Appendix E

Proposal for an International Year of the Salmon

International Year of the Salmon Study Group

15 April 2015, *originally presented as NPAFC Doc. 1609, Appendix 7*

Background

The North Pacific Anadromous Fish Commission (NPAFC) has endorsed in principle the concept of an International Year of the Salmon (IYS) initiative. At the May 2014 Annual Meeting the Commission directed the Committee on Scientific Research and Statistics (CSRS) Study Group on International Year of the Salmon (IYS-SG) to further scope the initiative and provided the following Terms of Reference (Records of the 22nd Annual Meeting, p. 112):

> *The International Year of the Salmon (IYS) Study Group should continue to scope the initiative through a series of virtual and/or face to face meetings of interested parties and outside interests to develop an IYS proposal that will be discussed by the NPAFC at the 2015 Annual Meeting. The proposal developed by this group would address the following considerations:*
>
> - *Scope of the Programme (Pacific-Atlantic, Farmed Salmon and other ecosystem considerations, etc.)*
> - *Benefits of the Program*
> - *Potential for Funding and Identification of Partners (NGO's Industry, State and Federal Agencies, other RFMO's, etc.)*
> - *Communications and Outreach Strategy*
> - *Identification of Field and Analytical Research (Strategic Research Plan)*
> - *Starting Year and Duration*

The IYS-SG convened a Scoping Workshop (February 17–18, 2015) in Vancouver, Canada with members of the IYS-SG and invited scientific experts from the member countries. The main objectives of the workshop were to:

- Develop a list of major scientific issues that will, or are likely to, affect salmon production in the foreseeable future, and around which an IYS could be developed and funded.
- Identify the unknowns and scientific questions related to each issue.
- Discuss the scope (spatial, temporal, species) of an IYS that will be needed to answer the questions (test the hypotheses).

A report of the International Year of the Salmon Scoping Workshop was prepared by the Chair of the Study Group and is available from the NPAFC Secretariat.

The IYS-SG met at the NPAFC Secretariat on February 19, 2015 to consider what had been presented and discussed at the workshop and to develop recommendations (below) on the IYS initiative for the CSRS. Drs. Koval and Lincoln were unable to attend. At the invitation of the Chairman, the IYS-SG meeting was

attended by Drs. Robie Macdonald (Emeritus, Fisheries & Oceans Canada), and consultants Dr. Skip McKinnell and Mr. Marc Nelitz.

Concept of the International Year of the Salmon

The International Year of the Salmon (2018–2019) is an intensive burst of internationally coordinated, interdisciplinary, stimulating scientific research focused on salmon, and their relation to people. New technologies, new observations and new analytical methods, some developed exclusively during the IYS, will be focused on knowledge gaps that prevent a clear understanding of the future of salmon in a rapidly changing world.

Concept of the International Year of the Salmon (continued)

Research themes

The IYS will be seeking First Proposals under five broad scientific themes:

1. *Status of Salmon:* to understand the present status of salmon and their environment.

2. *Salmon in a changing salmosphere*[1]*:* 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.

3. *New Frontiers:* to develop new technologies and analytical methods to advance salmon science and to explore the uncharted regions of the salmosphere.

4. *Human Dimension:* to investigate the cultural, social, and economic elements that depend upon sustainable salmon populations.

5. *Information Systems:* to develop an integrated archive of accessible electronic data collected during the IYS and tools to support future research.

In pursuing these themes, the IYS will seek to develop and utilize new technological capabilities to make major advances in knowledge and understanding. It will leave a legacy of new or enhanced observational systems, research networks, as well as an unprecedented degree of access to the data and information it will generate. Key objectives are to attract and develop the next generation of researchers and to engage the interest and involvement of students, the general public, and decision-makers worldwide.

Rationale

IYS is an international research effort to understand the future of salmon. Salmon are iconic indicators of ecological health and the state of the human environment. For many, salmon are a source of food and economic security through fisheries or tourism. For indigenous peoples, salmon have an important connection with social and ceremonial traditions. Food security is an emerging issue and salmon will be important contributors to that security in the future. The well-being of people and salmon are linked.

1 The current and future geographic range of salmon in the Subarctic and Arctic.

Resource managers, fishers, processors, businesses, and governments need a better understanding of the future of salmon populations. Environmental changes are occurring in the salmosphere that will affect salmon distribution and abundance. Increases and decreases in abundance are likely to occur in the 21st century but at present, there is insufficient knowledge to understand how the changes will play out. New insights will require an understanding of the cumulative effects of a broad array of human and natural factors affecting salmon in order to manage what can be controlled and to mitigate what cannot.

An intense burst of international research can provide the field observations to address knowledge gaps as well as the analytical tools technologies and a new generation of scientists to facilitate the unprecedented international collaboration required to sustain salmon and people in a rapidly changing world.

Why now?

- The 21st century will be a time of rapid environmental change because of increasing quantities of greenhouse gases, carbon pollution, the shrinking of glaciers and sea level rise, increasing ocean stratification and many other related phenomena.
- *Status quo* is not a reasonable expectation for the future, and the current understanding of salmon in the ocean is insufficient to make reliable forecasts of the consequences of such major changes.
- Technological developments during the past decade now make it possible for quantum leaps in understanding many aspects of the life of salmon in the ocean.
    - New kinds of tags can be attached to salmon at sea to provide a detailed record of the environment that a salmon experiences.
    - Developments in genetic stock identification now make it possible to identify the origin of salmon in ways that were never possible when the baseline information was collected decades ago.
    - New data-integrating ocean models are now providing high resolution images (nowcasts) of potential productivity hot spots and migration corridors that can be linked to the data on ocean habitat provided by tags
    - IPCC-class climate models can be coupled to new information on distribution and migration to project salmon futures under various climate change scenarios.
    - The timescale for preparations allows advances in technology and logistics to be exploited to address new issues and to access new areas
- There is a pressing need to capture contemporary information on change and to understand the effects of this change on salmon and our human well-being.

Why call it a 'Year'?

- While the activities will grow through a planning and preliminary sampling phase to a peak in 2018–2019, then decline over a total period of 7 years, a clear idea of the target year(s) provides for better planning and coordination.
- A period of 2 years allows for anticipated differences in national budget cycles, but in the Pacific it also allows for a comparison of odd and even cycle years of the most abundant species (pink salmon).
- The geophysical research community has led the way in demonstrating the benefits of having a “year” as a call to action.

Why international?

- Salmon have passports, but they do not know which one they carry.
- Salmon travel widely, crossing international boundaries with impunity.
- Scientific expertise is distributed among nations.
- Many processes that affect salmon distribution and survival are large-scale.
- The broad salmosphere is effectively a laboratory to determine factors that affect abundance and distribution through comparative studies.
- Common objectives foster cooperation.
- Costs and benefits are shared among nations.

Major Recommendations

A.1 – An International Year of the Salmon programme be established as an intense, forward-looking, international, collaborative research programme directed at filling critical knowledge gaps, developing analytical tools and training a new generation of scientists to understand salmon and their future.

A.2 – The theme of the IYS is *Salmon and People in a Changing World* to focus on the intimate nature of the relationship between salmon and people and their joint future.

A.3 – The geographic scope of the IYS be defined broadly as the salmosphere because similar issues affect all northern seas to varying degrees.

A.4 – The thematic scope of the IYS be focused on issues that affect salmon distribution and abundance, and how these changes are expected to affect people.

A.5 – The temporal scope of IYS be 7 years duration with two years (2018–2019) reserved for intensive coordinated field study, primarily in the oceans.

<u>Recommendations about implementation</u>

B.1 – The NPAFC Secretariat determine the core membership of partners in the IYS by communicating with relevant regional organizations.

B.2 – A Second Scoping Meeting for the IYS with core partners be convened to refine the approach proposed by NPAFC. A scheme for the international governance of the IYS is an expected outcome.

B.3 – The science of the IYS be led by an IYS Scientific Steering Committee that will be formed to provide overall scientific direction for the program. Membership will be based on relevant expertise and determined by regional science and conservation organizations that have committed to supporting IYS goals. Regional science panels will likely be needed to provide leadership and coordination within regions. The IYS-SSC will identify the number of regions.

B.4 – The IYS research programme be developed from an international *Call for Pre-proposals* to the scientific community to conduct IYS-related research. The call will be developed by the IYS-SSC according to broad objectives outlined in B.3 and research themes identified below. The IYS-SSC will use these to develop a detailed IYS research plan and to request full proposals of researchers whose

research projects are consistent with the IYS detailed plan. A primary function of the IYS-SSC is to ensure optimal use of resources and consistency of research projects with IYS objectives.

B.5 – An International Project Office be established to provide oversight, planning, administrative services, and to support the IYS-SSC and Regional Science Panels.

B.6 – National funding commitments to IYS are to be determined as early as possible to attract good project proposals (proposals to who?), and to attract researchers and students to the program.

B.7 – A press release about IYS be prepared and released at an appropriate time to be determined by the Secretariat, and that such communications be managed by the NPAFC Secretariat until such time as this function is transferred to the International Project Office.

1. Scope of the Program

The IYS-SG discussed the geographic scale, duration, and themes of an IYS. The "salmon" of the IYS are the anadromous members of the sub-family Salmonidae, which includes the salmons, trouts, and charrs, but excludes the whitefishes and graylings.

The IYS-SG noted that Atlantic salmon are found in the North Pacific Ocean and Bering Sea and Pacific salmon are found in watersheds draining into the Atlantic Ocean, and both are found in the southern hemisphere as a result of introductions. Range expansions by species of Pacific salmon into the Arctic are uncertain at this time, although chum salmon are endemic to the McKenzie River. Atlantic salmon are endemic to the European part of the Arctic.

The IYS-SG felt that international partners in the Atlantic, with mandates aligned to those of NPAFC, should be invited to participate in the IYS. Many pressing issues in salmon conservation and management, such as declining abundances, and farmed and wild salmon interactions are common to the Atlantic and Pacific oceans. Regional comparisons in large-scale programs such as GLOBEC have been a productive means of understanding marine ecosystem variability. Preliminary communications between organizations in Atlantic and Pacific researchers on the idea of developing a hemispheric IYS have suggested that the invitations would be welcome.

Self-sustaining populations of salmonids in the southern hemisphere are a consequence of intentional introductions more than 100 years ago, or escapes from salmon farms in recent decades. Inter-comparisons of these populations with the original donor stocks have provided new insights into their biology, their strategies for adaptation, and evolutionary trajectory. To the extent that new research on salmon in the southern hemisphere addresses the fundamental key questions of the IYS, such projects will be considered as any other.

The annual production of farmed salmon exceeds that of the wild salmon catch in many regions of the salmosphere. The IYS will not consider First Proposals directed at farmed salmon production, but will consider proposals that address the interactions of wild and farmed salmon.

The IYS is a tremendous opportunity for the international research community to:

- conduct collaborative scientific research on key unknowns about salmon
- advance understanding of salmon ecology during the whole life cycle including freshwater and

marine periods; specifically:
    - to discover stock-specific information about seasonal migration, distribution, and abundance of salmon throughout the oceans.
    - to learn more about key factors of salmon mortality at each stage of their life cycle, especially during early ocean life and winter periods.
    - to gain new knowledge on oceanic conditions in remote areas
- enhance capacity for salmon science with new observational systems, tools, and research networks
- strengthen international cooperation
- train the next generation of researchers
- provide unprecedented access to data and information
- capture the interest of the public and showcase science and technology.

2. Benefits of the Programme

Charles Darwin did not set sail on the *Beagle* in 1831 with an intention of making observations to support one of the greatest ideas ever to emerge from science. Rather, he wrote what might have been expected at the outset, a book describing *The Voyage of the Beagle* that was published in 1839. He returned to England with specimens, descriptions, maps, and drawings, but the greatest success of that voyage was an unintended outcome, a theory of evolution by natural selection. The primary lesson to be learned from Darwin's experience is that confronting historical data and new observations with prepared minds has a potential to lead to remarkable outcomes.

Major international research programs always produce a mixture of social, economic, and academic benefits in varying proportion. Some programs have immediate benefit while some benefits emerge more gradually. Regardless, the key feature of all of them is the cooperative effort by nations, organizations, and individuals to remove some veil of human ignorance by undertaking a shared voyage of discovery.

IYS research will produce outputs that are typical (e.g., new field observations leading to new maps of the distributions of individual salmon populations, better models, linked and shared databases housed on data servers). The cooperative approach will produce new international standards in methods and data exchange, where none currently exist. These outputs are expected to have an impact in some specific ways (e.g., improved collaboration, understanding, capacity, awareness).

Salmon return home to their natal streams, so people tend to have greater interest in “their” salmon, not all salmon. Individual populations face different threats and potentially different futures, depending on where they are located and where they go. The intensive burst of field effort will help to fill the considerable gaps in understanding of salmon in under-studied regions of their ocean residence. Better knowledge of their distributions and migrations in the ocean will improve advice to different stakeholders on the fate of their salmon and allow these stakeholders to make decisions that affect their lives and livelihoods. Indigenous peoples will have the information needed to support their cultural practices and provide food for their communities. Better information will facilitate pre-season forecasts of abundance and timing by scientists, and a better understanding of the fate of salmon in the 21st century will allow harvesters and processors to plan business investments. National and international governing agencies can improve enforceable regulations/management policies. This understanding will inform fisheries management as well as resource management more broadly during a period of anticipated rapid climatic change during the 21st century.

The IYS legacy is expected to be:

6. A comprehensive international network of data and information needed for ongoing research and to form the baseline for study of climate change effects on salmon.
7. New tools, technologies and analytical methods that draw on the data and can be applied on international and local scales.
8. A new generation of enthusiastic scientists trained to work with these data and tools with personal connections to the international science community needed to collaborate and build on the work of the IYS.
9. Improved intra- and international collaboration (among institutes, agencies, and countries).
10. Improved high seas fisheries enforcement through improved understanding and tools to predict the ocean distribution of salmon.
11. It is foreseen that science in many disciplines in the post-IYS era will be vastly strengthened and improved.
12. Fresh ideas seeded by examination of existing and new data will drive enlightened researchers to new discoveries.

Social and economic benefits of IYS include:

- greater awareness and appreciation of the connection of salmon and people, the importance of salmon, their stewardship, and links to climate and culture.
- People will be inspired to affect positive change, either individually or collectively, to sustain salmon and their ecosystems.
- Better long-term and short-term forecasts of salmon returns will improve the economic performance of fisheries.
- Identification of current and future factors affecting salmon productivity, whether natural or anthropogenic, will inform mitigation strategies to sustain salmon.
- Economic returns from hatcheries can be optimized.
- The role of salmon as a key component of food security will be understood.
- Across borders, stakeholders, indigenous peoples, and the public are engaged on similar salmon issues such as food security, cultural identity, and economic benefits.
- Recognition and fostering of common threads among diverse salmon-dependent communities provides an anchor for why the science is important and why people should care about salmon.

The kinds of benefits that will accrue from the IYS can be classified into a few general categories but the primary benefits are better understanding of the present to inform a new understanding of the future.

Improved understanding of:

- seasonal distributions, migration routes, and abundances of salmon populations will facilitate:
  - better salmon research and management
  - updating outdated baseline information and set a new standard for future comparisons
  - knowing the key factors causing mortality at each stage of the salmon life cycle
  - development of more accurate models for long-term and short-term forecast of salmon returns
  - knowing how, when, and where wild and hatchery salmon interact
- how to modify hatchery practices to optimize marine survival of salmon to foster sustainable food sources for people

- the effects on salmon of changing nutrient and water quality of the North Pacific Ocean
- the cumulative effects of multiple stressors on salmon
- biological and oceanographic factors which govern or limit production of salmon species in oceanic ecosystems
- the impacts of climate change on salmon

Better cooperation and communication through:

- new shared databases
- improved intra- and international collaboration (between institutes, agencies and countries)
- engaging a new generation of people in salmon studies and conservation
- raising awareness of salmon research and conservation
- engaging stakeholders and public across national borders focused on similar salmon issues such as food security, cultural identity, and economic benefits
- recognizing and fostering of a common message among diverse salmon-dependent communities provides an anchor for why the science is important and why people should care about salmon and salmon conservation
- engaging business and industry in developing new technology.

NPAFC will gain an awareness of public attitudes and opinions which will guide the Commission in their future activities.

- IYS scientific activities will help to resolve key scientific questions that are relevant to the NPAFC Science Plan. They will identify potential projects or activities that are most likely to lead to progress in understanding unexplained variability in salmon abundance, migration, growth, and survival.
- IYS will provide improved advice to fisheries management during what is anticipated to be a period of rapid climatic change during the 21st century. Stepping away from routine monitoring of salmon populations to re-examine accumulated scientific materials and data should reveal potential challenges to salmon stock sustainability before problems become clinically significant.
- NPAFC should expect a multiplier effect in its efforts to support anadromous stock conservation in the North Pacific Ocean through widespread advertisements of IYS events on the web and the print media.

3. Potential for Funding and Identification of Partners

Recognizing that major international research programs are funded largely by national resources, with variable levels of interest and investment in programs, and with different national administrative procedures among nations, the approach taken by the IYS-SG was to develop a compelling argument for the IYS and to present it in an attractive format with simple descriptions of the need for an IYS.

If the IYS can generate enough interest as a whole, support could come from government as well as business and industry in the form of technology development (e.g. new tags for migration studies, greater levels of automation in salmon science, other ideas may emerge) or ships of opportunity. There are potential partnerships and support from associations of harvesters, foundations with interests in fish conservation, and non-governmental organizations which need fresh ideas for their conservation activities. Crowd sourcing/funding is a new approach to fundraising that will be investigated.

An incomplete list, focusing on the North Pacific region, is attached to indicate examples of the broad range of potential IYS partners (Table E.1).

4. Communications and Outreach Strategy

It is important to develop a strategy to engage people early in the development and throughout the program. Each day, individuals from all walks of life are making decisions that affect salmon or their habitat. These ought to be informed decisions so it is important to encourage communications among "salmon people" to foster a shared commitment and responsibility for salmon sustainability throughout the salmosphere. The IYS will ultimately include a comprehensive Communications and Engagement Plan that facilitates two-way communication between researchers and target audiences that include:

- kindergarten, primary, secondary and post-secondary students and their teachers
- new researchers and their professors
- indigenous peoples
- communities with salmon
- resource managers
- the general public and their day to day decisions that affect salmon
- salmon fishers
- salmon industry

Rapidly evolving web-based media and communications technologies will enable an unprecedented ability to communicate, interact, and contribute directly through citizen science.

5. Field and Analytical Research

IYS research will comprise physical, chemical, biological, engineering, and social studies addressing five research themes conducted over a seven-year period. A two-year period of fund-raising, proposal selection, preparation and planning will be followed by an intensive two-year field study phase and three subsequent years of analysis, major symposia, and publication. The broad scope of physical, biological, and social science requires the engagement of the broad community including government, university, NGO, private sector, and citizen scientists. Projects will be developed from calls for proposals for each research theme. The preliminary five broad scientific themes identified by the IYS-SG based on the initial Scoping Meeting are listed below.

Theme 1. Status of Salmon: to understand the present status of salmon and their environment

- Seasonal distribution and abundance of major salmon populations.
    - Winter- A major knowledge gap is the nature of seasonal spatial transitions from autumn through the first and subsequent winters to spring in the open ocean. Variation in survival during the first winter at sea has been hypothesized to have a major role in determining the numbers of adults that return to spawn.
    - Migration- How salmon migrate at sea has inspired many hypotheses, but there is no consensus about how it operates.
    - Ocean entry- Juvenile abundance at ocean entry is a parameter that is critical to understanding and quantifying mortality at sea, but it is rarely measured.

- Growth and survival of salmon
    - Carrying capacity- Understanding and quantifying current and future limits to salmon

production. The ability of an ocean to produce salmon is not constant, and for the most part, the limits are not known. A general concern is that competition among different salmon populations will lead to lower growth and survival at high abundances, especially during periods of lower biological productivity.

- Density-dependence- There is a need to understand how salmon growth and survival are affected by salmon abundance. High abundance in salmon populations is generally considered to be a desirable property. Indeed, consistent abundances have allowed salmon to become a staple food. What are the benefits and costs associated with high abundances?
- Optima- There is a need to understand the interplay of ecological, biological, and economic factors affecting salmon. New research under the IYS could resolve some of the unknowns about oceanic limits to production, and the general role of salmon in the ocean foodweb. Where limits are not yet evident, IYS could provide advice that would lead to better marine survivals and better hatchery practices. What level of production can be achieved without compromising the sustainability of the resource?
- Salmon health- Understanding the effects of pathogens and stressors on the growth and survival of salmon in the wild.
- Cumulative effects- How does the accumulation of individual non-lethal stressors affect the ultimate survival of salmon?
- Freshwater landscapes - Understanding the status of freshwater ecosystems and the effect of changing habitat on salmon abundance
- Regional inter-comparisons- A powerful technique for understanding variability in one population is to compare its variability with another on scales from watersheds to hemispheres.

Theme 2. Salmon in a changing salmosphere: to understand and quantify the effects of natural environmental variability and anthropogenic factors affecting salmon and to make projections of future changes

- Retrospective studies
  - Historical surveys of salmon on the high seas and in coastal waters have produced rich collections of data and samples that are under-utilized. Scale samples that were deposited in archives decades ago can now provide records of individual fish age and growth and with the advent of DNA-based stock-identification, the identity of individual salmon can be determined for some species.
- Climate change in the salmosphere
  - Earth System Models- To understand the range of possibilities about the future of the world's salmon populations, it will be necessary to understand how the salmosphere will change under different climate scenarios. The output of the models must coincide with the temporal and spatial scales of variability experienced by salmon.
- Salmon futures
  - Future salmon distributions- How is salmon distribution determined at present and how will the anticipated changes affect future spatial distributions?
  - Salmon productivity- How does energy flow to salmon and how will it in the future?
  - Policy and management- How will salmon adapt to a changing world?

Theme 3. New Frontiers: to develop new technologies to advance salmon science

- Technological advances
    - Stock identification- The ability to understand stock-specific distributions of salmon requires the development of new markers for species (e.g. pink salmon) where there is considerable genetic similarity among populations.
    - Genomics- Genomic technology allows for the rapid assessment of the physiological condition of salmon and helps to identify the cause.
    - Marking- expand mass marking (e.g. otoliths) to identify hatchery salmon in the ocean
    - Salmon observation systems- Long migrations beneath the water surface to remote locations make salmon difficult animals to observe. Improved tagging and tracking technologies are needed to understand stock-specific patterns of migration and survival.
    - Standard methods- Standard methods have been developed in salmon biology. New tools and methods will require new standards or intercalibrations to make data comparable across platforms.
    - Biophysical models- Linking salmon to biophysical models is an emerging technique for studying variability in growth and survival of salmon and may lead to better forecasts of abundance.

Theme 4. Human Dimension: to investigate the cultural, social, and ecological processes that jointly shape the sustainability of people and salmon in the salmosphere.

Salmon and humans co-exist in socio-ecological systems where ecological (or 'natural') systems and human (cultural, social, economic, socio-political, ethical, and management) systems are dimensions of a greater whole.

- Develop the role of salmon in food security.
- How do changes in the health of salmon populations affect place-based human societies?
- Develop and apply analytical methods to examine what has occurred and conditional predictions of what is likely to occur under anticipated future conditions in social-ecological systems where salmon and humans interact.
- Understand the relationship between salmon and indigenous peoples.
- Create a mechanism for an international exchange of indigenous knowledge, traditions and experience relating to salmon.

Theme 5. Information systems

The ability to share information and collaborate advances almost daily. A modern web-based framework to rapidly access data and collaborate will be one of the most important legacies of the IYS.

- Data archaeology- In some jurisdictions, the baseline information about salmon in the sea is more than 50 years old. Readily available historical data on salmon and their environment will ensure an adequate basis of comparison with IYS data.
- Data servers- The data collected during the IYS will serve as a basis for future comparisons. It will require management and distribution.

6. Starting Year and Duration

The IYS is envisaged as a multiyear programme with the largest investments occurring during two years of intensive field work involving the coordinated efforts of multiple vessels. A proposed seven year timeline is presented in Table E.2 with the intensive field years in 2018 and 2019. Very few resources will

be required beyond 2019, but large international programs have found that it is important to plan for five or more years to ensure that projects are completed, results communicated, and data archived.

Table E.1. Preliminary list of IYS potential partners.

Country	Organization Name	Website	Mission
Type of Organization: Conservation-non-profits			
Canada	Pacific Salmon Foundation	www.psf.ca	Provide thoughtful leadership in the conservation, restoration and enhancement of Pacific salmon and their ecosystems.
Canada	Raincoast Conservation Foundation	www.raincoast.org	Use rigorous, peer-reviewed science and grassroots activism to further our conservation objectives. This approach 'informed advocacy' and it is unique amongst conservation efforts. Investigate to understand coastal species and processes; inform by bringing science to decision makers and communities; inspire action to protect wildlife and their wilderness habitats
Canada	Pacific Wild	pacificwild.org	Defend wildlife and their habitat on Canada's Pacific coast by developing and implementing solution-based conservation strategies
Canada	David Suzuki Foundation	www.davidsuzuki.org	The mission is to protect the diversity of nature and our quality of life, now and for the future.
Canada and US (Nanaimo and Snohomish)	Sustainable Fisheries Foundation	sustainablefisheriesfoundation.org	A non-profit organization dedicated to the protection, enhancement, and wise use of fisheries resources and their habitats. Our mission is to promote a balanced approach to fisheries management – one based on sound ecological and economic principles – to ensure that fish populations, and the ecosystems they depend on, remain viable, productive, and accessible to future generations.
US	Save our wild salmon	www.wildsalmon.org	A nationwide coalition of conservation organizations, commercial and sport fishing associations, businesses, river groups, and taxpayer advocates working collectively to restore self-sustaining, abundant, and harvestable populations of wild salmon and steelhead to rivers, streams and oceans of the Pacific Salmon states.
US	Long Live The Kings	www.lltk.org	Committed to restoring wild salmon and steelhead to the waters of the Pacific Northwest
US	Bering Sea Fishermen's	www.bsfaak.org	Gives the subsistence and commercial fishermen a voice in the sustainability and development of Bering Sea and western

	Association		Alaska fishery resources
US	North Pacific Research Board	www.nprb.org	Committed to building a clear understanding of the North Pacific, Bering Sea and Arctic Ocean Ecosystems that enables effective management and sustainable use
US & Canada	The Nature Conservancy	www.natureconservancy.ca www.nature.org	Conserve lands and water
US	Gordon and Betty Moore Foundation	www.moore.org	Wild Salmon Ecosystems Initiative. Working with partners across the North Pacific to ensure that these salmon ecosystems remain healthy. Specific strategies include the following: Maintain healthy habitat in key watersheds; Ensure sustainable management of salmon fisheries; Promote natural resource use practices that are compatible with maintaining healthy salmon systems
US	Wild Salmon Center	wildsalmoncenter.org	Promote the conservation and sustainable use of wild salmon ecosystems across the Pacific Rim. Identify science-based solutions to sustain wild salmonids and the human communities and livelihoods that depend on them.
Fishermen's organizations			
Canada	The Steelhead Society of British Columbia	www.steelheadsociety.org	Charitable non-profit river conservation organization. The Society has evolved to advocate for the health of all wild salmonids and wild rivers in BC.
Other organizations			
Canada	Vancouver Aquarium	www.vanaqua.org	Protecting our oceans
US	Seattle Aquarium	www.seattleaquarium.org	Hands-on marine experiences and conservation education
US	Pacific Seafood Processors Association	www.pspafish.net	A nonprofit seafood industry trade association. Its corporate members are major seafood processing companies with operations in Alaska and Washington
Inter-governmental organizations			
Can-US	Pacific Salmon Commission	www.psc.org	Shared responsibility to act with wisdom and ensure their migrations continue, by managing for rich harvests, while allowing the salmon to return in abundance to the rivers of their birth.

Can-Jpn-China-Rus-Kor-US	PICES	www.pices.int	Promote and coordinate marine research in the northern North Pacific and adjacent seas.
many	NASCO	www.nasco.int	Conserving and restoring wild Atlantic salmon
Tribal entities			
US	Northwest Indian Fisheries Commission		
US	Columbia River Inter-Tribal Fish Commission		
Canada	Fraser River Aboriginal Fisheries Secretariat	www.frafs.ca	The Secretariat provides communications and biological support services to First Nations, and coordinates the *Forum on Conservation and Harvest Planning for Fraser Salmon* and the *Fraser Salmon Roadmap (Fraser Salmon Management Agreement)* processes. As the numbers of meetings and workshops increase in response to a multitude of initiatives and issues surrounding the management of Fraser River salmon, the Secretariat also plays a key role in coordinating and supporting these initiatives by arranging venues and associated services for both First Nations and DFO.
Canada	Skeena Fisheries Commission		
Canada	First Nations Fisheries Council		

Country	**Organization Name**	**Website**
Universities & Institutions		
Canada	University of British Columbia	
Canada	Simon Fraser University	
Canada	Vancouver Island University	
Canada	Thompson River University	
Canada	UVIC	
Japan	Hokkaido University	
Russia	Far-Eastern Federal University	www.dvfu.ru/en/web/fefu
US	University of Washington	
US	University of Alaska	
US	Oregon State University	

US	University of Oregon	
US	Sea Grant	
Governments		
Canada	Fisheries and Oceans Canada	
Canada	B.C. Ministry of Forests, Land &Natural Resource Operations	
Japan	Japan Fisheries Agency	
Japan	Fisheries Research Agency	
Japan	Salmon and Freshwater Fisheries Research Institute	
Korea	Korea Fisheries Resources Agency	
Russia	Federal Agency for Fishery	www.fish.gov.ru
Russia	Academy of Sciences	www.ras.ru
US	Alaska Department of Fish and Game	
US	Oregon Department of Fish and Wildlife	
US	California Department of fish and Game	
US	US Army Corps of Engineers	
US	National Marine Fisheries Service	
US	Fish and Wildlife Service	
US	Washington Department of Fish and Game	

Table E.2. Proposed IYS timeline.

Year	Science	Resources/Partnerships	Communication and Engagement
2015 and 2016	• Determine core members of research partnership • Conduct 2nd IYS Scoping Meeting with all partners • Establish IYS-SSC • Establish an International Project Office (perhaps interim) • Convene IYS-SSC meeting in conjunction with IYS Workshop • Issue Call for Pre-proposals • Issue Call for Proposals • Data policy and management	• Develop IYS promotional material • Obtain seed funding • Identify patron and sponsors • Identify contributors/donors • Develop governmental proposals Secure research funding	• Press release • Invitations to potential partners • Distribution of promotional materials
2017	• Student recruitment • Retrospective studies • Data archaeological projects • Cruise planning and coordination		
2018	• Primary field season • Analysis • IYS post-season workshop • Cruise planning and coordination	• Major expenditures • Ships at sea	
2020	• Analysis and writing • Establish permanent IYS data archive		
2021	• Dénouement Symposium		
2020	• Journal Issue		