Rehabilitation of Japanese Salmon Hatcheries Hit by the March 11, 2011, Earthquake and Tsunami

At 14:46 on March 11, 2011, Japan suffered a massive earthquake and tsunami that caused the loss of many precious lives. It destroyed buildings and facilities, including salmon hatcheries along the Pacific coast of northern Honshu, where salmon fry had been raised and released (Fig. 1). This disaster also ruined the Miyako office of the Tohoku National Fisheries Research Institute of the Fisheries Research Agency (FRA), which was in charge of distributing salmon release technologies to hatcheries in the area.

Autumn chum salmon is an important fisheries resource in Tohoku, supporting not only fisheries, but also local processing, distribution, and other industries. Almost the entire salmon stock in Japan, including areas affected by the earthquake, is maintained by artificial propagation and release of fry. Therefore, the salmon release system, which starts with the capture of parent salmon, needed to be restored by the autumn of 2011 to rehabilitate the fisheries in the area.

To help rebuild the system, the then National Salmon Resources Center (integrated into the Hokkaido National Fisheries Research Institute in April 2011) started to investigate the extent of damage and provide support to hatchery facilities immediately after the earthquake.
The FRA provided reconstruction support by establishing a headquarters for conducting surveys, research, and development for the restoration of fisheries and rehabilitation of local offices on April 13, 2011, one month after the earthquake. A salmon release team was also set up in the FRA headquarters, and immediately started to work on restoring salmon rearing facilities for the eventual release of salmon fry.

Reconstruction support plans and the items to be assessed during the initial local surveys were discussed and decided by the FRA and the Tohoku, Hokkaido, and Japan Sea National Fisheries Research Institutes at their first meeting on April 12. The support plans and the details of the first local surveys were explained to the administrative offices of Iwate, Miyagi, and Fukushima Prefectures, and prefectural salmon propagation associations. Official requests for support were received from the prefectural governments.

The first local surveys of damaged salmon hatcheries in Iwate and Miyagi Prefectures were conducted from May 10 to 20, 2011. Hatcheries in Fukushima Prefecture could not be surveyed because entry to the area was banned due to the nuclear accident at the Fukushima Daiichi Nuclear Plant.

In May, most hatchery damage remained as it was after the earthquake (Fig. 2), but some hatcheries had started to clear rubble, which was a hopeful sign. Surveys revealed the earthquake had severely damaged electric and piping systems, but had only slightly affected fish pools. In particular, concrete pools were almost unaffected and just needed the rubble removed, which provided some optimism about the possibility of restoring the hatcheries before the autumn return of adult chum salmon.

Along the coast of Iwate Prefecture, initial surveys showed that 27 facilities at 20 hatcheries (out of a total of 39 facilities at 28 hatcheries) were damaged (Fig. 1). It was estimated that possibly 262.3 million salmon fry could be released in spring 2012 (430 million were released in 2010) if the rubble was cleared away from the fish pools. In Miyagi Prefecture, 14 facilities at 12 hatcheries (out of a total of 19 facilities at 17 hatcheries) were damaged. An estimated release of 50 million fry in 2012 (65.7 million in 2010) was thought possible if rubble was removed. These numbers of fry releases were estimated by assuming the water supply and conditions in the hatcheries would be restored to the level before the earthquake by autumn 2011.

Pilot surveys of well capacity were carried out to help prefectural governments plan for and conduct urgently needed well survey projects (Fig. 3). The pilot surveys showed that submerged wells and electrical equipment had to be fixed before restoration of the hatcheries could begin. At the request of prefectural governments, the team conducted pilot surveys of wells at two hatcheries each in Iwate and Miyagi from June 20 to July 4 to determine priorities for the prefectural government surveys.

Surveys showed that the water quality and quantity of water in the wells in Iwate were normal, suggesting that well capacity could be easily restored to pre-earthquake levels. On the other hand, high concentrations of chloride ions were detected in wells in Miyagi Prefecture, suggesting that well water had been salinated due to land subsidence. Equivalent or higher salt levels were also detected in wells monitored jointly with the government of Miyagi.
Development of embryos exposed to chloride ion concentrations of about 500 mg/L detected in the well water was quickly tested at the Hokkaido National Fisheries Research Institute in Sapporo. Testing showed that a salt concentration as low as 1/32 of sea water has a serious negative impact on egg fertilization at the high water temperature ranges experienced in the Honshu area. Thus, the decision was made not to use well and river water for fertilization, but instead to transfer fertilized eggs in the water-hardening stage to other hatcheries after rinsing, and rear them there until eggs reached the eyed-stage.

Hokkaido hatcheries lent incubators for free to the affected hatcheries because manufacturers in the affected areas lacked the material and capacity to provide a sufficient number of incubators by the autumn when the adult parent salmon would return.

A second round of local surveys was conducted from November 7 to 10 in Iwate and Miyagi Prefectures to clarify the state of restoration and problems at damaged hatcheries and at facilities for capturing fish and gathering eggs. These surveys revealed overall delays in hatchery reconstruction due to setbacks in design work and equipment delivery. In some rivers in Iwate Prefecture, capture of parent adult salmon had not yet started.

Currently, rehabilitation of salmon propagation in Tohoku has been delayed, but it has been somewhat restored since the earthquake, thanks to the great efforts of the people concerned. Returning adult salmon were captured in more than half of the rivers. In Iwate Prefecture, adult salmon were captured in 27 rivers, the same number as the previous year, although many fish-capturing facilities were damaged. The final number of salmon captured was 355 thousand (63% of the previous year’s level). In Miyagi Prefecture, the seven fish-capturing facilities damaged by the earthquake were all restored, and fish were captured in 17 rivers, the same number as the previous year. As of mid December the number of salmon captured was 191 thousand (101% of the previous year’s level).

Hatching and release of salmon were also successful. In Iwate Prefecture, salmon fry were produced in 22 of the total 28 hatcheries along the coast. Based on estimates by the FRA, 291 million fry were released in 2012, which was about 68% of the number (430 million) released in the spring of 2010. In Miyagi Prefecture, salmon fry were released from all 17 hatcheries. An estimated total of 49 million fry was released, and this was about 74% of the number (66 million) released in 2010.

The salmon release team initiated support to rehabilitate salmon rearing and release facilities in affected areas soon after the earthquake. The team is now providing technical support to improve facilities and increase the number of fry releases. In addition, the team is prioritizing action items for 2012 and for the future, including systems for rearing and release of salmon.

In all these activities, the FRA has consistently taken the approach of not simply restoring facilities to their pre-earthquake condition, but to make improvements now that will be needed in the future. The prefectural governments of Iwate and Miyagi have formulated rehabilitation plans that aim for complete restoration of all hatchery facilities by 2013 and 2017, respectively. The FRA will continue to provide technological support for salmon enhancement to the prefectural governments affected by the 2011 Tohoku earthquake.


Fumio Ito
Nemuro Field Station, Hokkaido National Fisheries Research Institute, Fisheries Research Agency, Nakashibetsu

Fumio Ito has a unique background. Following graduation, he worked at the Japan National Railways (JNR), and after JNR was divided in several private companies, he moved to the Hokkaido Salmon Hatchery in 1987. His responsibilities include taking the lead in providing salmon enhancement techniques to private hatchery managers in Hokkaido and Honshu. When the earthquake and tsunami hit the Pacific coast of northern Honshu on March 11, 2011, he took prompt and direct actions to recover egg collection and production capacity at damaged hatchery facilities. He hopes salmon will become an icon of the strong revival of people in the earthquake and tsunami-stricken areas.
On March 27-28, 2012, NPAFC members met for the Enforcement Evaluation and Coordination Meeting (EECM), in Jeju Island, Republic of Korea. Participants focused on discussing 2012 enforcement and coordination plans for high-seas driftnet patrols by ship and aircraft in the NPAFC Convention Area. The NPAFC Committee on Enforcement (ENFO) convened a workshop on “Procedures of Interception and Seizure of Vessels of Interest on the High Seas” that followed the EECM meeting and provided each country with the opportunity to review its procedures in relation to this subject.

The EECM covered a variety of topics in anticipation of the 2012 patrol season. Canada informed the group that aircraft will conduct patrols and they are exploring possibly extending patrol coverage in the Convention Area. The NPAFC Committee on Enforcement (ENFO) convened a workshop on “Procedures of Interception and Seizure of Vessels of Interest on the High Seas” that followed the EECM meeting and provided each country with the opportunity to review its procedures in relation to this subject.

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Information from Canada’s Radar Satellite II (RS2) will continue supporting aircraft patrols and this information can be used to facilitate fisheries enforcement activities of other members, if requested. Japan informed the group of a tentative scheme for vessel patrols and aircraft enforcement activities in 2012. Russia said its efforts will include deployment of patrol craft from the Sakhalin Border Guard Directorate and the Northeastern Border Guard Directorate. The United States will dedicate aircraft to patrol high threat areas in 2012, and conduct long-duration surface patrols. Korea provided the favorable news that the Ministry for Food, Agriculture, Forestry and Fisheries (MIFAFF) is currently reviewing the practicality of inspection and boarding of vessels under Korea’s domestic regulations. If possible, this would mean Korean patrol vessels could conduct investigations of suspected IUU foreign fishing vessels by boarding these vessels within the Korean EEZ (exclusive economic zone).

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Interviews with the master and crew revealed that high-seas driftnet (HSDN) vessels are taking measures to evade and deceive law enforcement by dismantling fishing equipment and altering their ship names and identification. They are also shifting fishing areas and fishing times so as to evade patrols, and they are aware of recent vessel patrols and boarding activities.

Based on this information, it is clear that NPAFC-related enforcement activities are having a deterrent effect on HSDN fishing. It is also clear there is a need to maintain the security of patrol planning.

Other topics discussed by the group included updating and prioritizing recommendations from the NPAFC performance review relevant to the enforcement objectives of the Commission. The Executive Director gave a presentation and led a review of the ENFO List of Actions, and reminded everyone that the fall 2013 Annual Meeting will not be conducted as a face-to-face meeting. Therefore, some actions initially planned for finalization at the 2013 Annual Meeting will be shifted to the spring 2013 ENFO meeting. The group agreed to establish an ENFO Terms of Reference Review Working Group whose task will be to revise or re-write the ENFO terms of reference, taking account of several recommendations. It was also agreed that the United States will voluntarily submit an updated draft terms of reference for an IUU Vessel List for review by the members by the end of August. The ENFO group agreed to provide feedback on the draft by the end of September. After further review, IUU vessel listing procedures for NPAFC will be submitted to the Commission for consideration at the 20th Annual Meeting.

A five-minute NPAFC enforcement video that briefly explains the purpose of NPAFC and related activities by its member countries was shown, and the group was asked for their review and comments. After incorporating the group’s comments, the video will be finalized, and presented at the 20th Annual Meeting. The group was deeply impressed with the video and expressed its appreciation to the Secretariat for producing it.

Immediately after adjournment of the EECM, the workshop on “Procedures of Interception and Seizure of Vessels of Interest on the High Seas” was held. Each country reviewed this topic in relation to its own unique situation. They introduced and described their domestic regulations regarding inspection procedures of foreign IUU fishing vessels.
Jeongseok Park was born and raised in Busan, Korea, where he lived for almost 30 years while obtaining his BSc and MSc, and finished the coursework to obtain a PhD in Fisheries Resources Economics from Pukyong National University. His areas of interest include bio-economics of fisheries management; quota allocation schemes; and fisheries monitoring, control and surveillance issues. In 2006 Jeongseok joined the International Fisheries Organization Division of the Ministry for Food, Agriculture, Forestry and Fisheries (MIFAFF) as Assistant Director. In addition to his participation at NPAFC, he represents the Republic of Korea at many regional fisheries management organizations including International Commission for the Conservation of Atlantic Tunas, Indian Ocean Tuna Commission, International Whaling Commission, and North Pacific Fisheries Commission, which is currently in the process of coming into existence. Recently, Jeongseok has taken on the added responsibility as Fisheries Negotiator. Jeongseok particularly enjoys the opportunity provided by his career in international fisheries management to work with colleagues from other countries.
In the 20 years since its establishment, NPAFC has devoted serious effort to opposing illegal fishing in its Convention Area (Fig. 1). The ongoing ever-changing tactics employed by those involved in illegal high-seas fishing require constant vigilance, responsive coordination, and long-term dedication by agencies concerned with enforcement of fishing regulations. Incorporation of port state measures (PSM) into NPAFC enforcement planning can further reduce future illegal high-seas fishing.

To maximize efficiency and speedily share information obtained on suspected illegal fishing, member countries (Canada, Japan, Korea, Russia, and United States) coordinate their enforcement patrols and surveillance of the Convention Area (Figs. 2 - 4). However, the North Pacific is a vast area, and monitoring and surveillance of vessels on the high seas may not be enough to completely prevent illegal fishing. To augment its enforcement actions against illegal fishing, NPAFC members are currently considering instituting PSM in their respective countries and providing guidelines for NPAFC. Port state measures work to block movement of illegally caught fish into domestic and international markets, where such catches can quickly become mixed with legally-obtained fishery products. Port state measures can be a cost-effective way to reduce incentives for persons considering illegal fishing and transportation. They also serve to enhance the effectiveness of at-sea patrols.

The United Nations has been concerned with IUU fishing for several decades. The 1982 UN Convention on the Law of the Sea was followed by the Food and Agriculture Organization’s (FAO) adopting a Code of Conduct for Responsible Fisheries in 1995, which focused on management processes for sustainable fisheries. In 2001, the FAO Committee on Fisheries (COFI) adopted the International Plan of Action to prevent, deter, and eliminate IUU fishing (IPOA-IUU). This plan outlines responsibilities and measures for flag states, coastal states, port states, and regional fisheries management organizations (RFMO) to follow in order to prevent and combat IUU fishing, and the NPAFC participated actively in development of the plan.

In 2000 then NPAFC President, Fran Ulmer, sent a letter to FAO explaining NPAFC’s procedures for successful enforcement efforts and offering to help in drafting the IPOA based on expertise and experience developed at NPAFC. After lengthy deliberations, the FAO developed a detailed and comprehensive guideline aimed to combat IUU fishing in its Port State Measures Agreement in 2009 (see http://www.fao.org/fishery/psm/en).
NPAFC’s expertise in fisheries enforcement stems from its members taking appropriate individual and collective measures to deter IUU fishing. At the beginning of each year, operational-level officers of the several enforcement agencies of member countries meet at the Enforcement Evaluation and Coordination Meeting and evaluate the enforcement activity of the previous year and plan for what is anticipated for the current year (see article in this issue). Until recently, patrol and boarding inspection procedures have been the primary concern, but discussions are proceeding regarding the development of PSM. The NPAFC Committee on Enforcement recognized that PSM could be an effective tool to combat IUU fishing. The committee further agreed to implement the FAO PSM Agreement where it is consistent with the national laws of its members. The NPAFC Performance Review (www.npafc.org) encouraged member countries to join the Agreement and to analyze its measures within the NPAFC enforcement context. These recommendations were approved at the 2011 Annual Meeting. In 2012, NPAFC members have agreed to report on the status of their domestic laws pertaining to PSM, and the Committee on Enforcement continues working to develop ways of incorporating PSM into NPAFC activities. Once the details are worked out, NPAFC’s creation of PSM guidelines, in conjunction with member countries’ domestic laws, will add another important tool to further reduce illegal high seas fishing.

**Further reading**


*Fig. 4. After being sighted for suspected illegal pelagic high seas driftnet fishing in the NPAFC Convention Area by Japanese air patrols, the Bangun Perkasa was apprehended by the United States Coast Guard. Because the vessel was determined to be stateless, it was seized and escorted back to the US where it was prosecuted under US domestic law. No salmon was found among the fish products aboard the vessel (USCG photo).*

*Fig. 3. A large amount of frozen salmon was found in the Bellatrix hold. The Panamanian government was informed their vessel was caught illegally fishing. Korean authorities confiscated the salmon catch and the ship was allowed to return to Panama.*
What does it mean…?

... port state measures?

Port state measures (PSM) began in the realm of environmental protection as a way to reduce the risk of oil spill contamination in the maritime environment. The massive 1978 oil spill off the coast of Brittany (France) caused by the grounding of the tanker Amoco Cadiz catalyzed the creation of port state control measures. This incident was a turning point and caused a strong political and public outcry in Europe for far more stringent regulations with regard to the safety of shipping. This pressure resulted in a comprehensive memorandum on port state control adopted in 1982, and since then many regional memoranda have been adopted.

Recognition by FAO that PSM could be used to protect fish stocks from illegal fishing led the 2009 FAO Port State Measures (PSM) Agreement (see http://www.fao.org/fishery/psm/en). The PSM Agreement defines the port state requirements that a foreign fishing vessel must comply with as a condition for use of ports within the port state. The Agreement requires the port state to designate and to publicize which ports are available for inspection of vessels, and calls for prior notification by vessels of their port of entry, vessel type, and the catch on board. The PSM Agreement restricts ports of entry, landing and transhipment of fish, and provision of supplies and services, and the Agreement further requires appropriate vessel and product documentation, trade-related measures and sanctions. Currently, several regional fisheries management organizations have adopted these measures into development of their own agreements to help eliminate illegal fishing within their respective convention areas.

... IUU fishing?

Illegal fishing is now often referred to as illegal, unreported, and unregulated fishing (IUU fishing). IUU fishing can occur anywhere in the world. Illegal fishing can mean fishing out of season, harvesting prohibited species, fishing by prohibited gear, catching more than the allowed quota, and fishing without a license. Unreported fishing generally means fishing activity that goes unreported or misreported to national authorities or to the responsible regional fisheries management organization. Unregulated fishing refers to fishing conducted by vessels that are stateless, using a flag of convenience, or flagged by a State not party to the responsible regional fisheries management organization. Unregulated fishing also occurs when fishing is conducted in areas where there are no conservation or management measures in place. The most common illegal fishing activity in the NPAFC Convention Area is large-scale high-seas driftnet fishing, which can deplete marine stocks of target and non-target species.

Deterrence of IUU fishing in the NPAFC context is outlined in its Convention (see http://www.npafc.org/new/about_convention.html). NPAFC conservation measures state that directed fishing for anadromous fish is prohibited in the Convention Area (with the exception of scientifically-reviewed and approved research fishing). In addition, any incidental catch of anadromous fish is minimized to the maximum extent practicable, and keeping any incidentally caught anadromous fish taken during fishing operations directed at other species is prohibited. Furthermore, the Convention provides that the member countries take appropriate measures in accordance with international law and their respective domestic laws to prevent illegal trafficking in anadromous fish and to penalize those involved in this trafficking.
... flag state?

The flag state of a fishing vessel is the state under whose laws the vessel is registered or licensed. The flag state has the authority and responsibility to enforce regulations over vessels registered under its flag.

... large-scale driftnet fishing?

A driftnet is a net suspended vertically (approximately 2-3 m) in the water between a float line at the top and a lead line at the bottom. In the sea, it drifts and moves with water currents and the wind and catches fish by entangling them in the mesh of the net.

What distinguishes a large-scale driftnet from other types of vertical nets is its much greater length. Before the UN ban on driftnets, some fisheries set multiple panels of driftnet totaling as much as 50 km in length per night. There was a major outcry against that many large-scale driftnet fishing vessels in the South Pacific, with claims they threatened the ecosystems and the economies of coastal states. This led to a ban in the Wellington Convention (1989) of driftnets over 2.5 km in length. One month later, the UN called upon its members to reduce the fishing effort of large-scale driftnets and requested FAO to study its impacts. By the end of 1992, a global moratorium on all large-scale pelagic driftnet fishing was declared.

... high seas?

The high seas are the international waters of the world’s oceans located outside the exclusive economic zones (200-mile EEZs) of coastal nations.

... anadromous fish?

Anadromous fish migrate from freshwater where they hatch to the ocean where they spend most of their lives and grow to maturity before and returning to fresh water to spawn. In the case of NPAFC’s responsibilities, anadromous fish include the six species of Pacific salmon (sockeye, chum, pink, coho, Chinook, and cherry salmon) and steelhead trout (see http://www.npafc.org/new/science_species.html.)

Youngho Park graduated from Seoul National University, Korea, with a BA in Economics and completed his coursework for an MA in Public Policy. In 2003 he joined the Ministry for Food, Agriculture, Forestry, and Fisheries (MIFAFF) as a deputy director. In January 2012, Youngho moved to the NPAFC Secretariat in Vancouver, BC, as an on-the-job trainee. Since his arrival at the Secretariat, he has supported the deliberations of the 2012 Enforcement Evaluation and Coordination Meeting. His future plans include developing expertise on procedures for international enforcement of fisheries conservation measures, especially port state measures.
The day I received a phone call asking if I would consider serving as one of Canada’s representatives to the North Pacific Anadromous Fish Commission (NPAFC) was a lucky one for me. The 1997 Order-in-Council appointing me as a representative to the Canadian section of the NPAFC said I was to “hold office during pleasure for a term of two years.” While this referred to the government’s “pleasure”, I am happy to say that the satisfaction seems to have been mutual since I managed to get myself reappointed six times by both Liberal and Conservative governments.

My 15-year tenure as a member of the NPAFC family allowed me to be part of something very special, the world’s best example of international fisheries cooperation. No other regional fisheries management organization (RFMO) has achieved what the NPAFC has accomplished. The five NPAFC member countries have shown the rest of the world what is possible when countries work together for the fish. They have shown how to protect fish stocks against unauthorized harvest and how to develop and share the scientific knowledge essential to good fisheries management.

The NPAFC is successful because it provides a place where people can get to know each other. It fosters the development of personal and professional relationships based on common concerns for salmon. The real credit for the success of the NPAFC belongs to the individual enforcement officers, scientists, and fisheries managers who have come together under its umbrella with the help of a small and highly dedicated staff.

While I have many fond memories of the NPAFC at work, two occasions stand out in my mind as vivid examples of why the organization has been successful.

- There was the moment on May 16, 2001, when I watched enforcement officers from Russia, the USA, Japan, and Canada exchange “high fives”, as we circled over a driftnet vessel in international waters, and sent its location to a Russian Border Guard patrol vessel. This was international fisheries enforcement in action. Officials from four countries were aboard a US Coast Guard C-130 aircraft, flying out of a Russian air base on the Kamchatka Peninsula. We later stood on a dock in Petropavlovsk-Kamchatsky harbour as the offending vessel was escorted to port for the imposition of stern penalties by a Russian court.
Gerry Kristianson was trained as a political scientist, earning his doctorate after studies at the University of British Columbia and the Australian National University. A life-long recreational angler, following his retirement from a professional career as an academic, diplomat, and management consultant, Gerry became closely involved in the political issues surrounding the management of North Pacific fisheries. He is chairman of Canada’s Sport Fishing Advisory Board, a Director of the Sport Fishing Institute of British Columbia, and he has been one of Canada’s representatives on the Pacific Salmon Commission since 1998. In 1997 Gerry was appointed as a representative of Canada to NPAFC and continued until the end of his tenure in 2011. He served twice as the Chairperson of the Committee on Finance and Administration (2001 and 2010-2011).

One of the reasons the NPAFC has been successful is that, unlike many RFMOs, it hasn’t had to deal with the allocation of fish between the member countries. The parties have been united in their determination to keep everyone (including each other) away from the fish until they return to national jurisdiction. A key challenge for the future will be to maintain this unity in the face of growing evidence that ocean carrying capacity may be limited and hatchery production from one country may be having an adverse impact on “wild” or naturally reproducing fish from another. This issue was raised on several occasions during last October’s NPAFC workshop in Nanaimo following the 19th Annual Meeting, and the May issue of the journal “Environmental Biology of Fishes” (volume 94, issue 1) contains a series of peer-reviewed studies which, according to a press release from the Wild Salmon Center in Portland, suggest “mounting evidence that salmon raised in man-made hatcheries can harm wild salmon through competition for food and habitat”.

The Wild Salmon Center press release talks about “the need for a new international agreement or treaty to address the expansion of hatchery salmon in the open waters of the North Pacific”. In my opinion it would be a mistake to try and separate this subject from the core responsibilities of the NPAFC. Instead, the member countries need to figure out how to deal with the carrying capacity challenge without undermining the cooperative spirit that has made possible the high seas drift net ban and the open sharing of salmon science. Having already created an environment of co-operation and good will, the NPAFC has the best chance to find the necessary common ground. Otherwise we could face the worst of all situations, where everyone loses because the fish lose.

Gerry Kristianson
Past NPAFC Representative of Canada (1997-2011)
Piers Island, BC
The Research Planning and Coordinating Meeting (RPCM) of the Committee on Scientific Research and Statistics (CSRS) was held April 10-18, 2012 by email. A very large thank you is due to the Secretariat staff, in particular Dr. Nancy Davis, who did an outstanding job of organizing the meeting and producing an excellent draft report.

This was the second consecutive year the meeting was conducted by email. While the email approach is certainly very efficient and cost effective in the short term with respect to collating and documenting information for the RPCM, the opportunity for face to face discussion of the long term aspects of research and cruise planning is missed. This highlights the importance of the work we are initiating in response to the performance review to ensure that our annual meetings and working groups are effective mechanisms for the exchange of scientific information and ideas. In the upcoming months leading up to the annual meeting we will be reviewing the Terms of Reference (ToR) for the CSRS and its Working Groups. I will be working with the Secretariat to circulate a draft of the CSRS ToR to the CSRS points of contact and members of the Science Sub-Committee very shortly. I look forward to working with all of you on this very important initiative.

It is encouraging to see the extremely active research and cruise plans for 2012 covering each of the five themes in the NPAFC Science plan. At the 2012 RPCM, the national research plans of Canada, Russia, and the United States were presented to complement those presented by Japan and Korea in 2011. A key aspect of developing integrated research programs is through the exchange of scientists. The parties continue to do so and two technicians from Japan will be receiving training in otolith mark analysis at the Mark, Tag, and Age Laboratory of the Alaska Department of Fish and Game (Juneau) in September 2012. In addition, two Russian scientists will participate in the US BASIS survey in the southeastern Bering Sea in fall 2012.

Workshops are one of the major activities the CSRS uses to address emerging scientific issues. The Secretariat has just announced the release of Technical Report No. 8. This report is a compilation of extended abstracts submitted by oral and poster presenters and a synthesis of the NPAFC workshop entitled “Explanations for the High Abundance of Pink and Chum Salmon and Future Trends,” held in October 2011 in Nanaimo, BC. The findings significantly improve our understanding of factors affecting pink and chum salmon abundance, and there are helpful recommendations regarding future research. The richness of the findings speaks to the utility of detailed comparisons of productivity across species and populations throughout the North Pacific, something the CSRS will continue to pursue and refine.

During the RPCM, the topic of the timing of the next workshop entitled “Migration and Survival Mechanisms of Juvenile Salmon and Steelhead in Ocean Ecosystems” was discussed. The decision was made to hold the 2-day workshop on juvenile salmonids following the spring 2013 CSRS meeting (see announcement this issue). This upcoming juvenile workshop will provide scientists with an excellent opportunity to share and review new information on the juvenile salmonid research component of the NPAFC Science Plan.

Thanks again to the Secretariat and I hope all of you enjoy the warm weather and wishes for smooth sailing to those of you who will be at sea this year in the North Pacific.

Mark Saunders
CSRS Chairperson

Mark Saunders manages the Salmon and Freshwater Ecosystems Division for Fisheries and Oceans Canada at the Pacific Biological Station in Nanaimo, B.C. The Division includes staff working on salmon stock assessment, freshwater habitat, molecular genetics, fish health, and marine ecology. The first half of his 30-year career focused on stock assessment and research of marine fish including Pacific hake, pollock, sablefish, and spiny dogfish. The second half of his career included work on hydroacoustic surveys and fisheries oceanography of the California Current system. In 2003 Mark took on an assignment working on development and implementation of Canada’s Wild Salmon Policy and then returned to his current position in 2009. He lives in the small town of Chemainus, Vancouver Island, where he lives with his wife, two daughters, and a large and slightly neurotic white dog. Mark’s hobbies include kayaking, cycling, skiing, and running the local soccer club.
3rd International Workshop on
Migration and Survival Mechanisms of Juvenile Salmon and Steelhead in Ocean Ecosystems

April 25-26, 2013
Sheraton Princess Kaiulani
Honolulu, Hawaii, USA

ABSTRACTS DUE NOVEMBER 16, 2012
Email abstracts to secretariat@npafc.org
More information www.npafc.org

Objectives
- Identify ecological mechanisms regulating production
- Integrate information on environment and production during critical life history stages
- Relate variation in abundance, growth, and survival to climate-induced changes in habitat

Topics
1. Seasonal distribution and migration route/timing
2. Hydrological characteristics, primary production, and prey resources
3. Trophic linkages, growth rates, and predation rates
4. Ecological interactions among species and populations
5. Survival rate and survival mechanisms
6. Population size and carrying capacity
7. Survival and salmonid ecology during the first winter at sea

Organizing Committee
Joseph Orsi (Auke Bay Laboratories, USA; Organizing Committee Chairperson); Ki Baik Seong (Inland Aquaculture Research Center, Korea); Marc Trudel (Pacific Biological Station, Canada); Shigeaki Urawa (Hokkaido National Fisheries Research Institute, Japan); Alexander Zavalokin (Pacific Scientific Research Fisheries Center; Russia); Nancy D. Davis (NPAFC Secretariat)
Background

In recognition of the importance of understanding juvenile salmonid production in ocean environments, NPAFC has organized two previous workshops on the subject of juvenile salmonids in marine habitats. In 2000, the NPAFC organized a “Workshop on Factors Affecting Production of Juvenile Salmon” in Tokyo, Japan, and presentations were summarized in NPAFC Technical Report 2 and national review papers were published in NPAFC Bulletin No. 3. In 2006, the NPAFC convened the “Second International Workshop on Factors Affecting Production of Juvenile Salmon” in Sapporo, Japan. Presentations were summarized in NPAFC Technical Report 7.

The previous workshops have suggested the initial period after juvenile salmon migrate to sea and the following first winter are the most critical phase with respect to ocean survival of anadromous populations. Observations have shown there is considerable inter-annual variation in abundance, growth, and survival rates of juvenile salmon in the ocean. These variations are related to climate-induced changes in habitats that operate at regional and local scales. These processes are monitored annually in the coastal and offshore waters of Asia and North America. Using long-term monitoring data, scientists have begun developing models to forecast commercial harvest. Study of the migration and survival mechanisms of juvenile salmon is a research component of the 2011-2015 Science Plan, “Forecast of Pacific salmon production in the ocean ecosystems under changing climate” (NPAFC Doc. 1255). During the seven years between the second juvenile salmonid workshop in 2006 and the upcoming workshop in 2013, significant new research results have become available, so researchers will have the opportunity to share and review current information on migration and survival mechanisms of juvenile salmon and steelhead in ocean ecosystems.

Presentations

Presenters are encouraged to address one of the workshop objectives within the framework of their selected topic session (objectives and topics are listed on the previous page). The workshop will be conducted in English. Sessions will comprise contributed presentations, which will be selected for oral or poster presentation. Oral presentations are 15 minutes followed by 3 minutes of discussion. Posters will be available for viewing throughout the duration of the workshop.

Schedule

November 16, 2012: Abstract submissions due
Mid-December, 2012: Announcement of abstract selection to authors
2nd week of January, 2013: Meeting registration opens
April 25-26, 2013: Workshop and extended abstracts due

Workshop Proceedings

Oral and poster presenters are asked to submit an extended abstract that will be compiled into the workshop proceedings and issued as a NPAFC Technical Report after the workshop. The technical report will be available online at the NPAFC website.
Lightly Pickled Spicy Salmon and Vegetables

by Liu Wei

The following recipe and photo were provided by Liu Wei from the Heilongjiang Fisheries Research Institute. She presented a poster at the 2011 NPAFC Workshop in Nanaimo, B.C., Canada.

This dish features a fresh, light, and refreshing flavor complimented by a nice sour and spicy taste.

Ingredients

- 2 kg salmon
- white vinegar (enough to cover salmon strips and skin)
- 2 cups bean sprouts
- 1-2 cucumbers with most of the skin removed and cut into sticks
- 1 cup fresh cilantro, finely chopped
- 5-6 cloves fresh garlic, finely chopped
- 3 tablespoons toasted sesame oil
- 1 teaspoon hot chili oil (to taste)
- 1 bunch Chinese broccoli (gai lan) - cut into 1-cm pieces (slice stems lengthwise for faster cooking)
- 2 teaspoon salt (to taste)
- toasted sesame seeds and chopped bell pepper for garnish

Method

1. Wash, clean, and remove scales from the salmon.

2. Fillet the fish and cut the fish into strips leaving the skin attached (if preferred)

3. Pour white vinegar over the fish strips. Leave it to marinate for 5 minutes, drain, and repeat with fresh vinegar. Fish strips should turn whitish.

4. Grill or broil the fish strips. If the skin is used, place fish skin side down and heat until the skin curls and the meat is cooked. Remove from the grill and pour white vinegar over the strips. Leave it to marinate for 5 minutes, drain, and repeat with fresh vinegar.

5. Sauté Chinese broccoli with some of the sesame oil and the garlic; then combine fish strips, bean sprouts, cucumber, cilantro, garlic, sesame oil, chili oil, Chinese broccoli, and salt.

6. Sprinkle with toasted sesame seeds and place sliced bell pepper on top for garnish before serving.

Dr. Liu Wei is a researcher and academic leader at the Heilongjiang Fisheries Research Institute of the Chinese Academy of Fishery Sciences. She instructs graduate students at the Shanghai Ocean University, the Northeast Agricultural University, and the Dalian Maritime University of Aquaculture. Her scientific interests include fishery resource assessment and fish conservation, ecology, and physiology. She has published numerous articles on hatchery techniques and physiology of juvenile chum salmon and other fishes, received provincial awards for her work, and accepted several invitations to visit laboratories in Russia and the United States.
**RECENT PUBLICATIONS**

**Technical Report 8** is available [online](#) at the NPAFC website. This report is a compilation of extended abstracts presented at the 2011 NPAFC International Workshop, “Explanations for the High Abundance of Pink and Chum Salmon and Future Trends”, by authors that number among the top international experts working on pink and chum salmon. Explanations centered around favorable environmental factors providing opportunities for pink and chum salmon to grow quickly, particular biological and life history characteristics of pink and chum salmon that make them more responsive than other salmon species to favourable environmental conditions, and human activities such as stock enhancement, reductions in harvest, and responsible fisheries management that have contributed to increased production of pink and chum salmon.

**NPAFC 2011 Annual Report** is available on CD-ROM and [online](#) from the NPAFC website. The Annual Report includes major discussions that took place at intercessional meetings, the 2011 NPAFC International Workshop on Explanations for the High Abundance of Pink and Chum Salmon and Future Trends, and the 19th Annual Meeting of the Commission.

**UPCOMING EVENTS**

**NPAFC 20th Annual Meeting**  
St. Petersburg, Russia  
October 7-12, 2012  
Park Inn Pribaltiyskaya by Raddison  
*CSRS starts on October 7th  
1st Plenary starts on October 8th  
[http://www.npafc.org/new/events_annual.html](http://www.npafc.org/new/events_annual.html)

**NPAFC Third International Workshop on Migration and Survival Mechanisms of Juvenile Salmon and Steelhead in Ocean Ecosystems**  
Sheraton Princess Kaiulani  
Honolulu, Hawaii, USA  
April 25-26, 2013  
[http://www.npafc.org/new/events/workshops/workshop2013/workshop_home.html](http://www.npafc.org/new/events/workshops/workshop2013/workshop_home.html)

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Visit the NPAFC website: [http://www.npafc.org](http://www.npafc.org) for more information on events, publications, scientific documents, and salmon catch statistics.

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The Commission encourages submission of articles and images on NPAFC-related activities for publication in the newsletter.