New Year’s Message from the President  

By Junichiro Okamoto  

NPAFC President

A Happy New Year to my colleague members of the NPAFC, Secretariat staff, and people involved in salmon fisheries, research, and enforcement in the North Pacific. On behalf of NPAFC, I would like to express my best wishes and make a brief remark about where the NPAFC is headed in 2015.

Salmon stocks in the North Pacific are biologically unique and represent great economic and cultural blessings to people in the North Pacific Rim. Following the legacy of a predecessor organization (INPFC; International North Pacific Fisheries Commission; established in 1953), the NPAFC has performed well in conserving anadromous stocks in the North Pacific since its establishment in 1993 through the commitment of its member countries. Cooperation among the member countries in support of human networks in administration, research, and enforcement is one of the most important assets of NPAFC.

In 2015, it is expected that a new regional fisheries management organization, the North Pacific Fisheries Commission (NPFC), will take effect. While the competencies of NPAFC and NPFC are clearly demarcated, the NPFC will be a brother organization of NPAFC in the North Pacific because a major part of the convention areas and current membership of the two organizations overlap. NPAFC has to step into a new era in coordination with NPFC in various fields in order to promote effectiveness of NPAFC business and for the mutual benefit of both organizations.

Enforcement efforts have successfully contained IUU (illegal, unreported, and unregulated) fishing that targets salmon in the NPAFC Convention Area. I congratulate the people who have contributed to such a consequential outcome through cooperation within the framework of NPAFC. To preserve this outcome, NPAFC needs to continue to maintain these successful cooperative efforts.

Although scientists of the member countries of NPAFC have long cooperated in their best efforts to analyze the mysterious life of anadromous stocks in nature, we have not yet completely heard the dream and reality of life for these stocks. A long task remains ahead for NPAFC-related science to develop an understanding of the dynamics of salmon stocks in the North Pacific environment.

In this connection, it is timely that NPAFC will hold the International Symposium on Pacific Salmon and Steelhead Production in a Changing Climate: Past, Present and Future from 17 to 19 May, 2015, in conjunction with 23rd Annual Meeting of NPAFC. The Annual Meeting will be held in Kobe, Japan, from 11 to 15 May, 2015. As the President of NPAFC, I would like to warmly welcome all the delegations to Kobe and I hope they will enjoy their visit to Kobe very much.

In closing, may the New Year bring us peaceful times, happiness, success, wealth, and prosperity.

Junichiro Okamoto  

Graduated from the Faculty of Agriculture at the University of Tokyo and then joined the Fisheries Agency of Japan (FAJ). At FAJ, he worked on domestic fisheries management, international fisheries trade policy, and fisheries negotiations with the (then) Soviet Union, Canada, South Korea, and U.S.A. Junichiro participated in deliberations of numerous organizations including the Organization for Economic Co-operation and Development, Inter-American Tropical Tuna Commission, International Whaling Commission, Convention on the Conservation of Antarctic Marine Living Resources, and General Agreement on Tariffs and Trade. He was Division Director of Agriculture at the University of Tokyo and then joined the Fisheries Agency of Japan (FAJ). At FAJ, he worked on domestic fisheries management, international fisheries trade policy, and fisheries negotiations with the (then) Soviet Union, Canada, South Korea, and U.S.A. Junichiro participated in deliberations of numerous organizations including the Organization for Economic Co-operation and Development, Inter-American Tropical Tuna Commission, International Whaling Commission, Convention on the Conservation of Antarctic Marine Living Resources, and General Agreement on Tariffs and Trade. He was Division Director of Agriculture and Fisheries at the Japan External Trade Organization in New York and served as Deputy Secretary General of the Southeast Asian Fisheries Development Center in Bangkok. His broad experience with international fisheries organizations has deepened his fondness for travel abroad. Since retiring from Hokkaido University in 2013, he has been serving as an Executive Managing Director at the Japan Overseas Fishing Association in Tokyo. Junichiro has been a Representative of Japan to NPAFC since 2009 and was elected NPAFC President in 2014.
Freedom of Fishing on the High Seas, and the Relevance of Regional Fisheries Management Organisations (RFMOs)

By Stefán Ásmundsson
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The following article is available on the website of the North East Atlantic Fisheries Commission (NEAFC) http://www.neafc.org and is reproduced here with permission of the author. The NEAFC is a regional fisheries management organisation in the Northeast Atlantic, with a convention area that covers the area from the southern tip of Greenland, east to the Barents Sea, and south to Portugal. The Contracting Parties include Denmark, European Union, Iceland, Norway, and the Russian Federation. The paper discusses the relevance of conservation measures of a regional fisheries management organisation, such as NPAFC, to both members and non-members of the organisation.—Editor

Introduction

International law significantly limits the right of States to authorise their nationals to engage in fishing on the high seas. This right is subject to conditions such as setting appropriate conservation and management measures and cooperating with other relevant States. Management of high seas fisheries is in many areas done through competent regional fisheries management organisations (RFMOs), who thereby play a key role in high seas fisheries and whose measures are relevant for all States, including non-members.

Nevertheless, there is not a full understanding of this among those who take part in discussions, and write reports, on ocean issues. It is too common to hear and see claims that a near absolute freedom to fish on the high seas constitutes a severe problem, and that RFMOs cannot be a sufficiently effective tool to deal with this problem as their measures are only relevant for the States that are formal members of the relevant RFMO.

This short overview is intended to explain the legal reality in a not-too-technical manner, in an attempt to improve the general understanding of these issues. It presents a summary with clear conclusions in this regard.

UN Fish Stocks Agreement

The UN Fish Stocks Agreement2 (UNFSA) is the international legal instrument that most explicitly establishes the rule that conservation and management measures established by RFMOs are relevant for all States, not only the members of the relevant RFMO. Article 8(3) reads in part: “Where a subregional or regional fisheries management organization or arrangement has the competence to establish conservation and management measures for particular straddling fish stocks or highly migratory fish stocks, States fishing for the stocks on the high seas and relevant coastal States shall give effect to their duty to cooperate by becoming members of such organization or participants in such arrangement, or by agreeing to apply the conservation and management measures established by such organization or arrangement.”

In 1998 Stefán Ásmundsson graduated with distinction from Lancaster University, UK, with a Masters degree (LLM) in international law and international relations. In his studies he placed an emphasis on the international legal framework of fisheries. He was employed by the Icelandic Ministry of Fisheries as a Director from 2003. There he worked on various fisheries related issues, mainly involving international aspects, including being Iceland’s Head of Delegation to the North East Atlantic Fisheries Commission (NEAFC). He served as President of NEAFC from 2007 to 2009. Stefán also served as a Policy Officer with the European Commission from 2009 to 2011, working on the reform of the European Union’s Common Fisheries Policy. He took up the post of Secretary of NEAFC on 1 July 2011.

1The author is the Secretary of the North East Atlantic Fisheries Commission (NEAFC) and has previously served as a Legal Adviser and a Director in the Icelandic Ministry of Fisheries and Agriculture and as a Policy Officer in the European Commission. All opinions and statements are those of the author and do not necessarily represent the position of NEAFC or its Contracting Parties.

The NPAFC Convention specifies these conservation measures for fishing activities in the (NPAFC) Convention Area:

(a) prohibit directed fishing for anadromous fish (with the exception of scientifically reviewed and approved research fishing);
(b) reduce to the maximum extent possible the incidental taking of anadromous fish;
(c) prohibit retention of anadromous fish on board a fishing vessel that has taken anadromous fish incidentally while fishing for other species.

Furthermore, the Convention provides that 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.—Editor

Article 8(4) of UNFSA gives teeth to this provision: “Only those States which are members of such an organization or participants in such an arrangement, or which agree to apply the conservation and management measures established by such organization or arrangement, shall have access to the fishery resources to which those measures apply.” This makes it absolutely explicit that States that do not fulfil either of these two conditions do not have a freedom to fish on the high seas.

Furthermore, article 8(5) provides that where there is no RFMO to establish conservation and management measures for a particular straddling fish stock or highly migratory fish stock, relevant coastal States and States fishing on the high seas for the stock in the subregion or region shall cooperate to establish such an organization or enter into other appropriate arrangements to ensure conservation and management of such stock and shall participate in the work of the organization or arrangement.

UNFSA now has more than 80 Parties (correct as of 30 January 2014), which include most of the world’s major fishing States. There has been an average of three new Parties per year over the past decade, following a surge of new Parties prior to that. Suggestions that UNFSA’s relevance is limited due to a lack of Parties are therefore not appropriate. Consequently, suggestions that measures adopted by RFMOs have a limited relevance for those States that are not members of the relevant RFMO are not appropriate either.

The provisions of UNFSA quoted above are as clear as they can be. Where an RFMO has competence, States that intend to authorise fishing shall become members of the RFMO or agree to apply the measures the RFMO establishes. Otherwise they are not fulfilling their obligations and do not have a right to authorise their nationals to fish. The relevance of RFMOs for non-members could hardly be greater: States that are not members of a relevant RFMO are legally obliged to apply the measures it establishes.

The simplicity and clarity of this provision makes it almost superfluous to say anything more on the subject. Noting the clarity of this provision and the number of Parties to UNFSA should really be sufficient to correct anyone who makes claims regarding the right to fish on the high seas being almost without limits and the measures established by RFMOs being relevant only for its members.

UNFSA includes further limits to the freedom of the high seas. This involves issues such as the precautionary approach and the compatibility of conservation and management measures. This overview will not go into the details of these, as it is not necessary to demonstrate the fact that UNFSA clearly limits the freedom of the high seas, and makes RFMOs relevant for non-members. It should nevertheless be noted that the limits that UNFSA sets on the freedom to fish on the high seas are actually greater than those that are covered in this overview.

However, while acceptance of UNFSA is widespread and continues to grow, it is not universal. It may therefore be useful to demonstrate also the limitations of the right to fish in the high seas, and the relevance of RFMOs for non-members, for those States that have not accepted UNFSA. The fact is that while UNFSA is more explicit in this context, the generally accepted international law of the sea also significantly limits the right to fish in the high seas and makes RFMOs relevant for non-members.
**UN Convention on the Law of the Sea**

The 1982 UN Convention on the Law of the Sea (UNCLOS) is as close as it is possible to get to have a generally accepted set of laws that apply to fisheries related issues. The Convention has 166 Parties (correct as of 30 January 2014), and the States that are not Parties generally accept the parts relating to fisheries as customary international law. The UNCLOS provisions relating to fisheries therefore constitute generally accepted international law to an extent that is very uncommon for international agreements.

The following parts of this overview will go through the relevant provisions of UNCLOS, item by item. References to particular articles will be references to articles of UNCLOS, unless otherwise stated.

**Freedom of the high seas**

The freedom of the high seas is one of the important principles of UNCLOS. However, it is very important to note that this freedom is not absolute. In fact, it has significant limitations. The freedom of the high seas is set out in article 87.

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**UNCLOS Article 87**

**Freedom of the high seas**

1. The high seas are open to all States, whether coastal or land-locked. Freedom of the high seas is exercised under the conditions laid down by this Convention and by other rules of international law. It comprises, inter alia, both for coastal and land-locked States:
   (a) freedom of navigation;
   (b) freedom of overflight;
   (c) freedom to lay submarine cables and pipelines, subject to Part VI;
   (d) freedom to construct artificial islands and other installations permitted under international law, subject to Part VI;
   (e) freedom of fishing, subject to the conditions laid down in section 2;
   (f) freedom of scientific research, subject to Parts VI and XIII.

2. These freedoms shall be exercised by all States with due regard for the interests of other States in their exercise of the freedom of the high seas, and also with due regard for the rights under this Convention with respect to activities in the Area.

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The wording of the sub-items in paragraph 1 is of two different types. One type states that there is freedom for a specific activity (e.g. navigation), and says nothing more. Therefore, only the general limitation applies. The other type explicitly states that the freedom of the high seas is subject to specific limitations that are set out in other parts of the Convention. The freedom of fishing on the high seas is among the activities that are clearly limited in this manner. UNCLOS states that while there is such a thing as the freedom of fishing on the high seas, it is “subject to the conditions laid down in section 2”, and thereby clearly not absolute but limited.

The obvious next step is then to examine what limitations this refers to. Article 87 is in section 1 of Part VII of UNCLOS. The statement that the freedom of fishing in the high seas is subject to the conditions laid down in section 2 therefore refers to section 2 of Part VII, which contains articles 116-120.

**Limitations of the freedom to fish on the high seas**

Article 116 explicitly establishes that the right of States to authorise their nationals to fish on the high seas is subject to specific limitations. This means that States simply do not have the right to authorise their nationals to fish on the high seas unless they fulfil the conditions.

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**UNCLOS Article 116**

**Right to fish on the high seas**

All States have the right for their nationals to engage in fishing on the high seas subject to:

(a) their treaty obligations;
(b) the rights and duties as well as the interests of coastal States provided for, inter alia, in article 63, paragraph 2, and articles 64 to 67; and
(c) the provisions of this section.

It is important to note in particular the use of the words “subject to“. This means that the right to fish is only effective if the conditions in the sub-paragraphs are met. This is fundamentally different from an obligation to “take account of”, “note” or any other softer language. High seas fishing by vessels flying the flag of a State that does not fulfil the conditions in the sub-paragraphs of article 116 is simply illegal fishing according to generally accepted international law.

Before summarising, one should examine each of the conditions set out in article 116, to conclude on exactly what conditions a State must fulfil before it can legally authorise its nationals to engage in fishing on the high seas.

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Paragraph 2 sets out a general limitation regarding affecting the rights of others. This could on its own be of great significance for fisheries as they are the utilisation of limited resources which affect all other users of the resource. However, the other limitations relevant to fisheries are quite explicit, and there is therefore no need in this overview to go into a discussion on possible interpretations of this general obligation to take account of the rights of others.
“their treaty obligations” (article 116(a))

Any obligation undertaken by a State can be relevant in this context. This can include any treaty obligation, including obligations relating to membership of an RFMO. However, this limitation is only relevant for the States that are parties to the relevant treaty and this overview will therefore not examine this provision in any further detail.

“the rights and duties as well as the interests of coastal States provided for, inter alia, in article 63, paragraph 2, and articles 64 to 67” (article 116(b))

This wording is unusual in treaty law, as it refers not only to rights and duties but also to interests, which can be more difficult to define. Furthermore, while there is a reference to articles 63-67, the phrase “inter alia” makes it clear that the reference does not constitute an exhaustive list. This overview will not go into a discussion regarding what rights, duties and interests of coastal States are relevant, or regarding how interests should be defined in this context. It will make do with considering only the provisions that are explicitly referred to, and the rights and duties they establish. However, it is worth noting that this can be considered to be a minimalistic approach, as the wording refers to further limitations than the ones looked at here.

Article 63(2)

Article 63(2) establishes the general rule that where a stock occurs both in areas within and beyond national jurisdiction, all coastal States and States fishing for the stock in the high seas shall seek to agree on conservation and management measures. This principle is generally known as the duty to cooperate, and it means that a State that has not sought to reach an agreement on the management of a stock does not have the right under international law to authorise its nationals to fish for it in the high seas.

It should also be noted that the provision explicitly mentions that efforts to reach agreement on management should be “either directly or through appropriate subregional or regional organizations”. It follows from this that in cases where an RFMO has competence to set management measures for a fish stock, it is natural for these consultations to take place through that RFMO.

The conclusion is that where an RFMO has competence to set management measures for a stock that occurs both in areas within and outside national jurisdiction, no State can legally authorise its nationals to fish for the relevant fish stock without approaching the RFMO and seeking to reach an agreement through it. It would presumably also be consistent with international law to approach each member of the RFMO individually on a bilateral basis, but going through the RFMO would seem to be a more natural way to proceed. High seas fishing for a stock that occurs both in areas within and outside national jurisdiction by vessels flying the flag of a State that has not sought agreement through a relevant RFMO, or through a series of bilateral initiatives with all the members of the RFMO, is simply illegal fishing according to generally accepted international law.

This makes measures set by a competent RFMO very relevant for non-members, either directly in their cooperation with the RFMO or indirectly through their bilateral cooperation with the members of the RFMO, where the measures would inevitably form a basis.

Articles 64-67

Articles 64-67 relate to specific types of species: highly migratory species, marine mammals, anadromous stocks and catadromous species. Rather than establishing general rules, they contain provisions that apply explicitly to the relevant type of species. For the purposes of this overview, there is not a need to go into detail regarding these articles. However, it should be noted that they do not in any way undermine the duty to cooperate or the rule of using international organisations as a tool to give effect to that duty. On the contrary, they can be seen as strengthening the view that international organisations such as RFMOs are the appropriate tool for giving effect to the duty to cooperate.

“the provisions of this section” (article 116(c))

Paragraph (c) of article 116 establishes that the right of States to authorise their nationals to fish in the high seas is subject to the other provisions of section 2 of Part VII, i.e. articles 117-120. This means that a State that does not fulfil the obligations established in articles 117-120 does not have the legal right to authorise its nationals to fish on the high seas. It is therefore worthwhile to look individually at each of these provisions.
Article 117 creates an explicit obligation to set conservation measures. High seas fishing by vessels flying the flag of a State that has not taken, or cooperated with others in taking, the appropriate conservation measures is simply illegal fishing according to generally accepted international law.

**UNCLOS Article 117**

_Duty of States to adopt with respect to their nationals measures for the conservation of the living resources of the high seas_

All States have the duty to take, or to cooperate with other States in taking, such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas.

Directly related to this is the limitation in article 119, which elaborates further on the conservation of the living resources of the high seas. Due to the phrase “subject to” in article 116, one can again conclude that States may only authorise high seas fishing if the conservation measures they take are consistent with article 119. This explicitly includes setting allowed catch levels on the basis of the best scientific evidence available, contributing and exchanging scientific and fisheries data through competent international organisations, and taking account not only of the target species but also species associated with or dependent upon them. High seas fishing by vessels flying the flag of a State that has not taken such measures is simply illegal fishing according to generally accepted international law.

A common way of meeting the obligations under articles 117 and 119 is to work within RFMOs. RFMOs are not necessarily the only option in this context and other arrangements can also be valid. However, in areas where an RFMO has competence to set the appropriate measures, it can be seen as the natural forum for meeting these obligations.

**UNCLOS Article 118**

_Cooperation of States in the conservation and management of living resources_

States shall cooperate with each other in the conservation and management of living resources in the areas of the high seas. States whose nationals exploit identical living resources, or different living resources in the same area, shall enter into negotiations with a view to taking the measures necessary for the conservation of the living resources concerned. They shall, as appropriate, cooperate to establish subregional or regional fisheries organizations to this end.

Article 120 establishes that the provisions on marine mammals in article 65 also apply in the high seas. This is not relevant for this overview, so the details will not be examined here.

Article 118 is the last provision that is explicitly referred to in article 116 as a limitation to the right to fish in the high seas. This article is very important for this overview.

Article 118 establishes the so-called duty to cooperate, which was already mentioned in the context of article 63(2). While article 63(2) applies to stocks that occur both within areas under national jurisdiction and in the high seas, article 118 applies to all high seas fishing and ensures that the duty to cooperate applies to all living resources that occur on the high seas.

Again, due to the wording “subject to” in article 116, States that do not fulfil the provisions of article 118 do not have a right to authorise their nationals to fish on the high seas. This means that high seas fishing by vessels flying the flag of a State that does not cooperate with other relevant States in conservation and management is simply illegal fishing according to generally accepted international law.

Of crucial importance for the purposes of this overview, and for the relevance of RFMOs, is that article 118 explicitly mentions as relevant States in this context all States who fish for the same resources or different resources “in the same area”. This means that States intending to authorise high seas fishing must not only consult those who conduct the same activity as they intend to conduct, and the States within whose jurisdiction the resources occur, but also all those who engage in fishing in that area. In areas where an RFMO has competence, this generally means for practical purposes that they must cooperate in conservation and management with all the members of that RFMO.

Article 118 also provides that States fishing in the high seas shall, as appropriate, cooperate to establish subregional or regional organisations to conduct this conservation and management. However, it does not explicitly state that States must take part in such organisations where they exist to be considered as having fulfilled their duty to cooperate. In this regard, one can say that article 8(3) of UNFSA, discussed above, goes further. However, it may be a natural reading of the text that where relevant States have established an organisation as explicitly called for in article 118, this organisation be considered the appropriate forum for fulfilling the duty to cooperate.
In any case, article 118 is very clear in making it a condition for allowing high seas fishing that the relevant State cooperates with not only those who fish for the same resources, but all States whose nationals conduct fishing in the same area. Leaving aside the question of legal obligation to cooperate with an RFMO, the most straightforward way to achieve this cooperation is through the relevant RFMO. The duty to cooperate is explicitly there in article 118 and non-membership of an RFMO does not absolve any State of this explicit condition for allowing nationals to engage in high seas fishing.

In areas where there is a competent RFMO, the participating States fulfil their duty to cooperate through it. One can hypothetically argue that the duty can be fulfilled without cooperating with the RFMO, through a series of bilateral cooperation with all the relevant States. However, to do this in practice would be far from simple.

Measures set by RFMOs are clearly very relevant for non-members in either case. Such measures will either be the basis of their cooperation with the relevant RFMO or the basis of their bilateral cooperation with the members of the RFMO.

The conclusion of the examination of article 118 is that high seas fishing in an area where a relevant RFMO has competence, by vessels flying the flag of a State that neither cooperates in conservation and management with the RFMO nor on a bilateral level with all members of that RFMO, is simply illegal fishing according to generally accepted international law.

Conclusion

The conclusion of this overview is that the right of States to authorise high seas fishing is significantly limited by international law and that the conservation and management measures established by RFMOs are relevant for all States, including those that are not members of the relevant RFMO.

The main points can be summarised as follows:

- UNFSA establishes very explicitly that States shall either join competent RFMOs or, if they are not members, apply the measures that the relevant RFMO sets.
- UNFSA further provides that only those States which fulfil either of these conditions shall have access to the relevant fishery resources.
- UNFSA includes further limits to the freedom of the high seas. This involves issues such as the precautionary approach and the compatibility of conservation and management measures.
- UNFSA is widely accepted, with more than 80 Parties that include most major fishing States. Criticism based on it not being sufficiently widely accepted to be looked at as a major source of international law for high seas fishing is therefore unfounded.
- Even without taking account of UNFSA, the conclusion still stands that under international law the freedom of high seas fishing is significantly limited and RFMO measures are relevant for all States.
- The parts of UNCLOS that relate to fishing are generally accepted as customary international law and are therefore binding on all States.
- Article 87 of UNCLOS explicitly limits the freedom of fishing on the high seas. High seas fishing by vessels flying the flag of a State that does not fulfil the conditions set in UNCLOS is simply illegal fishing.
- UNCLOS establishes that States may not authorise their nationals to engage in fishing on the high seas unless they take the appropriate conservation measures.
- UNCLOS establishes that States must cooperate in conservation and management with those which are involved in fishing in the same area, regardless of whether they fish for the same resources or not.
- In areas where a RFMO has competence, the measures it adopts affect non-members either directly in their cooperation with the RFMO or indirectly as the basis for cooperation at a bilateral level with the members of the RFMO.
Post-Tsunami Salmon Research and Education in Iwate Prefecture, Japan

By Syuiti Abe
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Iwate is one of the prefectures in the Sanriku region, located on the Pacific coast of northern Honshu or Tohoku, Japan, where a massive earthquake and devastating tsunami destroyed many fishing villages and towns on March 11, 2011. Immediately after the catastrophe, Iwate University instituted the university-wide Organization for Revitalization of the Sanriku-Region and decided to establish a new Graduate School of Fisheries Science in spring 2016 to promote rehabilitation of the fisheries industry in Sanriku. To help accomplish this goal, the University dispatched a delegation to domestic and foreign universities and research institutions to learn about advanced fishery research and education systems.

On a sunny morning in late July 2014, a small group of us from Iwate University visited the NPAFC Secretariat in downtown Vancouver to exchange information of mutual interest on Pacific salmon issues and discuss the launch of the new graduate school at Iwate University. Fortunately, Executive Director Vladimir Radchenko, our dear Administrator, Wakako-san, and two other young ladies working for the office were present to welcome us. For about two and half hours, we discussed many Pacific salmon issues and the current situation for rehabilitating people’s lives and industries in Sanriku. We greatly appreciated the deep sympathy and warm concern about the people in Sanriku shown by the office staff. There was keen interest in our endeavor.

Iwate University and the Sanriku Fisheries Research Center

Iwate University is located in Morioka City, the capital of Iwate Prefecture, and situated about 500 km north of Tokyo in the Tohoku region. Iwate University was established in 1949 as a national university and inaugurated into a national cooperation along with 86 other national universities in 2005. Iwate University’s faculties and graduate schools include Humanities and Social Sciences, Education, Engineering, and Agriculture. The University’s enrollment is currently over 6,000 students with 800 administrative and teaching staff.

Born as an agricultural school in inland Iwate Prefecture, Iwate University has never oriented itself academically to fishery science and fisheries on the Pacific coast of the prefecture. However, the 2011 catastrophe caused the University to chart a new course so it could contribute to the rehabilitation of coastal fisheries industries.
In April 2013 Iwate University established the Sanriku Fisheries Research Center (SFRC) in Kamaishi, one of five cities on the coast, as a center of fishery education and research in the Sanriku region. The Center is a two-story building (1,900 m²) with wet laboratories for fish rearing and processing on the first floor and dry laboratories for molecular biosciences and food sciences on the second floor. The SFRC will become a center for education and research of fisheries science in our new graduate school and undergraduate course.

Salmon production before and after the catastrophe in Iwate

Iwate rivers produce chum and masu, with the masu run being roughly one-tenth to one-twentieth the size of the annual chum salmon run. Artificial propagation is carried out mainly for chum salmon. Historically, chum salmon enhancement in Iwate dated as early as the middle of the 18th century, with catch regulation and fry protection for preserving homing fish in the Tsugaruishi River. The earliest artificial chum propagation began with construction of a hatchery on this river in 1905. Full-scale hatchery operations in Iwate started in 1992 after construction of 28 hatcheries on 27 coastal rivers. The number of fry released was 46 million in 1970 and increased to 0.44 billion in 1988. This high level of fry releases was maintained until 2010, one year before the catastrophe. The total chum salmon catch, including inshore set net and river catch, was about one million in the 1970s, ten million in the 1980s, and reached the maximum, 24 million, in 1996. The chum catch rapidly decreased to about 7 to 10 million in subsequent years, but suddenly dropped to 5.6 million in 2010. Moreover, the catastrophic year 2011 had the worst chum salmon run, 2.8 million, ever recorded since the start of full-scale hatchery operations in 1992. The earthquake and tsunami hit 23 of 28 hatcheries before fry were released and the fry reared at tsunami-hit hatcheries were likely totally lost.

Most of the damaged hatcheries were reconstructed by autumn 2011 with the monumental effort of the people involved (see Newsletter No. 32: 1-3). The number of fry released was 0.32 billion in 2012, 0.37 billion in 2013, and 0.40 billion in 2014 due to the low level of salmon returning in 2011 and in subsequent years, i.e., 3.2 million in 2012 and 5.2 million in 2013.

According to recent salmon statistics in Iwate, the return of particular year classes of chum salmon includes about 10% 3-year olds, 60% 4-year olds, 30% 5-year olds, and a few 6-year old fish. Chum salmon returns in 2014 seem to be at a similar level to 2013, with 4.4 million returning by December 10, due to an unusual predominance of 5-year old fish. The number of 4-year old fish, which is the major year class returning every year, was greatly depressed especially in hatcheries hit by the 2011 tsunami and returns of 5-year old fish are expected to decrease in 2015.

People are quite anxious about future chum salmon runs. As there was a minimal number of fry released in 2011 and releases have been relatively low in the years following, this will adversely influence salmon returning in 2015 and subsequent years.
Goal of salmon research and education at Iwate University

Chum salmon is the main fishery species of the Iwate coast. All the coastal fishery cooperatives rely on chum salmon catches, which is more than 60-80% of the annual revenue in each cooperative. Therefore, it is clear that rehabilitation of the fisheries industry in Iwate depends heavily on recovery of the chum salmon fishery. The SFRC aims to help sustain the chum salmon fishery by conducting genetic identification of major stocks, if there are any, which chiefly contribute to salmon returns. If such stocks are found, then we can propose an effective resource management plan for those stocks, which will help improve current hatchery operation and optimize the salmon enhancement strategy in Iwate and other prefectures in Sanriku.

In addition to genetic work, production of healthy fry and understanding the early inshore life history of fry are necessary for increasing future salmon return rates. Besides these basic investigations, we plan to nurture students to work in fisheries industries and related sectors as a “fisheries promoter”, someone capable of overlooking the whole system of aquatic food supply with an expertise of one or more fields, such as fishing, aquaculture, processing, economics, or marketing. A fisheries promoter is expected to help stimulate fisheries innovation, such as direct marketing by fishermen themselves. With help of a promoter, for example, salmon and its processed products will have more commercial value than before, and this in turn will accelerate rehabilitation of salmon fisheries and local societies hit by the tsunami. Thus, we will set salmon as one of the major targets of research and education in the new graduate school and undergraduate course at Iwate University.

Chum salmon is a common, important fishery resource in the North Pacific. Therefore, international cooperation is a prerequisite for conservation and management of chum salmon resources. In this sense, our graduate school orientation towards salmon science should work together with NPAFC and other international organizations of fisheries science. We would be happy to have the criticisms and comments of our colleagues in the world salmon community regarding the above-mentioned endeavor of Iwate University.
Background

Chum salmon is one of the important fish resources for Japanese commercial fisheries. Salmon catches generally occupy a position within the first ten species-groups of the most harvested fish in the whole country, accounting for about 5% in 2013 (Fig 1). Of the total salmon catch, chum salmon represents about 95% and pink salmon about 4%. Chum salmon are mainly captured from late August to December in the coastal waters of northern Japan, when adult salmon migrate toward their natal rivers to spawn. In some regions, commercial chum catches continue through January or February.

Management of the salmon fishery falls under provincial jurisdiction. For example, in Hokkaido (the highest salmon producing area in Japan) the Governor granted more than 900 set-net licenses in 2014. Set-nets are commonly used for salmon fishing, and they are anchored along the shore to capture migrating adults. These licenses, which are effective for five years, almost entirely encompass the island coastline of Hokkaido (Fig 2).

Although a large portion of chum salmon are harvested in coastal waters due to high fishing pressure, fish that escape the coastal fishery are captured in their natal rivers (Fig 3). These in-river catches help to supply eggs for hatcheries and provide incomes to hatchery organizations and freshwater fishermen’s cooperatives. At present, about 250 salmon hatcheries produce about 1.6-1.9 billion chum salmon fry every year in northern Japan. This is nearly 40% of the annual releases from hatcheries around the Pacific Rim.

To maintain chum salmon resources for commercial fisheries in Japan, it is important to achieve the annual planned number of chum releases in each river system (i.e., by each hatchery). At the same time, however, it cannot be denied that such mass hatchery releases may cause risks to the sustainability of this species from a long-term viewpoint. To evade or minimize the risks accompanied with hatchery releases, biological monitoring is indispensable for Japanese chum salmon.

Monitoring unit

Hatchery releases of chum salmon contribute to maintaining the fisheries resources of this species in Japan. In all rivers where salmon production is enhanced, data about adult chum catches, eggs taken for hatcheries, chum fry production, time and average
size at release, and the numbers of chum fry released are recorded. This information is first collected at each hatchery organization or fishermen’s cooperative, then gathered at the prefectural level, and finally assembled for the whole country by three National Institutes of the Fishery Research Agency (Hokkaido National Fisheries Research Institute, HNFRI; Tohoku National Fisheries Research Institute, TNFRI; and Japan Sea National Fisheries Research Institute, JSNFRI).

Recent studies on the genetic structure of Japanese chum salmon suggest that seven regional groups exist in Japan. Five of these groups are in Hokkaido and two are in Honshu (4, 5; Fig. 4). Based on these regional groups, HNFRI, TNFRI, and JSNFRI monitor biological characteristics of returning adult chum salmon in several rivers with enhanced salmon production in each regional group. Data on body size (fork length and weight) and age (determined from scales) are fundamental biological characteristics and they are routinely obtained from about 100 fish collected at 10-day intervals throughout the upriver migration.

At rivers where chum fry are released with thermal marks, the otoliths are collected for detection of the marks. Data on fecundity and egg size of female chum salmon and fish pathogens are occasionally surveyed in some rivers. These surveys, particularly for fecundity and egg size information, have not been always been carried out for the same river populations, but they are conducted on populations within each regional group every year. In 2013, for example, body size information and scales samples were collected from more than 40,000 fish from 47 production-enhanced rivers, otoliths were obtained from more than 10,000 fish from 10 rivers, and data on fecundity and egg size were acquired from about 1,200 fish from 12 rivers.

Furthermore, genetic samples from adult chum salmon are collected from some major rivers, with the populations varying each year. The objective of genetic monitoring is to maintain surveillance of the genetic structure and diversity of each of the regional groups.

Although the intensity of surveys (i.e., sample size and sampling frequency) has changed over time, some of the data series, such as body size and fish age, have been monitored as far back as the 1940s, or even earlier for some populations. But large portions of the earlier monitoring data remain as handwritten texts, and scale samples kept as acetate cards are often damaged. An intensive archiving process will be necessary in the future to preserve and provide access to this historical data.
The current monitoring scheme evolved gradually in the early 1990s, and some collected data for the years 1994-2005 were published in the *Salmon DataBase*. For enhanced user convenience, the *Salmon DataBase* is available in electronic format starting from the 2006 survey year. Access to the electronic data is limited to data users/providers, such as provincial governments or provincial research institutes. Due to the East Japan Earthquake on March 11, 2011, there are some gaps in the data, or data authorization may be delayed in some provinces, which consequently makes it difficult to compile monitoring data for the whole country.

**Utilization of monitoring data**

Firstly, the current year’s data are used to evaluate the status of returning chum salmon. Through the fishery season each year, the number of chum salmon caught in coastal fisheries, in rivers, and the amount of fish used for hatchery egg collection are compiled as a monthly flash report by each province or by smaller regional-scale jurisdictions in northern Japan. The monthly report is available on the HNFRI web page. In addition, some short reports on the status of chum salmon, such as age composition and body size, are also available monthly on the HNFRI web page.

Next, the data collected through the whole season are used to develop a forecast for the next year’s chum salmon returns. A sibling method is commonly used to forecast the chum salmon run. The sibling method is one in which the expected number of fish returning at age $t$ in year $i$ is calculated from the actual number of fish returning at age $t-1$ last year $i-1$ (from the same year-class or brood year) based on a regression between the number of fish returning at age $t-1$ and age $t$ for the particular region. In some provinces, forecasts are produced on a provincial scale. HNFRI provides a forecast at larger regional scales, such as Okhotsk coast, Pacific coast, and Sea of Japan coast.

As a final step, all the monitoring data, particularly the amount of coastal and in-river catches, the quantity of fish used for egg-taking, and hatchery fry release data, are aggregated and authorized by the relevant provinces. After authorization the information is placed in the *Salmon DataBase*, where it can be utilized for a variety of salmon research investigations.

Recently, 1994-2008 chum salmon biological data obtained from the *Salmon DataBase*, such as the timing of peak upriver migration, body size, age at maturity, egg size, and fecundity, were compared among the seven regional groups that are recognized to be genetically different (6). Results showed that regional differences were statistically detected for almost all the
characteristics examined. This suggests that regionally distinguishable biological traits are still present over the wide range of stocks in Japan, despite the large hatchery releases over a long time period, and the long-distance transplantsations which were frequently done in the 1970s-1980s. In addition, these characteristics often show geographical transitions along a latitudinal gradient. For example, Fig. 5 shows the geographical transition of peak timing in upriver migration. Although the transition is not clear in stocks from along the Okhotsk coast, the peak of upriver migration for stocks along the Pacific coast is later for those located at 39-40°N then for stocks located at either higher or lower latitudes. For stocks along the Sea of Japan coast, the peak timing is clearly different in the two regional groups separated by the Tsugaru Strait (41°30’N, 140°40’E).

Recent biological characteristics are not always the same as those previously observed. Machidori (7) investigated the timing of chum salmon upriver migration for stocks along the Sea of Japan coast of Honshu during 1970 and 1974. He reported that chum stocks from the Ira River to the Nezugaseki River appeared to have the most delayed timing of upriver migration compared to more northerly or southerly stocks (Fig. 6). His observations are similar to the latitudinal change observed in stocks along the Pacific coast of Honshu today (Fig 5). The recent data demonstrate the timing of upriver migration is earlier in many stocks as compared with the early 1970s and any latitudinal variance in run timing that existed previously has since disappeared (Fig. 6).

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**Fig. 6.** The timing of peak chum salmon upriver migration along the Sea of Japan coast of Honshu. Green points are based on 1970–1974 data and bars indicate the range when two-thirds of the annual catch was caught (7). Red points are based on 1994-2008 data and indicate the mode when 50% of the catch was caught (6). Figure modified from Fig. 3 (7).
Examples of various types of weirs used in Japan to capture adult chum salmon in rivers. They are made of nets (weir 1), wood and bamboo (weir 2), steel (weir 3), and a fish wheel (weir 4).

Photo credits: Weir 1, 2, and 4 FRA (HNFRI), Weir 3 T. Saito

Machidori (7) observed that the latitudinal change in run timing existed along both the Sea of Japan and Pacific coasts of Honshu. However, the latitudinal component in the variation in run timing is now reduced in Honshu stocks located along the Sea of Japan due to changes in the run timing of populations from that area. In this region, early-run chum salmon were transplanted from Hokkaido during the 1970s and 1980s to increase salmon production. Artificial manipulation is considered to be a principal cause of the change in run timing. To conserve regional stocks of chum salmon, long-distance transplants are now restrained. But the results of past alterations of population structures often remain in present and future generations.

Sea water temperatures are higher along the Honshu coast of the Sea of Japan than other regions where chum inhabit, such as the Okhotsk and Pacific coasts. Advanced run timing may expose adult chum salmon returning to the Sea of Japan to higher water temperatures, particularly in the future as global warming becomes more serious. To see the signs of potentially harmful changes in chum stocks, monitoring of today’s biological characteristics and comparing this to data from the past is indispensable.
Marine monitoring
The HNFRI conducts two types of the marine monitoring for chum salmon—one is coastal and the other is offshore.

Coastal monitoring
Today's coastal monitoring program began in the late 1990s (about 1997), when previous research studies for juvenile salmon were coalesced. There are two coastal monitoring areas off Hokkaido.

One monitoring area is near the town of Atsuta (43°23’55”N, 141°25’57”E), located on Ishikari Bay. At Ishikari Bay, the Ishikari River, the longest river in Hokkaido (268 km), discharges into the Sea of Japan. This river is well known as the most important river for salmon enhancement along the Sea of Japan coast of Hokkaido. A tributary of the Ishikari River is the Chitose River, where HNFRI’s salmon hatchery and Chitose Field Station (CFS) are located. At the hatchery, about 30 million chum salmon juveniles are produced annually, and all the fish are released with otolith thermal marks. Because the CFS is the only salmon hatchery in the Ishikari River system, many of juvenile salmon collected in the coastal waters off Atsuta in April through June originate from the CFS. Recently, a relationship between juvenile CPUE (catch per unit effort) in the coastal area off Atsuta and the number of their adult returns to the Chitose River was discovered (8). This suggests that the brood-year strength of Chitose River fish is determined during the period of time between release from the hatchery and the first few months after sea entry. The monitoring data collected at Atsuta serves to understand the mortality processes of juvenile salmon during their early ocean life.

The second coastal monitoring area is near the town of Konbunori (42°57’10”N, 144°31’51”E), located on the Pacific coast of eastern Hokkaido. Juvenile chum salmon are collected from mid-June to mid-July every year with a two-boat surface trawl. At Atsuta the body size of chum juveniles are mainly < 70 mm fork length (FL), but at Konbunori juvenile body size ranges from 70 to 100 mm FL, or more. This indicates that juvenile chum salmon caught off Konbunori are survivors of the mass mortality phase of early ocean life and they are migrating toward the Sea of Okhotsk, which is the nursery area of Japanese chum salmon after leaving coastal waters. A variety of otolith thermally-marked juveniles originating from rivers on Hokkaido, the Pacific coast of Honshu, and even those migrating from the Honshu’s Sea of Japan coast are recaptured in the coastal waters off Konbunori. The monitoring program and related research have discovered that juvenile chum salmon originating from the rivers on the Sea of Japan coast of Honshu migrate toward the Sea of Okhotsk by moving through the Tsugaru Strait and traveling along Hokkaido’s Pacific coast. Thus, the coastal waters off Konbunori are now regarded as an important migration corridor for Japanese chum salmon. Monitoring juveniles at Konbunori enables us to observe migration timing of fish originating from several regions of northern Japan.

The juvenile chum salmon are densely distributed close to shore, and the monitoring surveys at Atsuta and Konbunori are conducted in a very narrow zone within 10 km of shore. Because of the surveys’ proximity to the shoreline, they overlap with coastal fishing areas for set-nets, gill nets, octopus pots, etc. Therefore monitoring surveys are conducted with the assistance of fishermen who have expert local knowledge. Their assistance is crucial to the past and future success of the monitoring surveys.
Offshore monitoring

The Bering Sea is a well-known rearing area for immature chum salmon (age 0.1 and older) originating from both Asia and North America. Ecosystem dynamics, including physical oceanography (such as water temperature), biological changes (such as feeding conditions), and interactions with other species, all play an important role in determining the growth and survival of chum salmon in the Bering Sea.

Japanese research vessels have monitored the condition of Pacific salmon stocks since 1952, and HNFRI started a new offshore monitoring program in the Bering Sea in 2007 using the R/V *Hokko maru* (902 gross tons). The offshore monitoring survey is carried out in July and August every year at 17 stations in the central Bering Sea (Fig. 7). At each station, data on physical oceanography (vertical profiles of temperature and salinity) and samples of macrozooplankton, salmonids, and other pelagic fish are collected. Fish samples are collected during daytime with a surface trawl that is towed for one hour at a speed of approximately 5 knots. The trawl net collects fish from the surface to about 30 m depth. For salmonids, basic information is collected on body size (fork length and weight), sex, and gonad weight, and scales are removed for age-determination. In addition, samples of body tissues are collected for genetic stock identification, and otoliths of chum salmon are obtained for detection of thermal marks. Occasionally, stomach samples are also collected.

![Fig. 7. The location of offshore monitoring trawl survey stations for salmonids in the central Bering Sea. These operations have been conducted in July-August by the Japanese research vessel *Hokko maru* since 2007.](image)

![Fig. 8. Scaled mass index (grams) of chum salmon obtained from central Bering Sea surveys, 2007-2009 and 2011-2013. The index is based on body weight standardized to 400 mm fork length. Error bars indicate 95% confidence intervals. Significant differences (p<0.05) among years are indicated with unique single letters. Figure modified from Fig. 5 (9).](image)
The offshore monitoring program has revealed new information about chum salmon in the Bering Sea. For example, genetics analyses have demonstrated that Russian stocks of chum salmon were dominant in the survey area in 2007 and 2009-2012 (9), which likely reflects the relative abundance of this species among the surrounding countries in recent years. In addition, the program has indicated a decreasing trend in chum salmon body condition based on a scaled mass index, a measurement of size based on body weight standardized to 400 mm FL (Fig. 8). The index shows chum salmon body size was smaller in 2011-2013 compared to 2007-2009, and the lowest value was observed in 2013. This result implies the growth of chum salmon in 2011-2013 in the Bering Sea has declined.

Conclusion

Japanese chum salmon fisheries are largely supported by salmon hatchery production, which annually release 1.6-1.9 billion fry. The annual number of chum salmon fry released has been almost constant since the early 1980s, but the adult returns have fluctuated widely and the decline has been particularly evident since 2008. Collection of data by the salmon monitoring programs has been profoundly useful in clarifying the reasons for the recent decline in returns, and possibly in reducing the decline. This continues as the top priority for scientific investigations of Japanese chum salmon today.

Recent analyses demonstrated that Japanese chum salmon stocks have regionally distinguishable biological characteristics, which appear to reflect the genetic differences among regional groups, despite the releases of large numbers of hatchery fish that have continued for a long time and the country-wide transplantation of fish. However, some characteristics, such as run timing of adult salmon, have changed over time due, at least in part, to hatchery manipulations. Changes in biological traits may pose risks to the sustainability of Japanese chum stocks in the future. To minimize the risks, biological monitoring is required in order to develop a time-based data series by which the past and present status of salmon can be assessed.
Research on wild salmon has revealed that the contribution of wild chum salmon is far from negligible in Japan (10). Conservation of wild chum salmon serves to increase the long-term sustainability of this species and contributes to the stability of salmon hatchery programs and salmon fisheries. At present, the monitoring program for wild salmon is not well developed and establishing it on a strong footing is an important priority.

Acknowledgements

Many people conduct and contribute to salmon biological monitoring programs in Japan. Local staff of salmon hatcheries and fishermen’s cooperatives, provincial governments, and provincial research institutes provide data on salmon catch and hatchery operations, and colleagues at HNFRI, TNFRI, and JSNFRI conduct field surveys in rivers and the ocean and process biological data. Local fishermen assist the coastal monitoring program at their expense of time for work. I especially wish to thank Toru Nagasawa and Shigehiko Urawa for giving me the opportunity to prepare this article and Nancy Davis for her endurance in reviewing my English in an early version of this draft.

References

The official list of Indigenous Peoples that live in the Russian North, Siberia, and the Far East includes 40 nations, numbering about 260 thousand people according to the 2010 population census (1). The greatest numbers of Indigenous Peoples are living in Khabarovsk Krai, Sakhalin Oblast, Kamchatka Krai, and Primorsky Krai.

The historic Pacific salmon fisheries of these Indigenous Peoples developed both along the coasts, and near lakes and rivers rich with fish. Cultural activities involving salmon fishing developed where salmon was an important food resource. This mode of life was especially true for the Nanais, Ulchs, Itelmens, Okhotsk Evens, eastern Koryaks, and Chuvans (2). Although today's lifestyle is different than it was in the past, the most significant traditional economic activity was and continues to be fishing.

In general, Indigenous Peoples are associated with the presence of their own language, a focus on a traditional livelihood, and the collective attachment to the geographically-defined territory of their ancestors and its natural resources.

The United Nations General Assembly adopted the Declaration on the Rights of Indigenous Peoples in 2007. While the Declaration is not legally binding, it does represent the development of international legal norms for Indigenous Peoples, and it reflects on the commitment of states to move in certain directions to abide by its principles (3). Among other things, the Declaration states that respect for Indigenous knowledge, cultures, and traditional practices contributes to equitable and sustainable development and management of the environment (4).
Based on centuries of experience, the traditional knowledge of Indigenous Peoples is sensitive to the seasonal changes of natural phenomena and to the distribution of fish and wildlife. These groups have local knowledge of the optimal time and place to catch fish (5). A characteristic feature of natural resource management by Indigenous groups includes a deliberate limit on consumption. This in turn creates an inherent catch self-regulation and a flexible animal harvest rate based on natural dynamics. Another feature is the existence of cultural value systems that control the behavior of individual members in the group in relation to natural resource exploitation (6).

A Federal Act of the Russian Federation recognizes that in territories where Indigenous Peoples manage their living resources using traditional practices, such resources are not depleted because there is a cultural attitude favouring long-term resource stewardship by these groups (7). According to Russian law, subsistence fishing provides for a traditional way of life, and a basic legal principle is to provide managed access to resources for a variety of user groups, including Indigenous Peoples (8).

In the 18th century, the traditional homelands of these groups were affected by settlement of Russians from the west and Manchu and Chinese people moving in from the south. These migrations forced Indigenous groups off their traditional lands, and the existing orderly system of natural resource utilization began to come apart. Migrants heavily exploited fish and wildlife resources, causing reductions in the abundance of the most valuable species. Already by the late 19th and early 20th centuries, there were significant reductions in fish resources in the Amur River basin. After 1910, high catch volumes further decreased the abundance of salmon.

During early years of the USSR, fishing regulations were adopted that conveyed management of the fishing grounds to national cooperatives. The influential positions in those cooperatives were occupied by newcomers from central Russia. Indigenous groups lacked their own political, economic, or legal institutions. The Soviet policy of conurbation (urban agglomeration) prompted people to relocate from small settlements that were thought to have no future prospects to municipal centers and industrial communities (6). Indigenous groups became isolated from the historical base of their fishing and hunting grounds. This separation was accompanied by the loss of their national traditions and the severing of familiar ties with the land. As a result, most Indigenous fishermen lost their basic traditional fishing occupation. Over time, many Indigenous Peoples have forgotten the cultural activities of their traditional societies having moved from their original lands to urban areas and a different life-style. Because of these losses, much of the current debate on subsistence fishing by Indigenous groups center on the question of who is and who is not an Indigenous person.


Photo credit: Maxim Koval, KamchatNIRO
While the status of Indigenous People to conduct subsistence fishing is debated, this should not disparage other nationalities because Indigenous groups possess different privileges. Further, disputes about who is the “most native” for a particular territory usually lead up a blind alley. One option under consideration is creation of aboriginal self-governing structures that would exist in parallel with local governments (9). An Association of Indigenous Peoples of the North and Far East in Russia functions in similar ways to the local governments, but the association only exists in a limited number of places.

The Federal Agency for Fisheries makes an annual plan for the total overall allowable catches of aquatic biological resources. The subsistence catch is given the first priority, then catch for other purposes are determined from the residual. Indigenous Peoples have argued that establishment of catch quotas belittles their fishing rights, and Indigenous groups in Russia’s northern territories have never agreed with catch regulation of fish for their own consumption.

Rules have been accepted to ensure priority access for subsistence fishing by Indigenous Peoples, and following that there was a marked increase in the number of newly created and registered Indigenous fishermen in the Russian Far East. An authorized Indigenous agency receives approval for a subsistence fishery after submitting a satisfactory application that is received in a timely manner and in accordance with an established process.
Until recently, there was an undesirable practice where Indigenous groups claimed an unreasonably large amount of biological resources for their subsistence and the number of applications from Indigenous People increased rapidly. In recent years, the number of these communities has grown almost tenfold (10). In a number of cases, non-indigenous persons initiated the establishment of such so-called Indigenous communities in order to obtain subsistence catches for themselves. In addition, there was information that commercial fishermen received offers for sale of fish from organizations owned by an Indigenous person and caught under rules pertaining to subsistence, not commercial fishing. These conditions were urgently creating the need to clarify rules identifying Indigenous groups.

In this regard, Article 26 of the Russian Federation Constitution states that everyone shall have the right to determine and indicate his nationality and no one may be forced to determine and indicate his or her nationality (11). It would be helpful to adopt a common official documentation that confirms an Indigenous person’s status. This could provide a mechanism to eliminate uncontrolled access to fishing resources by legal entities (communities, associations) and individuals.

Some Indigenous groups have received access to such large amounts of fish that they exceed their subsistence needs, and this has created a situation where monopolization of access to the fishery resources destabilizes the fisheries industry and exacerbates ethnic tension. To solve this problem it is necessary to limit the amount of fish caught for subsistence to the amount needed for subsistence. This can be done by dividing the total catch into two components: subsistence catch and commercial catch, according to an historical formula. One limiting factor for the subsistence catch would be prohibition of the commercial sale of a subsistence catch (6).

### Conclusion
Restricting access to subsistence fishing by Indigenous People in order for them to catch food and maintain their cultural practices is unreasonable as a country’s wealth is in its citizens and traditions. Alternatively, it is not ethically correct to discriminate against the rest of a local population who are also residents of the same coastal region. Conceptual improvements to legislation to regulate traditional fishing is a thorny, but necessary issue. What is needed is the creation of legal mechanisms that will correct these problems. Currently, there are many legislative bills under consideration regarding Indigenous Peoples and subsistence catch, and there is every chance that in the near future the situation will begin to move in a constructive direction.
References and Notes:


In 2014, the NPAFC-PICES Framework for Enhanced Scientific Cooperation in the North Pacific Ocean, developed by a joint NPAFC-PICES study group, was endorsed by both organizations. The framework can be downloaded at the link: http://www.npafc.org/new/about/Other%20Organizations/PICES/NPAFC%20PICES%20Framework%20April%202014%20Final.pdf.

The framework identified two major scientific topics of joint interest to NPAFC and PICES:

- Effects of climate change on the dynamics and production of Pacific salmon populations; and
- Oceanographic properties and the growth and survival of Pacific salmon.

The first outcome from the new framework was a joint workshop held at the Expo venue in Yeosu, Korea, on 17 October 2014 as part of the PICES Annual Meeting. Approximately 25 people heard 11 oral presentations and contributed to active discussions throughout the day on topics related to what is known about winter distribution of salmon and what adjustments might be expected with climate change.

In the first invited presentation, Kate Myers, speaking on behalf of scientists from the USA, Canada, Japan, and Russia, described the life of Pacific salmon and steelhead in a changing winter ocean. Myers reviewed major research findings from salmon research in the high seas from the 1950's through to the present time. She recommended the development of databases to house winter survey biological and catch data as well as relevant ocean conditions. In addition, she suggested that NPAFC
Some of the participants at the PICES-NPAFC collaborative workshop, *Linkages between the winter distribution of Pacific salmon and their marine ecosystems and how this might be altered by climate change*, held at the 2014 PICES Annual Meeting, Yeosu, Korea.

Photo credit: Jim Irvine

and PICES could collaborate on developing quantitative multispecies, multistage models to help identify key factors influencing winter distribution, and thereby improve our understanding of potential future climate change effects.

In the second invited presentation, Hiromichi Ueno described findings by Japanese researchers investigating temporal and spatial variations in growth factors of Pacific salmon. Ueno explained the importance of eddies in the Gulf of Alaska in advection of nutrients off shore. Predatory zooplankton densities, indicators of salmon prey abundance, varied in association with the PDO (Pacific Decadal Oscillation) in most areas. In the Bering Sea, these modelled densities were consistent with salmon catches and appeared to be correlated with estimates of salmon carrying capacity.

Jim Irvine reviewed the critical period concept for Pacific salmon in a presentation prepared by Marc Trudel and himself. This concept, developed 100 years ago by Johan Hjort (ICES, 1914), does not appear to have been adequately tested. Trudel and Irvine proposed an approach to do so, applying it to coho salmon in the Strait of Georgia. They had evidence suggesting the early marine period was critical, but later periods in life may not be critical, at least for these fish.

Although Svetlana Naydenko was unable to attend, Alex Zavolokin gave her detailed presentation summarizing Russian winter research on salmon in the western North Pacific. Pink and chum salmon catches were strongly dependent on western subarctic circulation patterns. Both species were caught to depths exceeding 100 meters and pink salmon were more surface oriented at night than during the day. Food was found to be not limiting during winter/spring and salmon fed on a wide variety of prey.

Sonia Batten described findings from pioneering work by David Welch on thermal limits of salmon. Seasonal southern limits for the distribution of steelhead, and sockeye, pink, chum, coho, and Chinook salmon may be at the point where food availability just supports temperature-determined metabolic processes. Large areas of the North Pacific are projected to be lost to salmon as a result of global warming. The impact of warming is likely to be most severe for west coast North American stocks. As distributions shift into the Bering Sea in response to warming, it is unclear whether the migration of salmon returning to southern areas will be impeded by the Alaskan Peninsula. Experiments with archival tags are a potential means of evaluating how return migration pathways are affected by sea surface temperature (SST).
Shigehiko Urawa summarized results from winter surveys in the North Pacific and Bering Sea in his presentation on the winter distribution and trophic conditions of chum and pink salmon and how these may be altered with climate change. Interestingly, the SSTs where pink and chum have been caught were relatively consistent within locations among winters of different years, but the fish caught in the Gulf of Alaska were in consistently warmer waters than those in the western North Pacific. Ocean age-1 chum salmon had much lower lipid contents than older fish, suggesting critical conditions of young fish during their first winter. The total lipid contents of chum and pink salmon in the Gulf of Alaska were significantly lower than those in the western North Pacific Ocean. The degree of impact of future climate warming may differ among regional stocks and ages of salmon.

Alex Zavolokin described factors affecting the winter mortality of pink salmon from the Okhotsk Sea. Data from fish produced from the 2007 and 2008 spawning years were examined; the first brood year having a low marine survival and the second a much higher survival. Scale circuli spacing was measured for juvenile pink salmon collected in the fall and for maturing fish collected in the following summer. For low surviving progeny of fish having spawned in 2007, mean circuli spacing of juvenile pink salmon was lower than those of maturing salmon, while the progeny of fish spawned in 2008 had experienced better survival and circuli spacing was similar for juvenile and maturing salmon. This suggests that low survival of fish in the first year was the result of high mortality in slow growing juvenile salmon. Similar growth rates of fish in their second year of life observed in both brood years implied that high mortality during the first year at sea was not due to starvation, but perhaps to predation.

Ed Farley’s presentation on the impact of climate variability and change on winter survival of Bristol Bay sockeye salmon was given by co-author Phil Mundy. The sizes of juvenile sockeye salmon were strongly correlated with back-calculated sizes of juvenile sockeye salmon from adults (survivors) that returned to Bristol Bay two and three years later. Results suggested that juvenile sockeye salmon that reached ~180–250 mm in length during late summer had a 50 percent chance of survival through adulthood; juvenile sockeye salmon <115 mm had less than a 5 percent chance of survival. Evidence supported climate driven control of sockeye salmon populations in Bristol Bay through mechanisms operating in the marine environment during winter. Climate drivers likely interact with other factors to determine year class strength.

In the final presentation of the workshop, Shoshiro Minobe provided preliminary projections of changes in suitable salmon habitat as measured by SST using climate model outputs from the Coupled Model Intercomparison Project Phase 5 (CMIP5). Using SST data from a 2011 publication, Minobe described effects of climate warming on zooplankton and salmon habitats with a model not available to the earlier researchers. Nevertheless, his findings were similar to those found in the earlier publication—salmon will migrate to the north and west due to SST warming; effects may be larger during spring-autumn than during winter; Chinook salmon may be impacted the most and coho and steelhead may benefit at least initially from warming; and sockeye salmon are expected to decrease in abundance. Minobe plans to re-run this model with more precise temporally and spatially described salmon habitat.

Several presentations from the workshop are expected to be presented at the *NPAFC International Symposium on Pacific Salmon and Steelhead Production in a Changing Climate: Past, Present, and Future* in May 2015 (see poster page 35) by NPAFC and PICES scientists. Continued collaboration between NPAFC and PICES scientists will provide ongoing benefits to both organizations.
The new book, *Salmon: Biology, Ecological Impacts and Economic Importance*, is a collection of scientific reviews in diverse fields of salmonid ecology, morphology, genetics, fisheries, aquaculture, and economic importance of salmon. Twenty-eight authors from seven “salmon-dependent” (a word from Chapter 14 that caught my fancy) countries represent 15 chapters filled with both well-known and new information on considered issues. The well-made book cover features mature salmon migrating upstream bringing new life for future generations, nutrients for freshwater ecosystems, and prosperity for coastal communities. In a similar fashion, this picture symbolizes that assimilation of the book’s information by the reader provides a baseline for new advances.

In the Preface, editors mention that they tried to provide a good mix of both basic and applied topics in the book to attract more attention to the volume’s content. This objective is achieved and is particularly effective nowadays when potential readers search for information on the Internet using keywords and meta-tags. The book conveys some customized information, and by skimming through the contents, general information may expand the reader’s scope of interest. Several specific features will be of particular interest to readers. It covers matters related to Atlantic salmon, “King of Fish” (1) and Pacific salmon. Such an approach emphasizes the tight interconnections of problematic matters between salmon and climate change, habitat degradation, and fisheries management in both Atlantic and Pacific environments.

Wild and hatchery salmon populations in the marine life period depend on feeding and survival conditions defined by a complex of physical and biocenological factors. They are sensitive to year-to-year variability in oceanic forcing that sometimes produces enormous fluctuations in abundance of salmon stocks throughout a species’ range. These fluctuations occur due to salmon mortality in the early marine and oceanic phases that is significant, making it important to analyze the carrying capacity for pelagic fish through top-down and bottom-up controls.

Although I do not share an opinion that “Pacific salmon … are among the most critically endangered wild fishes in their native ranges” (page 195) or that “production potential of wild salmon has declined since the 1990s” (page 223), such polemic bitterness should attract readers’ attention and increase public awareness of salmon stock conservation and their studies. Even though the productivity of wild salmon stocks is currently at a high level and providing recent annual harvest of about 1.1 million tons, this “era of prosperity” can be quickly replaced by years of low salmon abundance as occurred on a Pacific-wide scale in the 1940s.

In general, a starting point for the book is recognition that regime shifts and the dynamics of climatic and oceanographic conditions affect salmon. Almost all chapters in the book deal with this important problem of environmental conditions influencing different aspects of salmon nutrition, growth, metabolism, body shape and conditions, behavior, and finally genotype through
natural selection. Several major reviews consider the future of salmonid fish production in relation to global warming, ecosystem health, and habitat degradation. Such links to global problems that are becoming ever more urgent give the book a timely relevance.

Although Atlantic salmon and the common Pacific salmon species have been studied for a long time in periods of low and high stock abundance, there are many poorly studied matters of their biology and ecology that are partially covered by the book’s chapters.

Comparative studies of hatchery conditions and seed quality in chum salmon, metabolic rates and requirements of farmed salmon, and lipid composition of different phenotypic groups of Atlantic salmon provide an important background for future research on juvenile salmon survival mechanisms. Importance of disease as a critical factor in the decline of seed quality and fry survival in hatchery production are emphasized in the first two chapters. Together with studies on energy contents and physiological conditions of salmon at different life stages, it forms an advanced research area to improve natural mortality forecasts for wild and farmed salmon. There are many scientific facts and hypotheses that will add to popular discussions of wild and hatchery salmon stock interrelationships, environmental impact of salmon aquaculture, and trends in salmon fisheries over the coming years.

A brief introductory chapter aggregates information from individual chapters into a unified whole. It provides an overview on salmonid fish diversity and basic information about captured and farmed salmonid fish production. A few focused specialists keep in mind the “balance sheet” that there is more than twice the amount of farmed salmon production compared to wild salmon harvest. It is important to notice, especially for Canada, that farmed fish contribute substantially to the economies of some coastal communities, which produce a larger value of high-demand seafood production. Pacific salmon capture fisheries are responsible for roughly 30% of the total salmonid production on the world food fish market that in large part is represented by less valuable pink and chum salmon. Therefore, fish farming is becoming more economically important than many traditional fisheries, which raises new economic and social questions in salmon-related matters and influences managerial decisions to ensure conservation and sustainability of salmonids. That is why I recommend this book to a wide readership including economists, analysts, environmentalists, NGOs, and mass media.

Salmon aquaculture production grows quickly from year to year. Likely, that is a reason why some figures are outdated, including annual production of salmon farms in total by species. The first source of discrepancy is the reference to different years. Thus, in Chapter 1, farmed salmon, trout, and char production raised in net pens is estimated as more than 2.3 million tons per
annum with a lack of reference to a particular year. The value increases up to 2.5 million tons in Chapter 12 with the same authorship and to “almost 2.5 million tonnes” (as global production of farmed salmon) in 2012 in Chapter 15. Authors of Chapter 13 mistakenly refer to 2.5 million tons as the total salmon production that “could be caught or grown in 2014”. This value is underestimated because, according to Chapter 14, global salmon production was 3.89 million tons in 2011. Chapter 14 also lists all main subtotals of this sum, including a second source of discrepancy. Influenced by the bulk of marine net pen production, people frequently lose sight of freshwater salmonid aquaculture that also supplies large production. Rainbow trout freshwater and brackish water aquaculture in 72 countries produced about 480,000 tons in 2011 and almost 540,000 tons in 2012, while marine rainbow trout farming supplied 290,000 and 316,000 tons in eight States (http://data.fao.org/). Together with Arctic char aquaculture production of 3,500-3,700 tons, this value is the difference between global production of farmed salmon (Chapter 15) and salmonid fish production raised in net pens (Chapters 1 and 12). It would be useful to clarify and standardize salmon aquaculture statistics through the volume together with usage of the term “tons” (Chapters 1, 8, 12-14) and “tonnes” (Chapters 7 and 15).

One more remark on the first chapter relates to the statement that the sub-family Salmoninae comprises more than 110 species. In the cited article (2), authors deal with 30 species of salmonids and do not consider their total abundance. FishBase (http://www.fishbase.org/) lists 120 valid species of Salmoninae and it seems to be the most appropriate source for enumerating species diversity (3). There are well-known phylogenetic and systematic problems concerning the sub-family Salmoninae. Different opinions exist about the number of species in individual genera and about the number and phylogeny of the genera themselves (e.g., see review (4)).

In Chapter 3, brief “notes in the margin” was devoted to intraspecific morphological variation of Atlantic salmon and description of a new species or subspecies, but one would like more. It would be very advantageous to invite a detailed review on salmonid fish taxonomy in such a collection of scientific articles devoted to this subfamily. Now, taxonomy for many rare salmonid species can be described, as was done for Salmo dentex and S. marmoratus: “Species is poorly studied and its status has remained unclear due to lack of samples for detailed analyses, hybridization with other trout lineages and diverse and multiple designations of the same trout in different areas” (http://www.troutsalmonchar.com/).

Chapters are distinguished from one another by volume and by scope. Some authors focus on their own in-house studies and present an extended summary of mostly their own writings per se (e.g., share of self-citation is more than 60% in Chapter 7). However, this is not bad, especially when important publications are not easily accessible by prospective readers. Based on published articles, the Chapter 7 author suggested a new approach for future ecological studies for better understanding of fish production in natural ecosystems through advanced study of food digestion and utilization rates in changing environmental conditions.
In Chapter 10, authors have an historical overview of the extensive and ambitious chum salmon hatchery program in Japan that gives reason to consider this large-scale experiment a domestication of salmon as recently as ten years ago. Authors convey information, arguments, and speculations regarding ecological and genetic interactions between wild and hatchery produced Pacific salmon and recommend measures to support sustainability of wild and hatchery stocks. In conclusion, they point to one important and timely question related to the issue: “How can we ensure fishery management adaptively responds to emerging new information on trends and status of naturally reproduced salmon?”

Contrary to the common belief that almost all Pacific salmon in Japan originate in hatcheries, several studies examining the contribution of hatchery/wild fish by mass marking of hatchery fish show a significant contribution of wild salmon to total stock abundance. Thus, the contribution of wild fish was estimated to be ~26% for chum and ~80% for pink and masu salmon (5). It is evident that the large-scale hatchery experiment in Japan slides into a new stage with a high-grade convergence of both naturally reproducing and hatchery stocks. In this relation, the authors’ recommendation to separate wild and hatchery salmon populations looks belated.

Another review is presented in chapters using literature surveys, when the author(s) summarizes a bulk of published sources and encourages readers to go to the references for further details. Such reviews are presented on the intraspecific morphological heterogeneity of Atlantic salmon (Chapter 3), salmonid nutritional and anti-nutritional factors (Chapter 9), and on behavior and genetics of salmon (Chapter 10). In the first one, the author analyses morphological development under the influence of different driving factors (water velocity, temperature, selection pressure, and feeding) and makes conclusions separately for natural and aquaculture environments. Despite all the merits of this review, it should be noted that the wording “genetically identical cultured and wild Atlantic salmon parr” is inaccurate. Origination from wild parents from the same river does not mean cultured progeny are genetically identical.

In Chapter 10, salmon behaviour, including migration and navigation, is considered a result of genotype expression through adaptations to local conditions. This chapter cites 237(!) papers and includes seven pages of introductory literature review—about 60% of the whole text.

It is regrettable that authors of these three chapters did not select attractive figures and/or tables from the cited literature to illustrate the main points in their reviews. In comparison, Chapter 7 contains 20 figures and 2 tables that notably facilitate an understanding of the text.

As for other chapters, several of them provide brilliant snapshots of the current state of knowledge in specific scientific fields, and their conclusions sometimes reveal significant relevance to allied topics. In this relation, I would like to highlight the absence of a water temperature effect (within the comfortable interval 4-8°C) on the ATP content of chum salmon fry (Chapter 2). It is an important consideration in the method of otolith thermal marking, which is widely applied to Pacific salmon in hatcheries. The influence of fasting remains less clear. The author makes three contradictory conclusions: “Fasting for more than three days caused a decrease in ATP content in fry” (caption to the Figure 3), “fasting for more than 72 hours resulted in ATP increase content of fry”, and “data indicate that feeding and fasting have little or no impact on ATP content” (page 16). These statements need further clarification. A little discrepancy in statements also occurs regarding dietary supplementation: “iron citrate or cotton seed oil can improve seed quality” (Abstract) and “it is unclear whether dietary iron citrate supplementation improves seed quality” (page 17). Such statements may confuse readers unfamiliar with the experimental details.

Chapter 4 is a little bit more specialized than others, both by topic and by geography. However, it also consists of one incorrect statement: “the alevins gained scale cover and became juveniles (page 48). In fact, salmon alevins first become fry and then grow
scales. Authors of another specialized review (Chapter 13) attract readers’ attention to the problem of non-waster salmon processing and the importance of such prospective by-products as collagen and gelatin. It should be noted that advanced raw fish processing promises even more benefits. Recent technological studies reveal that salmon heads contain relatively high concentrations of hexosamines—amino sugars that are valuable, biologically active compounds (6).

Chapter 8 is another example of a comprehensive and well-organized review. It contains more than the basic information on recommended water quality criteria, oxygen consumption, carbon dioxide, and excretory production of Atlantic salmon fry, parr, smolt, and adult stages on Norwegian farms. The second part of the review emphasizes tests of optimal/sub-optimal/critical levels of oxygen, carbon dioxide, and ammonia connected to the metabolism of the fish stock in the pre-smolt stage in freshwater and after transfer to the marine environment. It includes brief descriptions of flow-through farms and recirculating systems with an emphasis on critically important and poorly studied points. Therefore, this review can be used as a guide for new aquaculture farmers (together with data on the effects of dietary supplementation on chum salmon fry from Chapter 2) and as background for future research.

The most extensive (by volume) review on the economic importance of wild Pacific Salmon appears at the end of book (Chapter 14). It contains up-to-date information for two geographically distinct regions: Japan and Alaska. Recent events are described, like the catastrophic tsunami of 2011 in eastern Japan, obtaining the MSC certificate by the Japanese domestic salmon fishery in the Kitami region of the Okhotsk Sea coast of Hokkaido, and data are updated until 2013. It is cheerful to read about the significance of the Convention for the Conservation of Anadromous stocks in the North Pacific Ocean (NPAFC Convention) for salmon stock conservation and rational exploitation. Some information given is rare in English-language sources, particularly for brand-labeled chum salmon in the Japanese domestic market, its high value, and, therefore, the importance of marine fisheries for juvenile and immature salmon. It should be noted only that correspondence of the subsection “Importance of the Okhotsk Sea…” to the economic importance of wild Pacific Salmon remained somewhat unclear. Observations on ice cover dynamics and hatchery release timing are undoubtedly interesting, but go slightly beyond the general topic under review.

The sections on evolution of Pacific salmon fisheries management in Alaska were presented in Chapter 14 in an informative manner. Pacific salmon is one of the most important groups of fish in the world’s fishery. Their portion of the world capture fishery harvest is gradually increasing and recently reached 0.98% in 2011. The author cites the statement that the increase in production of pink and chum salmon is primarily a result of enhanced artificial production for these two species (7). I do not completely agree, particularly for pink salmon whose stock dynamics are driven mostly by favorable environmental conditions. Moreover, salmon importance is not limited by the bulk or monetary value of catch. Beside commercial fishery profit, the chapter emphasizes that coastal communities benefit from sport and subsistence fishing and tourism. Interesting observations are made regarding the importance of fishing in creating interregional connections. Pacific salmon have a broad significance for the dietary, social, and cultural needs of coastal societies around the North Pacific and have become cultural icons across the North Pacific Rim.

In conclusion, I think the book makes a positive general impression. It provides vast information and leaves enough space to differentiate one’s own views from those of authors. Undoubtedly, this book will improve the readers’ knowledge and develop understandings on the importance of salmonid fishes in a complex of interrelated and interdependent aspects of human activities.

References
Announcement: 2015 NPAFC Internship Program

APPLICATION DEADLINE: March 12, 2015

The NPAFC invites citizens from its member countries (Canada, Japan, Republic of Korea, Russian Federation, and USA) to apply for the NPAFC Internship Program. One intern will be accepted upon approval of the Commission. The intern will work at the NPAFC Secretariat office in Vancouver, BC, Canada.

The intern will gain experience and knowledge in operations of the NPAFC and provide an opportunity to test their interest in international governmental organizations, management, fisheries, biology, ecology, and fisheries enforcement. The intern will work under the supervision of the Executive Director and/or his designate. In general, the intern will assist in a variety of tasks, including:

- Preparing information and support for scientific projects
- Assisting, organizing, and editing various NPAFC publications
- Coordinating international cooperative programs
- Assisting Secretariat activities and special projects

Internship period: Starts on or about September 1, 2015, for a period up to a maximum of 6 months. The intern is expected to perform their tasks at the Secretariat office on a daily basis, Monday-Friday, 7.5 hours per day.

Qualifications: Applicants must be a citizen of a NPAFC member country, have a university degree, the ability to read, write, and speak English, the ability to use computers and the internet; and demonstrated personal initiative. Applicants must currently be a part of the government or academic sector, a recent graduate, or currently enrolled in school for an advanced degree.

Financial support: NPAFC will provide a stipend of $2000 CDN per month. Travel cost to and from the intern’s place of residence and the location of the Secretariat office and cost of medical insurance will be at the intern’s own expense or by home country support. Travel expenses associated with the Intern’s work in the Secretariat will be covered by NPAFC.

Applications: Completed applications must include all of the following:
- cover letter describing the applicant’s interests and qualifications,
- resume showing academic and/or work experience,
- three professional letters of reference

Email the completed application to secretariat@npafc.org.

For complete information: Go to http://www.npafc.org/new/about_internship.html and contact the NPAFC Secretariat for questions at secretariat@npafc.org.
May 17-19, 2015
Kobe International conference Center, Kobe, Japan

REGISTRATION NOW OPEN ONLINE
http://www.npafc.org/new/events/symposium/2015symposium/symposium_registration.html

Topic Sessions

1. Migration and survival mechanisms of salmonids during critical periods in their marine life history
   Session Conveners: Marc Trudel (Canada) and Ju Kyoung Kim (Korea)
   1a. Initial period of marine life
       Keynote Speaker: David Welch (Canada)
   1b. Winter period
       Keynote Speaker: Katherine (Kate) Myers (USA)
   Key areas:
   • Distribution and migration route/timing during initial marine life and winter periods
   • Hydrological characteristics, primary production, and prey resources in ocean habitats
   • Trophic linkages, growth rates, and predation rates
   • Survival rate and survival mechanisms
   • Ecological interactions between species and between populations

2. Climate change impacts on salmonid production and their marine ecosystems
   Session Conveners: Edward Farley (USA) and Olga Temnykh (Russia)
   Keynote Speakers: Emanuele (Manu) Di Lorenzo (USA) and Suam Kim (Korea)
   Key areas:
   • Effects of climate change and climate cycles on anadromous populations, pelagic fish communities, and ocean ecosystems
   • Key climatic and oceanographic factors affecting long-term changes in ocean food production and salmon growth rates
   • Possible climate change impacts on ocean salmon habitats
   • Climate change and climate cycles affects on carrying capacity

3. Retrospective analysis of key salmonid populations as indicators of marine ecosystem conditions
   Session Conveners: James Irvine (Canada) and Toshihiko Saito (Japan)
   Keynote Speakers: Alexander Kaev (Russia) and Gregory Ruggerone (USA)
   Key areas:
   • Time series of salmonid population characteristics (abundance, age and body size at return, timing of return, fecundity, egg size, trophic condition, genetic diversity, disease and parasites) as indicators of regional and basin-scale ecosystem conditions
   • Retrospective analysis of salmon production and habitat environmental characteristics as a method of predicting changes and how abundances will respond to changing climate
   • Time series of regional salmonid production characteristics including wild and hatchery fish
   • Understanding the implications of habitat utilization by increasing numbers of Pacific Rim salmon populations
4. Application of stock identification and models for salmonid population management

Session Conveners: Jeffrey Guyon (USA) and Michio Kishi (Japan)

4a. Stock identification development and applications for management
Keynote Speaker: Lisa Seeb (USA)

4b. Model development and applications for management
Keynote Speaker: Randall Peterman (Canada)

Key areas:
- Recent developments to improve stock identification methods
- Novel approaches incorporating stock identification techniques for management
- Descriptive, physical, mathematical, and statistical salmonid models useful for management

5. Forecasting salmonid production and linked ecosystems in a changing climate

Session Conveners: Alexander Zavolokin (Russia) and Richard Beamish (Canada)

Keynote Speakers: Richard Beamish (Canada)
Masahide Kaeriyama (Japan)
Skip McKinnell (Canada)

Key areas:
- Common mechanisms regulating salmonid production
- Successes in short-term and long-term forecasting of salmonid production
- Future scenario of climate and ecosystem changes and their implications for salmon
- Lessons learned from forecasting salmon production and future research directions

The NPAFC expresses appreciation to Symposium Co-sponsors:
Photo/Artwork Competition
for the new NPAFC Handbook Cover

The NPAFC Secretariat is holding a competition for photo/artwork for the new NPAFC Handbook cover. The Secretariat will select the best design and give the winner a small prize. The photo or artwork can be a literal or abstract image relevant to NPAFC. The Secretariat will complete the cover design by placing the title and other text on the photo/artwork.

Anyone is eligible to submit photos and/or artwork. An individual may submit up to a maximum of 10 photos/artwork. The winner will be announced on the NPAFC website and the image will be credited. If interested in seeing the layout of the current Handbook cover, a thumbnail image is available at http://www.npafc.org/new/about_handbook.html.

Requirements

- image orientation: portrait
- image resolution: 300 dpi
- colour: CMYK colour model for printing
- image size can be no smaller than 5 inches by 8 inches (13 cm by 20.5 cm), but can be larger
- approximate final size of the cover: 5 inches by 8 inches (13 cm by 20.5 cm)
- image(s) must be submitted by email to the NPAFC Secretariat secretariat@npafc.org by March 31, 2015

Deadline for submissions is March 31, 2015.

For questions, contact the NPAFC Secretariat secretariat@npafc.org.
Traditional Russian foods include a variety of soups, which is particularly popular for lunch. There are many types of traditional Russian soups—among the most famous being Rassolnik (pickled cucumbers, pearl barley, and pork or beef kidneys), Schi (fresh cabbage, meat, and sour dressing), Kharcho (beef, rice, walnuts, and garlic), and Okroshka (boiled potatoes, eggs, beef, veal, sausages, or ham with kvass, a non-alcoholic beverage made from fermented flour and malt). The most popular soup that is made from fish is the clear soup called Ukha (see Newsletter No. 30:16).

Creamy salmon soup is one of my favorites. It is tasty and popular in countries with long and cold winters because it satisfies, warms, and improves mood. In this recipe, any salmon, especially sockeye, coho, and chum, or trout will do. My mother adores cooking soups with salmon and gave me this recipe a few years ago.

### Ingredients

- 4 slices salmon fillet (500-600 g) cut into large pieces for the soup plus the bones of the frame (including head and tail) to make the fish broth
- 1 whole leek cut into large pieces
- parsley (stems and leaves and use the parsley root if it is available)
- 1 Tablespoon butter
- 3 Tablespoons cooking oil
- 1 shredded carrot
- 1 onion sliced into rings
- 2 Tablespoons flour
- 1/2 cup milk
- 1 cup cream

### Method:

1. Remove fish scales, rinse the fish, and separate the fillets from the bones.

To make the fish broth: place the frame into a pot with 5-6 cups of water. Add leeks and parsley. Bring to a boil and simmer for 15-20 minutes. Filter the broth through a sieve or cheese cloth and return the broth to the pot.

2. Add salmon fillets, butter, 1 tablespoon oil, shredded carrots, and onion to the broth and cook on low heat for 10-15 minutes. Remove and set aside a few pieces of the cooked salmon to add later to the top of each serving.

3. In a separate pot, heat 2 tablespoon of cooking oil and fry 2 tablespoon of flour until golden color. Add the fish broth (with vegetables and fish) and cook for 2 minutes.

4. Place the soup mixture in a blender and puree.

5. Heat the milk and cream in another pot. When heated through, pour it slowly into the soup while stirring. Cook the soup for just a minute or so until small bubbles appear.

6. Add salt and pepper to taste.

8. Pour the pureed soup back into the pot and keep it hot.

9. Pour the soup into individual serving bowls, and place a piece of the reserved salmon and some of the croutons on top of each serving.
**Upcoming Events**

**International Year of Salmon Scoping Meeting** will be held February 17-19, 2015, at the Pacific Salmon Commission office in Vancouver, B.C., Canada.

The objective of this workshop is to seek advice from invited experts regarding a proposal for a multinational and multidisciplinary research effort directed at critical unknowns associated with salmon production. The research effort would provide the scientific basis for a possible International Year of the Salmon.

**NPAFC 2015**

23rd Annual Meeting  
Kobe, Japan  
May 11-15, 2015  
Kobe International Conference Center  
http://www.npafc.org/new/events_annual.html

**NPAFC International Symposium on Pacific Salmon and Steelhead Production in a Changing Climate: Past, Present, and Future**  
May 17-19, 2015  
Kobe, Japan  

Registration now open!  
More information at www.npafc.org

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

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

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