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**Report of the March 2, 2017 International Year of the Salmon
Working Group Meeting, Richmond, BC**

by

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

Submitted to the

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Draft Report of the International Year of the Salmon Working Group Meeting

Richmond, BC

March 2, 2017

The International Year of the Salmon Working Group (IYS-WG) met on March 2, 2017, at the Vancouver Airport Marriot Hotel in Richmond, BC, Canada. The purpose of the one-day meeting was to consider the progress made during the North Pacific Steering Committee (NPSC) Meeting held during the previous two days and to determine the next steps of the IYS-WG with respect to the development of research and outreach plans that reflect NPAFC priorities. IYS-WG participants included Mark Saunders (Chairperson) and Jim Irvine from Canada, Shigehiko Urawa, Kengo Suzuki, and Shunpei Sato from Japan, Ju Kyoung Kim and Sera Choi from Korea, Igor Melnikov from Russia, and Andrew Gray and Dion Oxman from the United States. Other participants included Andrew Stegemann (NPSC meeting facilitator), Allan Berezny (UBC), George Iwama (UBC), Madeline Young (NPAFC), Jeongseok Park (NPAFC), and Vladimir Radchenko (NPAFC).

Welcome and Opening Remarks

IYS-WG Chairperson Mark Saunders opened the meeting and welcomed all participants. The agenda was reviewed, which included the following items:

1. Welcome and opening remarks from the Chair and IYW-WG members
2. Review of the agenda
3. Review of the IYS-WG Terms of Reference
4. Consideration of NPAFC priorities and plans by IYS Research Theme/Science Theme
 - a. Status of Pacific salmon and steelhead trout (status of salmon);
 - b. Pacific salmon and steelhead trout in a changing North Pacific Ocean (salmon in the salmosphere);
 - c. New technologies (new frontiers);
 - d. Management systems;
 - e. Integrated information systems (information systems);
5. IYS 2018 Symposium/Event and proposed Japanese Symposium on the sustainable management of chum salmon in changing environments
6. Development of the IYS Work Plan
7. Other—IYS Secretariat, SharePoint Site.
8. Summary and Next Steps

There was general support for the agenda among participants, although a few suggestions were made. The need for a focused discussion on IYS themes was brought forward, including “signature projects” that could be carried out under each theme. Additionally, a request was made to include a discussion on possible formation of an IYS Secretariat. With consideration of these topics, the agenda was set.

Review of IYS Working Group Terms of Reference

The IYS-WG reviewed the IYS-WG Terms of Reference that had been adopted during the 2016 NPAFC Annual Meeting (Appendix A). Concern was expressed over the second bullet point, as once the NPSC was

established, the IYS-WG would no longer have a role in assisting with its development and coordination. The IYS-WG would have a role in working within the NPAFC and reporting back to the Commission. Language was to be revised in the IYS-WG Terms of Reference and brought forward at the IYS WG meeting in May.

Consideration of NPAFC Priorities and Plans by IYS Research Theme

Focused discussions during the next session of the meeting outlined specific activities that could be carried out by NPAFC member countries under the IYS and how they could provide opportunities for further funding. The primary goals and research objectives of the 2016–2020 NPAFC Science Plan are explicitly linked to IYS research themes; as there is no IYS Science Plan, meeting participants reviewed the 2016–2020 NPAFC Science Plan to identify activities that were missing or activities that could be expanded to the broader North Pacific or salmosphere under the IYS. Some activities could be completed by the NPAFC, while others would require partners. Additionally, it was noted that some projects would fall under multiple IYS research themes/NPAFC science themes. The need for signature projects was highlighted, which were defined as compelling, high impact projects that will keep the momentum of the IYS going while additional projects are planned. These big projects would demand funds and would gather interest within the science community as well as the general public.

Potential research and outreach activities related to the IYS and the 2016–2020 NPAFC Science Plan

Inventory of data sets (status of salmon)

- IYS-WG would be responsible for facilitating the assembly of this information
- Would include information on where the data sets are located, who is responsible for them, and how to gain access
- May require collaboration (especially for steelhead data)

Salmon Atlas (status of salmon, information systems)

- A compelling signature project that could be completed for the 2018 Symposium
- The original Salmon Atlas was produced by the Wild Salmon Center using old technology and is now out of date
- The new format would be electronic and would allow user to obtain information specific to different rivers
- Hemispheric (both Pacific and Atlantic regions)
 - Consensus for the need for a Salmon Atlas in the Pacific
 - A similar project is currently underway in the Atlantic
- Will be a large undertaking and will require extensive GIS capacity

Retrospective analyses (status of salmon)

- There is a large amount of value in retrospective analyses (i.e., they do not require ship time and much of the heavy lifting has already been completed)
- Will likely require international collaboration and could provide an academic linkage
- Stores of coded wire tag data available going back decades (PSC, ADFG)
 - Could provide clues as to how fish and climate conditions have changed though time
- Decades worth of otolith and scale collections available (DFO and other agencies)
- Otolith studies

- Number of ways otoliths can be used to reconstruct migration patterns
- Chemical analyses are expensive, especially to run significant number of samples (could use small sample size and do visual checks instead)
- Scales studies
 - There are projects currently underway (e.g., recent publication on 39 years' worth of scale growth measurements on *Qualicum chum salmon*)
 - Inexpensive but large investment of time and expertise
- A signature project using retrospective analyses could link oceanographic data to growth patterns in the North Pacific
 - Could frame as a “CSI” or “forensics” project to sell to the public and decision-makers

Physical and chemical profiles can be created with new high seas collections of otoliths and scales (new technologies)

Coordinators of the Wild Salmon Network (presented by Jonathan Moore during the NPSC meeting) should be encouraged to think broadly and work under the IYS

Modelling (changing salmosphere)

- Hemispheric
- There needs to be a larger discussion about how coupling could work
 - World Meteorological Organization should be engaged (not currently focused in North Pacific, but could potentially be persuaded to do more)
- Japanese research on magnetic fields and salmon migration
 - Compelling, interesting projects that could attract physicists, physiologists, etc.

Projects under “new technologies” will relate to other themes (e.g., status of salmon and salmon in a changing salmosphere)

- Genomics studies are fundamental pillars for understanding populations
 - Marine and aquatic genomics are research areas of strength and there is already a lot of collaboration
 - Status of genetic diversity of Pacific salmon (differences in wild and hatchery fish, wild/hatchery interactions)
- Salmon survival projects
 - Comparison of caloric content of salmon juveniles and salmon one year later
 - A gain of 25–27 % leads to an increased chance of survival
 - A gain of only 10–15 % (colder years) leads to a significant drop in survival
 - A scientific document will be presented to the NPAFC at the Annual Meeting in May

Development of modern information systems (new technologies & information systems)

- e.g., Roundtable – designed to assemble and organize many different types of information, including data
- Bring in big IT companies
 - Session at the 2018 Symposium?
 - Oracle Canada as a sponsor?

New paradigms in management systems that better integrate science (human dimension)

- Include managers and policy makers from across the hemisphere

Information Systems

- Need a way to structure information that is going to be generated from the IYS
- Escapements need to be captured
- Connect with other NPAFC Working Groups
 - Working Group on Salmon Marking (A preproposal for a Tag Recovery Interactive Mapping Project will be presented at the 2017 NPAFC Annual Meeting)

Communication and Outreach

- Include a major outreach component with all projects (live streaming?)
- Need a coordinated outreach approach between the Pacific and Atlantic
 - Apply planning approach
 - Strategic campaigns to help with fundraising and to influence the public
- Lots of outreach potential with high seas research
- YouTube clips, Ted Talks, etc.
 - Important ways to relay information to younger people
- Communication Plan
 - Material around high level goals needs to be completed
 - Also should speak to projects under development

During discussions on IYS and NPAFC Science Plan related activities, a proposal was brought forward by Russia for extensive winter and summer surveys across the North Pacific (Appendix B). The concept was unanimously supported by all participants and it was indicated that all NPAFC member countries would be invited to participate in the research cruises. There is a requirement for five vessels, three of which could be chartered from Russia. Two additional vessels are required, there is a possibility that a Japanese vessel would be available in 2019 and a new Canadian research vessel would come on-line in 2019. To facilitate the Russian proposal, further discussions are required at the 2017 CSRS meeting.

IYS 2018 Symposium and Local Symposium in Tokyo

With regards to the IYS 2018 Symposium, it was agreed the date, location, and objectives had to be determined for planning to commence in earnest. Although discussions had ensued during the NPSC meeting over the possibility of postponing the symposium to early 2019, it was indicated by the Chairperson that the IYS Coordinating Committee was set on a having the symposium in late 2018. Meeting participants echoed concerns from the NPSC meeting regarding potential timing overlap with the PICES Annual Meeting, which is set to occur in late October to early November. It was thus agreed that the IYS 2018 Symposium should be held before or after this meeting. Although the possibility of having two events to open the IYS was discussed during the NPSC meeting (i.e., a cultural even in late 2018 and a small symposium in early 2019), one symposium/event was deemed a more feasible option.

Top choices for the location of the symposium were Vancouver (if held in the Pacific region) and London (if held in the Atlantic), as proximity to either the NPAFC or NASCO Secretariat is likely to be important. Some concerns were voiced over the IYS becoming too Canada-central if the symposium were to be held

in Vancouver. With that being said, meeting participants from Russia and Japan expressed preference to host the symposium in Vancouver, while Korean participants suggested London might be the better option. Meeting participants were informed that proposals for hosting the event in both locations would be assembled. Additionally, a decision was made to host the opening and closing symposiums in different locations with the possibility of having smaller meetings in different locations around the salmosphere throughout the duration of the IYS. Lastly, participants discussed symposium publication and whether there would be published proceedings or peer-reviewed publications of symposium results. If the latter option, an arrangement with a journal would need to be established as soon as possible—a suggestion from NASCO was to approach the ICES Journal of Marine Science.

Discussion shifted to the Japan's proposed 2018 local IYS symposium on the sustainable management of chum salmon in changing environments, which is cosponsored by the IYS North Pacific Steering Committee (Appendix C). The symposium was to be held in Japanese and some suggestions were put forward with how to make it more accessible to the rest of the hemisphere, including live streaming and translation of abstracts. It was stated that progress needs to be made by the IYS Coordinating Committee on criteria for IYS endorsement. Japan has asked that at the 2017 CSRS meeting, the IYS-WG will make a request of funding for the travel and interpretation fees of an IYS keynote presenter.

Development of an IYS Work Plan

A work plan was devised that included a call for reports from NPAFC member countries on activities that will be undertaken in relation to the 2016–2020 NPAFC Science Plan and IYS research themes. These documents (which do not necessarily have to be standard NPAFC documents) would be presented at the 2017 NPAFC Annual Meeting. More details would be requested for the 2018 Annual Meeting (e.g., survey grids, funding estimates).

Another element to be included in the IYS-WG Work Plan was the possibility of hosting IYS-related workshops in conjunction with the NPAFC annual meetings every year (a one or two day workshop after the annual meeting). Topics of the workshops could be chosen from the IYS and NPAFC Science Plan and the rotation between countries would provide a good opportunity for local outreach.

Other—IYS Secretariat and SharePoint

Due to the need for dedicated staff to make progress on IYS planning and implementation, there was unanimous support among meeting participants for the formation of an IYS Secretariat in the Pacific region. The IYS Secretariat could be housed in the office of the NPAFC Secretariat as long as it remained small, and the cost per year was estimated at approximately \$500,000 CAD. A funding proposal will be prepared for submission to a number of sources including NPAFC F & A, the Canadian Partnership funds and other parties or organizations that may participate.

Participants will be invited to use the SharePoint site to communicate; instructions were to be distributed on how to connect.

Summary and Next Steps

Before a summary of the meeting was given, participants from Japan, Korea, and Russia were asked for advice on how to connect to universities within their countries. Research relevant to the IYS in Japan

includes annual high seas salmon surveys and collection of eDNA from high seas water samples by Hokkaido University. The Japanese Society of Fisheries Sciences (JSFS) would present another opportunity to connect with academics, as many scientists are expected to attend the local IYS symposium during the 2018 spring JSFS Annual Meeting in Tokyo. Korean participants offered to contact three universities in Korea that are involved in salmon and climate change research, as well as look into Korean meetings that may be similar to JSFS in Japan. In Russia, fisheries research institutions conduct most research on species relevant to the IYS.

In summary, the IYS-WG Chairperson acknowledged the progress that had been made, while recognizing the large amount of work ahead. Important discussions were carried out regarding signature projects and North Pacific research activities. It was agreed that bids from the Atlantic and Pacific over the location of the IYS 2018 Symposium (London or Vancouver, respectively) would be assessed, while there was also rationale for wanting to move events away from Vancouver. Additionally, there was strong support for planning a full suite of workshops throughout the duration of the IYS in different locations around the salmosphere. A work plan was formed which included a request to NPAFC member countries to report out on plans for IYS related activities during the 2017 NPAFC Annual Meeting. Lastly, all participants recognized a need for the formation of an IYS Secretariat that would require a funding strategy over the next few years. There was extensive support for the Russian proposal, which has the potential to be a big and important project for the IYS in the North Pacific region as well as for NPAFC science activities. The Chairperson thanked all participants and closed the meeting.

Appendix A

International Year of the Salmon Working Group (IYS WG) Terms of Reference

The working group is composed of one or more members from each Party, and subject to approval by the CSRS. The CSRS designates one official chairperson who shall preside over the working group and act as the primary representative for the working group. The working group will report annually to CSRS on progress of its work that will include proposed changes in membership.

The primary goal of the IYS WG is to coordinate the planning and implementation of the North Pacific elements of the International Year of the Salmon initiative.

Subject to approval by CSRS:

The IYS WG shall:

- Participate in the IYS Coordinating Committee and Symposium Steering Committee;
- With assistance from the NPAFC Secretariat, develop and coordinate the North Pacific Steering Committee for the IYS including the following: Develop outreach activities, engage core partners, review progress, identify research priorities, support fund-raising for research, and establish reporting procedures;
- Draft an annual work plan for planning, outreach and research activities including IYS activities of CSRS Working Groups;
- In the final year of the IYS initiative prepare a synthesis and review of all aspects of the IYS initiative.

Appendix B

Proposal of signature project to the International Year of the Salmon

Proposed by TINRO-Center, Russian Federation

1. NPAFC member countries have the opportunity to make significant progress in understanding the marine life history period of Pacific salmon through a year of intensive coordinated research in the North Pacific. This will build on the experience of mutually coordinated research at sea that was gained through BASIS I and BASIS II initiatives.

Many issues of salmon stock abundance dynamics have been attributed to processes occurring during the marine life period of salmon; however, many uncertainties remain. Numerous hypotheses that are not necessarily supported by data have emerged about limiting factors, their ranking, carrying capacity, etc. In our recent publication “On steadiness of stereotypes...”, we listed up to 20 notable differing scientific opinions on the marine life period of salmon.

We propose large scale winter and summer expeditions utilizing up to five research vessels deployed simultaneously across the North Pacific Ocean.

2. A winter survey is proposed as follows:

Over-wintering remains the least well-studied period of salmon marine life. We suggest conducting a synchronous macro-survey of the North Pacific upper pelagic layer by efforts of 4–5 NPAFC member countries from the coasts of Asia to North America during February and March. The southern boundary of the survey grid will be restricted by the thermal limits of salmon dwelling. The survey area will be divided into five sectors (**Figure 1**). There will be 20–25 survey sections directed from north to south. Each research vessel will start survey operations in its designated sector at the same time to ensure the surveys are conducted in synchrony. Unified methods of trawl hauls, catch processing, and spectrum of research studies will be applied. Each vessel will work for 30–40 days.

Such a macro-survey has never been conducted before. If this ambitious project is implemented, it will demonstrate that many perceptions of salmon in North Pacific Ocean ecosystems should be revised. It will be a real epoch-making breakthrough with promising prospects.

3. A second summer survey proposal is similar:

On certain preconditions, this proposal may be implemented the same year as the first one. There is a similar synchronous macro-survey by 4–5 research vessels of the same NPAFC member countries. Dates are from 15 August to 30 September. The survey region is proposed to be the deep-water Bering Sea basins (Aleutian and Commander Basins) and North Pacific Ocean northwards of 50-51° N, from the Eastern Kamchatka to the eastern Alaska Gulf.

A major proportion of immature salmon aged one marine year and older dwell in these areas at the end of summer and autumn. Two abundant species of primary importance for the commercial fishery—chum and sockeye salmon—also dwell there. Information, including biological materials for salmon stock identification, data for their abundance estimation, and information on structure of nektonic communities will be collected by the trawl survey supplemented by oceanographic, hydrobiological and trophological studies in the summer-autumn season as well as in wintering period.

Far-reaching implications of the proposed trawl survey project are as follows: the survey will provide total estimations of salmon spawning stocks recruitment presented by 3–4 age cohorts for chum and sockeye salmon. These data will be evaluated for fishery forecasting in several consequent years. These estimations

will be useful for specialists, who deal with particular salmon stock assessment and forecasting in their regions, for their orientation in trends of abundance dynamics.

Shuntov, V.P., O.S. Temnykh, and O.A. Ivanov.

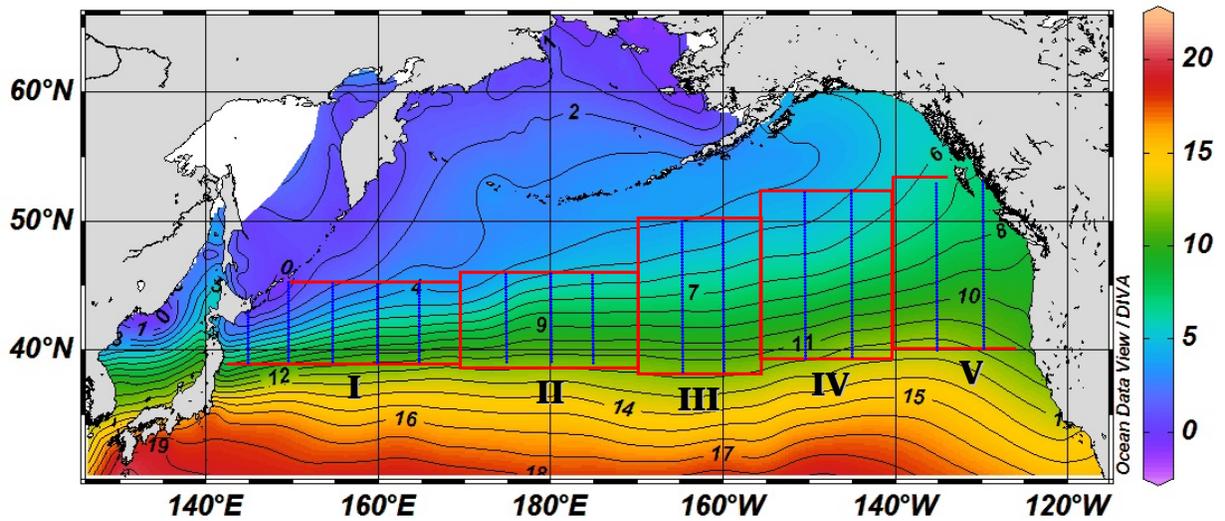


Figure 1. Approximate scheme of survey sectors in the North Pacific Ocean: I – eastward to 170°E, II – from 170°E to 170°W, III – from 170°W to 155°W, IV – from 155°W to 140°W, V – eastward from 140°W. Dotted lines show the direction of the survey course.

Appendix C

Proposal of IYS Local Symposium in Tokyo

Sustainable Management of Chum Salmon in Changing Environments

Date: March 26, 2018 (one day (9:00-17:30) during the 2018 Spring Annual Meeting of the Japanese Society of Fisheries Science)

Venue: Tokyo University of Marine Science and Technology, Shinagawa, Tokyo, Japan

Host Organization: The Japanese Society of Fisheries Science

Co-Sponsors: The Salmon Science Society; The International Year of the Salmon (IYS) North Pacific Steering Committee

Coordinators

Hitoshi Araki (Research Faculty of Agriculture, Hokkaido University)

Kazushi Miyashita (Field Science Center for Northern Biosphere, Hokkaido University) Mitsuhiro Nagata (Abashiri Fisheries Research Institute, HRO)

Yoshitaka Sasaki (Salmon and Freshwater Fisheries Research Institute, HRO)

Shigehiko Urawa (Hokkaido National Fisheries Research Institute, FRA; chief)

Background and Purpose

Chum salmon migrate widely in the North Pacific Ocean and adjacent seas, and finally return to their natal river for spawning. In Japan, chum salmon enhancement was initiated in 1880s, and the adult returns increased from 1970s with a peak of 89 million fish in 1996 due to the improvement of hatchery technologies and high-seas production. Thus chum salmon are an indispensable coastal fisheries resource, but the recent adult returns have trended decreasing with considerable interannual and regional fluctuations.

Pacific salmon are biologically and economically important for North Pacific rim countries, while they are facing unpredictable future: e.g., considerable reduction in salmon habitats and survivals may be caused by global warming. The North Pacific Anadromous Fish Commission (NPAFC) and North Atlantic Salmon Conservation Organization (NASCO) are leading to promote an ambitious program “the International Year of the Salmon (IYS)” with focal year in 2019. The IYS is an international framework for collaborative research and outreach to ensure that salmon and their habitats are conserved against increasing environmental variability.

In order to endorse effective IYS projects, the present symposium will encourage to: (1) comprehend the vision of IYS program; (2) understand the present status of chum salmon populations and their habitats; (3) assess effects of environmental variability on chum salmon distribution and survival; (4) evaluate new research technologies to advance salmon science; and (5) identify future research topics associated with IYS for the forecast of chum salmon distribution and production, and their sustainable management.

Program

09:00-09:10 **Opening Remarks**

Shigehiko Urawa (Hokkaido National Fisheries Research Institute, FRA)

I. Keynote Presentation (Chair: S. Urawa)

09:10-10:00 International Year of the Salmon: a research initiative for better understanding the mechanisms to regulate Pacific salmon production

Richard J. Beamish (Department of Fisheries and Oceans Canada)

10:00-10:10 coffee break

II. Status of Chum Salmon (Chair: K. Miyashita)

10:10-10:30 Status of Pacific salmon production in the North Pacific Ocean

Toshihiko Saito (Hokkaido National Fisheries Research Institute, FRA)

10:30-10:50 Status of chum salmon populations in Hokkaido

Yasuyuki Miyakoshi (Salmon and Freshwater Fisheries Research Institute, HRO)

10:50-11:10 Genetic structure and population dynamics of chum salmon in Sanriku (Pacific coast of northern Honshu)

Hideharu Tsukagoshi (Sanriku Fisheries Research Center, Iwate University)

III. Effects of Environmental Variability on Chum Salmon (Chair: M. Nagata)

11:10-11:30 Effects of environmental variability on reproduction of chum salmon in rivers

Hirokazu Urabe (Salmon and Freshwater Fisheries Research Institute, HRO)

11:30-11:50 Effects of environmental variability on migration and survival of juvenile chum salmon in coastal waters

Kiyoshi Kasugai (Salmon and Freshwater Fisheries Research Institute, HRO)

11:50-13:00 lunch time

13:00-13:20 Abundance and habitats of juvenile chum salmon and their adult returns in the Sanriku coast

Takuya Kawashima (Iwate Fisheries Technology Center)

13:20-13:40 Survival conditions of juvenile chum salmon on the basis of their growth characteristics

Kentaro Honda (Hokkaido National Fisheries Research Institute, FRA)

13:40-14:00 Status of Japanese chum salmon and their habitat environments in the high-seas ocean

Kengo Suzuki (Hokkaido National Fisheries Research Institute, FRA)

14:00-14:20 Effects of ocean variability on the distribution and abundance of chum salmon

Hiromichi Ueno (Research Faculty of Fisheries, Hokkaido University)

14:20-14:40 coffee break

IV. Development of New Technologies to Advance Salmon Science (Chair: Y. Sasaki)

14:40-15:00 Developing endocrine growth indices for juvenile chum salmon out-migrating to the ocean
Munetaka Shimizu (Faculty of Fisheries Sciences, Hokkaido University)

15:00-15:20 Control of diseases for the sustainable management of chum salmon
Hisae Kasai (Faculty of Fisheries Sciences, Hokkaido University)

15:20-15:40 Migration behavior of chum salmon evaluated by data logger technologies
Takashi Kitagawa (Atmosphere & Ocean Research Institute, University of Tokyo)

15:40-16:00 Migration routes of juvenile chum salmon simulated with a hydrodynamic model
Tomonori Azumaya (Hokkaido National Fisheries Research Institute, FRA)

16:00-16:20 Application of environmental DNA to population studies of chum salmon
Hitoshi Araki (Research Faculty of Agriculture, Hokkaido University)

16:20-16:40 coffee break

V. Panel Discussion (Chair: Masahide Kaeriyama, Institute for International Collaboration, Hokkaido University)

16:40-17:20 Future research associated with IYS for forecast of chum salmon production and their sustainable management

17:20-17:30 **Closing Remarks** *Kazushi Miyashita (Field Science Center for Northern Biosphere, Hokkaido University)*

Contact:

Shigehiko Urawa
Salmon Resources Research Department
Hokkaido National Fisheries Research Institute
Fisheries Research & Education Agency
2-2 Nakanoshima, Toyohira-ku
Sapporo 062-0922, Japan
Tel: +81-11-822-2340
Fax: +81-11-814-7797
E-mail: urawa@affrc.go.jp