Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Canadian Science Advisory Secretariat (CSAS)

Proceedings Series 2016/010

Central and Arctic, and Quebec regions

Proceedings of the zonal peer review of the Pre-COSEWIC Assessment for Lake Sturgeon, *Acipenser fulvescens*, Designatable Units 7–8, in Canada

November 3–4, 2015
Gatineau, Québec

Chairpersons: Kathleen Martin and Chantelle Sawatzky
Editors: Lia Kruger and Kathleen Martin

Fisheries and Oceans Canada
Freshwater Institute
501 University Crescent
Winnipeg, MB R3T 2N6

July 2016

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/
csas-sccs@dfo-mpo.gc.ca

ISSN 1701-1280

Correct citation for this publication:

DFO. 2016. Proceedings of the zonal peer review of the Pre-COSEWIC Assessment for Lake Sturgeon, *Acipenser fulvescens*, Designatable Units 7–8, in Canada; November 3–4, 2015. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2016/010.

Aussi disponible en français :

MPO. 2016. Compte rendu de l'examen zonal par les pairs sur l'évaluation pré-COSEPAC de l'esturgeon jaune (Acipenser fulvescens) des unités désignables 7-8 au Canada; les 3 et 4 novembre 2015. Secr. can. de consult. sci. du MPO, Compte rendu 2016/010.

TABLE OF CONTENTS

SUMMARY

In November 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed the eight Designatable Units (DUs) of Lake Sturgeon (*Acipenser fulvescens*) in Canada. COSEWIC is required under the *Species at Risk Act* (SARA) to review the classification of each species at least every 10 years. As a result Lake Sturgeon was included on COSEWIC's fall 2014 Call for Bids to produce a status report. COSEWIC plans to re-assess Lake Sturgeon in April 2017. Fisheries and Oceans Canada (DFO) held a regional peer review meeting to review information relevant to COSEWIC's status assessment for Lake Sturgeon, DUs 7–8 on November 3–4, 2015.

Meeting participants included DFO (Science, and Species at Risk programs), Anishinabek/Ontario Fisheries Resources Centre, Concordia University, U.S. Fish and Wildlife, Ontario Ministry of Natural Resources and Forestry, Hydro-Québec, Ministère des Forêts, de la faune et des Parcs du Québec, Ontario Power Generation Inc, Environnement et Terre Odanak and PDG EnviroScience et Faune Inc., Kitigan Zibi Anishinabeg, and the three COSEWIC report co-authors.

This Proceedings summarizes the relevant meeting discussions and conclusions from this pre-COSEWIC assessment.

SOMMAIRE

En novembre 2006, le Comité sur la situation des espèces en péril au Canada (COSEPAC) a évalué les huit unités désignables (UD) dans lesquelles se trouve l'esturgeon jaune (*Acipenser fulvescens*) au Canada. En vertu de la Loi sur les espèces en péril (LEP), le COSEPAC doit revoir la classification de chaque espèce au moins tous les dix ans. Par conséquent, le COSEPAC demandait dans son appel d'offres de l'automne 2014 la production d'un rapport sur la situation de l'esturgeon jaune. Le COSEPAC prévoit réévaluer la situation de l'esturgeon jaune en avril 2017. Les 3 et 4 novembre 2015, Pêches et Océans Canada (MPO) a tenu une réunion régionale d'examen par les pairs afin d'examiner les renseignements qui pourraient servir au COSEPAC lorsqu'il évaluera la situation de l'esturgeon jaune, unités désignables 7-8.

Ont participé à la réunion le MPO (Secteur des sciences et programme des espèces en péril), l'Anishinabek/Ontario Fisheries Resources Centre, l'Université Concordia, U.S. Fish and Wildlife, le ministère des Richesses naturelles et des Forêts de l'Ontario, Hydro-Québec, le ministère des Forêts, de la Faune et des Parcs du Québec, Ontario Power Generation Inc., le Bureau environnement et terre d'Odanak, EnviroScience et Faune Inc., la bande de Kitigan Zibi Anishinabeg et les trois coauteurs du rapport du COSEPAC.

Le présent compte rendu résume les discussions et constatations pertinentes de la réunion d'examen pré-COSEPAC.

INTRODUCTION

In November 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed the eight Designatable Units (DUs) of Lake Sturgeon (*Acipenser fulvescens*) in Canada. COSEWIC is required under the *Species at Risk Act* (SARA) to review the classification of each species at least every 10 years. As a result Lake Sturgeon was included on COSEWIC's fall 2014 Call for Bids to produce a status report. COSEWIC plans to re-assess Lake Sturgeon in April 2017[1].

The intent of this meeting, as described in the Terms of Reference (Appendix 1), was to peer-review existing information relevant to the COSEWIC status assessment for Lake Sturgeon DUs 7–8, considering data related to the status and trends of, and threats to this species inside and outside of Canadian waters, and the strengths and limitations of the information. The pre-COSEWIC assessment is a science-based peer review that assesses the life history characteristics (including growth parameters, mortality rates, fecundity, generation time, early life history patterns, and specialized niche or habitat requirements), threats to the species and its habitat, describes whether the species has a residence as defined by SARA and reviews designatable units. DU7 includes the Southern Hudson Bay-James Bay populations, and DU8 includes the Great Lakes-Upper St. Lawrence populations.

Meeting participants (Appendix 2) included DFO (Science, and Species at Risk), Anishinabek/Ontario Fisheries Resources Centre, Concordia University, US Fish and Wildlife, Ontario Ministry of Natural Resources and Forestry, Hydro-Québec, Ministère des Forêts, de la faune et des Parcs du Québec, Ontario Power Generation Inc., Environnement et Terre Odanak and PDG EnviroScience et Faune Inc., Kitigan Zibi Anishinabeg, and the three COSEWIC report co-authors. The meeting generally followed the agenda (Appendix 3).

This Proceedings summarizes the relevant meeting discussions and presents the key conclusions reached during the meeting.

ASSESSMENT

The meeting began with a round of introductions. One of the co-Chairs provided an overview of DFO's pre-COSEWIC assessment, the listing process under the SARA and where DFO Science assessments (i.e., pre-COSEWIC assessment and Recovery Potential Assessment [RPA]) fit within the process. The co-Chair provided COSEWIC's current designations for the Lake Sturgeon DUs and identified whether they were listed under provincial or federal species at risk legislation. The meeting Terms of Reference, guiding principles and agenda were then reviewed. Eighteen presentations were given during the meeting and discussions followed each presentation.

FEDERAL SPECIES AT RISK ACT PROCESS UPDATE

Authors Marthe Bérubé and Shelly Dunn

Presenter: Shelly Dunn

Summary

The *Species at Risk Act* (SARA) is designed as a key tool for the conservation and protection of Canada's biological diversity. The purpose of SARA is to prevent wildlife species from becoming

[1] The COSEWIC assessment date was changed from November 2016 to April 2017 following this meeting.

extinct or extirpated (lost from the wild in Canada); help in the recovery of extirpated, endangered or threatened species; and ensure that species of special concern do not become endangered or threatened.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is an independent group of experts that assesses the status of wildlife species and recommends a classification for their legal protection under the federal SARA. In November 2006, the status of Lake Sturgeon (*Acipenser fulvescens*) populations were assessed by COSEWIC. The Southern Hudson Bay-James Bay Lake Sturgeon populations, Designatable Unit (DU) 7 were assessed as 'Special Concern', and the Great Lakes-Upper (Western) St. Lawrence Lake Sturgeon populations, Designatable Unit (DU) 8 were assessed as 'Threatened'.

If COSEWIC determines that a species is at risk, then the federal Cabinet must determine whether to list that species under SARA. This decision is not made in isolation; it is made after the federal government holds consultations with affected stakeholders and other groups, taking into account the economic and social implications that listing a species may have on Canadians' lives and livelihoods. To address this, in the years following the 2006 Lake Sturgeon COSEWIC assessment, Fisheries and Oceans Canada (DFO) Species at Risk Program has initiated a number of actions including:

i. a government response statement committed to consultations to determine whether or not these Lake Sturgeon populations should be added to the List of Wildlife Species at Risk (Schedule 1) under SARA;

ii. recovery potential assessment[2]

iii. socio-economic analyses, and

iv. consultations across the distribution of DU7 (Manitoba, Ontario, Quebec) and DU8 (Ontario and Quebec), with provincial governments, Aboriginal communities and organizations, stakeholders, and the Canadian public that may be impacted by a SARA listing decision.

Consultation and cooperation with Canadians are essential to the protection of wildlife species in Canada. As such, provisions for consultation and cooperation are key elements of SARA. Consultations across all Lake Sturgeon DUs were undertaken in 2007–2008 through workbooks, letters, public notices, face-to-face meetings and workshops. Additional efforts were undertaken in 2010 for DU7 and throughout 2011–2013 for DU8 to follow-up and engage Aboriginal communities and stakeholder organizations that responded and could be impacted by a SARA listing decision.

Consultation results revealed that within DU7, 61% of decided respondents supported listing, and nine percent opposed listing Lake Sturgeon DU7 populations as 'Special Concern'. Within DU8, 64% of decided respondents supported listing, and 11% opposed listing Lake Sturgeon DU8 populations as 'Threatened' under SARA. Additional feedback was received from respondents who were undecided or simply commented without a clear position supporting or opposing a SARA listing within DU7 or DU8.

While the SARA listing advice for Lake Sturgeon populations in DUs 7 and 8 is under consideration, ongoing research and studies continue at the federal, provincial, industry, and Aboriginal levels. DFO has made particular effort to support a number of these studies through the federal Habitat Stewardship Program (HSP) and Aboriginal Funds for Species at Risk (AFSAR). Four projects within DU7 totalling approximately $133,400.00 and 29 projects across DU8 totalling

[2] A recovery potential assessment for DU8 was organized and completed in 2008 by DFO Science and included participation from DFO, provincial governments, Aboriginal experts, academia, and industry. The RPA process provides information and scientific advice required to meet the various requirements of SARA.

approximately $1,851,000.00 were supported by AFSAR funding since 2007. Information from these studies will help fill data gaps and inform future COSEWIC assessment and listing decisions for DU7 and DU8. Lake Sturgeon populations in DU7 and DU8 are scheduled for re-assessment by COSEWIC in 2017.

Should there be an affirmative decision by the federal government to list Lake Sturgeon, Southern Hudson Bay-James Bay populations as 'Special Concern' on Schedule 1 of SARA, a management plan would be developed for implementation across DU7. If Cabinet decides to add Lake Sturgeon, Great Lakes-Upper St. Lawrence populations (DU8) to the List of Wildlife Species at Risk (Schedule 1) of SARA as 'Threatened', a recovery strategy, critical habitat order, and one or more action plans would be developed.

Recovery Strategies are detailed plans that outline short-term objectives and long-term goals for protecting and recovering species at risk. Action plans are the second element of the Act's two-part recovery planning process, and are used to implement projects and activities to improve species status. Management plans differ from recovery strategies and action plans; they set goals and objectives for maintaining sustainable population levels of one or more species that are particularly sensitive to environmental factors, but which are not yet considered in danger of becoming extinct. Whenever possible, management plans are prepared for multiple species on an ecosystem or landscape level.

Discussion

A meeting participant asked whether it was unusual for a species to go through the complete COSEWIC cycle and not have the government make a listing decision. Is it special because of the wide distribution and its importance to people? Lake Sturgeon is a complex and widespread species with a high level of public and Aboriginal interest and potentially broad socio-economic implications to be considered in a listing decision. The importance of the Lake Sturgeon has given it greater weight and attention for consultations and gathering additional information to inform the listing advice. The underlying provincial differences in governing legislation and species status in Ontario and Quebec has also added complexity, particularly for DU8. As such, additional time has been required. The development of listing advice remains in process. Should the DU structure change as a result of new information in COSEWIC's re-assessment, Recovery Potential Assessments may need to be updated, additional consultations held, and this could impact listing decisions.

VARIATION IN ABUNDANCE, RECRUITMENT AND GROWTH OF LAKE STURGEON ACROSS ONTARIO

Presenter: Tim Haxton

Abstract

The objectives of this study were to:

i) assess the variation in relative abundance of Lake Sturgeon subjected to various man-induced stresses and physical characteristics at a landscape scale across Ontario, and;

ii) ascertain the factors that explain the variability observed among rivers using a multivariate approach.

A standardized index netting program targeting juvenile and adult Lake Sturgeon was conducted over two field seasons at 22 river sites across Ontario. Each river had unique or different human induced stresses and physical characteristics. Relative abundance of Lake Sturgeon varied in rivers across the Ontario landscape. A principal component analysis was conducted using site

physical characteristics with the associated anthropogenic stressors. The catch-per-unit-effort (CPUE) for juvenile and adult Lake Sturgeon were then regressed with the scores of principal components having eigenvalues greater than 1. The variation observed was best explained by the negative relationship observed between CPUE and the presence of hydro-electric generating stations. Historical commercial fisheries also had an effect on Lake Sturgeon abundance whereas subsistence fisheries seemed to focus on rivers that were not regulated and where Lake Sturgeon numbers were greater. Research and recovery efforts should focus to minimize the impact of hydro-electric generation on Lake Sturgeon while achieving socioeconomic goals. Recruitment was highly variable in both regulated and unregulated systems, whereas recruitment failure was more evident in regulated systems, particularly in peaking systems.

Variation in Lake Sturgeon growth was assessed across a broad area, using graphical and statistical modelling techniques to explore and summarize important influences. Total length at age 12 (TL12) was used as an index of growth rate for each of the 37 populations studied. Environmental variables were tested for their influence on variation in growth. Length over all ages, in relation to the same environmental variables, was also explored using mixed effect models (site as random effect, total length as response and age along with other environmental variables as the fixed covariates). The most important influences on growth were waterbody type (lake or river), growing degree days (GDD) and presence of a hydro-electric facility. Lake populations displayed faster growth than river sites. As GDD increased, growth rate increased, with sites in the St. Lawrence drainage showing slightly slower growth than Hudson Bay drainage sites for comparable GDD which suggests that growth could be genetically determined. The effect of dam presence was only pronounced among riverine populations within the same minor drainage basin. Lake Sturgeon from all three basins showed approximately a 12% faster growth at the impounded sites than unimpounded sites.

Discussion

A participant asked about annual landings from commercial fisheries that are still open in the Great Lakes. The presenter pointed out that subsistence fisheries for Lake Sturgeon still occur throughout the province and that some regions of the province still have aboriginal commercial fisheries for Lake Sturgeon. All remaining commercial fisheries are closed for lake sturgeon (since 2009). There are no commercial fisheries for lake sturgeon on the American side of the Great Lakes.

The co-Chair asked if Lake Sturgeon in the Great Lakes can be caught as bycatch in other commercial fisheries. Under Ontario's *Endangered Species Act* (ESA), Lake Sturgeon are exempt in commercial fisheries as long as the fisheries conform to licence conditions. Licence conditions restrict "harvest" not catch. No targeting is allowed and fish must be immediately returned to the water with no harm. There is a bycatch policy that is being developed that would allow bycatch to happen, but if Lake Sturgeon are caught they can't be kept. For the most part they are live released.

The presenter was asked what the sample sizes were for each of the levels in the sampling design. The presenter was confident in the data presented especially for the regulated and unregulated systems. For the water management regimes, the juvenile sample sizes were lower. Are there plans for more sampling? There may be new locations included in the future depending on funding. It may depend on a listing decision for the species.

A participant asked what was considered as a lake versus a river in the growth models. Lakes were considered large water bodies and those associated with the Great Lakes. The presenter said that anything to do with the Great Lakes and the populations in the Great Lakes was considered under lakes while anything found in the rivers were considered river populations. In Lake Huron and Lake Superior, there was a lot of noise in the results as a lot of the fish spent time in the tributaries.

LAKE STURGEON RESEARCH ON THE OTTAWA RIVER, ST. LAWRENCE AND GREAT LAKES WATERSHEDS

Presenter: Dan Gibson

Summary

Ontario Power Generation Lake Sturgeon Mitigation Plans Overview and Data Sharing for DU7/DU8

Amendments were made to the regulation under Ontario's *Endangered Species Act* (ESA) on July 1, 2013. There are prescribed requirements for proponents to minimize adverse effects and prepare mitigation plans. This reform in the regulation moved Ontario Power Generation Inc. (OPG) to a more prescribed, self-directed process to compliance.

ESA Mitigation Plan Development focused on Lake Sturgeon (2009–Present). Efforts were concentrated in Northwest Operations (NWO) and Ottawa St. Lawrence Plant Group (OSPG). Management efforts are also taking place in Northeast Operations (NEO) – DU7. OPG registered 11 Mitigation Plans in 2014 and nine Lake Sturgeon Plans. Multi-year plans (5 year intervals) focused on adaptive management and implementation of long term mitigation/monitoring programs including; habitat construction/creation, flow regime alterations, streamside rearing/enhanced recruitment measures, spawning assessment, abundance assessment.

Kaministiquia River – Kakabeka Falls

In 2003, the Water Management Planning Steering Committee established a Lake Sturgeon study agreement. Migration was examined annually from 2004 to 2012, spawning success was examined from 2004 to 2013. A mitigation plan was registered in 2014. Mitigation Plan commits to minimum flows in the spring, confirmatory drift netting and (potentially) juvenile monitoring.

Alexander Generating Station (GS) – Nipigon River

A Mitigation Plan was registered in 2013.There was a larval drift study conducted in spring/summer 2015 to investigate spawning, egg incubation and larval drift. OMNRF confirmed the presence of adult Lake Sturgeon in the vicinity of the Alexander GS powerhouse and spillway (June 17–23, 2015). Drift net surveys were conducted from July 20–August 5, 2015 (17 study days), within 300 m of both the powerhouse and spillway. Water temperatures increased from 14.0 to 16.1°C, and daily discharge (spill) remained consistent between 458–676 cms. There was a diverse community of small bodied and larval fish captured. No Lake Sturgeon eggs or larvae were captured. Future studies may consider genetic sampling from adult or juvenile fish to determine if the fish present in the lower Nipigon River are immigrants from upstream populations, other Lake Superior tributaries, or recruited from spawning within the Nipigon River.

Moon River Control Dam – DU8

Walleye habitat was constructed in 2008 and subsequently used by Lake Sturgeon. In 2011/12 OPG and OMNRF negotiated an avoidance plan. OMNRF confirmed spawning and larval drift surveys in 2013. There was suspected spawning May 25–29 at 12–14°C under 100 cms. They applied estimates of time to hatch (58 cumulative temperature units (CTU) (degree days > 5.8°C)) from spawning and drift (7 days from hatch to start of drift and 10 days to peak). Estimated hatch from May 31–June 3 and drift June 7–13 and 73 larval Lake Sturgeon were captured, all at night. The peak time was between 10–11 p.m. The mean length increased each day; June 9 (18.9 mm), June 10 (20.3 mm) and June 11. (21.6 mm).

There were separate presentations given for Upper Mattagami River – DU7 and Lower Mattagami River during this meeting. Refer to those summaries for more information.

Ottawa River – DU8

Chats Falls GS

Spawning Habitat was created in Fall 2012. A mitigation plan was registered in 2014. Effectiveness Monitoring was conducted in 2013–2015 and adult Lake Sturgeon were observed each year during spawning window. Video, egg mats, and drift net surveys were challenging. There was confirmed larvae production in 2015. The Quebec commercial fishery was closed in 2014. There are discussions of a juvenile index netting program planned for 2017.

Chenaux GS

A mitigation plan was registered in 2014. During the 2014 Netting Program (which targeted adults), 41 Lake Sturgeon (between 3–38 years old) were collected during spring and fall netting. All fish were PIT tagged and 10 were radio tagged. Targeted Lake Sturgeon collections were much more productive than previous general gillnet surveys. Two enhanced spawning areas one in the Quebec side tailwater and one in the Ontario side tailwater with larvae documented in both areas. Sampling will continue in 2016. Radio Telemetry is viable technology when fish are in shallow areas (i.e., < 10 m). There were 8 of 10 tagged fish documented in the general vicinity of tailwater spawning enhancement areas in spring.

Des Joachims GS

A mitigation plan was registered in 2014. In 2015, exploratory efforts were done in a large area with little available information. More effort is needed in the larger areas to better assess the upstream reach. Sampling was conducted in two tributaries just upstream of the dam and in the spring two adults were collected. No Lake Sturgeon were captured in the fall of 2015. Planned Efforts for 2016 include netting in upstream areas of the impoundment and Otto Holden tailwater.

Otto Holden GS

Sturgeon are suspected to spawn in downstream areas (reach between Otto Holden and Des Joachims). In 2014, there was limited netting effort in free-flowing upstream areas and five adult Lake Sturgeon were collected. In 2013, 37 Lake Sturgeon were collected at Public Works Dam (TL 826–1424 mm). There is an ongoing study using carbon isotope tracing to determine the food web (is food for juvenile Lake Sturgeon a limiting factor for recruitment).

St. Lawrence Seaway – DU8

R.H. Saunders GS

A mitigation plan was registered in 2014. In 2012, New York Power Association installed two tailwater spawning beds on the U.S. side of the river. In 2015, broodstock collections resulted in over 10,000 juveniles for stocking. There were limited indications of successful use at the tailwater spawning beds (NY). OPG is currently assessing the need to provide additional enhanced spawning habitat.

Discussion

A participant asked if the presenter had an idea of the percentage of the total volume of flow going through drift net on the Moon and Nipigon Rivers. Based on experience with the James Bay Rupert program, with 100% you may have spawning but no response in the nets. The presenter answered that there was very little evidence of a spawn (egg mat and drift netting) happening downstream of another station in the Northwest (Caribou Falls on the English River system) but when they did their netting program, they found a lot of sub-adult fish so they knew the fish were there but there wasn't strong evidence of spawning and they wondered if the same might be happening on the Nipigon River. There may be an abundance of fish there and just not detected in the drift nets. On the English River they did catch a number of eggs in the drift nets but very few larval fish. In the Nipigon River, however, they did not catch any eggs in the drift nets nor larvae. They did a drawdown test on the spill wall to inspect the substrate looking for eggs on rocks but didn't detect any. The spawning area is in deep water on the Nipigon River. On the Moon River, OMNRF targeted where the Lake Sturgeon were spawning and set up drift nets downstream. It is a much easier area to sample.

A participant noted that sometimes drift nets are set too close to the spawning ground to capture larval drift. In some systems in Quebec, they have found that the nets have to be 1.5–1.62 km downstream to make sure larvae are mixing in the water column. The presenter noted that this has not been the practice on other systems in Northwestern Ontario (i.e., Kaministiquia River in Thunder Bay).

A participant said that they have used a technique to sample the stomach contents without harming the fish and they will share that with the presenter.

Another participant asked the presenter to comment on the critique that temperature may not be the best indicator of spawning behaviour but may be a better indicator of migration pattern. Sometimes ice-out date or discharge is thought to be a better indicator of spawning. The presenter has seen Lake Sturgeon spawning at variable temperatures. On the systems they have been studying for the past 10 years, they are confident in their ability to tell whether temperature is affecting spawning. On the Nipigon River, they used temperature, telemetry data and video data as evidence that the fish were down stream spawning. To date, temperature has been a secondary measure, not a predictive measure, as telemetry has been used to confirm the presence of Lake Sturgeon downstream of the facility in the spring.

A participant noted that in James Bay they wanted to determine the onset of spawning. They tried to develop a model for ecological flow that considered cumulative degree days but it didn't work all the time. The time the fish are exposed over 6°C or 8°C is very important (for gonad maturation). If you have a late melt and fast heating they may spawn at 14°C or 16°C. So spawning temperature can range from 10–18°C. The presenter agreed and noted that on the Kaministiquia River in May this year, temperatures increased very quickly. May 1–9 they reached 13°C about 10–12 days earlier than normal so they immediately began counting the clock for CTUs. Then the temperature dropped for 8–9 days so it didn't reach 13°C again until late May. As a result, they were tracking three different potential spawning periods during which it is important to maintain minimum flows. On this system, based on 10+ years of correlated data, OPG is committed to using temperature but a similar understanding on other rivers is still being developed.

OVERVIEW OF WATER QUALITY WORK IN NORTHERN WATERSHEDS OF ONTARIO

Presenter: Dan Gibson

Abstract

While many Lake Sturgeon populations across North America remain threatened and imperiled, some populations are demonstrating modest signs of recovery. As such, where recovery is evident and data are available, it is important to examine these successes to determine where repeatable and transferable management strategies exist. For these reasons this study sought to investigate the role of water quality improvements on two recovering Lake Sturgeon populations. The objective of this study was to assess Lake Sturgeon abundance as a biological response to improved water quality in two regulated rivers in northern Ontario with similar industrial histories (Kaministiquia River and Kapuskasing River). As such, long-term industrial effluent loading records were contrasted with records of Lake Sturgeon abundance over time (1970–2012). The relationship between Lake Sturgeon abundance (based on CPUE data) and improved water quality conditions (caused by reductions in effluent loadings) were explored and discussed. The results of this study suggest that in both cases Lake Sturgeon has demonstrated a positive response to significant reductions in industrial effluent loadings since the 1970s and 1990s. The results support time-order, consistency of replication, and coherence tests for causality with generally known stress response relationships identified in the literature and other cases involving Lake Sturgeon recovery. While available data may be limited, the authors contend further studies should be explored to discern the long term contribution of water quality changes to the original decline of the Lake Sturgeon as well as its subsequent and ongoing recovery.

Discussion

A participant noted that some of the gains made in improving water quality were made through the decline of what use to be a major industry (i.e., pulp and paper industry). If the pulp and paper industry makes a comeback, are the regulations in place sufficient to protect the fish species or will water quality issues arise again? The presenter responded that the recession in 2009/2010 severely impacted the pulp and paper industry in Ontario and this, combined with energy rates, paint a bleak picture for the industry. The industry and government invested billions of dollars since 1992 in establishing treatments for the water quality issue. The effluent from the industry is being captured in secondary treatment lagoons similar to municipal waste water treatment. So the loadings are significantly reduced. However some of the credit comes from a slowdown in the industry. If the industry was to rebound then there might be more stressors in terms of loadings in the systems. Ontario Ministry of the Environment (MOE) does have strict criteria in place in terms of the attenuation rates. For example, on the Kaministiquia River there is a minimum flow on the system to account for the loadings that happen downstream.

A participant asked if the water quality improvements were also associated with changes in benthic fauna. On the Kapuskasing River there is a twenty year program monitoring the benthic community. There was essentially no benthic invertebrate community within 30 km (downstream) of the pulp and paper mill when it was operating. The diversity indices were zero. The benthic community has been re-established and benthic fishes have also come back. At Smooth Rock Falls this was evaluated with White Sucker. Within three years of the pulp mill closing they had White Sucker showing up downstream of the mill largely in response to availability of prey and for spawning purposes.

A participant asked whether Lake Sturgeon live in the historic reaches of the Kapuskasing River that were once highly polluted. Or do they just migrate though it? In the Kapuskasing River, a mark-recapture study in 2012 initially captured fish post spawn (when the species was well dispersed) and recaptured fish in the fall. There was high variability in movement between capture and recapture. As a result it is assumed that Lake Sturgeon likely inhabit most of the Kapuskasing River and Mattagami River as both are interconnected lacustrine basins and the potential chemical barrier that once was present on the Kapuskasing River seems to have been removed.

RESEARCH IN PROGRESS: USING 3D MODELLING TECHNIQUES AND META-ANALYSIS TO WORK TOWARDS A BETTER UNDERSTANDING OF LAKE STURGEON SPAWNING HABITAT

Authors: Andre-Marcel Baril, Pascale Biron and Jim Grant
Presenter: Andre-Marcel Baril

Abstract

The scarcity of spawning habitat has been identified as a threat to Lake Sturgeon (*Acipenser fulvescens)*. In the late 1980s, two landslides disturbed the downstream portion of a 1 km stretch of spawning habitat on the Ouareau River south of Crabtree, Quebec, which partially supports the largest remaining population of the species. In 2007, following declining egg deposition, a restoration project was undertaken to improve the quality of the site. To understand the effect of the restoration, detailed bathymetry was retrieved using a Differential Global Positioning System (DGPS), and in conjunction with a Wolman count survey of the substrate material across the site, a 3D hydrodynamic model was created using the software *Delft3D*. The model provides information on critical habitat characteristics including depth, current velocity and sheer stress for any discharge rate and is capable of running unsteady simulations mimicking real life scenarios. The results for flow regimes corresponding with spawning seasons are compared with local-historical data and results of a meta-analysis for depth, substrate size, current velocity and water temperature to understand the effect of the project and the needs of Lake Sturgeon.

Discussion

A participant noted that they have a lot of data on egg collections with substrate size and water depth from Hydro-Québec that they could provide.

A participant asked how they were incorporating variability into the model. Is it a dynamic model or do you do iterations? The presenter clarified that they used a dynamic model but they can input different variables, and variables to range, at the start. So for example, you can input variable discharge rates and levels into the site.

The presenter was asked how he would validate the model. The model will be validated by relating discharge rates from a gauging station 25 km upstream to water surface elevation measurements recorded with the DGPS. If the model shows the same results as what was observed on the site when measurements were taken, we can say with confidence the model is replicating the actual flow regime over the study area.

He was then asked for details about expanding the model with STELLA to evaluate poaching. The system dynamics model uses life history information from fish from within the lower St. Lawrence region with regard to mortality rates. Stochastic rates of poaching and fixed levels of commercial harvest can be input into the model, to infer how those affect Lake Sturgeon and predict population levels. Currently there are insufficient life history data and we do not know the baseline population level.

A participant noted that one of the criticisms of habitat suitability models is their transferability and they asked if they will be able to use the dynamic model in other sites. The model only predicts flow, velocities and depths and all these variables for that particular site. It is not transferable at all and it is only designed to predict what is going on at that one site. More data collection would be needed to use it at other sites.

A participant asked if the authors were to put more data from larger systems into the model, would they be able to provide a general model for Lake Sturgeon spawning grounds. The model is a fluid dynamics model not designed to predict anything beyond physical dimensions for the one specific site. It doesn't take input of meta-analysis. It is advantageous for data collection in the spring where you typically can't access certain spots. It wouldn't be used to produce a general model.

AN OVERVIEW OF LAKE STURGEON ASSESSMENT WORK ON THE KAMINISTIQUIA RIVER AND BLACK STURGEON RIVER, ON

Presenter: Mike Friday

Abstract

The Kaministiquia River watershed is approximately 6,050 km^2. The river is regulated by Ontario Power Generation (OPG) and empties into Thunder Bay on the north shore of Lake Superior. During the Kaministiquia River Water Management Planning process, the Ontario Ministry of Natural Resources and Forestry (OMNRF) identified concerns with the impacts of flow regime manipulations on Lake Sturgeon reproduction downstream of Kakabeka Falls. The access of adult Lake Sturgeon to their historical spawning site and reproductive success was identified as an issue during the planning process. In 2003, the Water Management Plan Steering Committee established a Research and Data Gathering Agreement that set out the principles under which all parties would cooperate to carry out studies and trials related to the Kaministiquia River Lake Sturgeon population over the period of the Water Management Plan. From 2004 to 2012, OPG and OMNRF examined the movements of adult Lake Sturgeon to the base of Kakabeka Falls during controlled spill (using radio telemetry) and monitored spawning success (using drift nets). The arrival of radio tagged Lake Sturgeon to Kakabeka Falls ranged from late April to the end of June. Spawning was documented as early as May 14 and as late as June 27. The start of larval drift ranged from May 31 to June 15. The end of larval drift ranged from June 8 to June 29. The effective number of breeding adults was assessed from larvae collected in 2005 and 2006. The number of breeding adults in 2005 was 54 (45–64, 95% CI) and 97 in 2006 (47–305, 95% CI). From this study OMNRF developed an ecologically based tool to predict spawning and duration of larval drift (Friday 2014) and OPG developed the Kakabeka Falls Generating Station Lake Sturgeon Mitigation Plan.

The Black Sturgeon River watershed is approximately 2660 km^2 has a mean annual flow of 19 $m^3 \cdot s^{-1}$ and empties into Black Bay on the north shore of Lake Superior. The Ontario Ministry of Natural Resources and Forestry (OMNRF) has conducted a number of studies on the Lake Sturgeon population downstream of the Camp 43 dam which is located approximately 17 river kilometres from the confluence with Lake Superior. The estimated population size of Lake

Sturgeon was 89 in 2003 (54–138, 95% CI) and 96 in 2004 (47–240, 95% CI). The radio telemetry study conducted from 2003 to 2009 showed that Lake Sturgeon:

(i) over-winter in Black Bay;

(ii) migrate into the Black Sturgeon River in the spring and early summer;,

(iii) migrate upstream as far as the Camp 43 dam;

(iv) inhabit the river during the spring, summer and early fall; and

(v) migrated from Black Bay into the Black Sturgeon River for up to 7 consecutive years which is inconsistent with spawning behaviour.

The genetic relationship of Lake Sturgeon above and below the dam, was assessed from samples collected from 2007–2009 (Upper Black Sturgeon River) and from 2002–2004 (from Lower Black Sturgeon River). Lake Sturgeon from Black Sturgeon River watershed are one population as genetic structuring was not evident among fish sampled from the upper portion of the river and those emigrating from Black Bay, Lake Superior. The effective number of breeding adults in the Black Sturgeon River downstream of the Camp 43 dam was assessed from larvae collected in 2015. Based on the 2015 cohort, the number of breeding adults in the Black Sturgeon River was 24 (14–44, 95% CI).

Discussion

The presenter was asked if the tool they developed could be transferred to different systems to see how effective it is. The presenter said that in 2013, they used the model and a continuous temperature logger to predict spawning and drift of larval Lake Sturgeon in the Kaministiquia River. When the temperature reached 13°C, for a period of two days, they began the CTU accumulation. It predicted drift within the day at 150 CTUs. It ended at about 420 CTUs in early July. A similar result occurred in 2015 on the Black Sturgeon River where they were able to predict spawning and larval drift.

A participant asked about population estimates. The presenter indicated the recapture phase is scheduled for the spring of 2016, so the estimate won't be available until that part of the study is complete. There has not been an adult estimate since 2001.

When the author was referring to breeders, was that pairs or just female breeders. The Welsh et al. (2015) publication parsed it out into male and female breeders.

Another meeting participant asked if the presenter had any initial thoughts on whether the population has increased or decreased since the last estimate. The presenter was able to mark 214 adults in spring 2015. In the past (2001), they used a single season Schumacher-Eschmeyer estimate over a two week interval in the fall. Given the periodicity of spawning you don't have all the fish showing up in the single year. Now they are using a Petersen estimate by marking fish in spring 2015 and recapturing in spring 2016. A participant asked how they would account for spawning periodicity when you do your population estimate over two spawning seasons. The presenter indicated that they were just using the two methods to give two different estimates. A participant asked if they could use the previous radio telemetry data to estimate the proportion of fish in the spawning run. Another participant indicated they are trying to run COLONY to find a spawning periodicity based on the years of larval drift, looking at how frequently the males and females come back. It takes time to run the model and it is not yet completed.

A participant noted that Pledger et al. (2013) is a paper on a statistical model for periodic spawners like Lake Sturgeon, so there is a tool for analyzing mark-recapture data among two years to come up with a spawning estimate.

A participant asked about the radio tags used in the study. In the Kaministiquia River they tagged in the spring with two-year tags so they were able to get a spawning migration in the year of tagging and then one more beyond that. In the Black Sturgeon River, five of the tags had eight-year tag life and five tags had three-year tag life.

A participant asked if the fish tagged in the Kaministiquia and Black Sturgeon rivers had shown up in any other rivers. The presenter was not aware of any being caught elsewhere. However, in 2015 they did catch a Lake Sturgeon in the Kaministiquia River that had been tagged in the U.S. from a system on the Keweenaw Peninsula. There have also been reports of commercial fishermen in Thunder Bay that caught Floy-tagged fish from the Kaministiquia River.

OTTAWA RIVER

Presenter: Tim Haxton

Abstract

The Ottawa River from Carillon to Lake Temiscaming, representing the provincial border between Quebec and Ontario has been intensely studied over the past decade. Lake Sturgeon (*Acipenser fulvescens*) stocks are well below historical levels across their natural range. Three primary anthropogenic stressors have been identified as potentially limiting Lake Sturgeon populations in the Ottawa River: (i) commercial harvest, (ii) contaminants, and (iii) water power management. Hypotheses i and iii were tested by comparing Lake Sturgeon abundance and examining growth among reaches differing in level of commercial harvest and water management regime; hypothesis ii was tested by assessing contaminant loads in Lake Sturgeon and examining effects on growth and condition. Relative abundance, growth, mortality, and mean size of Lake Sturgeon did not differ among river reaches with (n=6) and without (n=3) a commercial harvest. Mercury was the only contaminant that was elevated. Neither growth nor condition showed any detectable relationship with mercury body burden. Relative abundance of Lake Sturgeon was greater in unimpounded than impounded reaches; additionally, there is evidence of faster growth in the impounded versus unimpounded reaches, suggesting density-dependent compensation. Water power management appears to be the primary factor affecting Lake Sturgeon in this river.

Habitat requirements are not known for all life stages of Lake Sturgeon, especially the juvenile stage. Juvenile Lake Sturgeon can be important for assessing effectiveness of rehabilitation efforts and therefore life history requirements for this stage is important. A depth stratified, index netting program selective to juvenile Lake Sturgeon was conducted in the Ottawa River, Canada from 2008–2010. Overall, a total of 192 juvenile Lake Sturgeon were sampled. A Bayesian approach was used to analyze the data including logistic regression, Poisson regression and a generalized linear model. The probability of capturing a juvenile Lake Sturgeon in a net and their relative abundance was greatest at the 12–20 m depth stratum and lowest at 35–50 m depth stratum in both impounded and unimpounded river reaches. Lake Sturgeon mean total length was smallest at shallowest depth stratum (1–3 m) and greatest in the deepest depth stratum (50–75 m). For spatial segregation, mean total length of Lake Sturgeon was significantly smaller in the lower reach of the three contiguous, unimpounded reaches whereas the trend was opposite in impounded reaches where the smallest Lake Sturgeon were sampled in the upper third of the river reach. This study therefore identified areas where the probability of capturing a juvenile Lake Sturgeon is the greatest and where to best expend efforts through a stratified random sample study design when conducting effectiveness monitoring of any restoration or management actions.

Discussion

A participant asked if the presenter thought that there were natural barriers in the Ottawa River – so there was downstream drift with limited upstream movement. The presenter evaluated pictures of the river before the dams were installed and they concluded that there were no natural physical barriers in the Ottawa River especially during high flows. The system is managed for large freight and Otto Holden was considered the head of navigation in the historic records. Going further upstream, the river becomes narrower and shallower.

A participant questioned the analysis with commercial fishing. Since fishers won't fish where there are no fish how do you compare reaches with and without commercial fishing? The fishers have commercial licenses to fish specific areas and they cannot change the areas. Downstream of Ottawa was closed to commercial fishing in 1984 due to contaminant issues. For the Quebec portion of the river, commercial fishing was closed in 2013 as it was thought to be impacting the population. The number of fish caught was quite low in some sections of the river (e.g., 18 fish per year).

The presenter indicated that they had many tagged fish but very few recaptures which would indicate a very large population. However, they indicated that they had no confidence in the population estimates.

Another participant asked their opinion of the population status for Lake Sturgeon in the Ottawa River. The presenter thought it was encouraging that they are seeing more fish and good class size distribution and a few older fish. In the three contiguous sections they look good. They still have the effects of the some of the larger fish being taken from the system. In the lower stretches like Lac des Chats, and Lac Deschenes, there are still few juveniles. Lac Dollard des Ormeaux was closed in 1984 and although there are still very few adults there are lots of juveniles which is encouraging as recruitment is occurring. In Holden Lake and Lac la Cave reaches, there were fish on the spawning shoal but there are winter drawdowns so the young don't have the opportunity to survive. The presenter didn't think you would ever see Lake Sturgeon recover there. Another presenter indicated that between Gatineau and Carillon, most rapids are used by spawners every year.

A participant asked about the timing of the netting assessments. The broad-scale netting was done from June until mid- September when the temperatures reached 13°C. They were based on area so it took about 8–9 days on each section of the river. Trap nets were done in summer/fall until September when the temperatures went down from 15°C–10°C.

A meeting participant asked whether the commercial fishery had a quota and if the low harvest meant that they couldn't fill the quota. They had an individual quota for the different reaches in the Ottawa River.

LAKE SUPERIOR

Presenters: Tom Pratt, Curtis Avery, Andrew Ecclestone and Kyle Crans

Abstract

There are 15 recognized Canadian tributaries on Lake Superior that historically supported Lake Sturgeon, along with an additional population (or populations) in Lake Nipigon proper. Sturgeon are considered extirpated from four of those tributaries (Wolf, Gravel and Harmony rivers, and Stokely Creek). A fifth tributary, the Prairie River, was considered extirpated but juvenile Lake Sturgeon were captured off the river mouth in consecutive surveys so it is likely that a small, extant population persists in that location. Lake Sturgeon are extant but at critically low numbers in the Pigeon, Nipigon and Michipicoten rivers. Lake Sturgeon remain extant at low levels in the

Kaministiquia, Black Sturgeon, White and Batchawana rivers. Populations in the Pic and Goulais rivers and Lake Nipigon are thought to be larger. Population status in two locations, the Chippewa and Little Pic rivers, is unknown. Spawning run estimates exist for the Kaministiquia (~100 individuals) and Black Sturgeon (~90 individuals), and population estimates are available for Batchawana (~4,400 individuals) and Goulais (~9,000 individuals) bays. A single, coordinated effort to assess the lakewide status of Lake Sturgeon was undertaken in 2011. The survey found the highest catches off of the Goulais (6.5 Lake Sturgeon /net), Pic/White (3.6 Lake Sturgeon /net) and Black Sturgeon (2.4 Lake Sturgeon /net) rivers. Lake Sturgeon populations in Lake Superior appear to be slowly recovering, with habitat limitations including hydro-electric generation (Kaministiquia, Nipigon, Michipicoten), anthropogenic barriers (Black Sturgeon) and natural habitat limitations (e.g., natural barriers close to tributary mouths; Pigeon, Prairie, Chippewa) either limiting recovery or extending the time to recovery in some populations.

Discussion

One of the participants pointed out that based on the genetic analysis the north shore of Lake Superior was basically one meta-population using multiple tributaries. There was some evidence of subtle structuring from the Black Sturgeon River east. Michipicoten River is still part of the same group. The Kaministiquia (Thunder Bay) stands out. Goulais Bay is a mix between the Kaministiquia and the Northshore meta-population. Bad River is in Wisconsin and the Sturgeon River is in Michigan.

A participant asked if there was any genetic data taken from the 17 fish that were caught on the Nipigon River. The presenter replied that they did and the analysis showed that they were very closely related and indistinguishable from nearby north shore rivers.

A participant noted that the presenters had indicated some of the populations were extant, moderate, moderately abundant, or stable. Are any of the populations increasing? There are not good time series for any of them. Stable is based on CPUE being the same now as it was 10 years ago. If any are increasing, they are doing so very slowly. There is recruitment everywhere but they have not reached some threshold yet where you could see leaps in abundance. A participant suggested that they looked to be very small populations (several hundred fish). The presenter agreed and suggested they are likely less than 10% of the historic abundance before harvest. These are small to medium sized tributaries with only a few kilometres between the lake and the nearest impassible waterfall. Lake Superior is quite inhospitable for Lake Sturgeon. Sturgeon are there and they are persisting. There are few threats and they are likely slowly increasing.

With respect to the aggressive U.S. stocking, has it been going on long enough to evaluate its effect on lake-wide recovery? Most of the stocked fish are marked or tagged. There is some movement to nearby tributaries (e.g., Pigeon River) but the genetics of the fish are quite different (Winnebago strain) and identifiable from the rest of Lake Superior fish. In the future, we will be able to evaluate the impact through the genetics. They have just started to spawn in 2012, so knowing their impact is still a ways off. The stocking practices have changed and now tend to be small scale using stream-side rearing. They are no longer stocking the Winnebago strain that was stocked 20 years ago when they thought they were doing a good thing by stocking lots of Lake Sturgeon.

A participant asked why there were extirpated populations so close to extant populations. Historically, maybe there were so many Lake Sturgeon that some used the smaller tributaries even though the habitat was marginal. But now that abundance is so low, they may not use some of this marginal habitat.

A participant asked why they didn’t do two passes in their sampling. The first could use a stratified random sampling design to determine abundance. The second pass could target Lake Sturgeon in areas where they are more abundant to increase samples for the other parts of the study. The presenter indicated it was mostly a capacity issue. They don't have enough resources to sample the 17 tributaries.

Based on the sampling there were higher densities of fish closer to the rivers. The innermost strata had almost twice as many fish and then the next two strata were almost the same.

A participant asked if there were other rivers like the Kaministiquia where the juvenile fish may settle out in the river and not reach the lake. The only two with enough river distance would be the Pic River (96 rkm) or the Goulais River (80 rkm). However, although they use the bottom section of the Pic River for feeding, they don't appear to stay in the river. The Goulais River has several deep holes but it is generally shallow and sandy so it doesn't have the habitat for Lake Sturgeon to be year-round residents. The Kaministiquia River (48 rkm) seems to be unique.

A participant noted that the juvenile assessment program was very good and it should be implemented across the Great Lakes. Is there any evidence of year-class synchrony among the tributaries? The presenter has not looked at this although there are data with which to evaluate this. The presenter was asked if he had any concern that the annual survival is 0.7. Wouldn't that suggest a decline? He is concerned especially since it is both areas. It may be an issue with the program not calculating survival appropriately. If it is real, it may reflect the fish leaving rather than dying.

Lake Sturgeon abundance was always smaller in Superior than the other Great Lakes. Are the tributaries enough to support the population or could they be spawning in the lake (i.e., shoal spawners)? The presenter suggested that the tributaries may have been sufficient and there is no mention of lake spawners.

One of the participants noted that the summary table that was presented should be included in the status report for all populations. It included the site, population status (extant, extirpated, unknown), size of annual spawning run, observations (adults, spawning, larva, juveniles), juvenile index (year) and population status (Critical, Cautious, Healthy). The group agreed.

A participant noted that in Lake Superior, Lake Sturgeon seem to be in shallow warmer waters in bays. Is Lake Helen a deep lake with a thermocline and are Lake Sturgeon staying up in the shallow bays like Steamboat Bay? In the early spring, they seem to be going where the food is and where the habitat allows them. They observed Lake Sturgeon suspended at <2 m in water that could be 10 m deep as if they were sunbathing in the morning. They prefer the warmer shallow water in the spring. In the fall, they follow the slope and move around more. At the start of the study, Lake Helen was sampled to figure out Lake Sturgeon distribution. One was caught in 60 m of water. The depth tags used were set at 35 m.

LAKE HURON

Presenter: Lloyd Mohr, Kyle Crans and Keith Nahwegahbow

Abstract

At least 25 tributaries to the Canadian waters of Lake Huron are known to have had or currently have Lake Sturgeon populations. In addition, at least one shoal spawning location has been identified and several others are under investigation. Of the 25, only 5 are considered to have extirpated populations; this is less than what was thought 10 years ago. Lake Sturgeon population estimates are known for the southern Lake Huron/Upper St. Clair River population (35,484 individuals (95% CI = 25,939–45,030)) and also for a Saginaw Bay congregation (2,881 individuals (95% CI = 2,041–4,139)). Others are being estimated for the St. Marys River, Nottawasaga River, and the Mississaugi River. Adult spawning assessment has been the most commonly used

assessment technique with 8 locations completed in the past several years. Estimated spawning run numbers range from less than 50 to over 150. In addition a juvenile Lake Sturgeon assessment technique was completed on 10 Ontario tributaries in 2012. Three tributaries previously listed as extirpated had moderate (Blind River, 2.2 Lake Sturgeon /net) to high (Serpent River, 5.8 Lake Sturgeon /net) juvenile catches while four others had zero catches of juveniles. The technique continues to be under review and modification for Lake Huron. Significant work continues to be conducted on the St. Mary's River, the upper St. Clair River, and southern Lake Huron populations to better understand the meta-population dynamics of those areas. Habitat restoration efforts have shown remarkable success in eastern Georgian Bay in two hydro controlled tributaries. Installation of walleye spawning habitat and extended control of flow rates has resulted in the re-appearance of Lake Sturgeon, successful spawning, and successful larval recruitment. As more work is carried out, it becomes increasingly apparent that Lake Sturgeon populations are more widespread and more robust in Lake Huron than we thought in the past. Habitat connectivity, water flow alterations and historic pulp and paper effluent/deposits continue to be a limiting factor to the rate at which recovery is occurring. Continued effort will hopefully provide a better understanding of the status, relative abundance and sustainability of these populations.

Discussion

One of the participants thought that the egg count was quite low and wondered about the density of the egg mat used to find the spawning ground. The eggs were actually caught in the drift nets. The flow was too high (4 m/s) near the top of the riffles so the egg mats were coming out clean. One of the participants thought Lake Sturgeon may now spawn there.

The participant then asked about the net size used for the juvenile survey (4″+ mesh) and wondered if a smaller net size would be better. In Quebec, they are using experimental mesh (1″, 1.5″, 2″, 2.5″, 3″, 4″ mesh) gillnets for juveniles. Even though they are 12–14 years old, they tend to stack on the net. The juvenile survey was developed on Lake Superior. Most agencies in Ontario are very worried about bycatch (e.g., Walleye) so are concerned about using a smaller net size. The juvenile survey worked well in Superior but there is more bycatch the further south in Ontario you go. It was almost impossible to use the same method in Lake Erie because of bycatch. In Quebec, generally in areas where they catch Lake Sturgeon there is very little bycatch.

A participant asked about the range for the Vemco receivers. The literature indicated 500 m range. However they set them apart 1 km but receivers are picking up the fish up to 2 km away. This caused some issues and they are now moving them further away from each other.

There was a discussion around who was responsible for updating the table that will be used in the authors report. The presenter hoped that everyone will update the table with their own information.

A participant wondered if it seems that Lake Huron is in a similar state of recovery as Lake Superior. They don't have enough information at this point to know for sure but the expert opinion would be that there are slow increases but they haven't looked at the numbers before. It's too early to assess if things are better or not. Are Lake Sturgeon improving or are we better at finding them?

LAKE ERIE

Presenter: Lloyd Mohr

Abstract

A total of nine Lake Sturgeon tributary and shoal spawning locations have been identified in Canadian waters of Lake Erie. Of these, five are previously unknown populations. All of the extant populations are in the connecting waters of Lake Erie, the St. Clair and Detroit rivers and the

Niagara River. The only known Lake Sturgeon lake population is at a recently discovered spawning site in Buffalo Harbor, NY. The St. Clair-Detroit River system holds probably the largest Lake Sturgeon population upstream of the St. Lawrence River. A population in the north channel of the St. Clair River is estimated to be comprised of 11,720 individuals (95% CI = 7,356–16,083), while a population in the Detroit River is estimated to be 4,068 individuals (95% CI = 869–7,268). Movement throughout the St. Clair-Detroit River system has been monitored closely in recent years, resulting in a hypothesis of three distinct spawning populations; the Detroit River population, the Lake St. Clair population, and the upper St. Clair River/southern Lake Huron population. Lake Sturgeon spawning habitat improvement and creation in the Detroit and St. Clair rivers (approximately 5.7 ha at seven sites) has resulted in the creation of successful spawning locations and evidence of egg deposition and larval recruitment to the population. Recruitment assessment in Lake St. Clair suggests strong year classes for several years back to at least the early 1990s. A Lake Sturgeon juvenile index assessment was conducted in Lake Erie in 2014. A total of 5 sites (3 tributaries and 2 offshore shoals) in Ontario waters were studied, however, no juvenile Lake Sturgeon were captured at these sites. Fifteen juvenile Lake Sturgeon were captured in the St. Clair-Detroit River system using the same methodology. This assessment technique is under review for Lake Erie. Conversely, the commercial fishery in Ontario waters of Lake Erie continuously reports incidentally caught juvenile and sub-adult Lake Sturgeon primarily in the western basin of the lake. As in the other Great Lakes, as more effort is focused on Lake Sturgeon assessment, more information comes forth. Habitat loss continues to be a significant deterrent to Lake Sturgeon recovery in Lake Erie along with extremely low adult population size. The importance of the connecting waters is clearly evident as is the lack of Lake Sturgeon in the smaller tributaries of the lake basin itself. More work is required to address the unknown sites in the Ontario waters of Lake Erie.

Discussion

A participant asked why there were sites on the juvenile survey that were not in tributaries (e.g., Point Pelee, Rondeau Bay). The presenter didn't know for sure but thought maybe there was some historical evidence of shoal spawning. Another participant confirmed that suspected shoal spawning was the reason for sampling those sites.

A participant asked for clarification on the upstream drift in the St. Clair River. The norm seems to be for the Lake Sturgeon to move upstream, spawn, and then move back downstream to the feeding grounds and preferred habitat. There's a fairly strong indication that at least in older year classes (yearling and up), fish are moving upstream after they reach those stages (possibly due to the current). They are catching larvae ahead of known spawning shoals. There are two theories being considered. One strong theory is that in the St. Clair system, they think that they have fish that are actually migrating upstream rather than downstream. The other hypothesis is they are simply missing spawning locations further upstream from where they think the spawning site is located.

A participant asked about the recreational fishery on the U.S. side of Lake St. Clair. In 2014, there were 13 fish harvested but it was the fourth year of an increasing trend. The catch rates from creel surveys indicate the number caught are much higher than the number harvested. The majority of the fishery is, and always has been, catch-and-release but there has always been a harvest component. It has only been in the last few years that the harvest component has started to increase. There are 13 fish registered so far in 2015. The presenter was not sure if the number captured was increasing but there is an increasing trend in the number being kept. The catch rates should be available.

GENETIC STRUCTURE OF LAKE STURGEON POPULATIONS IN NORTHERN ONTARIO

Authors: Chris Wilson, Jenni McDermid, Shawna Kjartanson, Kristyne Wozney, and Tim Haxton
Presenter: Chris Wilson

Abstract

Genetic patterns within and among Lake Sturgeon populations in DU7 and DU8 show their origins from two colonization sources at the end of the Pleistocene. Previous work using mitochondrial DNA suggested the existence of two lineages with secondary contact in northeastern Ontario (Mattagami River drainage); these results were confirmed with microsatellite DNA analyses, which also revealed the ancestral sources and relationships of populations across Canada. Sturgeon populations in DU7 are genetically similar to populations in western DUs, and were largely founded from the west via Lake Agassiz and subsequent proglacial lakes which enabled colonization of northern Ontario and central Quebec. By contrast, Lake Sturgeon in the Great Lakes largely originated from a Mississippian refugium. Secondary contact between the two groups occurred in the precursor to modern-day Lake Nipigon, as well as in western Lake Superior. Genetic relationships among Lake Sturgeon populations within DU7 reflect shifting watershed boundaries during postglacial isostatic rebound, with populations in different major river systems becoming reciprocally isolated thousands of years ago. Genetic patterns within DU8 are detailed elsewhere (A. Welsh presentation). Within watersheds, genetic data from several river systems in Ontario reflect the historical connectivity among contiguous habitats prior to fragmentation by dams and reservoir construction. Populations within fragmented systems do not show significantly reduced genetic diversity as measured by allelic richness and heterozygosity, but have incurred genetic losses based on reductions in effective population size (N_e) over intervals of 1 to 2 generations. As N_e reflects the amount of genetic diversity comparable to the numbers of adults successfully contributing to the next generation, marked reductions in N_e in fragmented systems over a small number of generations may reflect challenges for successful recruitment and population rehabilitation.

Discussion

A participant asked if the Lake Nipigon signal could be the result of the Ogoki diversion. In 1943, in response to WWII, Canada and the U.S. agreed to the Ogoki diversion which diverts water into Lake Superior that would normally flow into James Bay. The diversion connects the upper portion of the Ogoki River to Lake Nipigon. This water was diverted to support three hydro-electric plants on the Nipigon River. This brought water from James Bay into the Great Lakes. This may have resulted in the separation identified in the dendograms. It may also be possible that Lake Nipigon looks the way it does because it would have had a very large historic population, it would not have had genetic drift and it was one of the main Lake Agassiz drainages. Despite where watersheds are today, it was basically a Lake Agassiz population trapped there that became isolated from the rest of the Great Lakes when the Barrier waterfall emerged about 8,400 years ago where the Alexander Dam is now. It is genetically the Missourian or western group but it is now part of the Great lakes watershed.

A participant asked since Nipigon is Missourian in origin but it is in a different biogeographic zone, would that be an argument to have it as a separate DU. The presenter said no because it could be a faithful reflection of colonization history and it has not changed that much because of the size of the population. It could also be because of the Ogoki Diversion. DUs are not based just on where they were colonized from because what happens when you have secondary contact. You could have a new novel combination of different divergent groups coming together.

A participant asked the presenter his thoughts on using genetic tools to distinguish DU boundaries considering the genetic diversity seems to be really low. The presenter noted it is easy to over interpret data. The real question is how different is different and when does it become important. Last week there was a presentation on the Nelson River using super high-resolution markers (DFO 2016). They can identify unbelievable structuring within the Nelson River. They look at thousands of single nucleotide polymorphisms. It doesn't mean the Nelson River should be subdivided into multiple DUs. The genetic work I presented show how the groups have shared ancestry and how they relate to each other. The DUs should reflect the significant and discrete criteria. The genetics is more informative for identifying management units within DUs because beyond the two lineages we don't see major evolutionary or adaptive splits within the species.

A participant asked whether Wisconsin information comes from the Winnebago system or does any come from the Bad River on Lake Superior. The samples we ran were not from Winnebago. Wisconsin would be an area where the two groups came together. Wisconsin, Minnesota, Northwestern Ontario would have been colonized by both groups. They are not Superior drainage fish.

A participant noted that they had pretty good sample coverage but wondered if the presenter would you like to see samples from elsewhere. In Northern Ontario, samples from the Severn, Winisk, Albany and Ogoki would be useful. Ogoki samples would help to evaluate Lake Nipigon. They have samples from Quebec to run as well. Ultimately, they would like to pull samples together from across the range to run through the single nucleotide polymorphism (SNP) analysis to give the highest resolution possible, then we could say what is informative for evolutionary groups for contemporary watersheds and how much change we see. Those markers don't have to be limited to neutral, because they are scattered through the genome and most are in non-coding areas but some will be in functional genes. So we could say, do we see any evidence where there has been divergence in response to local conditions?

A participant noted that for the most part that there is quite a bit of clustering around the DUs other than DU6 which we will discuss in the DU discussion.

LAKE ONTARIO

Presenter: Tim Haxton

Abstract

Rehabilitation effort has been taking place in Lake Ontario between 2008–2013 with NYSDEC in collaboration with USFWS, stocking 8,047 Lake Sturgeon into New York waters of Lake Ontario and its tributaries. Success of stocking efforts have been reflected in gillnet surveys with a slight increase in Lake Sturgeon catches in the past 15 years. Lake Sturgeon assessment has occurred in three main locations within Lake Ontario/St. Lawrence: lower Niagara River; Trent River; and the Upper St. Lawrence River.

A slight increase in the number of Lake Sturgeon has been detected using setlines in the lower Niagara River. The current population estimate for this area is 3,000–6,000, however the study is affected by the inherent low recapture rates of Lake Sturgeon. A diet study of Lake Sturgeon frequenting the lower Niagara showed that amphipods accounted for 91% of all prey items, whereas Round Goby account for 87% of wet mass. Telemetry and habitat studies are currently being conducted to map important habitat and learn the seasonal migration and use of this river.

Index netting was conducted in the Trent River and downstream of Dam 1 (i.e., Bay of Quinte). The technique targeted juvenile and adult Lake Sturgeon however, no Lake Sturgeon were captured. The species is believed to be extirpated in the Trent River outside of the occasional

migrant possibly transcending barriers through the lock system. Habitat within the sections assessed (Frankford and Percy Reach) was no longer considered conducive for the species. Lake Sturgeon are known to spawn downstream of Dam 1 and requires further assessment.

A long term study has been conducted in the Upper St. Lawrence river to assess the status of the population, and identify area of core occupancy. Between 2009 and 2013, 113 Lake Sturgeon were sampled (mean length 125.3 cm, mean weight 13.9 kg). Very few recaptures were sampled (n=5) therefore population estimates were unreliable. Lake Sturgeon moved in and out of the study area with fish originally tagged in the Oswegatchie River, NY recaptured in the study area. However, Lake Sturgeon remained within a core area of the river where the majority of the observations (68.4%) were from 10–20 m depth.

Discussion

A participant asked how close the spawning beds on the Niagara River are to the whirlpool. The presenter did not know.

The presenter agreed to update the table for Lake Ontario.

A participant asked if they had any idea where the fish in the lower Trent are coming from. The presenter thought that they were probably coming from the Bay of Quinte. There were not many.

Another participant commented that the Napanee River, which flows into the Bay of Quinte, is good spawning habitat for Walleye and they wondered if anyone has surveyed the Napanee River for Lake Sturgeon. Lake Sturgeon is considered extirpated there.

A participant noted that the proportion of Round Goby in the diet of Lake Sturgeon is amazing. Would you expect it to have an impact on the growth and condition of Lake Sturgeon? The presenter thought that it is likely for both Round Goby and Zebra Mussel. You would likely pick up their signature.

DU8 GENETICS WORK

Presenter: Amy Welsh

Abstract

Designatable Unit (DU) 8 currently consists of all Lake Sturgeon populations in the Great Lakes. Previous genetic work on Lake Sturgeon using a small portion of the mitochondrial DNA showed genetic differentiation between Hudson Bay and Great Lakes populations, with little genetic variation within the Great Lakes. However, using 12 microsatellite loci, genetic differences were observed between Great Lakes spawning populations. I presented data from 12 microsatellite loci from Canadian Great Lakes populations (representing the full range of DU8), as well as some Hudson Bay populations. The deepest observed split was between the Hudson Bay and Great Lakes populations. Taking a hierarchical approach, the next level of genetic distinction was between Lake Superior and the lower Great Lakes. Two populations in Lake Superior (Michipicoten and Goulais rivers) appear to move between Lake Superior and the lower Great Lakes. Within Lake Superior, the Kaministiquia River is distinct from the rest of the lake. Within the lower Great Lakes, there is some limited evidence that the St. Lawrence River is genetically distinct from the rest of the populations. Future work using higher-resolution genetic markers (i.e., SNPs) will provide additional information about genetic differences between populations within DU8.

Discussion

One participant noted that the Des Prairies sample is actually a St. Lawrence River sample. The Des Prairies River is very small and is what makes Montreal an island. The water comes from the Ottawa River. There are no obstacles between the St. Lawrence and Des Prairies rivers. The sample likely comes from sampling in Montreal while collecting eggs used to rear Lake Sturgeon for the Upper St. Lawrence River. About 60 years ago, before the construction of Moses-Saunders and Beauharnois dams, there were extensive movements between the lower St. Lawrence River and Lake Ontario. The presenter did not think the difference between the Des Prairies and St. Lawrence is real. They have lots of samples as the commercial harvest in the St. Lawrence is 10,000 fish per year. The presenter noted their sample size for the St. Lawrence is quite large and they are now looking at a finer scale analysis of the samples.

The participant also noted that the Grasse River is not a tributary of Lake Ontario but of Lake St. Francis downstream of Moses-Saunders. It is connected to Lake St. Francis with a depleted Lake Sturgeon stock.

Another participant asked if they excluded the PCoA results, how different would the St Lawrence be from the other populations. The presenter would then conclude that they were a part of the Lake Huron-Lake Ontario lower Great Lakes cluster. Looking at each of the other measures it falls within that range so a question was raised about whether there could be a bug in the input file. The presenter re-ran the PCA analysis and doubled checked the input file but there were no errors. She then undertook a factorial correspondence analysis (FCA) and found that the St Lawrence does still separate out but not as drastically as with the previous analysis, but the patterns generally match. Another participant noted that a weight of evidence approach should be taken. We have four analyses that show some slight separation with the St. Lawrence and one that shows a wide separation. The FCA takes into account the individual variability better than the previous analysis so should be given more weight.

The participant had a question about ghost populations mentioned and their absences leading to interpretation problems. They asked the presenter if it would clarify things if the U.S. data was included with the Canadian data. The analysis has been completed with all the populations including the U.S. This includes, the Bad and White rivers in southern Lake Superior and the Sturgeon River, western Lake Michigan includes the Menomonee, Wolf and Fox rivers. There are samples from the U.S. side of Lake Huron and the Grasse River off the St. Lawrence River. The Bad and White rivers in Lake Superior are genetically distinct from everything else. So there is higher genetic differentiation within Lake Superior. We see the same pattern with the Wisconsin samples that Chris observed; they are from the Lake Michigan basin and cluster more with the St. Lawrence. The U.S. populations in the lower Great Lakes are part of the lower Great Lakes cluster.

The Kaministiquia River samples pool with Minnesota and northern Wisconsin. The Kaministiquia River was historically degraded to the point of being anoxic based on an earlier presentation. When pooled with the U.S. samples, the next nearest rivers are the Bad and White rivers but it still pools out as an identifiable population and stands apart in Lake Superior even with the U.S. populations.

Another participant asked the presenter if they have looked at genetic diversity in the Kaministiquia River and if there was any indication of site fidelity or a founder type effect. The presenter wondered if it was harder for them to move around because of the bathymetry. There appears to be less movement between the spawning populations within Lake Superior compared to the lower Great Lakes.

A participant pointed out that site fidelity could account for some of it but it would be an overstatement. Looking across the Superior basin there are three regional populations. The

Kaministiquia River largely groups with Minnesota almost regardless of species, not just Lake Sturgeon. The presenter pointed out that there are no known natural Lake Sturgeon spawning populations in Minnesota. It pulls out as different from both the north and south shores. There was unlikely to have been a large population there so there may have been a bottleneck or founder event. They come out as noticeably different. Pukaskwa is not a good place to be a Lake Sturgeon and they don't seem to traverse the deep water between Thunder Bay and Black Bay based on the genetics. The Black Sturgeon, White and Pic rivers group together. The Michipicoten and Goulais have greater movement between Lake Superior and the rest of the Great Lakes.

A participant noted that in Quebec they have tagged about 6,000 Lake Sturgeon on spawning beds from the brown waters of the Ottawa system, the Des Prairies River and in the Great Lakes waters south of Montreal. Even during the same spawning seasons there were movements of spawners between spawning sites. These movements sometimes ranged from 40–50 km within two weeks. There may be exchange among the spawning sites during the same season in some of these large systems. Another participant asked if they were spawning or moving between sites to feed. The presenter and colleagues indicated they were spawning at the different sites.

Another participant noted that in Lake Superior they are seeing movements that fit with the genetic patterns. During yesterday's presentation they had noted a fish spawning in the Pic River which was picked up five years later in the Nipigon River. They have caught fish in the Michipicoten River that were tagged down in Goulais.

A participant noted it would be helpful to include the U.S. populations in with the genetic analysis for context as it is helpful to see the complete picture. Chris and Amy will pool their data with the U.S. populations for the assessment.

A participant questioned whether STRUCTURE could be trusted when it seemed to change depending on the analysis. The presenter clarified that the Michipicoten and Goulais rivers are a mixture of Lake Superior and Lake Huron. Their membership to these groups is almost 50:50. Within Lake Superior, the Michipicoten and Goulais rivers are more similar to the rest of the Lake Superior population than they are to the Kaministiquia River. The only reason they stand out is because they are intermediate between Lake Superior and Lake Huron, they are not genetically distinct.

A participant asked if the presenter had looked at genetic diversity or if there was a founder effect. The Kaministiquia River has similar genetic diversity to the rest of the Lake Superior population, so it didn't have lower allelic richness or lower heterozygosity relative to the others. The only population that had significant lower genetic diversity was the population from Grasse River flowing into the St Lawrence River which drives its FST higher.

A participant asked if the presenter had seen any evidence of the mixed populations (as in Michipicoten and Goulais rivers), on the Lake Huron side. They also wondered whether they would see these mixed populations in tributaries close to the St. Marys River. The presenter said there were some people collecting samples from the St. Marys River but analysis has yet to be done. It would be interesting to see what the results would be but there may be the same pattern.

BIOLOGY, STATUS AND MANAGEMENT OF LAKE STURGEON IN THE PROVINCE OF QUEBEC AND DEFINITION OF DU8 AND CONSTRAINTS

Presenters: Yves Paradis and Éliane Valiquette

Abstract

In the context of the ongoing COSEWIC assessment, we present an overview of the status of Lake Sturgeon populations across the province of Quebec. Data regarding Lake Sturgeon status are

scarce for the James Bay drainage basin (DU7), however, abundant and up to date information are available for the populations inhabiting the St. Lawrence River drainage basin (DU8). In the St. Lawrence River, habitat fragmentations induced by major hydropower dams built in the 60's had a profound impact on the current situation of the populations. Lake Sturgeon in Lake St. Francis have been physically isolated from the other populations for at least 65 years and they are now constrained in the portion of the river located in between the Moses-Saunders and Beauharnois dams. All indicators reveal that abundance of this species in Lake St. Francis is critically low and recruitment is virtually nonexistent. Lake Sturgeon populations from Lac des Deux-Montagnes (which experienced a massive winter kill in the 1950s) and from the Ottawa River, show signs of recovery. In the 350-km un-fragmented stretch of the lower St. Lawrence River located between Montreal and Quebec City, the status of Lake Sturgeon is totally different. In the lower St. Lawrence River, indicators show that sub-adult and adult abundance is high and stable, significant recruitment occurs annually, and the number of known spawning sites is increasing over the years; more than 10 active spawning grounds are known and at least four are used individually by more than 1,000 spawners. In addition to the new spawning grounds discovered recently, the main navigation channel and naturally deep pools of the St. Lawrence River were identified as a major habitat for juvenile and adult Lake Sturgeon. The Lake St. Francis Lake Sturgeon fishery was closed in 1988. While all commercial fishing activities in the Ottawa River and DU7 were closed in 2012-2013, an important commercial Lake Sturgeon fishery is maintained in the lower St. Lawrence River. In 2013, a new management plan was released confirming that the actual quota (80 tonnes$\cdot$year^{-1}) was sustainable. To increase the protection of the spawning stock, a new size slot (800–1305 mm) is currently imposed on commercial and recreational fisheries. Finally, this presentation highlights the great disparity existing within DU8 in terms of Lake Sturgeon population characteristics, habitat productivity and status. Considering that Lake Sturgeon populations from the Great Lakes, the Ottawa River, and the St. Lawrence River are isolated geographically, we argue that adjustment of DU8 boundaries should be made to more appropriately reflect the current situation.

Discussion

A participant asked about the quota that was reduced to 80 tonnes. What was the reason for not reaching the full quota? The quota is not reached every year for a number of reasons including the fishers not fishing at all. Another participant indicated that fishermen may try to selectively keep the best fish, weather may limit the season, the season itself is shortened and a length limit has been added also affecting the ability to fill the quotas. Timing of fishing may not coincide with the major movement patterns of the fish. In the fall, the large Lake Sturgeon show up at once but if it is later in the season when the weather is bad, you might not be able to get out to fish.

One of the participants asked if there was a subsistence First Nations harvest, either in DU7 or the Ottawa River. To the presenter's knowledge, there is First Nations harvest in the St. Lawrence River and DU7 but they do not have any information on the size of the harvest. There is an agreement with one of the Abenaki First Nations near Lac St. Pierre to report their harvest but it is very low. The Mohawks have a caviar fishery during the spawning period near Montreal in the Lachine Rapids. There may be other fisheries by Mohawks of Kahnawake and Kanesatake which is on Lac de Deux-Montagnes. It is likely low in Lac de Deux-Montagnes where there is no commercial fishery. These are caviar fisheries.

Another participant asked if they were doing anything different in terms of the management plan and they wondered how long until they know if the management plan is successful in achieving its goals. They have been doing some baseline monitoring; monitoring sub-adults, recruitment, and another indicator is the characterization of the commercial fishery and they do that every 10 years. They just completed this monitoring this summer, 2015, so should have a good indication of the number of mature females in the commercial fishery. All indicators should be updated every 2–5 years to ensure production is ok. The work of the conservation officers, to try to confirm the quota is respected, is extremely important.

Another participant had a question about the overwintering areas and their characteristics and importance. They wondered why the fish go there and if the population would disappear if the overwintering areas were lost. This year (2015) they are doing more work in the overwintering areas but for now there is not a lot of information on these areas. The presenter didn't know if they are on the north or south shore as the receivers are not a high resolution setup. He suggested that some are overwintering near the Montreal effluent outlet probably because it is warmer, and is highly productive in terms of food. Others are in the really deep pool (>20 m) near to Quebec City (Portneuf region). He expects that they gather with Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) there during the winter. A participant suggested that this was to avoid frazil ice.

Downstream of Montreal, in the channel you have Lake Ontario water. On the right side you have the water from the tributaries of the south shore. On the north side of the channel you have the Ottawa River water and the waters off the Laurentian-Precambrian shield flowing together. There is not one water mass downstream of Montreal; there are four or five water masses. The mixing occurs between Trois Rivière and Quebec City. The presenter indicated that the movement patterns depicted in the presentation might be different if fish had been tagged upstream of Montreal rather than downstream of it.

There was a question asked about whether a dam or obstructions built at Trois Rivière would affect the Lake Sturgeon population. The presenter indicated that any new obstruction on the system would have catastrophic effects on the population. He indicated that the main reasons for the abundance of Lake Sturgeon the St. Lawrence included the high productivity of the system. In an earlier presentation benthic productivity of a river in northern Ontario indicated <100 organisms/m^2, whereas in the St. Lawrence River it is 20 times that density of invertebrates. Even the large Lake Sturgeon feed on very small invertebrates. In addition, the habitat is not fragmented from Beauharnois to the brackish water. There is a lot of movement of larvae, young fish and spawners all along the system. There were two hydro dam projects near Montreal, one close to the Jacque Cartier Bridge and the other in the Lachine Rapids, both would have blocked passage of Lake Sturgeon and many other migrating species including American Shad, Muskellunge, American Eel, and Copper Redhorse. These two projects were rejected.

A participant asked if there was any evidence that the Richelieu River was being recolonized from Lake Champlain. There are several nearby systems (Des Prairies, Lake Champlain, lower St. Lawrence). Fragmentation occurred around 1840 and prevented passage so there was no exchange between the St. Lawrence and Lake Champlain for a century. They have an efficient fishway on the lower dam (Saint-Ours). Although not monitored throughout the season, it is sampled during migration indicating 40–50 Lake Sturgeon use the fishway, so it is possible to move fish upstream. The Chambly dam has an American Eel ladder but is not passable by Lake Sturgeon.

The presenter noted that they are working with a researcher at the University of Laval, experimenting with environmental DNA to predict abundance of Lake Sturgeon in the sections of the St. Lawrence River. Preliminary results are expected this winter. He would like to discuss with anyone that has experience in this field.

Another participant asked what they thought the limiting factor was for Lake Sturgeon in Lake St. Francis. The presenter indicated that closing the entry and the outlet of the system about 50 years ago and overfishing of the remaining population resulted in the current status. Moses-Saunders was built over the spawning rapids. There are no major tributaries from the north but there may be some good inputs to the system (good substrate and water velocity) from the south (e.g., Grasse River system) from the Adirondacks. They have been working with the Akwesasne group to restore spawning habitat. There has also been work with adding substrates below Moses-Saunders to create spawning habitat. The dam fragmented the river and flooded spawning beds (e.g., Long Sault Rapids). In addition, stream-side rearing is a mitigation used in the system. The fishery has been closed on the New York, Ontario and Quebec side for more than 30 years; the Akwesasne do have a fishery of several hundred fish annually some of which they sell as smoked fish.

A participant noted that one historic spawning site on the Grasse River has documented spawning in the 1970s which was recently published.

Lake Sturgeon is the host for Hickorynut. A participant asked whether species associations data were collected during any of the sampling. The presenters didn't know.

SUMMARY OF KNOWLEDGE ACQUIRED ON LAKE STURGEON IN THE CONTEXT OF THE EASTMAIN AND RUPERT DIVERSION PROJECT

Presenter: René Dion

Abstract

Since development of the La Grande complex first got underway in the 1970s, a number of studies have been done on fish in the James Bay territory. However, the first studies only paid limited attention to Lake Sturgeon. The first in-depth study of Lake Sturgeon in the James Bay territory only began with the advent of the Eastmain-1 hydro-electric development and the Eastmain-1-A and Sarcelle powerhouses and Rupert diversion project. In the Agreement, drawn up for the Eastmain-1 project, Hydro-Québec made a commitment to carry out a program for the study and management of Lake Sturgeon, which led to several surveys to characterize and monitor the species in the Eastmain River and in the Opinaca reservoir and its tributaries. Hydro-Québec also committed to implementing a number of measures to ensure that the Eastmain-1-A and Sarcelle powerhouses and Rupert diversion project would have no negative impacts on aquatic fauna, including measures to protect the fish and their habitat. Among other things, specific focus must be placed on Lake Sturgeon spawning grounds, which are of major cultural importance to the Cree.

Since 2002, a number of studies on Lake Sturgeon have been conducted throughout an area covering the watersheds of the Rupert and Eastmain rivers, Opinaca reservoir and the section downstream of the La Sarcelle control structure.

The data collected from these studies was used to develop the Eastmain-1-A and Sarcelle powerhouses and Rupert diversion project, for which an Environmental Impact Statement (EIS) was submitted by Hydro-Québec Production to responsible government authorities in 2004. Because of the temporal and geographical overlap of the two projects, the data on Lake Sturgeon was collected simultaneously in adjacent regions. This is why the environmental monitoring associated with Eastmain-1 was incorporated into the Environmental Follow-up Program for the Eastmain-1-A/Sarcelle/Rupert project as of 2010.

The main purpose of the report is to provide a summary of the knowledge about Lake Sturgeon acquired during the Eastmain-1-A/Sarcelle/Rupert project. In a single document, this report summarizes the highlights of the work done on Lake Sturgeon (taken from over 100 documents), with a view to providing an overall portrait of the species' situation within the study area (the Reduced-Flow section, Rupert Diversion Bay section and the Increased-Flow section) and presenting a preliminary overview of the main results obtained and observations made after two years of monitoring during the project's operation phase (2010 and 2011).

Discussion

A meeting participant asked why the work was done on Lake Sturgeon. Provincially is it considered susceptible? It had a lot to do with Hydro-Québec building relationships with the Cree. The species is important to them. Under the James Bay agreement the use of Lake Sturgeon in that area is exclusive to native people (Cree, Naskapi, Inuit).

Are there any statistics on the voluntary catch registration? There are annual reports on the Rupert River which are quite complete. The harvest is quite high (about 1,000 fish annually between two communities) and the average size of the spawning fish is small. The signs suggest an intensively exploited population. However, the presenter doesn't believe it is overfishing, it is heavily used because it is a very important species for the people.

A participant asked how the stocking program was working out. Unfortunately, they have no monitoring of the success of the stocking program. The original objective was to release 5,000 fingerlings (stocked in September) in one section of the river. They currently undertake a juvenile index. The stocked fingerlings were fitted with a nose tags but not many are caught in the juvenile survey. Either survival wasn't good or they moved out of the area.

The presenter noted the report dates back to 2012 but the monitoring program is still going on so the report authors should contact them if they want more updated information.

Another participant asked if there was a defined time frame for the monitoring for this project. The monitoring program has a schedule that runs until 2021. However, as part of the authorization monitoring may go beyond this since, for example for Lake Trout, it identifies five years of monitoring after it is shown that the particular site is being used for spawning.

FRAYE DE L'ESTURGEON JAUNE ET INFLUENCE DES DÉBITS, FRAYÈRE DE DRUMMONDVILLE, RIVIÈRE SAINT- FRANÇOIS 2014–2015

Presenter: Michel La Haye

Abstract

The St. Lawrence River Lake Sturgeon population in Quebec, between the Beauharnois power dams and the estuary, is showing signs of recovery after a long period of overexploitation during the decade between 1980 and 1990. This recovery translates into a return of genitors in spawning grounds abandoned by the species in the last decades as well as increased occupancy in the Des Prairies River (DPR) spawning grounds, the most important reproduction site in the St. Lawrence drainage. In 1996, a first report of a Lake Sturgeon spawning ground in the St. Francis River in Drummondville was made and led to the implementation of mitigative measures near the spawning ground in early 2000s. Follow-up activities on this site resumed 10 years later, all thanks to the commitment of the Abenakis of Odanak, an Aboriginal community that relates to the Lake Sturgeon, which is considered mythical. Since 2012, the Abenakis of Odanak Council's Environment and Land Department, with preservation in mind and in harmony with the governmental efforts targeting the recovery of the Lake Sturgeon population, spearheaded a number of research projects to know how this species uses the St. Francis River and the spawning ground in Drummondville. This project's main goal is to assess the Lake Sturgeon's reproductive success in the Drummondville hydro-electric station's tailrace and to study the flow-rate and water flow pattern impacts on spawning ground dynamics. Specifically, the research objectives were:

1. identify the spawning sites and describe on-site activity;
2. estimate the number of male and female genitors using the area;
3. estimate the number of drifting Lake Sturgeon larvae born on-site;

4. assess their reproductive success, and;
5. analyse the effects of fluctuations in the flow-rate and water flow pattern on the spawning ground dynamics and on the Lake Sturgeon's reproductive success in the Drummondville spawning ground on the St. Francis River.

In spring of 2014, spawning took place from May 14 to May 17 at temperatures between 14 °C and 16 °C near the Drummondville hydro-electric station. A total of 46 Lake Sturgeon were caught (including 2 females and 5 recaptures) mainly near the spawning area located under and up-stream from the Curé-Marchand Bridge where water flows into the river from the Drummondville dam's spillway. Other Lake Sturgeon were harvested near the spawning ground used in 2012, which is located just downstream from the station and is fed by turbine processed water from the hydro-electric station. Using the Schnabel index, the incoming genitors abundance was estimated at 111 (57–418; CI 95%) spawning Lake Sturgeon, including five (3–20; CI 95%) females. According to the fecundity and weight equation of the two females collected (145.55 kg average), an estimate of 1,033,479 (529,989–3,875,546; CI 95%) eggs were potentially spawned in the area studied in the spring of 2014. A total of 104 Lake Sturgeon larvae were caught between May 28 and June 7 mainly in four larval drifting sites. Located on a transect 3.5 km downstream of the spawning ground, the 10 larval drifting sites could catch larvae born in all the potential spawning sites in the Drummondville region, which were mostly covered in this research. The average number of captures for a single attempt at each site varied from 0.0027 to 0.0200 larvae/m^3 of filtered water, the greatest number of captures being 0.0684 larvae/m^3 of filtered water. Depending on the river overall flow-rate, an estimated 24,094 larvae were produced in the spawning ground in 2014 giving an estimated survival rate from egg to larva of 2.33%. All of the research objectives were met. The estimates of females and reproductive success are plausible given the results obtained with the follow-up in the main spawning ground in the St. Lawrence drainage at the DPR station's tailrace. With these results, Drummondville's spawning site can be put into perspective and compared to the DPR spawning grounds, providing tools to Quebec wildlife managers to better supervise recreational fishing on this site during the spawning season. An adequate regulatory oversight should be a priority in Drummondville's sensitive spawning ground because its low levels of genitors are paired with a great accessibility to fishing activities. The observed relocation of genitors and captures from the spawning ground used in spring 2012 towards a new spawning site in spring of 2014 coincide with a modification in the water flow pattern in the station's tailrace. The spawning site recorded downstream from the spillway in 2014 underwent strong flow-rate variations due to the river's great fluctuations. This might have affected the reproductive success observed in 2014, but its real extent remains unknown. This research represents a first step to better understand the effects of flow-rate and water flow pattern variations in the Drummondville spawning ground. One of the long-term objectives is to improve the management of river flow at the Drummondville station.

Discussion

A participant asked the presenter for clarification on hydropower peaking by Hydro-Québec. The presenter indicated that peaking was not part of the authorized operating regime. Following the meeting this was further clarified. Although hydropower plants may operate as peak generators (i.e., fluctuate power generation to respond to demand), the Government of Québec requires minimum downstream flow to ensure that impacts are controlled and minimized on all recently built hydropower plants. At the Drummondville power plant, which is a run-of-the-river plant authorized before the creation of Hydro-Québec, variations in flow and spills generally depend on what is coming from the drainage basin and through other upstream dams. The Drummondville power plant can have local influence on the flow discharged in the tailrace for short periods of time as was observed during field work in 2014 and 2015.

Another participant asked about Lake Sturgeon choosing spawning sites based on flow rather than substrate. They sometimes spawn over bedrock because the flow is too strong in their preferred location. In one system they found that if the current was 40 cms they would spawn there rather than looking for other areas. If it was more or less than that then they would spawn elsewhere. They found that they could manage for poaching by selecting spillway gates to move the spawning into the centre of the river away from poachers. The spawning beds were successful because the area where the Lake Sturgeon were found had inadequate substrate. They estimated that they needed 13–48 m^2 of habitat per female to optimize survival of eggs.

Another participant added that a management plan for the whole system may be developed however they want to understand the system better first.

OVERVIEW OF DESIGNATABLE UNITS

Presenter: Tom Pratt

Summary

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) recognizes that the conservation of biological diversity requires protection for taxonomic entities below the species level; these units of conservation are termed designatable units (DUs). To qualify as DUs, the conservation units should involve taxonomically defined sub-species, or involve sub-populations that are discrete and evolutionarily significant. Some of the criteria do not apply to Lake Sturgeon, but two discreteness criteria (Criterion 1: Evidence of genetic distinctiveness including, but not limited to, inherited traits (e.g., morphology, life history, behaviour) and/or neutral genetic markers (e.g., allozymes, DNA microsatellites, DNA restriction fragment length polymorphisms (RFLPs), DNA sequences); and Criterion 3) Occupation of differing eco-geographic regions that are relevant to the species and reflect historical or genetic distinction, as may be depicted on an appropriate biogeographic zone map), and a single significance criterion (Criterion 1: Evidence that the discrete population or group of populations differs markedly from others in genetic characteristics thought to reflect relatively deep intraspecific phylogenetic divergence) are relevant for Lake Sturgeon. Based on genetic evidence demonstrating only two genetic groupings based on microsatellite data, and the presence of Lake Sturgeon in four biogeographic zones, it was suggested that the number of DUs be reduced from eight in the 2006 status report to four in the upcoming report: DU1 Western Hudson Bay, DU2 Saskatchewan Nelson River, DU3 Southern Hudson Bay James Bay and DU4 Great Lakes Upper St. Lawrence.

Discussion

A participant asked why genetics played such an important role in defining DUs. The presenter indicated it was both genetics and the biogeographic units. It was actually not relying heavily on genetics. It emphasizes how genetics should not be over interpreted. The four DUs are not defined based on genetic similarities. Three of the four groups belong to the same ancestral group. So those are defined based on primary watershed. There is no deep genetic divergence. It will be useful for defining management units within DUs. Based on genetics there is DU8 and everyone else. But putting the remainder in one DU would not be appropriate since they are physically separated in separate watersheds.

A participant commented that when deciding on a DU, you are potentially imposing management restrictions and therefore, it is hard to separate management from the task of designating the DUs. Another participant responded that they didn't think the issue was the DU itself but more so the status that is assigned to that DU once they are identified. The purpose of designatable units is saying that this is an irreplaceable evolutionary component of the species. Its geographical occurrence is actually secondary and from the biological perspective, the management doesn't fall in there. So, first it's just defining what the important pieces are within a species and then the status can get assigned. Determining the status of a DU is difficult as populations within the DU could range from extirpated to near historic populations. The management units make it manageable by recognizing that not all populations will have the same status. It is important to recognize that the information presented over the past two weeks is new and was not available when COSEWIC did their last assessment.

There was a discussion around designatable units and the challenges that some of the participants see occurring by assigning DUs. There will always be a challenge with evaluating the Great Lakes-Upper St. Lawrence DU which has everything from a Lake Superior river with 20 spawners to populations in the Upper St. Lawrence that can sustain commercial fisheries.

The co-Chair reminded the group that they want the report authors to have all of the available information so COSEWIC can make the best possible assessment.

Participants all agreed with the four DUs from a purely scientific perspective as suggested by the presenter.

THREATS AND LIMITING FACTORS FOR LAKE STURGEON

Presenter: Doug Watkinson

Summary

The presenter went over limiting factors and threats from the last COSEWIC report with the meeting participants. He gave an overview of what should and should not be included in the report. COSEWIC has all the information on this in their guide to authors.

Some changes discussed at the pre-COSEWIC meeting for DUs 1–6 (DFO 2016) were presented. The biological factors identified are limiting only if a threat is present that impacts one or more of these aspects of the life history. The factors would need to be tied to threats. For example, diurnal larval drift is an effective anti-predation or dispersal strategy that has evolved over time but with peaking hydro facilities, flows are nearly opposite of the needs of Lake Sturgeon larvae. Flows may be decreased around 11:00 p.m. when larval drift would typically begin. This can lead to less dispersal distance, more interspecific competition and predation or stranding. However, it is not clear whether this should be included in both the threats section and as limiting factors. Participants at last week's meeting (DFO 2016) agreed that points 3, 4 and 5 should be removed from the limiting factors section.

Limiting Factors

1. Large size and late maturation
2. Intermittent spawning intervals
3. Specific temperature, flow velocities and substrate requirements to ensure uniform hatching and high survival of eggs
4. High fidelity to spawning and overwintering areas
5. Early age-0 stage (transition from larvae to exogenous feeding) is a critical life stage for Lake Sturgeon
6. Diurnal larval drift

Threats

1. Exploitation
2. Dams
3. Habitat degradation
4. Contaminants
5. Introduced species

Subsistence, traditional harvest and scientific sampling were not included in the last COSEWIC report. Gillnet mortality from scientific sampling could be as high as 1% based on last week's discussions (DFO 2016). Tagging Lake Sturgeon can result in localized infections.

Dams or barriers including weirs, can cause entrainment and fragmentation. Other impacts could include seasonal and daily disruptions in habitat through changes in the hydrograph. These changes to the hydrograph may disrupt spawning triggers and timing (colder water, lower discharge) ultimately impacting spawning success. Site specific impacts could occur below facilities when ramping occurs which could disrupt spawning triggers and timing, cause strandings, impact spawning success and could impact larva drift.

Habitat degradation associated with other human activities has been identified as a threat. It causes deterioration in overall water quality related to erosion and deposition of sediments. Suspended sediments themselves are probably not impacting Lake Sturgeon. It is the deposition of those sediments that changes the physical habitat important for Lake Sturgeon. We couldn't come up with an example where eutrophication had impacted the species. However, several participants suggested that it should be kept as a threat because of agricultural inputs. Wood fibre can change the substrate and water quality.

Channelization (including dredging) was not considered a threat in DUs 1–6 but is likely a threat in DU8. A participant pointed out that Lake Sturgeon will make use of areas that have been dredged after dredging has ended and once the habitat has come back to a suitable state. Another participant pointed out that habitat characteristics like depth and substrate may not return to the original state. There is a study on the effects of dredged sediment deposition on Lake Sturgeon and Atlantic Sturgeon use of an area (Hatin et al., 2007).

There are examples where contaminants have been detected in the species but may not be tied to population level declines but they do link to individual fish health. Des Prairies River fish had moderate to severe hepatic pathology. Concentrations of liver and intestine retinoids were significantly lower (as much as 40 times lower) in the Des Prairies River sample than elsewhere., Prevalence of fin deformities in larvae raised in an artificial stream was significantly greater in the progeny of Lake Sturgeon sampled in Des Prairies River (6.3%) compared with the progeny of Lake Sturgeon from the reference site (1.7%). Toxic effluent from pulp and paper mills caused a large die-off of Lake Sturgeon along the St. Lawrence River in 1984. Hart (1987) reported unacceptably high levels of mercury and polychlorinated biphenyls (PCBs) in Lake Sturgeon. It was also suggested that some of the contaminants issues are being addressed.

There was work done on lampricide impacts on Lake Sturgeon which has not yet been published. For most Canadian rivers mortality of age-0 sturgeon due to lampricide is low. However, lampricide interacts with high conductivity streams so in the southern part of the range lampricide can have a higher mortality of age-0 Lake Sturgeon.

In the last COSEWIC assessment, Zebra Mussel, Round Goby and Rainbow Smelt were identified as aquatic invasive species impacting Lake Sturgeon. During last week's discussions, participants suggested Rainbow Smelt be removed because there did not appear to be a connection between them and Lake Sturgeon (DFO 2016). Zebra Mussel and Round Goby are both part of the Lake Sturgeon diet in DU8. Zebra Mussel may impact Lake Sturgeon spawning habitat. Round Goby may compete for food and habitat, and prey on Lake Sturgeon eggs and larvae. Participants noted Zebra Mussel or Quagga Mussel have changed primary productivity to plankton populations and in some of the Great Lakes have had an impact on benthic production. They have changed the foodweb and ecology of the system, which could impact Lake Sturgeon.

Also included in the last COSEWIC assessment, Eurasian water milfoil and purple loosestrife were identified as being threats to Lake Sturgeon. Participants agreed they should be removed from the threats section.

Parasites and diseases (e.g., bacteria and viruses) were not included in the last COSEWIC assessment report but should be. Sea Lamprey should be included as an invasive species or as parasites that impact Lake Sturgeon in DU8. The Great Lakes Fishery Commission has published a number of reports looking at mortality rates in adult Lake Sturgeon from Sea Lamprey attacks. There is evidence that viral hemorrhagic septicemia (VHS) has killed some Lake Sturgeon in the Great Lakes. Last week we discussed Namao virus, its prevalence in hatcheries and in the wild and resultant stress-induced mortality (DFO 2016). A participant pointed out that there are other lamprey species that could be added (e.g., Silver Lamprey). It was also noted that Sea Lamprey parasitism can be particularly high on Lake Sturgeon caught in gillnets. A participant noted that botulism outbreaks can result in Lake Sturgeon mortality. There are internal OMNRF reports on this issue (L. Mohr, OMNRF pers. comm.).

Genetic contamination was not discussed in the last COSEWIC status report although it was included in the Technical Summary. There will be less concern for fish stocked within the same DU and ideally within adjacent MUs.

Participants agreed that the threats considered for DU7 should include exploitation, dams, habitat degradation, contaminants, parasites and diseases. In DU8, exploitation, dams, habitat degradation, contaminants, introduced species, parasites and diseases should be considered threats. Participants were unable to identify introduced species in DU7 that would be threats to Lake Sturgeon. The genetic contamination threat may be considered in the text with respect to stocking between DUs.

A participant asked whether creating habitat to offset impacts was considered in the threats section. The presenter said this is not included within the COSEWIC assessment report.

Site fidelity to winter habitat was not considered a limiting factor as fish will move to other habitats if the winter habitat is not available. However, another participant pointed out that as a result of moving to different habitats, secondary associations like incidence of stress and diseases may occur. In Lac des Deux-Montagnes, a winter kill occurred when effluent was released resulting in anoxic conditions under the ice in an area where Lake Sturgeon were overwintering.

The co-Chair pointed out that all participants should provide the report authors with any literature that documents threats relevant to Lake Sturgeon.

Meeting participants were thanked for their input and the meeting was adjourned. [3:51:17]

REFERENCES

DFO. 2016. Proceedings of the regional peer review of the pre-COSEWIC assessment for Lake Sturgeon, *Acipenser fulvescens*, Designatable Units 1-6 in Canada; October 27-29, 2015. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2016/009.

Friday, M.J. 2014. Estimating the critical reproductive periods of lake sturgeon (*Acipenser fulvescens*) using daily water temperature units. Ont. Min. Natur. Resour., Northwest Bio. & Mon, BAMS Technical Report TN-48. 7 p.

Hart, M.L. 1987. Considerations for the management of Lake Sturgeon (*Acipenser fulvescens*) commercial fishery in Ontario. *In* Proceedings of a workshop on the Lake Sturgeon (*Acipenser fulvescens*). Edited by Olver, C.H. Ont. Fish. Tech. Rep. Series No. 23. p. 85–90

Hatin, D., Lachance, S., and Fournier, D. 2007. Effect of dredged sediment deposition on use by Atlantic Sturgeon and Lake Sturgeon at an open-water disposal site in the St. Lawrence estuarine transition zone. Amer. Fish. Soc. Symp. 56: 235–255.

Kempinger, J.J. 1988. Spawning and early life history of Lake Sturgeon in the Lake Winnebago system, Wisconsin. Am. Fish. Soc. Symp. 5: 111–122.

Pledger, S., Baker, E., and Scribner, K. 2013. Breeding return times and abundance in capture-recapture models. Biometrics. 69(4): 991–1001. doi: 10.1111/biom.12094.

Welsh, A.B., Baerwald, M.R., Friday, M., and May, B. 2015. The effect of multiple spawning events on cohort genetic diversity of Lake Sturgeon (*Acipenser fulvescens*) in the Kaministiquia River. Environ. Biol. Fishes 98: 755–762.

APPENDIX 1. TERMS OF REFERENCE

PRE-COSEWIC ASSESSMENT FOR LAKE STURGEON DESIGNATABLE UNITS (DUs) 7–8

Zonal Peer Review Meeting – Central and Arctic, and Quebec Regions

November 3–4, 2015
Gatineau, QC

Chairperson: Kathleen Martin and Chantelle Sawatzky

Context

The implementation of the federal *Species at Risk Act* (SARA), proclaimed in June 2003, begins with an assessment of a species' risk of extinction by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a non-government scientific advisory body that has been established under Section 14(1) of SARA to perform species assessments, which provide the scientific foundation for listing species under SARA. Therefore, an assessment initiates the regulatory process whereby the competent Minister must decide whether to accept COSEWIC's assessment and add a species to Schedule 1 of SARA, which would result in legal protection for the species under the Act. If the species is already on Schedule 1 of SARA, the Minister may decide to keep the species on the list, reclassify it as per the COSEWIC assessment, or to remove it from the list (Section 27 of SARA).

Fisheries and Oceans Canada (DFO), as a generator and archivist of information on marine species and some freshwater species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species can be undertaken.

The Lake Sturgeon (*Acipenser fulvescens*) was listed on COSEWIC's fall 2014 Call for Bids to produce a status report, with the following justification:

In November 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed the eight designatable units of Lake Sturgeon. COSEWIC is required under SARA to review the classification of each species at least every 10 years. COSEWIC is planning to re-assess Lake Sturgeon in November 2016.

Objectives

The overall objective of this meeting is to peer-review DFO existing information relevant to the COSEWIC status assessment for Lake Sturgeon DUs 7-8, considering data related to the status and trends of, and threats to this species inside and outside of Canadian waters, and the strengths and limitations of the information. This information will be available to COSEWIC, the authors of the species status report, and the co-chairs of the applicable COSEWIC Species Specialist Subcommittee. Publications from the peer-review meeting (see below) will be posted on the CSAS website.

Specifically, DFO information relevant to the following will be reviewed to the extent possible:

1) Life history characteristics

- Growth parameters: age and/or length at maturity, maximum age and/or length
- Total and natural mortality rates and recruitment rates (if data are available)
- Fecundity
- Generation time
- Early life history patterns

- Specialised niche or habitat requirements

2) Review of designatable units

Available information on population differentiation, which could support a COSEWIC decision of which populations below the species' level would be suitable for assessment and designation, will be reviewed. Information on morphology, meristics, genetics and distribution will be considered and discussed.

Available information on population differentiation, which could support a COSEWIC decision of which populations below the species' level would be suitable for assessment and designation, will be reviewed. Information on morphology, meristics, genetics and distribution will be considered and discussed.

See COSEWIC 2008 Guidelines for recognizing Designatable Units below the Species Level.

3) Review the COSEWIC criteria for the species in Canada as a whole, and for each designatable units identified (if any).

COSEWIC Criterion – Declining Total Population

1. Summarize overall trends in population size (both number of mature individuals and total numbers in the population) over as long a period as possible and in particular for the past three generations (taken as mean age of parents). Additionally, present data on a scale appropriate to the data to clarify the rate of decline.
2. Identify threats to abundance— where declines have occurred over the past three generations, summarize the degree to which the causes of the declines are understood, and the evidence that the declines are a result of natural variability, habitat loss, fishing, or other human activity.
3. Where declines have occurred over the past three generations, summarize the evidence that the declines have ceased, are reversible, and the likely time scales for reversibility.

COSEWIC Criterion – Small Distribution and Decline or Fluctuation: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

1. Summarise the current extent of occurrence (in km^2) in Canadian waters
2. Summarise the current area of occupancy (in km^2) in Canadian waters
3. Summarise changes in extent of occurrence and area of occupancy over as long a time as possible, and in particular, over the past three generations.
4. Summarise any evidence that there have been changes in the degree of fragmentation of the overall population, or a reduction in the number of meta-population units.
5. Summarise the proportion of the population that resides in Canadian waters, migration patterns (if any), and known breeding areas.

COSEWIC Criterion – Small Total Population Size and Decline and Very Small and Restricted: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

1. Tabulate the best scientific estimates of the number of mature individuals;
2. If there are likely to be fewer than 10,000 mature individuals, summarize trends in numbers of mature individuals over the past 10 years or three generations, and, to the extent possible, causes for the trends.

Summarise the options for combining indicators to provide an assessment of status, and the caveats and uncertainties associated with each option.

For transboundary stocks, summarise the status of the population(s) outside of Canadian waters. State whether rescue from outside populations is likely.

4) Describe the characteristics or elements of the species habitat to the extent possible, and threats to that habitat

Habitat is defined as "in respect of aquatic species, spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced".

The phrasing of the following guidelines would be adapted to each specific species and some could be dropped on a case-by-case basis if considered *biologically* irrelevant. However, these questions should be posed even in cases when relatively little information is expected to be available, to ensure that every effort is made to consolidate whatever knowledge and information does exist on an aquatic species' habitat requirements, and made available to COSEWIC.

1. Describe the functional properties that a species' aquatic habitat must have to allow successful completion of all life history stages.
   In the best cases, the functional properties will include both features of the habitat occupied by the species and the mechanisms by which those habitat features play a role in the survivorship or fecundity of the species. However, in many cases the functional properties cannot be described beyond reporting patterns of distribution observed (or expected) in data sources, and general types of habitat feature known to be present in the area(s) of occurrence and suspected to have functional properties. Information will rarely be equally available for all life history stages of an aquatic species, and even distributional information may be missing for some stages. Science advice needs to be carefully worded in this regard to clearly communicate uncertainties and knowledge gaps.

2. Provide information on the spatial extent of the areas that are likely to have functional properties.

   Where geo-referenced data on habitat features are readily available, these data could be used to map and roughly quantify the locations and extent of the species' habitat. Generally however, it should be sufficient to provide narrative information on what is known of the extent of occurrence of the types of habitats identified. Many information sources, including Aboriginal Traditional Knowledge (ATK) and experiential knowledge, may contribute to these efforts.

3. Identify the activities most likely to threaten the functional properties, and provide information on the extent and consequences of those activities.

   COSEWIC's operational guidelines require consideration of both the imminence of each identified threat, and the strength of evidence that the threat actually does cause harm to the species or its habitat. The information and advice from the Pre-COSEWIC review should provide whatever information is available on both of those points. In addition, the information and advice should include at least a narrative discussion of the magnitude of impact caused by each identified threat when it does occur.

4. Recommend research or analysis activities that are necessary. Usually the work on the other Guidelines will identify many knowledge gaps. Recommendations made and enacted at this stage in the overall process could result in much more information being available should a Recovery Potential Assessment be required for the species.

5) Describe to the extent possible whether the species has a residence as defined by SARA

SARA s. 2(1) defines Residence as “a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating.”

6) Threats

A threat is any activity or process (both natural and anthropogenic) that has caused, is causing, or may cause harm, death, or behavioural changes to a species at risk or the destruction, degradation, and/or impairment of its habitat to the extent that population-level effects occur. Guidance is provided in: Environment Canada, 2007. Draft Guidelines on Identifying and Mitigating Threats to Species at Risk. *Species at Risk Act* Implementation Guidance. List and describe threats to the species considering:

- Threats need to pose serious or irreversible damage to the species. It is important to determine the magnitude (severity), extent (spatial), frequency (temporal) and causal certainty of each threat.
- Naturally limiting factors, such as aging, disease and/or predation that limit the distribution and/or abundance of a species are not normally considered threats unless they are altered by human activity or may pose a threat to a critically small or isolated population.
- Distinction should be made between general threats (e.g., agriculture) and specific threats (e.g., siltation from tile drains), which are caused by general activities.
- The causal certainty of each threat must be assessed and explicitly stated as threats identified may be based on hypothesis testing (lab or field), observation, expert opinion or speculation.

7) Other

Finally, as time allows, review status and trends in other indicators that would be relevant to evaluating the risk of extinction of the species. This includes the likelihood of imminent or continuing decline in the abundance or distribution of the species, or that would otherwise be of value in preparation of COSEWIC Status Reports.

Expected Publications

- Proceedings

Participation

Participation is expected from:

- Fisheries and Oceans Canada (DFO) (Science Sector, and Species at Risk Program)
- COSEWIC status report author
- Members of COSEWIC (co-Chairs and/or SSC experts)

Participation may also include:

- Relevant provinces
- Industry
- Aboriginal groups
- ENGOs
- Academia
- Other invited external experts as deemed necessary.

APPENDIX 2. PARTICIPANTS LIST

NAME	AFFILIATION
Curtis Avery	Anishinabek/Ontario Fisheries Resource Centre
Andre-Marcel Baril	Concordia University
Cam Barth	COSEWIC Report co-author
Marthe Bérubé	DFO, Species at Risk Program
James Boase	U.S. Fish and Wildlife Service
Corina Busby	DFO, Species at Risk Program
Chris Chenier	Ontario Ministry of Natural Resources and Forestry
Kyle Crans	Anishinabek/Ontario Fisheries Resource Centre
René Dion	Hydro-Québec
Pierre Dumont	Ministère des Forêts, de la Faune et des Parcs du Québec, Retired
Shelley Dunn	DFO, Species at Risk Program
Mike Friday	Ontario Ministry of Natural Resources and Forestry
Isabelle Gauthier	Ministère des Forêts, de la Faune et des Parcs du Québec
Dan Gibson	Ontario Power Generation Inc.
Tim Haxton	Ontario Ministry of Natural Resources and Forestry
Sarah Hogg	Ontario Ministry of Natural Resources and Forestry
Michel La Haye	Environnement et Terre Odanak, PDG EnviroScience et Faune Inc.
Michel Legault	Ministère des Forêts, de la Faune et des Parcs du Québec
Kathleen Martin (co-Chair)	DFO, Science
Craig McDougall	COSEWIC Report co-author
Lloyd Mohr	Ontario Ministry of Natural Resources and Forestry
Keith Nahwegahbow	Anishinabek/Ontario Fisheries Resource Centre
Patrick Nelson	COSEWIC Report co-author
Melissa Olmstead	Kitigan Zibi Anishinabeg
Yves Paradis	Ministère des Forêts, de la Faune et des Parcs du Québec
Tom Pratt	DFO, Science
Chantelle Sawatzky (co-Chair)	DFO, Science
Éliane Valiquetts	Ministère des Forêts, de la Faune et des Parcs du Québec
Amy Welsh	West Virginia University
Doug Watkinson	DFO, Science
Ernie Watson	DFO, Species at Risk Program
Chris Wilson	Ontario Ministry of Natural Resources and Forestry

APPENDIX 3. AGENDA

Pre-COSEWIC Assessment – Lake Sturgeon Designatable Units 7–8

Zonal Advisory Meeting – Central and Arctic and Quebec Regions

Location: Heritage A Room, Four Points by Sheraton Gatineau-Ottawa, 35 Laurier street, Gatineau, QC

Date: 3–4 November 2015

Chairs: Kathleen Martin and Chantelle Sawatzky

DAY 1 Tuesday November 3, 2015

Time	Topic	Presenter
9am	Welcome and Introductions	Kathleen Martin
9:15	Purpose of Meeting and Terms of Reference	Kathleen Martin
9:25	Overview of Species at Risk Activities	Marthe Bérubé/Shelly Dunn/Ernest Watson (DFO, SAR)
9:35	Variation in Abundance, Recruitment and Growth of Lake Sturgeon Across Ontario	Tim Haxton (MNRF)
10:05	Lake Sturgeon research on the Ottawa River, St. Lawrence and Great Lakes Watersheds	Dan Gibson (Ontario Power Generation)
10:30	HEALTH BREAK	-
10:45	Overview of Water Quality Work in Northern Watersheds of Ontario	Dan Gibson (Ontario Power Generation)
11:15	Research in Progress: using 3D Modelling Techniques and Meta-analysis to Work Towards a Better Understanding of Lake Sturgeon Spawning Habitat	Andre-Marcel Baril (Concordia University)
11:30	An overview of Lake Sturgeon assessment Work on the Kaministiquia River and Black Sturgeon River, ON	Mike Friday (MNRF)
12:00	LUNCH	-
1:15	Ottawa River	Tim Haxton (MNRF)
2:30	HEALTH BREAK	-
2:45	Lake Superior	Tom Pratt (DFO)
3:45	Lake Huron	Lloyd Mohr (MNRF)
4:45	END OF DAY 1	-

DAY 2 Wednesday November 4, 2015

Time	Topic	Presenter
9am	Welcome and Re-cap of DAY 1	Kathleen Martin
9:15	Lake Erie	Lloyd Mohr (MNRF)
10:15	HEALTH BREAK	-
10:30	Lake Ontario	Lloyd Mohr (MNRF)
11:00	Genetic Structure of Lake Sturgeon Populations in Northern Ontario	Chris Wilson (MNRF)
11:30	DU 8 Genetics Work	Tim Haxton (MNRF)
12:00	LUNCH	-
1:00	Biology, Status and Management of Lake Sturgeon in the Province of Quebec and Definition of DU 8 and Constraints	Yves Paradis/Éliane Valiquette (MFFP)
1 :45	Summary of Knowledge Acquired on Lake Sturgeon in the Context of the Eastmain and Rupert Diversion Project	Rene Dion (Hydro-Québec)
1 :55	Fraye de l'esturgeon jaune et influence des debits, frayere de Drummondville, riviere Saint- Francois 2014–2015	Michel La Haye (PDG Enviro Science et Faune Inc. And Environnement et Terre Odanak)
2 :15	Overview of Designatable Units	Tom Pratt (DFO)
2 :30	HEALTH BREAK	-
2 :45	Designatable Units Discussion	Group
3 :15	Threats and Limiting Factors for Lake Sturgeon	Doug Watkinson (DFO)
3 :30	Threats and Limiting Factors Discussion	Group
4 :45	Review Terms of Reference/ Wrap up	Kathleen Martin
5 :00	END OF MEETING	-