the previous day. The main difficulty posed is an inability to access and integrate existing data for salmon and their ecosystems. This is arguably the most significant barrier to salmon research. Partnerships with the Tula Foundation and the National Center for Ecosystem Analysis and Synthesis (NCEAS) at UC Santa Barbara provide opportunities to clarify root causes of the problem and to pursue solutions. The Tula foundation is working with IYS partners to standardize data collected in the 2019, 2020 and 2021 expeditions. Data will be integrated into the Canadian Integrated Ocean Observing System, a component of the Global Ocean Observatory System (GOOS) framework. Additionally, NCEAS plans to lead a workshop on the barriers to data synthesis using funding from the Moore Foundation, and the rescue and synthesis of historic high seas data is currently being examined by Skip McKinnell who has been hired as a consultant by the IYS. Once data are published online new technologies like Graph databases show potential for more effectively discovering and integrating data sets. Work with Tula and NCEAS will consider the potential for these technologies, in relation to the integration and accessibility of salmon related data.

Skip McKinnell followed the synopsis by giving a summary of his current work regarding the rescue and synthesis of historic high seas data. Historical (1950's, 60's, and 70's) data of salmon on the High Seas is at risk of being lost, and is contained in old International North Pacific Fisheries Commission (INPFC) documents, which often did not publish the biological data. His focus is on gathering salmon age, length, sex, from the biological data. Skip remarked at the large volume of data at risk of loss, due to many scientists and researchers who are in possession of this data preparing to retire or have already retired without publishing or sharing this data. There are approximately 300,000 records of salmon measured and aged from high seas records on the USA side alone. Hokkaido University discs, which contain data from dispatched research vessels in North Pacific (two expeditions once per year), add another 300,000 salmon measurement records to this (to bring the total to 600,000). The idea is to amass this historic data in standard formats and make it available to researchers who want to compare 1950's, 60's, and 70's to what is being found in the High Seas currently.

### **Making More Informed Decisions: Integrated Decision Making and Graphing**

Jim Irvine of DFO in Canada gave a brief presentation on integrated decision-making using graph database technology. He highlighted how the information flow process of data to management decisions, is often impeded by an inability to quickly access relevant information; this can be improved by applying graph database technology. Unlike spreadsheets or relational databases that we are familiar with that store data in tables or matrices, graph databases store data as a network of nodes that could be people, places or activities. Nodes are connected by links that describe relationships (e.g. works for, works at, authored, managed, etc.). If you wonder how ads show up so quickly in your social media feeds after you search Google for a widget it is because social media platforms use Graph databases. You are a node and information about you get stored at that node – location, preferences, etc. Your search adds to your node your interest in widget X and almost instantly retailers with an interest in selling you widget X can discover that and send you an ad. Similarly, if we are looking for people, activities or data related to

salmon we could use Graph databases to great effect once information and data are brought into the system. Jim Irvine and his collaborators have been funded to pilot the use of graph databases to consider how to better manage the complex scientific and fishery management response to declining southern BC Chinook salmon.

## **Discussion of Data Mobilization: Part 2**

Following the data mobilization synopsis and integrated decision making and graphing presentation, the floor was opened for participants to discuss their answers to the 3 questions posed at the end of the first day of meetings:

1. Is there agreement on the importance of the issue and support for the overall approach to the data management plan proposed?
2. Are there approaches initiatives, or funding that we should be aware of?
3. Are present partners or partner organization interested in engaging in this work through direct involvement or informative updates?

The discussion turned to maintaining the legacy of the IYS within the lens of data rescue and mobilization. Participants inquired about what would happen to the connections that IYS has established following 2022. Specific interest was directed towards how these international connections would be updated and maintained contributing to success in the form of ongoing projects and activity. This requires establishment of a network with priority of the legacy, specifically obtaining funding and staffing to continue IYS projects like data mobilization past 2022. Information mobilization is also of importance, including bringing together all presentations, publications and events that have occurred or are on-going. Having rapid access to papers and publications is vital, but currently not within IYS capacity. Mark Saunders hopes to have a solution potentially by 2022. The proposed NCEAS 2020 workshop plans to address the issue of information management and legacy strategy, encouraging working towards promotion of a legacy through increased connection. Funds are available to perform data mobilization, but the largest barriers faced are from cultural and capacity standpoints. Agencies have typically held maintaining data systems as a lower priority with respect to funding and individuals with knowledge of the data do not have enough time to devote to recovery of existing data.

The complexity of establishing and maintaining databases is the issue, as the concept of making data available has been ongoing. This is a result of two factors:

1. It can be challenging to motivate people to submit data and compile the resources due to a lack of interest;
2. Along with concerns of data “scooping”, scientists may also be hesitant about making raw data available if it has not been thoroughly reviewed and quality checked as errors may tarnish reputation.

A proposed solution for data “scooping” was to issue publication numbers related to IYS Signature Projects, keep track of publication numbers, and track anyone who accesses High Seas cruise data from the publicly available expedition database, providing final checks and ensure proper credit is given and data are not “scooped.”

## **Coordination of 2020/2021 Activities: IYS Planning, Workshops, Meetings, and Events**

### *Review of Calendar of Events*

Mark Saunders gave an overview of the upcoming 2020/2021 activities and events in the North Pacific and North Atlantic. The upcoming workshops and symposium will focus mainly on salmon ecology, international collaboration, and new technologies, such as data mobilization, genomic-based tools, otolith microchemistry and environmental DNA. The IYS will also take advantage of planned workshops, by highlighting them on the website and on social medias, to build connections and push for collaboration

from people or groups that may not have heard about the workshop.

#### *Proposed IYS Activities 2020/2021*

There will be continued executive level engagement of NASCO and NPAFC to affirm commitments to the IYS partnership. In addition to implementing the Theme Counsel Groups, NPAFC plans to continue developing and implementing priority projects, namely the 2021 High Seas Expedition, Likely Suspects Framework and Data Mobilization. IYS workshops and symposia will be planned and coordinated through 2022. Past 2020, the 4<sup>th</sup> NPAFC IYS Workshop is planned for May 2021 in Korea and final IYS Symposium will take place in 2022. IYS will continue to manage website/social media outlets and outreach. Fundraising efforts will be largely allocated to IYS Signature Projects, namely the 2021 Expedition (which requires approximately \$2.0–3.0M CAD more for additional ship time, travel and sample processing) and Likely Suspects Framework (approximately \$1.0M CAD). As we near IYS completion, the results for outreach and each of the IYS research themes/outcomes will be synthesized and planning the legacy of the IYS priority projects will be enacted.

#### *IYS Participation at Upcoming Workshops and Symposiums*

- Salmon Ocean Ecology Meeting in Monterey California (March 2020)
  - IYS High Seas Expedition Coordinator, IYS Coordinator and IYS Assistant Coordinator presenting
- American Fisheries Society Western Division Annual General Meeting in Vancouver, BC (April 2020)—*cancelled*
- 28<sup>th</sup> North Pacific Anadromous Fish Commission Annual Meeting in Hakodate, Japan (May 2020)—*the face-to-face meeting is cancelled, but it will be held virtually*
- Third NPAFC-IYS Workshop in Hakodate, Japan (May 2020) —discussed in detail during the first day of the meeting—*postponed*
  - IYS High Seas Expedition Coordinator presenting
- Marine Socio-Ecological Systems Symposium (MSEAS) in Yokohama, Japan (May 2020)
  - IYS High Seas Expedition Coordinator and IYS Coordinator presenting—*postponed*
- IYS 2020 Gulf of Alaska Workshop ‘Winter Ecology of Pacific Salmon in a Changing Ocean Ecosystem’ in St. Petersburg, Russia (September 2020, TBD)
- PICES Annual Meeting in Qingdao, China (October 2020)
  - Will need to be reconfirmed considering COVID-19 Pandemic
- NCEAS Bottlenecks to Data Mobilization Workshop (date TBD)

#### *IYS Related Symposia and Events*

- 2020 Hokkaido Salmon Conference on Current and Future Status of Salmon in Sapporo, Japan (May 2020)
- 2020 High-Seas Salmon Research in the Bering Sea (July 2020)
- Sapporo Salmon Festival 2020 in Sapporo, Japan (September 2020)

#### *RAFOS Ocean Acoustic Monitoring (ROAM)*

A review of ROAM can be found in the previous year’s NPSC meeting, NPAFC Doc. 1816. Briefly, ROAM is a telemetric tagging method to delineate migratory pathways of salmon at sea and explore causes of marine mortality. The project is led by researchers Tim Sheehan (National Marine Fisheries Service), Simon Thorrold (Woods Hole Oceanographic Institute), and Jon Carr (Atlantic Salmon Federation) in the Atlantic basin. While there have been some delays in the project, the IYS has maintained contact with Dr. Sheehan and received regular updates on the project. Currently, the field trials are being developed and are anticipated to occur in July/August 2020. A sound source is to set to be deployed off of the Northeast Shelf by a WHOI vessel in July 2020 and a glider mission will be organized to test the detection efficiency of the sound source and ROAM tag in July/August 2020. The glider will be retrieved in August/September 2020 and shortly after that the field-testing data should be available,

analyzed and ready for digesting. The ship is already scheduled (the deployment will be piggybacked onto a monitoring survey) and securing the glider commitment is underway. The project plan and timeline should be finalized soon, which will provide a more efficient and cost-effective approach than the previous plan.

Last year the IASRB agreed to set a tentative date for a workshop to discuss the feasibility of the ROAM technology for salmon, with the caveat that if the 2019 field season does not produce reasonable results then the workshop would not go ahead. The tentative date was set as May 4, 2020. However, given the situation and timeline, NASCO was informed that this meeting would not go ahead. Instead, the IASRB 2020 meeting in June will discuss the upcoming field trials and appropriate next steps, which may involve a rescheduling of the proposed/cancelled workshop.

A list of planned events related to the IYS in 2020 can be found in Appendix F, with more upcoming IYS events across the hemisphere on the Year of the Salmon website.

## **Overview of Likely Suspects**

An overview of the Likely Suspects Framework (LSF), a Signature Project of the IYS Initiative, was provided by IYS Coordinator Laura Tessier. The LSF is a joint initiative of both NPAFC in the Pacific and NASCO in the Atlantic, in partnership with The Missing Salmon Alliance. A detailed description of the Likely Suspects Framework was published by Crozier et al. 2018 as an important “Blue Book” and can be accessed here: <https://atlanticsalmontrust.org/wp-content/uploads/2018/08/Blue-Journal-June-2018.pdf>. In summary, the LSF is an overall spatial and temporal framework to link our understanding of salmon during their full life history cycle, bringing together freshwater, coastal and high seas information and would provide a basis for selecting key research priorities based on candidate mortality factors. It can be described as a toolkit that to assess the complex array of bottlenecks affecting survival through the complete life cycle from freshwater systems to the high seas. A key objective of the framework is to prompt specific, testable scientific hypotheses about the factors influencing salmon survival. Candidate mortality factors (or Likely Suspects) within the spatio-temporal framework (the Likely Suspects Framework) that cover the freshwater migration and marine phases of the life cycle will be identified, and key geographical areas and periods where mortality factors are known or thought to operate will be characterized as ecosystem “domains”. These domains can be identified at various locations, ranging from freshwater to overwintering feeding areas, and will be associated with different mortality factors. IYS is currently in the process of applying for funding through BC SRIF and other sources (e.g. Salmonscape workshop).

LSF outcomes include the production of a model framework to test hypotheses about factors driving salmon survival and/or productivity, mobilization and integration of data across life history stages/ecoregions, the creation of integrated modelling and research teams across the hemisphere, and the active use of produced results by management systems to prioritize research and management actions.

LSF is already being implemented in the Atlantic basin through the Missing Salmon Alliance (UK) and SeaSALAR (Norway). The IYS proposes having a Project Coordinator, two co-Principal Investigators and a Data Specialist to implement the framework in the Pacific. There is also a potential to incorporate local, Indigenous knowledge in parallel to western scientific approach. A team of post docs and grad students will be recruited to test various hypothesis using the LSF through case studies.

### ***Citation***

Crozier, W., K. Whelan, M. Buoro, G. Chaput, J. Daniels, S. Grant, K. Hyatt, J. Irvine, N. Ó'Maoiléidigh, E. Prévost, E. Rivot, I. Russell, M. Schmidt and B. Wells. 2018. Atlantic salmon mortality at sea: Developing an evidence-based “Likely Suspects” Framework. Atlantic Salmon Trust Likely Suspects Workshop. 58 pp.

## ***Discussion Feedback***

Participants were interested in whether any lessons had been learned from the Atlantic experience concerning LSF. Laura Tessier and IYS partners in the Pacific have been collaborating with Colin Bull, Principal Investigator for the Missing Salmon Alliance. While applying the framework to Atlantic salmon is less involved given a single species, the overlap in challenges to developing methods to understand factors across life histories in both basins has shown that increasing capacity through collaboration and comparative study is unquestionably more efficient and effective than working independently.

## **Effectiveness of IYS Communications**

### *Website*

Moronke Harris, the NPAFC intern prepared and presented a Google analytics report. This information was new to the NPSC and many participants commented on their appreciation for learning about the various analytics that were applied. There was great interest in the communications update, and the NPSC presented many ideas to continue successfully implementing IYS Communications strategies.

### *Social Media: Seadog Communications updates—2019 Analytics*

The NPAFC Intern presented a review of the IYS social media analytics for the year 2019. The analytics were originally compiled by external communications advisor Catherine Brown from Seadog Communications and focused on the IYS Twitter and Facebook accounts. The overall findings of the review of IYS social media accounts revealed peaks in posting content related to large events and conferences. Significant gaps in the frequency of posts were noted on Facebook, and to a lesser extent were noted on Twitter as well. The lack of a posting schedule in 2019 resulted in unpredictable exposure to content by audiences, who would have no interactions with IYS on social media until an event occurred, at which point they would be inundated with posts. There was a mismatch in posting frequency between Facebook and Twitter, despite receiving steady engagement rates from the audience.

Despite these inconsistencies, Seadog Communications reported that IYS had fantastic growth on Twitter over the focal year, with posts receiving multiple views and impressions. The average engagement rate was considered within the good/average range, at 1.1%. The advice was for the IYS to develop a regular posting schedule, focused on producing quality posts at optimal peak times (between 12:00–3:00 pm), with an average number of 60 Tweets per month. This will ensure the audience is receiving enough content to remain engaged, but without being inundated with unwanted posts. The same technique will be applied to Facebook, where audience engagement is spurred by consistent posting.

Instagram analytics are more challenging to analyze, and thus the IYS currently does not have statistics from this social media account. However, the same posting guidelines suggested for Facebook and Twitter are being implemented for this platform as well. Instagram has visual and aesthetic/popular appeal which could be used to the advantage of the IYS, and the IYS PR and Comms Coordinator is still developing an analytical method specific to this platform.

In summary, the IYS Twitter, Facebook and Instagram accounts saw a reasonable amount of success although there were areas where improvements could be made. The IYS website was also successful, although it requires increased promotion and regularly updated content. The IYS PR and Comms Coordinator will be creating engagement protocols for all social media platforms and the website to ensure that communications are as effective and efficient as possible.

### *IYS Strategic Communications*

The IYS PR and Comms Coordinator Camille Jasinski gave a presentation on the strategic plan for IYS Communications and Outreach. She gave an overview of the communications platforms that the IYS is currently using, and discussed how one of the core goals of the IYS to have an effective outreach and communications program, where people will turn to receive information on the status of salmon under changing conditions. Since the IYS is a joint initiative of both NPAFC and NASCO, they will maintain separate social media accounts with the North Pacific region being run by the NPAFC Secretariat and the IYS PR and Comms Coordinator. NASCO will run social media in the Atlantic. Each member country involved in IYS should consider ways that they can engage with their IYS social media locally.

Some policies of the IYS social media accounts include remaining politically neutral, especially in regards to farmed vs. wild salmon and pipeline debates. Additionally, the IYS will not share any critical, personal or negative opinions online. The overall objectives of the strategic communications plan are:

1. To share key messages about salmon and their status in a changing world;
2. Communicate salmon-related scientific information to the public and people in salmon-related fields or industries;
3. Promote IYS/NPAFC research, events and signature projects.

These objectives will be completed using a combination of the IYS social media platforms and IYS website as appropriate. As part of the strategic communications plan the IYS will continue to partner and collaborate with various other salmon organizations on social media to amplify the IYS online presence and raise awareness. The IYS will be teaming up with scientists, researchers and environmentalists who are part of the WG and NPSC to further educate the public on Pacific salmon research. Another important aspect of IYS communications involves Indigenous engagement, and the IYS is currently learning about the benefits of a Two-Eyed Seeing Approach, a Mi'kmaw term which was defined by Elder Albert Marshall in 2004 as, "learning to see from one eye with the strengths of Indigenous knowledge and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing.... and learning to use both these eyes together, for the benefit of all." More information on this topic can be found at: <http://www.integrativescience.ca/Principles/TwoEyedSeeing/>.

The expected audiences for the IYS communications include the scientific community in general, along with organizations that focus on salmon and environmental research. The IYS will use various platforms to communicate updates on IYS events, introduce signature projects and research findings, and spread awareness of the status of the salmon to various scientific communities and connections. This will encourage the audience to take action on salmon conservation and protection along with spreading awareness and increasing communication between the general public and scientific community.

### *Participant Suggestions*

Attendee suggestions for the development of the IYS Communications and Outreach Strategic Plan included taking into account that the IYS is an international organization when considering Indigenous involvement. Therefore, the focus cannot only be BC Indigenous involvement. The IYS will aim to consider adopting broad Indigenous involvement from all NPAFC member countries. In addition, there is a need for clarification of IYS objectives and target audience since different messages and tools are used to best interact with different audiences. The current Signature Projects are producing research for policy makers and governments, therefore it is imperative to ensure that these audiences are being reached by the communications strategy, as opposed to simple salmon facts that this subset of the target audience already

knows. Once a well-defined target audience is articulated, the entire engagement approach can be designed around this identified ‘client’.

### **Planning IYS Wrap-Up Symposium and Event**

Mark Saunders gave an overview of the development of the Terms of Reference (TOR) for the IYS Wrap-Up Symposium, which is planned to be in 2022 (Appendix G). The Wrap-Up Symposium will bring to light what we have learned over the course of the IYS. It will include participants from both the Pacific and Atlantic basins. The NPSC provided some feedback towards the proposed TOR for the Symposium. As NPAFC and NASCO are the lead organizations of the IYS, it was proposed that two co-convenors from each lead organization be nominated to handle meeting logistics, assisted by a Scientific Steering Committee and a local organizing committee. The scientific steering committee would plan the scientific program with advisement from the co-convenors. The IYS Working Group and the IYS Secretariat will work with NASCO and keep the NPSC engaged as the TOR are developed.

### **Wrap-up and Concluding Roundtable**

The meeting was concluded by NPSC participants sharing their final thoughts during a roundtable. Participants thanked the IYS and NPAFC Secretariat staff for organizing the meeting and for their continued dedication and hard work on the IYS. Best wishes and congratulations were expressed for NPAFC involvement in High Seas Expeditions. Many noted how far the IYS had come, the accomplishments of the last couple years and contributions of participants and partners in upcoming IYS projects. Findings that were discussed from 2019 Expedition results combined with previous information contribute to a compelling story of concern for salmon in the Pacific. The community is well positioned to be able to understand why observed changes are occurring. NPSC endorsed Doug Mecum’s suggestion that the legacy of the IYS should be characterized as a “new beginning”. The idea that we are flipping the script to do things differently in a rapidly changing world.

Many participants shared positive remarks about the data mobilization projects that the IYS is currently undertaking, and the plans for data management—including maintaining open communication to promote this. They were glad to hear that data is being coalesced and brought together along with transparency of data sharing and publication. It was raised that it may be helpful to encourage those who view the data and want to use it to contact the scientists that generated it for information on idiosyncrasies and how it was collected. This communications node is essential. Combining and identifying research areas and bringing international collaboration to each of this to work together meaningfully is required.

Numerous participants expressed how pleased they were with the progress since the last NPSC meeting in 2019. The Year of the Salmon website has seen a lot of visitors and the number of projects and events that are being posted speaks to the value of the IYS and its continued success. It was expressed that the IYS social media accounts are crucial for the success of the IYS, and the IYS staff will continue improving the online presence of the IYS and extending its reach to a greater audience. As the communications strategy is developed, it is imperative to focus on actionable science, namely moving forward past publications to avoid lost opportunities. What is being performed is groundbreaking science. Understanding of the North Pacific system and elements within it must be delivered and conveyed to policy makers in a way that will be useful for policy and produce true change. Regarding the legacy of the IYS, the data sharing systems from the Expeditions and networks should continue the momentum through 2022 and beyond. For this, permanent, adaptable architecture is required to be put in place to continue aspects of the initiative.

Mark Saunders thanked all NPSC participants for their time and commitment to the IYS and stated that he

was very encouraged by recent meetings and events and will try and keep building momentum around the IYS moving forward. He noted the valuable discussion and direction that had taken place. There are several pressing issues at hand, two of which are fundraising and data mobilization, and the IYS recognizes that assistance is needed from others in this process. Key outcomes will likely be decided at the NPAFC Annual Meeting in May. Finally, the IYS Secretariat will produce a report from this NPSC meeting to be circulated to participants, and weekly updates to the NPSC will be resumed.

**Table 1.** Participants of the 2020 International Year of the Salmon North Pacific Steering Committee Meeting Agenda (February 26–27, Vancouver, BC, Canada), listed in alphabetical order by last name. Laurie Weitkamp and Ed Farley were present via telephone. Brian Hunt and Jackie King were only present for the first day. Rae Hull left for the afternoon of the first day but returned for the second day.

|    | <b>Name</b>       | <b>Role</b>                    | <b>Organization</b>              | <b>Country</b>    |
|----|-------------------|--------------------------------|----------------------------------|-------------------|
| 1  | Hal Batchelder    | NPSC Member                    | PICES                            | Canada            |
| 2  | Richard Beamish   | NPSC Attendee                  | Independent                      | Canada            |
| 3  | Gustavo Bisbal    | NPSC Attendee                  | USGS                             | USA               |
| 4  | Richard Brodeur   | NPSC Attendee                  | NOAA                             | USA               |
| 5  | Ed Farley         | NPSC Member                    | NOAA                             | USA               |
| 6  | John Field        | NPSC Member                    | Pacific Salmon Commission        | Canada            |
| 7  | Rae Hull          | NPSC Attendee                  | Independent Producer/CTV and CBC | Canada            |
| 8  | Brian Hunt        | NPSC Member                    | UBC                              | Canada            |
| 9  | Jason Hwang       | NPSC Member                    | PSF                              | Canada            |
| 10 | Jim Irvine        | IYS-WG & NPSC Member           | DFO                              | Canada            |
| 11 | Brett Johnson     | NPSC Attendee                  | Hakai Institute                  | Canada            |
| 12 | Ju Kyoung Kim     | IYS-WG & NPSC Member           | Korea Fisheries Resources Agency | Korea             |
| 13 | Suam Kim          | NPAFC President                | NPAFC                            | Korea             |
| 14 | Jackie King       | NPSC Member                    | DFO                              | Canada            |
| 15 | Gerry Kristianson | NPSC Attendee                  | Sport Fishery Advisory Board     | Canada            |
| 16 | James Mack        | NPSC Attendee                  | BC Government                    | Canada            |
| 17 | Skip McKinnell    | IYS-WG & NPSC Member           | Consultant                       | Canada            |
| 18 | Doug Mecum        | IYS-WG & NPSC Member           | NOAA                             | USA               |
| 19 | Igor Melnikov     | NPSC Attendee                  | TINRO-Center                     | Russia            |
| 20 | Dion Oxman        | IYS-WG & NPSC Member           | ADFG                             | USA               |
| 21 | Evgeny Pakhomov   | NPSC Member                    | UBC                              | Canada            |
| 22 | Jeongseok Park    | NPAFC Secretariat; NPSC Member | NPAFC Secretariat                | NPAFC Secretariat |
| 23 | Eric Peterson     | NPSC Attendee                  | Hakai Institute/Tula Foundation  | Canada            |
| 24 | Jordan Point      | NPSC Attendee                  | First Nation Fishery Council     | Canada            |

|    |                    |   |  |                      |
|----|--------------------|---|--|----------------------|
| 25 | Vladimir Radchenko | NPAFC Secretariat;<br>NPSC Member                                 | NPAFC Secretariat                                    | NPAFC<br>Secretariat |
| 26 | Brian Riddell      | NPSC Attendee   | Pacific Salmon<br>Foundation                         | Canada               |
| 27 | Shunpei Sato       | IYS-WG Member   | Japan Fisheries<br>Research and<br>Education Agency  | Japan                |
| 28 | Mark Saunders      | NPAFC Secretariat;<br>IYS-WG Chair;<br>NPSC Chair; CC<br>Co-Chair | NPAFC Secretariat                                    | NPAFC<br>Secretariat |
| 29 | Kengo Suzuki       | IYS-WG & NPSC<br>Member   | Japan Fisheries<br>Research and<br>Education Agency  | Japan                |
| 30 | Stephanie Taylor   | NPAFC Secretariat   | NPAFC Secretariat                                    | NPAFC<br>Secretariat |
| 31 | Shigehiko Urawa    | IYS-WG & NPSC<br>Member   | Hokkaido National<br>Fisheries Research<br>Institute | Japan                |
| 32 | Jacques White      | NPSC Member   | Long Live the Kings                                  | USA                  |
| 33 | Sang-Seon Yun      | IYS-WG & NPSC<br>Member   | Big River Scientific,<br>LLC                         | Korea                |

**Table 2.** 2019 International Gulf of Alaska Expedition salmon catch abundance estimates (Pakhomov et al. 2019)

| <b>Salmon Species</b> | <b>Frequency of occurrence (%)</b> | <b>Numbers (Millions)</b> | <b>Biomass (1,000 tons)</b> |
|-----------------------|------------------------------------|---------------------------|-----------------------------|
| <b>Chum</b>           | 63.8                               | 27.7                      | 27.7                        |
| <b>Sockeye</b>        | 31.0                               | 9.0                       | 10.3                        |
| <b>Coho</b>           | 37.9                               | 13.59                     | 10.4                        |
| <b>Pink</b>           | 17.2                               | 4.21                      | 1.63                        |
| <b>Chinook</b>        | 5.17                               | 0.37                      | 1.32                        |
| <b>All Species</b>    | 82.8                               | 54.95                     | 51.3                        |

**Table 3.** 2020 International Year of the Salmon North Pacific Steering Committee Meeting breakout groups with leaders and then participants.

| <b>Facilitator</b>  | Mark Saunders   | Stephanie Taylor  | Laura Tessier      | Moronke Harris and Camille Jasinski |
|---------------------|-----------------|-------------------|--------------------|-------------------------------------|
| <b>Participants</b> | Eric Peterson   | Jordan Point      | Brett Johnson      | Richard Brodeur                     |
|                     | Brian Riddell   | John Field        | Hal Batchelder     | Suam Kim                            |
|                     | Jackie King     | Richard Beamish   | Jim Irvine         | Brian Hunt                          |
|                     | Shigehiko Urawa | Jeongseok Park    | Jason Hwang        | Skip McKinnell                      |
|                     | Ju Kyoung Kim   | Sang-Seon Yun     | Vladimir Radchenko | Jacques White                       |
|                     | Gustavo Bisbal  | Doug Mecum        | Igor Melnikov      |                                     |
|                     | Rae Hull        | Gerry Kristianson | Shunpei Sato       |                                     |
|                     | Evgeny Pakhomov | Dion Oxman        | Kengo Suzuki       |                                     |
|                     |                 |                   | James Mack         |                                     |

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## Appendix A



### 2020 IYS North Pacific Steering Committee Meeting

*February 26 & 27, 2020 | Vancouver, B.C.*

***Location:***

*Day One: Garibaldi Room, Blue Horizon Hotel, 1225 Robson St*

*Day Two: Garibaldi Room, Blue Horizon Hotel, 1225 Robson St*

***Hosted by:*** North Pacific Anadromous Fish Commission (Tel: 604-775-5550, Email: [secretariat@npafc.org](mailto:secretariat@npafc.org))

***Meeting Chair:*** Mark Saunders

#### **Wednesday, February 26, 2020**

8:30 am–4:30 pm

Two 15-minute coffee breaks

Lunch provided by NPAFC

Evening Reception 6:30pm—Member’s Lounge, The Vancouver Club (915 W Hastings St, Vancouver)

#### **Thursday, February 27, 2020**

8:30 am–12:00 pm

One 15-minute coffee break

### ***Annotated Agenda***

#### **Meeting Objectives:**

- (1) Review progress on IYS implementation
  - a. Success of the IYS focal year
  - b. Provide updates on signature projects: High Seas Expedition, Likely Suspects and Data Mobilization
  - c. Review and develop communication and outreach strategies to continue forming connections with our partners along with the public to raise awareness about the status of salmon.
- (2) Continuing the engagement of the NPSC with current and upcoming activities and determining the next steps for IYS through 2021

## **DAY ONE**

(1) 8:30–9:00 **Morning coffee and tea**

(2) 9:00–9:45 **Welcome, agenda review and introductions—Mark Saunders**

- First Nations welcome (Chief Bill Williams, Squamish Nation); NPAFC welcome from Dr. Suam Kim, NPAFC President
- Roundtable introductions
- Review of the agenda and meeting objectives
- Review of NPSC Terms of Reference

(3) 9:45–10:15 **Report on progress made on IYS activities in 2019 – Mark Saunders**

Discussion Document #1

*To ensure all committee members understand activities and progress made to date.*

- Review of activities since January 2019
- Overview of IYS Signature projects

(4) 10:15–10:30 **Break**

(5) 10:30–11:15 **Overview of 2019 High Seas Expedition Results, with next steps from the 2020 High Seas Expedition Cruise Plan**

*To ensure all committee members are aware of the progress made and current status of the IYS Signature project—the high seas research cruise.*

10:30–10:45 **Overview of the 2019 High Seas Expedition Results – Richard Beamish**

Discussion Document #2—PICES report

15 minute presentation

10:45–11:15 **Overview of the 2020 High Seas Expedition Cruise Plan – Richard Beamish**

Discussion Document #3—2020 Draft Cruise Plan

15 minute presentation with 15 minute discussion

(6) 11:15–12:30 **Discuss research planning for 2021 Pan-Pacific High Seas Expedition**

Discussion Document #4—Omitted

*To ensure all committee members are familiar with the progress of the 2021 cruise plan.*

11:15–11:45 **Overview of 2021 Pan-Pacific High Seas Expedition Cruise Plan—Stephanie Taylor**

*Summary of the Pan-Pacific expedition plans to date, including logistics and equipment.*

15 minute presentation with 15 minute discussion

11:45–12:15 **Breakout Session**

*To seek feedback for funding opportunities and strategies, along with some outreach and communication ideas specific to High Seas cruises (general IYS communications and outreach will be discussed on Day 2). Provide feedback about the media events and other platforms used to raise awareness about 2019, along with the plans for the 2020 expedition. Discuss the next steps to effectively promote 2021 Pan-Pacific High Seas Expedition.*

**12:15–12:30 Plenary Session to report out and discuss results of Breakout Session**

**(7) 12:30–1:30 Lunch—provided by NPAFC**

**(8) 1:30–2:20 Coordination of 2020 Activities including IYS planning, workshops, meetings, and events—Mark Saunders**

Discussion Document #5—Calendar of events

*To ensure all committee members are aware and can provide input on 2020 IYS coordination between partners.*

**1:30 –1:40 Review calendar of events**

**1:30–1:50 IYS Participation at upcoming workshops and symposiums**

- Salmon Ocean Ecology Meeting in Monterey California (March 2020)
  - IYS High Seas Expedition Coordinator, IYS Coordinator and IYS Assistant Coordinator presenting
- Third NPAFC-IYS Workshop in Hakodate, Japan (May 2020)—discussed in detail in the next section.
  - IYS High Seas Expedition Coordinator presenting
- Marine Socio-Ecological Systems Symposium (MSEAS) in Yokohama, Japan (May 2020)
  - IYS High Seas Expedition Coordinator and IYS Coordinator presenting
- IYS 2020 Gulf of Alaska workshop in St Petersburg, Russia (September 2020, TBD)
- PICES October 2020 in Qingdao, China (October 2020)
- NCEAS Bottlenecks to Data Mobilization Workshop (date TBD)

**1:50–2:10 NPAFC-IYS Third Workshop—Shigehiko Urawa**

- May 2020, Hakodate, Japan
- Linkages between Pacific Salmon Production and Environmental Changes

15 minute presentation with 5 minute discussion

**2:10v 2:20 Discuss Upcoming workshops and symposia that IYS should be involved in**

**(10) 2:20–2:45 Overview presentation of the First Nations Fisheries Council—Jordan Point**

15 minute presentation and 10 minute discussion

**(11) 2:45–3:00 Break**

**3:0–3:20 Update on the IYS Workplan and Fundraising**

Discussion Document #6—Omitted

- Review of IYS activities and projects, potential opportunities for partner involvement.
- Review funding opportunities for IYS secretariat, research and outreach activities

(12) 3:20–3:30 **Overview of Data Mobilization—Mark Saunders**

*Brief introduction on IYS Data Mobilization.*

(13) 3:30–3:45 **Overview presentation of Hakai Institute/Tula Foundation (an IYS Partner)—Eric Peterson**

15 minute presentation

(14) 3:45–4:15 **Discussion of Data Mobilization**

(15) 4:15–4:30 **Day One closing remarks**

**DAY TWO**

(1) 8:30–9:00 **Morning coffee and tea**

(3) 9:00–9:25 **Summary of Day 1—Mark Saunders**

10 minute presentation and 15 minute discussion

(4) 9:25–9:50 **Overview of Likely Suspects—Laura Tessier**

10 minute presentation and 15 minute discussion

(5) 9:50–10:40 **Effectiveness of IYS Communications**

Discussion Document #7

*Brainstorming of approaches to outreach at local, regional and hemispheric scales. Raising awareness about our Signature Projects and determining outreach strategies for each one.*

9:50–10:00 **Website and Social Media Analytics Update—Moronke Harris**

*To familiarize committee with the website and social medias and the engagement plan for both.*

Present Google analytics report and progress of work with Seadog Communications

10 minute presentation

10:00–10:15 **Overview of IYS Outreach and Communication Activities—Camille Jasinski**

*To update the committee with the ways IYS has been raising awareness and engaging with the general public and scientists. Input on how to continue to raise awareness and how to measure the effectiveness of our campaign is encouraged.*

10 minute presentation with 5 minute discussion

10:15–10:30 **Break Out Session**

*How to involve public and scientists in our High Seas Expedition, Likely*

*Suspects, and Data Mobilization projects? Strategies for effective outreach and communication to continue raising awareness about IYS and our ongoing Signature Projects now that the focal year has been completed.*

**10:30–10:45 Plenary Session to report out and discuss communications strategy**

*Ensure that we have a plan to support communication for the High Seas expedition. Looking for input from NPSC and our partners about ways to improve communication and keep the public engaged now that the IYS focal year has been completed.*

**(6) 10:45–11:00 Break**

**(7) 11:00–11:30 Planning IYS Wrap-up Symposium and Event**

*To receive input on continuing the plan for the 2022 IYS Wrap-Up Symposium, including suggestions for location and event type. To also receive suggestions for engaging NASCO in the planning of the symposium.*

**(8) 11:30–12:00 Wrap-up and Concluding roundtable**

## **Appendix B**

### **Terms of Reference for the IYS North Pacific Steering Committee**

Revised February 26, 2020.

1. NPAFC as the lead organization for the North Pacific establishes the IYS North Pacific Steering Committee to remain active for the effective duration of the IYS.

2. The North Pacific Steering Committee shall consist of:

(a) One representative from each NPAFC party, a representative of the NPAFC Secretariat, and invited representatives from core partners. It would be desirable to have both scientists and managers involved

(b) and ideally representatives with experience of outreach initiatives and additional experts, as needed to support IYS functions.

(c) The North Pacific Steering Committee may co-opt, as required, additional representatives to serve on the North Pacific Steering Committee who have expertise relevant to a specific activity being undertaken by the Committee.

(d) The North Pacific Steering Committee may designate a Chairperson or Co-Chairpersons and establish working groups or other subordinate body or person as it requires to fulfill its tasks.

3. The North Pacific Steering Committee's mandate is to coordinate the planning, implementation and administration of the IYS and review its progress in the North Pacific. The North Pacific Committee will undertake the following activities:

- engage core partners;
- resolve species, life stages and geographical areas of the North Pacific Ocean to be included in the IYS, in addition to those identified in section 5 of the Outline Proposal;
- develop criteria for IYS endorsement, identify outreach and research priorities, review outreach and research proposals, identify research priorities and develop research plans for activities engaged at the basin and local scale; including ensuring that IYS data sets, once developed, are archived and available in public archives;
- develop outreach activities, target audiences and messages;
- coordinate fundraising in support of its functions and activities;
- review progress of the IYS at the basin/local level; and
- such other tasks as may be identified by the lead organizations.

4. The Chair of the North Pacific Steering Committee will report to NPAFC on the work of the North Pacific Steering Committee.

5. The North Pacific Steering Committee will operate by consensus.

6. The costs incurred by each North Pacific Steering Committee member in participating in the Committee's work, including any fees for service, should be borne by the organization appointing the Committee member, if otherwise will not be decided by the NPAFC.

7. The North Pacific Steering Committee may incur costs, including engaging professional support, in accordance with budgetary provision and spending plans made by NPAFC or funds raised from other sources and made available to the North Pacific Steering Committee through the NPAFC. The NPAFC Executive Director shall ensure that the receipt and expenditure of funds are consistent with NPAFC's Financial Rules.

# Appendix C

## North Pacific Steering Committee Meeting Discussion Document #1: IYS Activities and Progress in 2019—North Pacific Region

### DISCUSSION DOCUMENT #1



INTERNATIONAL  
YEAR OF THE SALMON

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## IYS Activities and Progress in 2019—North Pacific Region

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### Preamble

This report documents North Pacific IYS activities that took place in the IYS focal year 2019 in support of the vision of the IYS to set the conditions for the resilience of salmon and people in a rapidly changing world. Those conditions include effectively connecting people and organizations to efficiently and collaboratively share and generate knowledge and take action to salmon.

In 2019, we began to realize the benefits of building governance across the hemisphere as groups of researchers and executives began to identify with the logic of working collaboratively on common problems. The relationships developed through these governance arrangements have established the IYS with its partners as a reputable brand/entity that can take effect action on a significant international scale. The extremely successful 2019 Expedition and associated media events drew attention to high seas research and set the stage for us to successfully raise \$3M Canadian from the DFO BC Salmon Restoration and Innovation Fund to support Canada's contribution to the 2021 High Seas Expedition. We are close to having \$4.5M in ship time commitments for the Expedition and are working to leverage these investments to secure additional funding for associated research activities. A \$500K grant to the National Center for Ecosystem Synthesis and Analysis is being directed to understanding the bottlenecks that prevent mobilization of data to support salmon science and we have been working with a new Missing Salmon Alliance of NGO's on the joint development of a Likely Suspects Initiative to jointly develop the methods to model and manage factors affecting the survival of salmon across their life history stages. The focal year achieved its goal of raising the awareness of the IYS and we are now challenged to use this awareness to gain support for additional funding and activities for implementation through 2022 that will ultimately leave a legacy of well-connected researchers and institutions that support well-informed public and regulatory decision making in support of salmon.

## **Review of Activities since January 2019**

As the focal year of the IYS, 2019 unsurprisingly saw numerous programs, projects, workshops and symposia held throughout the Northern Hemisphere. During this busy and productive year, IYS workshops and symposia were held to develop priorities and plans for high-impact projects to address research outcomes as well as further the understanding associated with outcomes. Significant strides were made in raise awareness concerning the Year of the Salmon and building our on-line presence

After the launch of the IYS website in 2018, there was a significant amount of activity with registering events and promotions on social media. There were 182 events registered and 56 projects at the end of the 2019 focal year. Our Twitter account had an over 50% growth rate in 2019, with an increase in followers from approximately 300 at the start of the year to over 757 followers currently. Not only did our followers more than double, but our audience had increased levels of engagement with our posts on Instagram and Facebook. There were 4,073 engagements on Twitter and 1,798 on Facebook over the course of 2019. This means that the people viewing our information were also interacting with it, clicking the links and being directed to our profile etc. These accounts will now be managed by a dedicated Public Relations and Communications Coordinator, who will further develop these networks and use the established platforms to their fullest potential as we reach and interact with larger audiences. These platforms are an effective means of communication with the public and scientific experts alike.

In 2019, there were over 96 meetings between IYS partners and potential partners. Partnerships crossing cultures and great distances unquestionably take time to develop. Thus far, IYS has been successful at establishing collaborations with over 35 partners in the North Pacific representing government science from five countries, academia, First Nations, NGO's and industry, who are participating in the development and implementation of IYS on a broad scale. In the Atlantic basin, we continue to work with our main IYS partner although they will be less active now that the focal year is over and they have a lower priority on research. The workshops, symposia, and events for the IYS focal year and 2019 Gulf of Alaska Expedition had a large presence on social media, which in turn has resulted in a larger online following for the announcement of future IYS-related events, ongoing projects, and meetings.

The document is divided into IYS Activities and Outreach, Symposia/Sessions/Workshops, Meetings, Signature Projects, Publications, and Positional Changes.

**IYS Highlighted Symposia/Sessions/Workshops** (Refer to Calendar of Events for upcoming and 2020 events)

- I. The Second NPAFC-IYS Workshop: Salmon Ocean Ecology in a Changing Climate, Portland OR, USA (May 2019)
  - Host: The North Pacific Anadromous Fish Commission (NPAFC)
  - Partner: The Salmon Ocean Ecology Meeting (SOEM)
  - Workshop Objectives
    - Improve current knowledge of the migration, distribution, growth and survival of salmon and their environment in the ocean;
    - Increase understanding of the causes of variations in salmon production in a changing climate;
    - Anticipate future changes in the distribution and abundance of salmon and their marine ecosystems;
    - Develop and apply new technologies and analytical methods to research and management of salmon; and
    - Invent integrated information/management systems to support research, sustainable management, and public understanding for the conservation of salmon
  - Topics Sessions
    1. Current status of salmon and their environments
      - 1.1. Biological traits of key salmon populations
      - 1.2. Migration and distribution
      - 1.3. Growth and survival
    2. Salmon in changing ocean conditions
      - 2.1. Linkage between salmon production, climate and ocean changes
      - 2.2. Modeling the future for salmon
    3. New technologies/integrated information systems for salmon research and management
      - 3.1. New technologies
      - 3.2. Integrated information and management systems
  - Organizing Committee

Richard Brodeur (SOEM; Northwest Fisheries Science Center, NOAA, USA; Organizing Committee vice-chairperson); Ed Farley, Jr. (Auke Bay Laboratories, Ted Stevens Marine Research Institute, NMFS, USA); Jim Irvine (Pacific Biological Station, DFO, Canada); Ju Kyoung Kim (Inland Life Resources Center, FIRA, Korea); Svetlana Naydenko (Pacific Scientific Research Fisheries Center; TINRO-Center, Russia); Mark Saunders (International Year of the Salmon (IYS) North

Pacific Steering Committee, Canada; Organizing Committee vice-chairperson); Michael Schmidt (SOEM; Long Live the Kings, USA); Shigehiko Urawa (Hokkaido National Fisheries Research Institute, FRA, Japan; Organizing Committee vice-chairperson); Brian Wells (SOEM; Southwest Fisheries Science Center, NOAA, USA; Organizing Committee vice-chairperson); Jeongseok Park (NPAFC Secretariat, Canada)

## II. ICES Likely Suspects Workshop, Copenhagen Denmark (June 2019): Workshop for North Atlantic Salmon At-Sea Mortality (WKSalm)

- IYS Director Attended
- Addressing the common issues and high degree of overlap organizations across the world face concerning declining salmon productivity experienced since the early 1990's

- Overview:

Workshop for North Atlantic Salmon At-Sea Mortality will meet at ICES HQ, Copenhagen, Denmark on 24–28 June 2019 for a 5-day scoping meeting; then in autumn 2020 for a 3-day data evaluation meeting; and then for a 5-day modelling meeting in 2020/2021.

The Workshop aimed to:

- Identify data sources that could inform estimates of at-sea salmon mortality and the associated available data, including data from North Atlantic salmon as well as ecosystem data (such as oceanographic time-series, plankton surveys, International Ecosystem Summer Survey in the Nordic Seas (IESSNS), pelagic or demersal fish surveys);
- Develop a data call that will integrate these sources with existing ICES databases;
- Evaluate the appropriateness of data and methods used to estimate at-sea salmon mortality;
- Identify data gaps and develop recommendations for future data acquisition.
- Evaluate modelling approaches to integrate marine data fully to cover the whole life cycle of Atlantic salmon in the context of the 'Likely Suspects' Framework (see [http://www.nasco.int/sas/pdf/archive/papers/2018/SAG\\_18\\_04\\_AST%20Likely%20Suspects%20Framework%20Update.pdf](http://www.nasco.int/sas/pdf/archive/papers/2018/SAG_18_04_AST%20Likely%20Suspects%20Framework%20Update.pdf))

## III. NASCO Symposium 2019: Managing the Atlantic salmon in a Rapidly Changing Environment – Management Challenges and Possible Responses, Tromsø, Norway (June 2019)

- Overview:

To mark the International Year of the Salmon, a two-day Symposium will be held ahead of the North Atlantic Salmon Conservation Organization's (NASCO) Annual Meeting, which in 2019 is being hosted by Norway in Tromsø. Attendance is open to all, and people connected with, inspired by or passionate about wild Atlantic salmon are encouraged to register. The focus will be on challenges facing the

Atlantic salmon and possible responses that can help conserve this precious resource in a rapidly changing environment.

The Symposium is structured under two main themes:

1. Climate change and state of the salmon, with scientific overviews being provided on these subjects; and
2. Management challenges and solutions.

Perspectives were provided from a number of different viewpoints, including managers, scientists, NGOs and Indigenous People. Participation in finding solutions to the many challenges facing this iconic species is encouraged through discussion, the provision of posters and networking during the event's social activities.

The Symposium Steering Committee drew together the conclusions from the two days to take forward as recommendations to the North Atlantic Salmon Conservation Organization's (NASCO) Annual Meeting.

- Draft Programme:  
<http://www.nasco.int/pdf/2019%20papers/DRAFT%20Tromso%20Symposium%20Programme%20v2.1.pdf>

#### IV. World Salmon Forum, Seattle USA (August 2019)

- IYS Director attended
- Overview:

Wild salmon populations in both the Atlantic and Pacific basins began declining at the onset of the Industrial Revolution and more dramatically in recent decades. As a result, many populations are at imminent risk of extinction. The World Salmon Forum (WSF) aims to bring together a coalition of scientists, advocates, and foundations dedicated to sustaining wild salmon. WSF will challenge the way in which salmon are managed and investigate the science required to underpin effective management.

The WSF's mission is to sustain wild Atlantic and Pacific salmon, seatrout, and steelhead populations for the future. Salmon diversity and abundance are a gift from the past through millions of years of evolution and adaptation. Our collective stewardship should ensure that wild salmon remain a legacy for future generations.

The WSF is designed to bring together wild salmon conservation groups from around the world to share new policies and measures that will provide for the survival of these magnificent animals.

The WSF event is pleased to be associated with the International Year of the Salmon in our mutual efforts to preserve wild salmon around the world.

The WSF website will serve as a conduit and resource tool for WSF Coalition members and the public to share ideas and resources that can bring about positive change in wild salmon management and policy.

- World Salmon Forum 2019 Topics:
  - a. Aquaculture – Open water or land-based?
  - b. Harvest – Mixed Stock or Terminal – Nonselective or Selective?
  - c. Hatcheries – Problem or Solution?
  - d. Management – Status quo or New Place-based Conceptual Foundation?
  - e. Research – Likely Suspects Framework
  - f. International Year of the Salmon – Working together

V. North Pacific Marine Science Organization (PICES) 2019 Meeting, Victoria, BC Canada (October 2019)

- Two-days of talks were presented at special session (W16) allowing researchers from the 2019 Gulf of Alaska Expedition to share their preliminary findings
- One-day workshop at Oceans Network Canada gathered ocean experts to provide input on 2021 Pan-Pacific Expedition planning. Participants assisted hypothesis development and survey design
- Deliverables:
  - a. PICES Press release by the Assistant IYS Coordinator (See IYS Publications below)
  - b. NPAFC article by the Assistant IYS Coordinator (See IYS Publications below)
  - c. Two commissioned news articles within the National Observer:
    - i. Investigating salmon mysteries on the high sea:  
<https://www.nationalobserver.com/2019/12/16/features/investigating-salmon-mysteries-high-seas>
    - ii. Researchers tap salmon DNA to decode marine mysteries:  
<https://www.nationalobserver.com/2020/01/20/features/researchers-tap-salmon-dna-decode-marine-mysteries>

VI. Missing Salmon Alliance Forum, London, United Kingdom (November 2019)

- IYS Director attended and gave a presentation on the IYS Initiative
- Overview:
- The Missing Salmon Alliance (MSA) is fighting to reverse the devastating collapse in wild salmon around the UK. By combining expertise, coordinating activities and advocating effective management solutions we can help the wild Atlantic salmon survive and thrive in our rivers and seas for the next generation. This 1<sup>st</sup> Missing Salmon Alliance Forum launched the joint plan for action and addressed the need for key NGOs to take a collaborative approach to conserving wild Atlantic salmon.
- The IYS Director met with the Principal Investigator of the Likely Suspects Framework (LSF), Dr. Colin Bull. The LSF proposal for the Pacific basin was discussed and a partnership was formed. The IYS is continuing to work with Dr. Bull on the LSF Signature Project.

- The overarching goal of the Missing Salmon Alliance is to reverse the collapse of wild salmon in the UK by combining expertise, coordinating activities and advocating effective management solutions for wild Atlantic Salmon.

## IYS Partner Meetings

- Over 105 meetings with partners/potential partners from January 2019 to date
- I. Informal Salmon Science Confab, Pacific Salmon Commission, Vancouver BC, Canada (September 2019, November 2019, and January 2020)
    - IYS Director, IYS High Seas Coordinator, IYS Coordinator, and Assistant IYS Coordinator attended three meetings
    - Overview:
 

Quarterly convening of salmon scientists and oceanographer from multiple organizations to address the largest issues facing salmon conservation today. Turning passive behaviour into collaboration between member organizations.
    - Ultimate Purpose:
 

To transform the way domestic agencies and international organizations see salmon assessment needs and research priorities. Also aim to increase communication about funding appropriation in research management. Improving interface b/w science and management to provide forums that better link the research provided for decisions.
  - II. "Salmon Scales - Eats and Feats", North Pacific - International Year of the Salmon Public Bridging Event, Portland, OR, USA (May 2019)
    - Event Purpose/Description
      - Continue to raise awareness, build support and facilitate partnerships with the International Year of the Salmon in the Pacific Northwest through an engaging and entertaining evening public reception.
      - Build a multi-dimensional program that utilizes the themes - connection - knowledge - action. The program will feature: 1) CONNECTION - Salmon Cuisine in the Kitchen, 2) KNOWLEDGE - IGA Expedition Presentation, 3) ACTION - Salmon stakeholders at various scale highlighting salmon successes.
      - Featured Ocean Wise Executive Chef and IYS Ambassador Chef Ned Bell
    - Event Objectives
      - Highlight the North Pacific Anadromous Fish Commission and the overall International Year of the Salmon vision, outcomes and themes from the initiation in 2019 through to 2022
      - Demonstrate the international collaboration at the political, scientific level from Japan, Russia, Korea, Canada, the United States and other hemispheric partners
      - Share IYS successes to date through the various signature projects, partnerships, identified "projects" and "events"
      - Highlight the importance of salmon and people through a public food and cuisine based event that highlights the connection from the high seas to your dinner plate. IYS Dignitary Reception, Ecotrust Natural Capitol Center, Portland, OR (May 2019)

- Event Partners
    - NPAFC, Wild Salmon Center, Washington Department of Fish and Wildlife, National Marine Fisheries Service
  - Event Purpose
    - Continue to raise awareness, build support and facilitate partnerships with the International Year of the Salmon in the Pacific Northwest through an engaging and entertaining evening reception.
  - Event Objectives
    - Highlight the overall vision, outcomes and themes from the IYS from the focal year 2019 through to 2022
    - Demonstrate the international collaboration at the political, scientific level from Japan, Russia, Korea, Canada, the United States and other hemispheric partners
    - Share IYS successes to date through the various signature projects, partnerships, identified "projects" and "events"
    - Firmly position the value proposition - the "why this matters", "what makes this unique", and "how to get involved" within the Pacific Northwest
- III. 2019 Hokkaido Salmon Conference on International Year of the Salmon: Salmon and Our Life, Sapporo, Japan (May 18, 2019)
- Event Partners
    - Hokkaido Salmon Network, Hokkaido National Fisheries Research Institute, Hokkaido Research Organization
  - Event Overview
    - The Hokkaido Salmon Conference is an annual event for the public, hosted by the Hokkaido Salmon Network in alliance with various groups interested in salmon and their habitats. The present conference focused on IYS to consider salmon's socio-economic and cultural consequences in human life, following up four keynote presentations on IYS activities, salmon production in changing ocean environments, salmon cultures, and fisheries economics.
- IV. Salmon Café 2019: Finding Our Salmon, Morioka, Japan (June 15, 2019)
- Event Partners
    - Tohoku Marine Science Project, Iwate Prefecture
  - Event Overview
    - The Salmon Café is annually held in Morioka, Iwate, northern Japan in order to support the recovery from the 2011 earthquake/tunami disaster in the Sanriku coast by the Tohoku Marine Science Project. At the opportunity of the International Year of the Salmon in 2019, the forum aimed that people took looks at various aspects of salmon in the world, Japan and local areas, and conceived our future living with salmon. IYS activities including an outline of the International Gulf of Alaska Expedition 2019 were introduced with ocean migration of Japanese chum salmon and causes of their marine mortalities.
- V. JSFS Hokkaido Division Open Symposium on Research Activities for Sustainable Management of Chum Salmon in the International Year of the Salmon, Sapporo, Japan (November 3, 2019)
- Event Partners

- Hokkaido Division of Japanese Society of Fisheries Science, Hokkaido Research Organization, Hokkaido National Fisheries Research Institute
- Event Overview
  - Following up the IYS Local Symposium on “Sustainable Management of Chum Salmon in Changing Environments” held in Tokyo March 2018, the present symposium was organized by the Hokkaido Division of Japanese Society of Fisheries Science (JSFS). The program included 8 keynote presentations focusing on the growth, migration and survival of juvenile chum salmon in the early ocean life. Extreme seawater temperature changes and growth reduction of juvenile chum salmon in the coastal waters might cause their early marine mortalities, resulting in recent low adult returns in northern Japan.

### **IYS Highlighted Activities and Outreach**

- I. Salmon and Blueberry Festival, Vancouver BC, Canada (July 2019)
  - Ocean Wise Chef Ned Bell gave a wild salmon cooking demonstration and short aquaculture educational talk at the University of British Columbia (UBC)
  - IYS Coordinator and Assistant IYS Coordinator attended
  - Informational brochures and other materials were given out as they and talked to students about IYS
  
- II. Coho Festival 2019, Vancouver BC, Canada (September 2019)
  - IYS had an exhibitor’s booth which engaged children in salmon cut out colouring activities while parents and adults were given informational brochures and other salmon-related information such as Salmon Safe wine list
  
- III. Sapporo Salmon Festa 2019, Sapporo, Japan (September 16, 2019)
  - The Sapporo Salmon Festa is an annual event for citizens to celebrate chum salmon returns in the Toyohira River running through downtown Sapporo. The Sapporo Salmon Museum (host organization) and collaborative organizations/groups exhibited various materials to learn the life history of salmon and their habitat conservation. The Hokkaido National Fisheries Research Institute displayed several posters to promote International Year of the Salmon in Japan.
  
- IV. Fall Salmon Festival, Sapporo, Japan (October 5, 2019)
  - The Fall Salmon Festival was held in the front square of the JR Sapporo Station, downtown Sapporo, Japan, on October 5, 2019. This annual event was hosted by the Hokkaido Set Net Fisheries Association with local fisheries associations to promote the consumption of salmon caught in the coastal areas of Hokkaido. Several hundred participants were treated with traditional salmon egg bowls and salmon soups. Staffs of the Hokkaido National Fisheries Research Institute (HNFRI) set a booth including posters, flags and a computer quiz program, so that people learned the IYS program and associated NPAFC and HNFRI activities for the sustainable conservation of high-seas salmon.
  
- V. 25th Anniversary of the Chitose Aquarium and IYS Jointed Event: Stories of Fish and Salmon in Hokkaido, Chitose, Japan (October 14, 2019)

- The Chitose Aquarium celebrated its 25th anniversary on September 10, 2019. This memorial year was also a focal year for International Year of the Salmon (IYS). In conjunction with the Fisheries Agency of Japan and Hokkaido National Fisheries Research Institute, the Chitose Aquarium hosted an Anniversary/IYS event with Sakana-kun, a unique “fish-specific” talent and also a guest associate professor of Tokyo University of Marine Science and Technology. Sakana-kun and the aquarium director Mr. Kikuchi gave informal lectures for 2,300 participants (mainly kids) by easy to understand and interesting stories of salmon and other local fishes in Hokkaido.

### III. American Fisheries Society Meeting 2019, Reno NV, USA (September 2019)

- IYS Coordinator attended and supported 3 IYS associated sessions:
- Multi-scale Impacts of Climate Change and Human Activities on Salmon Productivity
- The Science of Pacific Salmon Conservation: Foundations, Myths, and Emerging Insights
- From Grassroots to Mainstream: How Informed Advocacy and Social Branding Can Drive Conservation of Fish and Wildlife
- Attended a Salmon Science Social organized by SFU
- Connected with AFS staff to build connections with IYS
- Networked with salmon professionals

### IV. First Nations Fisheries Council Meeting, Harrison BC, Canada (November 2019)

- IYS Director, IYS High Seas Coordinator and IYS Coordinator attended
- The theme of this assembly was “Amplifying Voices: Strength in Unity for First Nations Fisheries”
- The IYS Director gave an overview presentation of the IYS Signature Projects and discussed how the FNFC might be involved in the High Seas Expedition and Likely Suspects Project
- The Assembly presentations included updates on the work of the FNFC, a special Indigenous youth-led panel where they presented research projects related to fish, habitat and water, along with presentations from government partners. There were fisheries management discussions which related to operational, policy and legislative issues.

## **Overview of Developed IYS Signature Projects**

### **2019 International Gulf of Alaska Expedition**

- International Gulf of Alaska Expedition Launch, Vancouver BC (February 2019)

In February 2019, an International Gulf of Alaska Expedition was completed with 21 scientific personnel from five Pacific Rim countries, Canada, Japan, Korea, Russia and the United States, aboard the chartered 62 m Russian R/V *Professor Kaganovskiy*. The expedition was organized by Dr. Richard J. Beamish, the Pacific Salmon Foundation and NPAFC with \$1.2M in funding from private individuals, industry,

government agencies and NGOs. Significant funding was provided by the British Columbia Salmon Restoration and Innovation Fund (BC SRIF).

Prior to leaving, the scientific team received a send-off from Dr. Richard J. Beamish, the scientist who conceived and planned the expedition, and dignitaries including the Honourable Jonathan Wilkinson the Minister of Fisheries, Oceans and the Canadian Coast Guard, and the Honourable Lana Popham, Minister of Agriculture from the Province of British Columbia. The vessel visited 58 stations in the Gulf of Alaska and returned to Vancouver on March 18, 2019.

The end-of-winter trawl survey provided a comprehensive understanding of the abundance, condition, country of origin and location of stocks from salmon producing countries. This information is needed to understand how climate and the changing ocean environment affect salmon production. As the first in decades to study salmon in the winter high seas, the voyage set a precedent for addressing gaps in our knowledge through survey work of salmon, plankton and physical conditions in the central Gulf of Alaska.

- Deliverables:
  - a. Mini-documentary by Stuart McNish of Oh Boy Productions
  - b. Preliminary results presented at PICES workshop in Victoria, BC (October 2019)

## 2020 International Gulf of Alaska Expedition

A second International Gulf of Alaska expedition, officially announced in January 2020, is planned for March – April 2020. It will take place leaving from Vancouver, BC on March 11, and returning April 5, 2020 aboard the 37 m long, Canadian commercial trawler, *Pacific Legacy*. The vessel has modern accommodations for 15 researchers, and is planned to have participants from Canada, Japan, Korea, United States and Russia. To repeat the 2019 survey, a comparable trawl net will be used at set sampling locations similar to the first expedition, with deeper sets included and more stations within the Canadian and United States EEZ. Sampling type will be similar with limited oceanographic sampling.

The hypothesis being addressed is that fish that grow faster in the early months in the ocean (nearshore) are the ones that best survive through the first ocean winter, and largely determine the subsequent year class strength (Beamish and Riddell 2020).

Funding for the expedition was available through government organizations, foundations, the commercial fishing industry and private donations, the Pacific Salmon Foundation (PSF), NPAFC (trawl net), and the governments of Canada and the Province of B.C. (BC SRIF). As the supporting financial agency, the PSF will manage the financial aspects. The expedition will be a contribution to the International Year of the Salmon and coordinated with the North Pacific Anadromous Fish Commission. We are confident that the results of both the 2019 and 2020 expeditions will continue to demonstrate the value of this research and the value of continuing these surveys to monitor ocean changes and impacts of rearing Pacific salmon.

A preliminary cruise plan drafted by Beamish and Riddell (2020) was submitted to the NPAFC in January of 2020, and is now available as NPAFC Doc. 1870 at <https://npafc.org>.

- Deliverable:
  - IYS taking the lead on a voyage send-off media event on March 11<sup>th</sup> (Victoria, BC Point Hope Ship Yards)

### *Citation*

Beamish, R.J., and B.E. Riddell. 2020. Preliminary cruise plan for the second Gulf of Alaska expedition. NPAFC Doc. 1870. 9 pp. Fisheries and Oceans Canada, Pacific Biological Station, and Pacific Salmon Foundation (Available at <https://npafc.org>).

## **2021 Pan-Pacific High Seas Expedition**

- 2021 Pan-Pacific High Seas Expedition Planning Ongoing

Building on the single vessel expedition conducted from February–March 2019 in the Gulf of Alaska, a 2021 International Pan-Pacific Expedition has been proposed. If implemented, it will employ up to five research vessels operating simultaneously to survey the full breadth of the North Pacific Ocean in winter 2021. Similar to the 2019 voyage, these vessels would carry leading scientists from Canada, Japan, Korea, Russia and the United States, all committed to answering questions about the mechanisms affecting the productivity and distribution of salmon. Aside from increasing the area surveyed, the 2021 Expedition would diversify data collection. Three to four vessels would cover a pan-Pacific grid while another would conduct fine scale oceanographic research to provide greater detail for our understanding of how salmon interact with the high seas environment. In conjunction with the tentative 2021 winter surveys, NPAFC member countries would conduct coastal and high seas salmon surveys during the spring, summer and fall of 2020–2021. The 2021 Expedition has the potential to provide a platform for international collaborative ecosystem research to monitor the distribution, abundance and productivity of salmon to directly inform fisheries management and enforcement decisions to be made in an increasingly uncertain future.

### **"Likely Suspects" Framework**

In 2017, IYS, led by NPAFC in the Pacific and NASCO in the Atlantic, joined The Atlantic Salmon Trust in developing a framework for conceptualizing survival issues impacting Atlantic salmon during the freshwater migration phase and subsequent marine phases. The approach would take known historical data on salmon abundance and survival and construct a broad-scale model to quantify and partition the losses of salmon in freshwater and at sea. The goal of this will be to identify where and how mortality factors have changed between earlier periods of higher marine survival and the more recent/current low survival phase. It aims to provide coherent guidance on how future research on survival can be identified and prioritized:

- The concept positions candidate mortality factors (Likely Suspects) within an overall spatio-temporal framework (the Likely Suspects Framework) covering the freshwater migration and marine phases of the life cycle. Key geographical areas and periods where mortality factors are known or thought to operate are characterized as ecosystem “domains”.
- Domains can be identified at various locations, ranging from freshwater to overwintering feeding areas, and will be associated with different mortality factors.

Management on the local and regional level can be adapted to reflect the known likely suspects, whether that includes habitat restoration, harvest restrictions, or enhancement opportunities.

## Data Mobilization

- Expedition data mobilization to be launched in 2020

One of the goals of the IYS Expeditions is to have all the data collected during the IYS international surveys (2019, 2020, and 2021) openly available to the science community. To achieve this, we have partnered with the Tula Foundation (Victoria, BC) and are currently working with them to develop the methods to standardize and share the data. The science team will have first access to publication of information, but it will be open to all users via a website to be maintained at UBC. Beginning in 2020, and in collaboration with the Tula Foundation, data collected in both the 2019 and 2020 expeditions will be integrated into the Canadian Integrated Ocean Observing System, a component of the Global Ocean Observing System (GOOS) framework. This will allow us to provide the data openly to all users.

## IYS Secretariat Publications 2019

NPAFC. 2019a. Report of the Proceedings for the IYS Workshop: *International Year of the Salmon Workshop on Salmon Status and Trends*, Vancouver, BC, Canada, January 23–24, 2019. Edited by J.R. Irvine, K. Chapman, and J. Park. N. Pac. Anadr. Fish Comm. Tech. Rep. 13: 91 p. (Available at <https://npafc.org>)

NPAFC. 2019b. Report of the Proceedings for the IYS Workshop: *First International Year of the Salmon Data Laboratory (ISDL) Workshop*, Vancouver, BC, Canada, January 25, 2019. Edited by S. Akenhead, N. Bendriem, and J. Park. N. Pac. Anadr. Fish Comm. Tech. Rep. 14: 31 p. (Available at <https://npafc.org>)

NPAFC. 2019c. Second NPAFC-IYS Workshop on *Salmon Ocean Ecology in a Changing Climate*. Portland, Oregon, USA, May 18–20, 2019. Edited by J. Park and L. Tessier. N. Pac. Anadr. Fish Comm. Tech. Rep. 15: 204 p. (Available at <https://npafc.org>)

## IYS Secretariat Publications 2020

Harris M.K. Proven potential of integrated ecosystem research in expanding human understanding of the high seas environment (January 28, 2020) North Pacific Anadromous Fish Commission (NPAFC) Newsletter. February 2020 No. 47, pp. 12–19 (Available at <https://npafc.org>).

Tessier L.R. The response of Pacific salmon and their prey to changing ocean conditions and acidification (January 28, 2020) North Pacific Anadromous Fish Commission (NPAFC) Newsletter. February 2020 No. 47, pp. 20–27 (Available at <https://npafc.org>).

Tessier L.R., Taylor S. and Saunders M. Progress of The International Year of the Salmon initiative in establishing the conditions for understanding the mechanisms affecting Pacific salmon productivity in a rapidly changing world (January 21, 2020) Book of Abstracts—20th Salmon Ocean Ecology Meeting, Monterey Bay CA, USA, p. 9 (Available at <https://ecosystemoceanography.com/soem2020/>).

Harris M.K., Vazhova A., Mark Saunders M., Radchenko V., Pakhomov E.A. and Hunt B.P.V. Winter phytoplankton isoscapes in the Gulf of Alaska: decoding Pacific salmon ecosystems on the high seas (January 21, 2020) Book of Abstracts—20th Salmon Ocean Ecology Meeting, Monterey Bay CA, USA, p. 8 (Available at <https://ecosystemoceanography.com/soem2020/>).

Taylor S., Radchenko V., Tessier L.R., Saunders M. and Harris M.K. Investigating factors influencing Pacific salmon in the marine environment: the International Year of the Salmon Pan Pacific High Seas Expedition 2021 (January 21, 2020) Book of Abstracts—20th Salmon Ocean Ecology Meeting, Monterey Bay CA, USA, p. 7 (Available at <https://ecosystemoceanography.com/soem2020/>).

Harris M.K. The 2019 International Gulf of Alaska Expedition: a pioneering exploration of the overwintering conditions of Pacific salmon (January 16, 2020) PICES Press: Newsletter of the North Pacific Marine Science Organization. Winter 2020 Vol. 28 (No. 1), pp. 27–29 (Available at <https://meetings.pices.int/>).

Tessier, L.R., Saunders, M., and Radchenko V.I. Building Connections for Salmon Resilience and Sustainability in a Changing Climate: The Role of International Year of the Salmon. Regional Fishery Body Secretariats Network (RSN) Newsletter. Our unknown success stories: Unveiling our achievements (In Press).

Taylor S., Radchenko V., Tessier L.R., Saunders M. and Harris M.K. The International Year of the Salmon High Seas Expedition 2021: Towards Effective International Ocean Science Collaboration in a Rapidly Changing World (In Press) Book of Abstracts—2020 Marine Socio-Ecological Systems International Symposium, Yokohama, Japan.

Tessier L.R., Taylor S. and Saunders M. The role of International Year of the Salmon in establishing the conditions to develop the knowledge required for the effective management of Pacific salmon at local and hemispheric scales (In Press) Book of Abstracts—2020 Marine Socio-Ecological Systems International Symposium, Yokohama, Japan.

#### **IYS Secretariat 2019/2020**

- Mark Saunders —IYS Director
- Stephanie Taylor—IYS High Seas Expedition Coordinator (November 2019), Former IYS Coordinator (August 2019)
- Laura Tessier—IYS Coordinator (November 2019), Former Assistant IYS Coordinator (July 2019)
- Moronke Harris—Assistant IYS Coordinator (September 2019)
- Michelle Porter—IYS Administrative Assistant (November 2019)
- Camille Jasinski—Public Relations and Communications Coordinator (January 2020)

## Appendix D

### North Pacific Steering Committee Meeting Discussion Document #2: 2019 IYS Expedition Preliminary Results



#### 2019 IYS Expedition Preliminary Results

##### **FIS Workshop (W16)**

**Developing a collaborative, integrated ecosystem survey program to determine climate/ocean mechanisms affecting the productivity and distribution of salmon and associated pelagic fishes across the North Pacific Ocean**

Co-Sponsors: *North Pacific Anadromous Fish Commission (NPAFC), North Pacific Fisheries Commission (NPFC)*

Convenors: *Mark Saunders (NPAFC), Hal Batchelder (PICES), Dick Beamish (Canada), Ed Farley (USA), Suam Kim (Republic of Korea), Chrys Neville (Canada), Evgeny Pakhomov (Canada), Shigehiko Urawa (Japan), Laurie Weitkamp (USA), Alex Zavolokin (NPFC), Vladimir Radchenko (NPAFC), Brian Wells (USA)*

##### Invited Speakers:

*Alexey Somov (VNIRO-TINRO, Russia)*

*Kjell Rone Utne (Institute of Marine Research, Norway)*

*Laurie Weitkamp (NOAA, USA)*

##### Background

The high-seas pelagic ecosystems of the North Pacific support five species of Pacific salmon and Steelhead trout as well as associated species including Pacific saury (*Cololabis saira*) and North Pacific Armorhead (*Pentaceros wheeleri*). Communities and resource managers around the Pacific rim are challenged to understand and forecast the impacts of an increasingly uncertain climate on the distribution and productivity of these culturally and economically important fishes. New knowledge is required to determine how climate uncertainty is affecting distribution and productivity across scales from coastal to high seas and how human intervention with hatchery production impacts the structure of North Pacific ecosystems in relation to carrying capacity. The NPAFC along with NGO's, government, academic and private partners as part the International Year of the Salmon (IYS), conducted a high seas expedition with scientists from around the North Pacific rim in winter 2019. This expedition began to address gaps in our knowledge through survey work on salmon, plankton, and physical conditions in the central Gulf of Alaska. The intention is that this effort will lead to a program of coordinated integrated surveys across the entire North Pacific that will allow us to test hypotheses related to mechanisms affecting salmon productivity and in time provide timely forecasts and advice. This workshop convened salmon/fish specialists, oceanographers, climatologists and resource managers from around the Pacific Rim to review the progress made during the March 2019 survey and recommend the core elements of a pan-Pacific high seas ecosystem research survey program that would be implemented through 2022 to assess the ocean/climate mechanisms affecting salmon distribution and productivity. Popular articles will be published in the PICES Press and posted to the IYS website.

## Summary of Presentations

### Day 1: October 19, 2019

Mr. Mark Saunders (IYS Director, Pacific Region) opened the workshop on behalf of all convenors and welcomed participants. More than 60 individuals participated in the workshop and there were 27 presentations that took place over two days.

Dr. Ed Farley opened the first session by discussing “The challenges to understand how rapid climate warming impacts marine ecology of Pacific salmon.” As a changing climate and associated anomalous events in the large marine ecosystems of the subarctic North Pacific Ocean (NPO) progressively expose Pacific salmon to conditions that are outside “normal” climate cycles, society will encounter new resource management issues. One challenge is to understand how winter ocean conditions and potential competition impact the distribution, migration, and survival of Pacific salmon in the NPO.

Dr. Dick Beamish presented a general overview of the “2019 Gulf of Alaska Expedition” from inception to completion. Responsible stewardship of Pacific salmon in a future of changing ocean ecosystems requires a better understanding of the mechanisms that regulate production during their ocean residence. The Gulf of Alaska expedition on the Russian ship, R/V *Professor Kaganovskiy*, during the winter of 2019 brought together 21 researchers from Pacific salmon producing countries to gather data to test hypotheses concerning the mechanism(s) that control salmon production in the ocean. The principal hypothesis is that juvenile salmon that grow the fastest in their first few weeks in the ocean survive the best, with survival mostly determined by the end of the first ocean winter, with the understanding that rapid growth during the first months in the ocean increases survival rates.

Invited speaker Dr. Alexey Somov gave an “Overview of methodology and high-level results of Russian salmon research and comparison with results obtained in 2019 GoA salmon expedition”. The IYS Gulf of Alaska survey in February-March 2019 partially filled the spatial gap of salmon winter ecology studies. Applying the identical methodology with previous Russian research in the western NPO allows a comparison with the Gulf of Alaska. Decades of Russian regular observing provides an understanding of long-term abundance dynamics, limiting factors and carrying capacity of salmon marine feeding habitat.

Dr. Evgeny Pakhomov presented an “Overview of preliminary findings during the February-March 2019 International Gulf of Alaska Expedition”. The expedition encountered the development of a phytoplankton bloom and possibly copepod reproduction. While overall zooplankton abundance was low, analysis has also revealed that during the survey period, mesozooplankton assemblages in the Gulf of Alaska were uniform, but the microzooplankton assemblages were unique. There was also a strong mismatch between the Juday net plankton distribution and prey species found in salmon stomachs, suggesting that future surveys consider alternate sampling gear.

Invited speaker Dr. Laurie Weitkamp covered “Pacific salmon ecosystems on the high seas: Initial findings from the Winter 2019 Gulf of Alaska Expedition”. The study area spanned roughly 10° latitude (47-57°N) and longitude (138-148°W) and it encompassed the eastern extreme of the North Pacific Current and the beginning of the northbound Alaska current. There was clear spatial variation in water conditions and catches across the study area. However, the spatial distributions and abundances of salmon species had some unexpected surprises, including a relatively abundance of Coho salmon which is supposedly coastal species found far from shore. Wide variation in salmon condition—even for conspecifics caught together in the same haul—suggested that mechanisms regulating survival may be more complex than anticipated. Results from this expedition increased our understanding of the Gulf of Alaska in late winter which has received little attention, and provided an important baseline for future studies, including proposed research in 2021.

Ms. Anna Vazhova spoke on a “Hydrochemical study in the open part of the Gulf of Alaska in the winter 2019”. Two domains were determined within the surveyed area: 1) The first domain was located in the northwestern part of the area, where the cyclonic circulation of the Subarctic gyre provides high concentrations of dissolved oxygen and nutrients, 2) The second domain was influenced by both Subarctic front and the coastal processes that forms its transformed waters of the Gulf of Alaska. In this area, oxygen content and pre-vegetative concentrations of nutrients were lower. Below the thermocline (~200 m), the maximum concentrations of silicon, dissolved phosphate

and nitrogen were observed in the centre of Subarctic gyre. The nutrients concentrations decreased southward. These chemical observations made it possible to identify the areas of heightened productivity and to assess the state of the ecosystem.

Mr. Vishnu Perumthuruthil Suseelan spoke about “Winter dynamics of phytoplankton biomass in the Gulf of Alaska derived from Sentinel 3 imagery.” The objective of this study was to use satellite-derived phytoplankton biomass to define the habitat condition of Pacific salmon in the Gulf of Alaska. An above-water hyperspectral radiometer (HyperSAS) was installed on the bow of the ship to measure the sea surface reflectance. The satellite images indicated that the surface Chl *a* concentration did not exceed values higher than 1.0 mg m<sup>-3</sup> in GoA between February to March. In general, high biomass (0.7 mg m<sup>-3</sup>) was observed in the central region of the GoA, however, a similar biomass also observed in the northern region (0.6 mg m<sup>-3</sup>). Furthermore, there is a trend of elevated biomass during March, especially towards the shelf region (>1.0 mg m<sup>-3</sup>). A detailed further analysis will be conducted to spectrally separate dominant phytoplankton groups from Sentinel 3 imagery.

Dr. Brian Hunt presented information on a “Mega-Swarm of northern sea nettles in the Gulf of Alaska (*Chrysaora melanaster*) in the winter of 2019.” He reported on the occurrence of an unprecedented bloom of the northern sea nettle *Chrysaora melanaster*. This species occupied the northern part of the survey area (~ 300,000 km<sup>2</sup>) with abundance averaging 1,800 individuals per km<sup>2</sup> and a standing stock biomass of 1.23 million tons wet weight. The center of distribution for *C. melanaster* is believed to be the Aleutian Islands, as the shelf supports their benthic polyp phase. The *C. melanaster* in the Gulf of Alaska likely originated from the Aleutian shelf. The dry weight of *C. melanaster* was 5 times the dry weight of salmon estimated to be in the Gulf of Alaska. Both species feed on zooplankton leading to concerns that the high abundance of *C. melanaster* in the Gulf of Alaska are competing with Pacific salmon during winter.

Following the first 8 presentations, participants discussed what had been revealed in these talks. Participants were asked three questions: I. Has your understanding changed after what was heard today? II. What was the most surprising thing you have learned today?, and III. What are the emerging high priority hypotheses to be tested? Participants noted that there were many prey species found in salmon stomachs that were not observed in the bongo, neuston, or Juday net results. New technologies such as gliders or alternate net types (micronekton) should be considered for future expeditions. Interestingly, the presentations revealed that the observed phytoplankton and zooplankton domains in the Gulf of Alaska matched up very well. Other suggestions were to study more detailed water chemistry parameters such as iron and pH, add multiple tows at each station where salmon are present to determine vertical distribution of salmon, expand the survey to the boundaries of salmon range, and to incorporate acoustics.

Dr. Vladimir Radchenko spoke about “Pacific salmon abundance and biomass as estimated by trawl survey in the Gulf of Alaska in winter 2019.” The expedition results showed that no northern shift of distribution was revealed in Pacific salmon distribution throughout the survey area. Surprisingly, pink salmon were not prevalent in the catch as expected. Pink salmon were caught in the southern portion of the survey, indicating that they may spend the winter further south, which concurs with historical records. Chum salmon were the most abundant salmon species in the Gulf of Alaska in winter and their distribution was mainly in the periphery zones of cyclonic eddy and anticyclonic meander of the Subarctic Current (northern branch). Sockeye salmon mostly occurred in the northern part of survey area with a sea-surface temperature (SST) of less than 7°C. The survey covered no more than 15% of the potential geographical range of North American sockeye stock distribution. Coho salmon distribution density is an order of magnitude higher in the Gulf of Alaska than found in Russian surveys in the northwestern North Pacific.

Ms. Chrys Neville presented information on “Changes in our thinking of ocean life of sockeye salmon.” During the winter of 2019, in addition to the Gulf of Alaska survey, there was additional fishing conducted in February 2019 in the central Pacific. Ms. Neville presented preliminary results describing the stock and age specific distribution of sockeye salmon in these two regions and how the information may provide new information on distribution pattern specifically for Fraser River sockeye salmon. This work is part of ongoing research examining stock specific distribution and condition of sockeye within the Pacific.

Dr. Shigehiko Urawa gave a talk on “Origins and status of chum salmon caught in the Gulf of Alaska in the winter of 2019.” A total of 223 chum salmon were caught using a surface trawl, which was the most abundant catch among all types of Pacific salmon. Although chum salmon were widely distributed within the survey area, they were

relatively abundant in southern warm waters. The SST of chum salmon habitats averaged 6.7°C, ranging between 5.0°C and 7.5°C. Genetic stock identification (GSI) using a Pacific-wide single nucleotide polymorphism (SNP) baseline indicated a mixture of 20% Japanese, 20% Russian, and 60% North American chum salmon. The GSI also demonstrated that most of Japanese chum salmon were distributed in the southern area south of 52°N. Otolith analysis detected 32 marked chum salmon, including 3 from eastern Hokkaido, Japan, 2 from western Sakhalin, Russia, 22 from Southeast Alaska, 1 from Southcentral Alaska, and 4 unknown marks. Fifteen percent of chum salmon showed “skinny” condition ( $0.9 < \text{Condition Factor}$ ), most of which were ocean age 2 or 3, originating from both continents. It is unknown whether these skinny fish can recover their condition or not in the following spring/summer season.

Dr. Kentaro Honda spoke about “Condition of salmon stocks in the summer Bering Sea.” Aboard a Japanese research vessel and mainly using a surface trawl, a summer high-seas research cruise to monitor the condition of Pacific salmon stocks and their habitats has been conducted in the central Bering Sea annually since 2007. The most abundant species was chum salmon, which represented more than 80% of the catch every year, followed by sockeye salmon (12.9% on average) and Chinook salmon (2.9% on average). Chum salmon was more abundant at north-eastern stations, while sockeye salmon tended to be caught at eastern stations. Nonetheless, no clear relationship between salmon abundance and physical environment or prey biomass has been found to date. Among chum salmon, ocean age 1 fish accounted for more than 50% in any given year. Proportions of older fish were lower, possibly because of their homing migration or winter mortalities. Results of genetic stock identification showed Russian chum stocks occupied the largest proportion every year as 60–75%, followed by Japanese stocks at 15–35%.

#### Discussion

At the end of Day 1, participants were asked the same questions that followed the morning session. Participants suggested additional considerations and improvements for future expeditions including sampling eDNA at greater depths to better understand vertical distribution of species, installing cameras in the trawl nets to determine if predators enter and exit the net during sets, having dedicated marine mammal and bird observers on board, and determining the vertical migration of salmon during the day and night.

Day 2: October 20, 2019

Mr. Mark Saunders started Day 2 of W16 by reviewing the main findings from Day 1. The presentations from Day 1 created compelling context for the work being done using scientific data from the 2019 International Gulf of Alaska Expedition. Dramatic shifts in salmon abundance in the catch and productivity were associated with warm and cold ocean conditions and differed depending on the area of the NPO. Generally, warmer oceanographic periods appear to be detrimental for salmon production in the Gulf of Alaska, but good for stocks in the Bering Sea. Bristol Bay sockeye where they are supported by the high abundance of Age 0+ pollock associated with the warm years. Russian experience in the western NPO indicated that winter surveys are well suited to study mechanisms but are not recommended to support forecasts given that the broad expanse of winter salmon distribution is difficult to cover in its entirety. Summer surveys have the capacity to cover a geographically smaller range that can be used as a basis for forecasting.

Ms. Albina Kanzeparova discussed “Non-salmonid species during the winter 2019 survey in the Northwestern Pacific and the Gulf of Alaska.” Macrozooplankton dominated in all areas, with *Chrysaora melanaster* being dominant in the Gulf of Alaska and *Aequorea* sp. being dominant in the Northwestern Pacific Ocean and Aleutian waters. *Boreoteuthis borealis* was the most abundant squid (by biomass). The biomass of *B. borealis* adults did not vary significantly, but biomass of juveniles increased as the ship travelled from west to east within the survey area. *Tarletonbeania crenularis* was dominant among the mesopelagic fishes. The highest fish biodiversity was recorded in the Gulf of Alaska. This was likely due to a high number of sampling stations and variable water masses.

Dr. Oleg Katugin presented information on “Distribution patterns of squid in the upper epipelagic layer of Gulf of Alaska in winter 2019.” A total of 9 species of squid and 1 species of pelagic octopus occurred in net hauls during the upper epipelagic trawl survey. Two squid species (*Boreoteuthis borealis* and *Onychoteuthis borealijaponica*) were the most abundant and accounted for almost 98% of all assessed cephalopod biomass in Gulf of Alaska trawl catches. *B. borealis* occurred across the entire survey area, whereas *O. borealijaponica* was captured mainly in the southern portion of the survey grid. *Okutania anonycha*, which has been known to be an abundant species in the northeast Pacific Ocean, were absent from trawl catches but did occur occasionally in the stomach contents of Pacific salmon. The observed distribution patterns for different species of squid are associated with numerous factors, such as species-specific latitudinal and vertical occurrence, differences in ontogenetic and diel vertical migrations, and the ability of trawl net to catch squid.

Dr. Charles Waters gave a presentation on “Winter energetic status of Pacific salmon in the Gulf of Alaska.” Winter has been hypothesized as a critical period for Pacific salmon, when inter- and intra-species competition is highest as prey resources are low. To better understand this critical period, the winter fitness of fish in the Gulf of Alaska was assessed using energy densities. Preliminary analyses suggest that energy densities between species were similar, despite different prey preferences and feeding intensities. Median energy values for chum, coho, pink, and sockeye salmon were comparable. Sockeye salmon was the only species for which energy densities were potentially correlated with environmental factors, but much more analyses are needed before any conclusions can be drawn.

Dr. Christoph Deeg presented a talk on behalf of Dr. Kristina Miller on “Genomic science tools being implemented on samples from the first Gulf of Alaska expedition in 2019.” Recently, they have developed genomic tools to assess the health and condition of salmon. These include 1) a high throughput infectious agent monitoring tool to simultaneously identify the presence and abundance of dozens of pathogens and 2) a series of curated biomarker panels of salmon genes that when co-expressed can recognize the presence of specific stressor responses (e.g. hypoxia, thermal, osmotic and general stress), inflammation, state of immune activation, viral disease development, and the likelihood of imminent mortality, all run simultaneously on a salmon “Fit-Chip.” When the Gulf of Alaska results were compared to coastal surveys run in 2018, although there was a drop in overall pathogen diversity and burden of most pathogenic species from coastal areas to the high seas, two parasites were observed at the highest burdens recorded: *Loma salmonidae* and *Ichthyophonus hofjerri*. It remains to be determined if the low pathogen diversity was due to the fish dying or recovering from most coastal infections. Follow up analyses will include histopathology to assess disease potential on fish with the two high burden parasites and application of the “Fit Chip”.

Dr. Alexey Somov discussed “Food habits of Pacific salmon in the North Pacific Ocean in winter 2019.” There was a spatial differentiation in the diet of all salmon observed in the North Pacific. Euphasiids were the most prevalent in

the subarctic, while pteropods and jellyfish were the most common in the transformed waters of the Gulf of Alaska. A positive relationship between feeding intensity and body condition was observed. In the Central Pacific in 2019, feeding intensity across all species was very low, which is unusual for this region and time.

Dr. Christoph Deeg also gave a talk about “At sea genetic stock identification of overwintering coho salmon in the Gulf of Alaska: Evaluation of nanopore sequencing for remote real-time deployment.” Genetic Stock Identification by SNP sequencing has become the gold standard for stock identification in Pacific salmon, which are found in mixed stocks during the oceanic phase of their lifecycle. However, recent advances in third-generation single-molecule sequencing platforms, like the Oxford Nanopore minion, provide base calling on portable pocket-sized sequencers and hold promise for the application of real-time in-field stock identification on variable batch sizes. Nanopore sequencing at sea yielded stock assignment for 52 of the 75 assessed individuals. Future development will focus on improving turnaround time, accuracy, throughput, and cost, as well as augmentation of the existing baseline. If successfully implemented, nanopore sequencing will deliver an attractive alternative to the current centralized large-scale assessment approach, providing a democratized management tool to diverse stakeholders.

Dr. Gennady Kantakov presented information on “Spatial distribution and abundance of floating macro- and microplastics based on visual observation and neuston net survey in the Gulf of Alaska in Winter 2019.” Spatial distribution and abundance of floating macro- and microplastics were estimated during the 2019 International Gulf of Alaska expedition. Surface-floating macroplastics were spotted at 25% of observation stations, and density of distribution in these areas ranged from 1.1 to 2.3 pieces per km<sup>2</sup>. Among floating objects, packing materials (57.1%), food/drink containers (28.6%) and fishing gear (14.3%) were most abundant. Microplastics, including hard fragments and fibers, were present in neuston net samples in small to moderate abundance. Pre-production plastic pellets were surprisingly absent from microplastic samples collected, and the abundance levels were similar to those measured in 1986. He suggested that ocean circulation in the Northeast Pacific does not appear to concentrate microplastics in the open ocean in the GOA.

Dr. Vladimir Radchenko discussed “Live fish trap for pelagic trawl and problems for its use for salmon revealed at the International Gulf of Alaska expedition in Winter 2019.” The live fish trap is a pelagic trawl device that ideally allows holding and lifting on board a research vessel of live, undamaged fish from the trawl catch for further study and/or tagging. Several fish, squid, and microzooplankton species were taken on board alive, including 2 coho salmon which were tagged using disk tags. Unfortunately, both salmon lost too many scales to guarantee a successful return to natal rivers. Jellyfish specimens had clear net imprints on their exumbrellas, which was evidence that individuals captured in the live-tagging box were experiencing hard contact with the net. Moving forward, adjustments will be made to improve the effectiveness of the live-tagging box.

Participants discussed potential hypotheses for future high seas expeditions. In particular they discussed whether or not the salmon were moving throughout the ocean. Indications from the work presented during this workshop suggest that they may be milling about, which many found surprising. To shed further light, elemental analyses of otoliths can be performed, and tagging will also help fill in the blanks. There is also emerging work which could allow scientists to reconstruct stress history of fish from their scales. This could help identify if tagging is causing increased stress. It can also shed more light on the apparent decrease of infectious agent load as fish head out to sea – is their health improving or are the infected fish not making it out to sea? By determining where salmon are in the high seas during the winter and combining it with the genomics work on infectious agent load, questions regarding disease transfer between populations can also be answered.

Dr. Kym Jacobson spoke about “Juvenile salmon and ocean ecosystem studies in the northern California Current System” on behalf of Dr. Rick Brodeur. Northern California Current surveys have been conducted since 1979 with few gaps. First conducted by researchers at the University of Oregon, they are now organized by the National Marine Fisheries Service. The surveys have revealed two underlying mechanisms that control salmon returns in coastal waters: 1) ocean conditions are bottom up drivers for juvenile salmon survival and 2) predation is also a factor but has been difficult to measure. The Northern California Current survey programs have also successfully developed tools to communicate findings and forecasts to management, including indicator stoplight charts.

Ms. Chrys Neville presented information on “Annual surveys for juvenile Pacific salmon in the coastal waters of British Columbia.” Juvenile Pacific salmon surveys have been conducted along the southern British Columbia coast since 1998. In 2017, along the west coast of Vancouver Island (WCVI), integrated pelagic ecosystem surveys were

initiated. These surveys combined the offshore juvenile salmon surveys and pelagic ecosystem nighttime trawl surveys. Acoustic transects were also completed as part of this. In addition to the surveys on WCVI, summer and fall surveys in the Strait of Georgia have also been completed since 1998. Integration of these surveys with the high seas work will allow for testing of key hypotheses on the mechanisms regulating ocean survival of Pacific salmon.

Dr. Kentaro Honda gave a presentation on “How does sea-entry condition of juvenile chum salmon affect their subsequent survival and growth? A case study on eastern Hokkaido, Japan.” Chum salmon (*Oncorhynchus keta*) are thought to experience considerable size-selective mortality during their early marine life stages. They found favorable sea-entry conditions (i.e., timing and body size) of Japanese juvenile chum salmon improved survival during their coastal residency. Most juvenile chum salmon sampled at Konbumori were found to migrate to the sea after SST exceeded 5°C. Juveniles smaller than 50 mm FL at the time of sea entry were likely to die before reaching Konbumori, while those larger than 65 mm FL were expected to grow quickly in this region. It is possible that these findings are not novel and may just be supporting our current ideal release strategy. However, if the period of favorable conditions was limited during this experiment like it has been in recent years in Japan, we may be able to state that intensive release of large-sized juveniles during a limited favorable period is an effective strategy to reduce mortality.

Dr. Suam Kim spoke about “Chum salmon monitoring using electronic tags in Yeongok river or mid-eastern coast, Korea.” As chum salmon do not eat during the spawning period, they must migrate and spawn using finite resources. Therefore, the movement strategy used to reach river spawning locations is critical. Salmon behavior in the downstream portion of the Yeongok river was monitored from Oct. 24, 2018 to Nov. 8, 2018 using electronic tags. Most salmon indicated that they preferred to reside deep in the water column and riverbank during upstream migration in the daytime. Regardless of release time, salmon began their upstream movement just after sunset. There was no difference in swimming speed between male and female specimens in the study area. However, females showed a higher fluctuation in environmental temperature than the males did, indicating that the females moved vertically in the water column more actively compared to the males.

Dr. Kjell Utne presented information on “International ecosystem survey in the Northeast Atlantic.” The international ecosystem survey in the Norwegian Sea and surrounding areas (IESSNS) is a collaboration between five countries where an area of more than 3 million km<sup>2</sup> is covered annually. The primary objective of the survey is to produce an annual swept-area index used in stock assessment of Northeast Atlantic mackerel, but the survey also targets herring and blue whiting acoustically and Atlantic salmon through surface trawling. Scrutinized acoustic data, oceanographic data, and all fish sampled data are kept in a common database accessible to all member nations. All the data are reviewed by multiple individuals to ensure quality. These surveys have also been an excellent opportunity for public outreach and communicating research being conducted to a wider audience.

Dr. Aleksandr Zavolokin discussed “Non-anadromous species in the subarctic North Pacific Ocean”. The goal of this study was to review past NPO pelagic surveys with emphasis on the period between January and March. This was done to identify species of North Pacific Fish Commission (NPFC) interest that could be caught during the winter 2019 Gulf of Alaska IYS Expedition. A review of historic high seas catch data revealed that all NPFC priority species have been caught in the North Pacific. Potential by-catch from the IYS Expeditions is of great interest to the NPFC due to the potential information it can offer concerning these priority species, as well as over 950 other mandated NPFC species. Collaboration between the NPFC and NPAFC concerning IYS surveys could support future collaborative studies on marine ecosystems, modelling, and the development of integrated information systems between the two organizations and their member nations.

The last presentation of the workshop was by Dr. Brian Wells on “Integrating salmon ocean research results into a management framework.” While accessible managerial levers affecting salmon recruitment are largely in freshwater, the efficacy of freshwater practices for recovery and rebuilding populations can only be evaluated by including the ocean habitat that comprises the majority of the salmon life cycle. To develop strategies to mitigate apparent changes in seascape processes, well-parameterized ocean models are required. Decades of studying salmon at sea have elucidated many of processes that affect salmon dynamics (e.g., growth, maturation, predation, distribution). However, this knowledge has been slow to be integrated into salmon management. With an eye on the future, strategic management of salmon to aid in their recovery, promote a stable fishery, and improve coastal community resilience must be proactive. Oceans surveys must define applicable objectives and, from those findings, ocean processes and habitats should be integrated into stock assessment, life-cycle, and ecosystem models to

evaluate managerial strategies.

### Discussion

A facilitated discussion session was held to synthesize information presented over the past two days into actionable ideas. The focus of this discussion was on how in-season intense management can benefit from a greater understanding of life-cycle processes. The following ideas were presented:

1. Currently preseason forecasting is an important tool in the United States (US) for ensuring that systems are not overutilized. However, preseason forecasts are variable in their success and more often the past has not been a good predictor of the future. Additional information on abundance from ocean expeditions may help improve models
2. Salmon returns in 2019 deviated from forecasts (in both directions) along the west coast of North America. Utilizing the knowledge gained from surveys such as the 2019 cruise may increase the accuracy of future predictions. Collection of data from multiple sources and stages during the salmon life cycle is an imperative factor for decreasing gaps in our understanding of salmon productivity and their activities on the high seas.
3. While many present were surprised with the low number of salmon caught, it was pointed out that the catches on this expedition were consistent with historical winter trawl surveys in the Gulf of Alaska. Low catches may indicate that the salmon were located elsewhere in the water column than where the net was deployed – deeper for example. The relative abundance of catches in the 2019 survey were not in accord with the known relative abundances of these species. Greater consideration of why this occurred is warranted.
4. The need for winter survival data when most of the variance in future adult returns can be obtained (in some locations) from coastal summer and fall surveys of outmigrating age x.0 fish was also questioned. For some major stocks, one of the main hypotheses of the 2019 cruise relating to abundance can be rejected without leaving the dock. Cohort abundance was mostly explained by events that occurred between freshwater and summer/fall surveys. It may not apply to all fisheries or species but in the few areas where effort has been expended to get these data the result is pretty clear. It was suggested that a review of what species/locations might benefit the most from winter survival data be conducted.
5. The final point brought up in discussion was the representative sampling of salmon on the high seas was age composition. After ocean entry, the abundance of a cohort can only decrease unless there is zero ocean mortality. That means that the most abundant age-classes are the youngest. If repeated sampling does not reflect this, then sampling is biased in some way that needs to be addressed.

## List of Papers

### *Oral Presentations*

#### **The challenges to understand how rapid climate warming impacts marine ecology of Pacific salmon**

Ed FARLEY

#### **2019 Gulf of Alaska Expedition**

Dick BEAMISH

#### **Overview of methodology and high-level results of Russian salmon research and comparison with obtained results in 2019 GoA salmon expedition**

Alexey A. SOMOV, Olga S. Temnykh, Svetlana V. Naidenko, Alexander N. Starovoytov, Igor I. Glebov, Vladimir I. Radchenko, Aleksander V. Zavolokin, and Vyacheslav P. Shuntov

#### **Overview of preliminary findings during the February-March 2019 International Gulf of Alaska expedition**

Evgeny A. PAKHOMOV, Christoph Deeg, Svetlana Esenkulova, Gerard Foley, Brian P.V. Hunt, Arkadii Ivanov, Hae Kun Jung, Gennady Kantakov, Albina Kanzeperova, Anton Khleborodov, Chrys Neville, Vladimir Radchenko, Igor Shurpa, Alexander Slabinsky, Alexei Somov, Shigehiko Urawa, Anna Vazhova, Perumthuruthil S. Vishnu, Charles Waters, Laurie WEITKAMP, Mikhail Zuev, Richard Beamish

#### **Pacific salmon ecosystems on the high seas: Initial findings from the Winter 2019 Gulf of Alaska Expedition**

Laurie A. WEITKAMP

#### **Hydrochemical study in open part of the Gulf of Alaska in the winter 2019**

Anna S. VAZHOVA

#### **Winter dynamics of phytoplankton biomass in the Gulf of Alaska derived from Sentinel 3 Imagery**

Vishnu PS and Maycira Costa

#### **Mega-swarm of northern sea nettles (*Chrysaora melanaster*) in the Gulf of Alaska in the winter of 2019**

Brian P.V. HUNT, Alexei Somov, Albina Kanzeperova, Evgeny A. Pakhomov, and Vladimir Radchenko

#### **Pacific salmon abundance and biomass as estimated by trawl survey in the Gulf of Alaska in February-March 2019**

Vladimir I. RADCHENKO and Aleksey A. Somov

#### **Changes in our thinking of the ocean life of sockeye salmon**

Chrys M. NEVILLE, Richard J. Beamish and Aleksey Somov

#### **Origins and status of chum salmon caught in the Gulf of Alaska in the winter of 2019**

Shigehiko URAWA, Shunpei Sato and Motoyasu Kuwaki

#### **Condition of Pacific salmon stocks in the summer Bering Sea**

Kentaro HONDA, Tomoki Sato, and Shunpei Sato

#### **Occurrence of non-salmonid species in the Northwestern Pacific Ocean and the Gulf of Alaska during the 2019 winter survey**

Albina N. KANZEPAROVA, Alexey A. Somov, Anna S. Vazhova, Mikhail A. Zuev, and Arkadiy M. Ivanov

#### **Distribution patterns of squid in the upper epipelagic Gulf of Alaska in winter 2019**

Oleg N. KATUGIN, Vladimir V. Kulik, Mikhail A. Zuev and Svetlana Esenkulova

#### **Winter energetic status of Pacific salmon in the Gulf of Alaska**

Charles D. WATERS, Todd Miller, Emily Fergusson, Dion Oxman, and Edward Farley Jr.

#### **Genomic science tools being implemented on samples from the first Gulf of Alaska expedition in 2019**

Kristina M. MILLER

#### **At sea genetic stock identification of overwintering coho salmon in the Gulf of Alaska: Evaluation of nanopore sequencing for remote real-time deployment**

Christoph M. DEEG, Ben J. G. Sutherland, Tobi J. Ming, Collin Wallace, Kim Jonsen, Kelsey L. Flynn, Charlie D. Waters,

Richard J. Beamish, Terry D. Beacham, and Kristi M Miller

**Spatial distribution and abundance of floating macro-and microplastics based on visual observations and neuston net survey in the Gulf of Alaska in February-March 2019**

Gennady A. KANTAKOV, Vladimir I. Radchenko, Evgeny A. Pakhomov and Brian Hunt

**Live fish trap for pelagic trawl and problems of its use for salmon revealed at the international Gulf of Alaska expedition in winter 2019**

Alexander A. Pavlenko, Vladimir I. RADCHENKO, Gennady A. Kantakov, Andrey Yu. Likhograev and Artem A. Likhoshapko

**Juvenile salmon and ocean ecosystem studies in the Northern California Current**

Kym C. JACOBSON, Richard D. Brodeur, Brian J. Burke, and Mary E. Hunsicker

**Annual surveys for juvenile Pacific salmon in the coastal waters of British Columbia**

Chrys M. NEVILLE

**How does sea-entry condition of juvenile chum salmon affect their subsequent survival/ growth? A case study in eastern Hokkaido, Japan**

Kentaro HONDA, Kotaro Shirai, Shinji Komatsu, and Toshihiko Saito

**IESSNS – International ecosystem survey in the Northeast Atlantic**

Kjell Rong UTNE, Anne Olafsdottir, Jan Arge Jacobsen, Teunis Jansen, Kai Wieland and Leif Nøttestad

**Non-anadromous Species in the Subarctic North Pacific**

Aleksandr ZAVOLOKIN

**Integrating salmon ocean research results into a management framework**

Brian K. WELLS, David D. Huff, Brian J. Burke, Steven T. Lindley, and Richard W. Zabel

## **Appendix E**

### **IYS Theme Counsel Groups Terms of Reference**

Revised February 27, 2020

1. Under the Terms of Reference for the North Pacific Steering Committee (NPSC), four Theme Counsel Groups (TCGs) are established, following the IYS themes plus outreach and communication. Some themes are combined to streamline the research and outreach planning processes:
  - Status of Salmon and Salmon in a Changing Salmosphere (TCG-1)
  - Human Dimension (TCG-2)
  - New Frontiers and Information Systems (TCG-3)
  - Outreach and Communication (TCG-4)
2. Each Theme Counsel Group shall consist of experts appointed from NPAFC member countries (Canada, Japan, Korea, Russia, and USA), however, there is no obligation to include representatives from every member country in each TCG. The NPSC will designate two Co-Chairs for each TCG. These positions will be filled by one representative from a country in the eastern Pacific and one from a country in the western Pacific. TCG Co-Chairs shall be members of the NPSC and facilitate communications among NPSC members to satisfy the mandate.
3. The Theme Counsel Groups' mandate is to support the NPSC by:
  - Recommending research and outreach priorities, and outcomes for each theme
  - Proposing/assembling research and outreach plans/projects by theme
  - Reporting status of research and outreach activities by theme

## Appendix F

### North Pacific Steering Committee Meeting Discussion Document #5



### Calendar of Events post January 2020

#### *Details of Workshops/Symposia/Meetings to be held in the Pacific in 2020*

##### *IYS North Pacific Steering Committee Meeting*

**When:** February 26 & 27, 2020

**Where:** Blue Horizon Hotel, 1225 Robson St., Vancouver BC

**Description:** Annual meeting of IYS partners to provide guidance on IYS plans and activities.

**Objectives:**

- Review progress on IYS implementation
  - Success of the focal year
  - Provide updates on signature projects: High Seas Expedition, Likely Suspects, and Data Mobilization
- Continuing the engagement of the NPSC with current and upcoming activities and determining the next steps for the IYS through 2021

##### *IYS Working Group Meeting*

**When:** February 25, 27 & 28, 2020

**Where:** Blue Horizon Hotel, 1225 Robson St., Vancouver BC

**Description:** Annual meeting of NPAFC working group which oversees the IYS, member consist of representatives from all 5 member countries.

**Objectives:**

- Review progress on IYS implementation
  - Success of the focal year
  - Provide updates on signature projects: High Seas Expedition, Likely Suspects, and Data Mobilization
- Continuing the engagement of the IYS-WG with current and upcoming activities and determining the next steps for the IYS through 2021
- Develop IYS workplan and budget for the 2020/21 fiscal year

### IYS 2020 Gulf of Alaska Expedition

**When:** March 11–April 6, 2020

**Where:** Gulf of Alaska

**Description:** Charter of a Canadian fishing vessel to continue the research conducted in the Gulf of Alaska in 2019 by the scientists aboard the R/V *Prof. Kaganovskiy*.

**Objectives:**

- The major scientific objective is to ultimately discover the fundamental mechanisms that regulate salmon in the North Pacific Ocean
- test the hypothesis that the fish that survive to the end of the first ocean winter are the individuals that grew faster in the first few months in the ocean
- demonstrate international cooperation on research

### Salmon Ocean Ecology Meeting

**When:** March 3–5, 2020

**Where:** Hopkins Marine Station, Monterey, CA, USA

**Description:** A workshop on salmon research in the marine environment. Three IYS staff members have submitted abstracts for oral presentations at the meeting.

**Objectives:**

- Recent decades featured significant trends and variability at multiple dimensions of marine habitat for salmon. Interactions between predator demand, environmental variability, hatchery practices, and salmon population dynamics need to be elucidated, modeled, and ultimately may need to be mitigated. We envision a salmon ocean ecology meeting that focuses on these aspects of the seascape and provides applications of and introductions to relevant survey and modeling tools.

### American Fisheries Society Western Division Annual General Meeting

**When:** April 12–16, 2020

**Where:** Pinnacle Hotel, Vancouver, BC

**Description:** For their annual meeting the AFS Western Division is hosting 25 symposia on a variety of topics. Four symposia are being organized by IYS partners.

**Objectives:**

- This meeting will highlight the myriad and successful ways boundaries have been crossed and intersections navigated in fisheries and aquatic sciences to achieve desired outcomes.
- A special focus will be given on generating outcomes from the diversity of symposia presented.
- Outcomes may include publications, proposals, recommendations, agreements, identification or clarification of uncertainties, and other action items

### 28<sup>th</sup> North Pacific Anadromous Fish Commission Annual Meeting

**When:** May 18–22, 2020

**Where:** Hakkodate, Japan

**Description:** Annual meeting of the NPAFC, will include a meeting of the IYS Working Group.

**Objectives:**

- Progress on the IYS implementation will be presented as part of this meeting
- IYS workplan and budget for 2020/21 fiscal year will be approved

### 3<sup>rd</sup> NPAFC IYS Workshop: Linkages between Pacific Salmon Production and Environmental Changes

**When:** May 23–25, 2020

**Where:** Hakodate, Japan

**Description:** Annual workshop hosted by the NPAFC for research relating to the IYS.

**Major Topics:**

- Salmon production in changing environments
- New technologies/integrated information systems for salmon research and management
- Resilience for salmon and people: lessons from the Great East Japan Earthquake in 2011

### Marine Socio-Ecological Systems: Navigating global change in the marine environment symposium

**When:** May 25–29, 2020

**Where:** Yokohama, Japan

**Description:** The focus of the symposium is on the integrated assessment of multiple ocean uses across sectors including fisheries, renewable energy, coastal development, oil and gas, transport, and the need for conservation. Emphasis will be on the methodological and empirical challenges involved in the human dimensions in integrated ecosystem assessments. IYS staff will present a poster and give an oral presentation.

**Objectives:**

- MSEAS 2020 presents a diverse and exciting range of topics to showcase the world's commercial, recreational, and indigenous fisheries.
- It will provide an important forum for identifying the critical developments needed over the coming decades to ensure the world's oceans are managed sustainably for the benefit of current and future generations.

2020 Hokkaido Salmon Conference on Current and Future Status of Salmon

**When:** May 30, 2020

**Where:** Sapporo, Japan

2020 High-Seas Salmon Research in the Bering Sea

**When:** July 15–August 7

Sapporo Salmon Festa 2020

**When:** September 2020 (TBD)

**Where:** Sapporo, Japan

IYS 2020 Gulf of Alaska Expedition Workshop – to be confirmed

**When:** September 2020

**Where:** St. Petersburg, Russia

**Description:** Workshop to present preliminary results of the 2020 expedition.

**Objectives:**

- Present preliminary results of the 2020 expedition
- Present further results from the 2019 expedition

Fall Salmon Festival

**When:** October 2020 (TBD)

**Where:** Sapporo, Japan

North Pacific Marine Science Organization (PICES) Annual Meeting

**When:** October 21–November 1, 2020

**Where:** Qingdao, China

**Description:** Annual meeting of PICES, will include a symposium on the IYS High Seas Expeditions organized by IYS staff.

**Objectives:**

- Present results from the 2020 and 2019 expeditions
- Strengthen connections between IYS and members of the PICES communities
- Discuss the upcoming 2021 High Seas Expedition

## Appendix G

### International Year of the Salmon Wrap-up Symposium Steering Committee Terms of Reference

#### STATUS OF SALMON

**Theme/Outcome:**

*From Outline Proposal:* To understand the present status of salmon and their environments.

*From Planning Primer:* The present status of salmon and their environments is understood.

**Rationale:**

Salmon are a keystone species and iconic indicators of ecological health. However, there is no centralized source of information on the status of salmon and their environment, or any consistent methodology for reporting and understanding these population and environmental variables. To effectively manage salmon, we must first be able to share the status of salmon and their environments in a consistent manner on an accessible platform. Then we can consider how this differs across watersheds, regions, countries, and the hemisphere, and we can begin to understand how to sustainably manage salmon at different scales and work towards the resiliency of both salmon and people.

**Detailed Outcome:**

The International Year of the Salmon (IYS) intends to bring together interested partners from across the salmosphere to create a platform for sharing data regarding the status of salmon and their environments that can be used to inform research, outreach, policy development, and management actions. This platform would be an open-access tool that utilizes different types of knowledge (local, scientific, traditional) to assess the overall status of salmon and their environments across the salmosphere. Furthermore, the IYS seeks to review approaches to assessing the status of salmon and their environments and promote a consistent methodology for measuring and reporting these variables. This would facilitate greater overall understanding of salmon and would allow the status of these species to be more easily tracked into the uncertain future.

**Example Impact Measures Associated with Outcome:**

- Percent of salmon populations whose status is reported using a consistent convention
- Percent of environmental and salmon data holdings available on an open common platform
- Percent of fisheries management plans informed by information on environmental variability
- Percent of data sets that use consistently collected and reported data on salmon status and environmental variables
- Number of annual reports on the status of salmon and their environments

## SALMON IN A CHANGING SALMOSPHERE

### **Theme/Outcome:**

*From Outline Proposal:* To understand and quantify the effects of natural environmental variability and anthropogenic factors affecting salmon distribution and abundance and to make projections of their future changes.

*From Planning Primer:* The effects of natural environmental variability and human factors affecting salmon distribution and abundance are understood and quantified.

### **Rationale:**

As natural environmental variability, climate change and human actions continue to alter ecosystems, salmon face an uncertain future. In this time of rapid change, new insights are needed on how these changes will affect salmon to effectively manage what can be controlled and mitigate what cannot. Developing this understanding will be strengthened by communication and collaboration at a salmosphere level, because while some effects may be localized, very likely there are similar processes occurring across the salmosphere. If we can learn how the salmosphere is evolving to better predict changes, we can be adaptive and effective in managing these challenges to improve the resiliency of salmon and the people that depend on them.

### **Detailed Outcome:**

The IYS seeks to bring together researchers across the salmosphere to share findings regarding the effects of the changing environment on salmon, due to both natural variability and human impacts. Through a series of high impact projects, the IYS aims to better understand what challenges salmon will face in the future in order to prepare people, such as Indigenous Peoples, policymakers, and managers, to meet those challenges. Projects such as a series of high seas research cruises in the North Pacific, a framework for identifying bottlenecks across salmon life history stages, and an examination of climate change and future projections in relation to salmon, will allow all concerned stakeholders to be more prepared for the future. By bringing people across the hemisphere together to work on understanding the changing salmosphere, the IYS aims to build partnerships and collaborations that will strengthen our overall understanding and ability to manage salmon into the future.

### **Example Impact Measures Associated with Outcome:**

- Percent of management plans informed by future climate change projections
- Number of articles published from research done on high seas cruises associated with the IYS
- Number of salmosphere-level collaborative projects that results from planning workshops around the theme ‘Salmon in a Changing Salmosphere’
- Number of publications that incorporate/quantify uncertainty
- Percent of stock assessments that include ecosystem level information

## NEW FRONTIERS

### **Theme/Outcome:**

*From Outline Proposal:* To develop new technologies and analytical methods to advance salmon science and to explore the uncharted regions of the salmosphere.

*From Planning Primer:* New technologies and analytical methods are advanced and applied to salmon research. Research is carried out to fill gaps in poorly studied regions of the salmosphere.

### **Rationale:**

With so many recent advancements in technology and analytical methods, it is now possible to use these tools to make major advancements in understanding salmon and how the changing salmosphere is impacting them. From new telemetric methods of tracking salmon, to the use of environmental DNA, to isotope and otolith studies, there are groups of people across the salmosphere already doing this groundbreaking work. Their efforts can be linked and amplified through the IYS to more rapidly and efficiently realize their development and application to gaps in our understanding.

### **Detailed Outcome:**

The IYS aims to further advances in new/emerging technologies and analytical methods that are immediately available to study salmon and understand their life history patterns and to better manage these species. The IYS seeks to facilitate collaboration between groups across the salmosphere who have similar research objectives and could benefit from developing and sharing new/emerging technology. These collaborations and advancements will enhance the ability, from a local to a salmosphere level, to effectively manage salmon for the resiliency of salmon and people into the future.

### **Example Impact Measures Associated with Outcome:**

- Number of salmosphere-scale collaborative projects focusing on new/emerging technologies
- Number of novel analytical methods for studying salmon published under the umbrella of the IYS
- Number of collections of salmon scales and otoliths that are identified
- Percent of salmon researchers who understand and have access to otolith microchemistry laboratories
- Percent of salmon managers and researchers who understand the potential uses for genomics technologies to conduct genetic stock identification and have access to genomics tools and expertise to assess salmon condition

## HUMAN DIMENSION

### **Outcome:**

*Original (from Outline Proposal):* To improve the resilience of people and salmon through the connection and collaboration of salmon-dependent communities, Indigenous Peoples, youth, harvesters and resource managers across the salmosphere.

*Another Option:* To improve the resilience of people and salmon by connecting salmon-dependent communities, Indigenous Peoples, youth, harvesters, and resource managers across the salmosphere to collaboratively find innovative and adaptive solutions to sustain salmon.

### **Rationale:**

Since the wellbeing of salmon and people are inextricably linked, it is important that the IYS considers the human dimensions of our associations with salmon. Salmon are not only an important source of food to many people, they are also culturally significant and an important aspect of many coastal economies. As the global population and demand for salmon rises, while climate change alters ecosystems, there is increased uncertainty around the fate of salmon. Looking to the future, it will be imperative to create tools and frameworks for acting quickly and effectively to manage salmon on multiple levels, from local to hemispheric, so as to increase the resilience of both salmon and people.

### **Detailed Outcome:**

The human dimension of the IYS seeks to involve all interested parties—researchers, managers, policymakers, Indigenous Peoples, harvesters, and the public—in collaborating to increase the resiliency of both salmon and people. The IYS strives to increase resiliency by developing innovative decision-making tools that incorporate multiple types of knowledge (scientific, local, traditional) and input from all stakeholders. Furthermore, by generating new and adaptive solutions to management, through strategies that incorporate multiple scales of governance and adaptive mechanisms that allow for fast action, the IYS seeks to leave a legacy of well-informed decision-makers that can effectively sustain, restore, and manage salmon. By facilitating conversations and collaboration across the salmosphere, people can work together to successfully manage salmon across all levels, from local to hemispheric.

### **Example Impact Measures Associated with Outcome:**

- Percent of fisheries management plans informed by information on environmental variability
- Percent of fisheries management plans informed by roundtable discussions
- Percent of fisheries management plans that incorporate multiple types of knowledge

## INFORMATION SYSTEMS

### **Theme/Outcome:**

*From Outline Proposal:* To develop an integrated archive of accessible electronic data collected during the IYS and tools to support future research.

*From Planning Primer:* Freely available information systems that house and mobilize historic and current data about salmon and their environment

### **Rationale:**

Currently, there is little information sharing and collaboration at the salmosphere level, despite the fact that there are hundreds of people and groups with similar goals working to conserve salmon. Even on smaller scales, such as national and regional, there can be minimal communication among people working towards the same goal. This can be partially attributed to the lack of centralized information systems which make data on science and management accessible to not only scientists and managers, but also the interested public. These kinds of systems can support collaborative efforts on a hemispheric scale to address common issues and face current and future challenges.

### **Detailed Outcome:**

The IYS seeks to create an open-access information system(s) that will house and mobilize historic, current, and future data on salmon research and management for the entire salmosphere. This system(s) will incorporate multiple types of knowledge (scientific, local, traditional) and will integrate the management side as well. It will facilitate collaboration and data sharing around the salmosphere to enhance our capacity to understand and effectively conserve salmon. This will be one of the most important legacies of the IYS and leverage the collective capacity of the salmosphere to build a resilient future for salmon and people.

### **Example Impact Measures Associated with Outcome:**

- Percent of environmental and salmon data holdings available on open-access information system(s)
- Number of individuals/organizations contributing to the information system
- Investment of time and funds in achieving 'Information Systems' objectives
- Number of publications using data that was downloaded from an open access platform
- Number of databases that have international standards applied

## OUTREACH AND COMMUNICATION

### **Outcome:**

*From both Planning Primer:* People understand the value of healthy salmon populations and engage to ensure salmon and their varied habitats are conserved and restored against the backdrop of increasing environmental change.

### **Rationale:**

Salmon are very important ecologically, economically, and culturally, yet many people are unaware of the challenges they face and will continue to face into the future. An integral part of conserving salmon includes communicating the value of healthy salmon and healthy ecosystems to the wider public to motivate conservation and management efforts that will ensure the persistence of these keystone species far into the future. With a rapidly changing salmosphere and an uncertain future for these fish, the outreach and communications piece is vital to ensure that we are building resilient futures for salmon and people.

### **Detailed Outcome:**

To disseminate important information on salmon and their environment, the IYS intends to facilitate an international outreach campaign regarding the status and future of salmon in a changing salmosphere. This outreach campaign will reach across the hemisphere to bring important information to not only scientists, policy-makers, managers, and harvesters, but also the public, regarding salmon and the challenges they face. This will be facilitated in multiple and innovative ways, such as through a website, social media, and videos/films, and will be facilitated in part by NGOs across the salmosphere committed to salmon conservation and sustainable management.

### **Example Impact Measures Associated with Outcome:**

- Number of followers on social media sites: Facebook, Twitter, Instagram
- Number of people who visit the IYS website
- Number of NGO partners involved in the outreach campaign
- Increase in citizen science involvement
- Number of media outlets reporting on salmon and their habitat
- Number of news stories about the IYS and IYS projects