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Fish and Shellfish Program NEWSLETTER

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In This Issue

https://www.epa.gov/fish-tech

This edition of the Fish and Shellfish Program Newsletter generally focuses on tribal issues associated with fish and shellfish.

Recent Advisory News

Great Lakes Indian Fish & Wildlife Commission Develops Lake-specific Muskellunge Consumption Advice

The Great Lakes Indian Fish & Wildlife Commission (GLIFWC) is a tribal natural resource agency representing eleven Ojibwe tribes in Michigan, Minnesota, and Wisconsin. GLIFWC's member tribes harvest and consume muskellunge as part of a subsistence diet. This species is the largest subsistence fish within inland waters of the tribes' treaty ceded territories. Muskellunge are highly piscivorous, residing at the top of the aquatic food web within these lakes, and therefore contain high concentrations of mercury.

Muskellunge *(Esox masquinongy). (Photo courtesy of U.S. Fish and Wildlife Service, Eric Engbreston)*

Since 2011, GLIFWC has made an effort to increase the amount of available mercury data for muskellunge, collecting and testing 189 fish from inland lakes for mercury. These data, in combination with existing GLIFWC and state (Minnesota, Wisconsin, and Michigan) data, were used to develop lake-specific consumption advice for 47 lakes within the ceded territories, primarily in Wisconsin. The advice, final on April 7, 2016, was generated for both the general (men 15 years and older and women beyond childbearing age) and sensitive (women of childbearing age and children under 15) populations. Because muskellunge can vary greatly in size and mercury concentrations increase with increasing fish length, the advice was generated for muskellunge of two sizes: 38 and 46 inches. A summary of the consumption advice is shown in the table on the next page. GLIFWC is currently developing outreach materials to communicate the results of this study to its member tribes.

The table below shows consumption recommendations for muskellunge up to 38 and 42 inches for the sensitive[1] and general[2] populations.

State	County	Lake	Safe Number of Meals per Month: 38-inch Muskellunge		Safe Number of Meals per Month: 48-inch Muskellunge	
			General Population	Sensitive Population	General Population	Sensitive Population
ALL	ALL	ALL	2	0	2	0
MI	Alger	Kingston Lake	8	2	8	2
MN	Cook	Crescent Lake	4	1	2	1
MN	Lake	Dumbbell Lake	2	0	1	0
MN	St. Louis	Boot Lake	0	0	0	0
WI	Ashland	English Lake	1	0	1	0
WI	Ashland	Moquah Lake	1	0	0	0
WI	Ashland	Potter Lake	1	0	1	0
WI	Ashland	Spider Lake	1	0	0	0
WI	Ashland	Spillerberg Lake	1	0	1	0
WI	Bayfield	Namekagon Lake	2	0	1	0
WI	Burnett	Big McKenzie Lake	4	1	2	0
WI	Oneida	Booth Lake	4	1	1	0
WI	Oneida	Buckskin Lake	2	0	2	0
WI	Oneida	Clear Lake	1	0	1	0
WI	Oneida	Minocqua Lake	4	1	2	0
WI	Oneida	Pelican Lake	2	0	1	0
WI	Oneida	Squirrel Lake	4	1	2	0
WI	Oneida	Tomahawk Lake	4	1	2	1
WI	Polk	Bone Lake	4	2	4	1
WI	Polk	Deer Lake	2	0	2	0
WI	Sawyer	Callahan Lake	2	0	2	0
WI	Sawyer	Grindstone Lake	4	1	2	0
WI	Sawyer	Lake Chippewa	4	1	2	1
WI	Sawyer	Lake Winter	2	0		0
WI	Sawyer	Lac Courte Oreilles	4	1	2	0
WI	Sawyer	Round Lake	4	1	2	0
WI	Sawyer	Sand Lake	2	0	2	0
WI	Sawyer	Sissabagama Lake	2	1	1	0
WI	Sawyer	Tiger Cat Flowage	2	0	1	0
WI	Vilas	Ballard Lake	1	0	1	0
WI	Vilas	Big Arbor Vitae Lake	8	2	4	1
WI	Vilas	Big Lake (Boulder JCT)	2	0	2	0
WI	Vilas	Big Muskellunge Lake	4	1	2	0
WI	Vilas	Big St Germain Lake	4	1	4	1
WI	Vilas	Brandy Lake	2	0	2	0
WI	Vilas	Clear Lake	2	0	1	0
WI	Vilas	Irving Lake	1	0	1	0
WI	Vilas	Kentuck Lake	2	1	2	0

State	County	Lake	Safe Number of Meals per Month: 38-inch Muskellunge		Safe Number of Meals per Month: 48-inch Muskellunge	
			General Population	Sensitive Population	General Population	Sensitive Population
WI	Vilas	Little Arbor Vitae Lake	8	2	4	2
WI	Vilas	Little John Lake	8	4	4	1
WI	Vilas	Little St Germain Lake	8	2	4	2
WI	Vilas	North Twin Lake	4	1	2	1
WI	Vilas	Trout Lake	4	1	2	0
WI	Vilas	Upper Gresham Lake	2	0	1	0
WI	Vilas	White Sand Lake	2	0	2	0
WI	Vilas	Wildcat Lake	4	1	2	1
WI	Washburn	Shell Lake	2	0	1	0

[1] Sensitive Population: Women of childbearing age and children under 15 years old.
[2] General Population: Women beyond childbearing age and men 15 years and older.

Sources: http://glifwc.org/Mercury/index.html; http://glifwc.org/Mercury/Musky%20Consumption%20Advice%20Memo%20Feb2016.pdf.

EPA News

Promulgation of Final Rule on Certain Federal Water Quality Standards Applicable to Maine

The U.S. Environmental Protection Agency (EPA) has issued final federal Clean Water Act water quality standards (WQS) that apply to water bodies under the state of Maine's jurisdiction.

Background

Until 2015, EPA had never approved any Maine WQS for waters in Indian lands. In 2014, the state of Maine sued EPA to make approval or disapproval decisions on all backlogged WQS. In decisions issued in February, March, and June 2015, EPA disapproved a number of Maine WQS as not adequately protective of human health or aquatic life. Most of the disapprovals applied only to waters in Indian lands; however, a few applied to all Maine waters.

If Maine adopts and submits new or revised WQS that EPA finds meet Clean Water Act requirements, EPA would withdraw its federal promulgation for those waters and/or pollutants for which EPA would approve Maine's new or revised standards.

Fish Consumption and Tribal Sustenance Fishing Use

There are four federally recognized Indian tribes in Maine, represented by five governing bodies. State and federal settlement acts that resolved litigation between Maine and the tribes create a unique arrangement granting the state of Maine authority to set WQS for waters in Indian lands. EPA concluded that the settlement acts provide for sustenance fishing practices in those waters; that under the Clean Water Act, sustenance fishing is a designated use; and that criteria must be adequate to protect that use.

Maine's human health criteria (HHC) are based on a fish consumption rate of 32.4 grams per day of fish. The best available information indicates that the HHC to protect tribal sustenance fishers in Maine should be based on a

much higher fish consumption rate. Because the state of Maine has not addressed the WQS disapprovals stemming from this information, EPA has finalized federal HHC applicable to waters in Indian lands and waters outside of Indian lands that are subject to sustenance fishing rights. EPA has incorporated a fish consumption rate that represents a level of fish consumption by the tribes unsuppressed by pollution concerns, as well as new data and scientific information on exposure and pollutant toxicity.

Scope of the Final Rule

EPA has finalized HHC for 96 pollutants that apply to waters in Indian lands. EPA has finalized six additional WQS for waters in Indian lands:

- Recreational and shellfishing bacteria criteria to protect human health;
- Tidal temperature, pH, and ammonia criteria to protect aquatic life;
- A mixing zone policy; and
- Clarification that natural conditions provisions cannot be applied to HHC.

EPA has finalized two WQS for all waters in Maine, including waters in Indian lands:

- Dissolved oxygen criteria for Class A waters to protect aquatic life; and
- Clarification that the Clean Water Act does not allow the commissioner of the Maine Department of Environmental Protection to waive compliance with WQS in case of oil spills.

Basis for the Human Health Criteria

EPA derives HHC for non-threshold carcinogens using the following inputs:

- Cancer slope factor;
- Cancer risk level;
- Body weight;
- Drinking water intake rate;
- Fish consumption rate; and
- Bioaccumulation or bioconcentration factor.

In deriving criteria for waters in Indian lands in Maine, in general, EPA used the same cancer slope factors, cancer risk level, body weight, drinking water intake rate, bioaccumulation factors, reference doses, and relative source contribution factors that EPA used in its most recent Clean Water Act section 304(a) recommended HHC. To protect tribal sustenance fishers in Maine, EPA derived the criteria using a fish consumption rate of 286 grams per day. This rate accounts for information from an anthropological/historical study of the tribes' traditional cultural practices and reflects input from affected tribes in Maine.

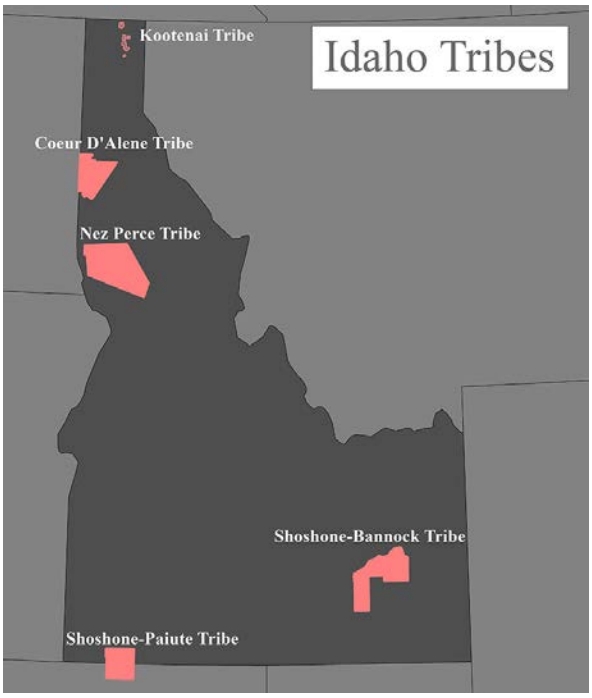
For more information, contact Jennifer Brundage at 202-566-1265, Brundage.Jennifer@epa.gov or Jeanne Voorhees at 617-918-1686, Voorhees.Jeanne@epa.gov.

To access the final rule, Federal Register notice, and supporting documents, visit EPA's WQS website at https://www.epa.gov/wqs-tech/promulgation-certain-federal-water-quality-standards-applicable-maine.

EPA Region 10 and Idaho Tribal Fish Consumption Survey

EPA and Idaho Tribal Governments (Kootenai, Coeur D'Alene, Nez Perce, Shoshone-Bannock, and Shoshone-Paiute) began work in December 2012 on a tribal fish consumption survey to better understand tribal fish consumption and support tribal environmental capacity building. Tribal governments provided tremendous leadership and resources to complete the surveys.

EPA and the Idaho tribes embarked on two survey types, quantitative and heritage. The Shoshone-Bannock and Nez Perce tribes participated in the quantitative survey. The quantitative survey used two methodologies to derive fish consumption rates: the nutritional survey methodology developed by the National Cancer Institute and the Food Frequency Questionnaire methodology. EPA's subcontractor hired, trained, and managed tribal interviewers from each tribe to improve response rates and protect culturally-sensitive information.



Location of Idaho tribes. *(Image courtesy of EPA)*

Tribal consumption data were used to develop fish consumption rate statistics for two different groups:

- Group 1: All fish and shellfish.
- Group 2: Fish and shellfish species that may acquire contaminants from habitat waters that are of concern under the Clean Water Act (i.e., near coastal, estuarine, and freshwater).

Interviews were conducted during the calendar year to assess seasonal changes in fish consumption. The survey methodology was reviewed by two institutional review boards, including one familiar with tribal traditional lifeways. Two peer reviewed final reports summarized quantitative consumption rates for the Nez Perce Tribe and the Shoshone Bannock Tribes.

EPA and its contractors also conducted a review of heritage fish consumption rates for the Kootenai, Coeur D'Alene, Nez Perce, and Shoshone-Bannock tribes in collaboration with those same tribes. Final heritage fish consumption reports were developed for each tribe and provided past fish consumption rates based on direct observation of past tribal fishing activity as well as daily caloric intake requirements, the caloric content of fish, and the fraction of the diet that consisted of fish. The reports discuss causes for fish population declines, heritage fish consumption information, and methods of rate derivation.

Key Outcomes and Findings

Fish consumption rates for the participating Idaho tribes indicate that they currently consume more fish than the general population.

Idaho tribes generally consume more fish than previously documented 20 years ago in the 1994 report, *A Fish Consumption Survey of the Umatilla, Nez Perce, Yakama, and Warm Springs Tribes of the Columbia River Basin*, conducted by the Columbia River Inter-Tribal Fish Commission (CRITFC).

Tribal members attribute increased fish consumption, in part, due to habitat improvements and an increased availability of fish in local rivers and lakes. Differences in the design of EPA's survey relative to the original CRITFC survey may also contribute to differences in derived fish consumption rates.

All current and heritage tribal fish consumption reports are available at www.epa.gov/columbiariver/idaho-tribal-fish-consumption-survey.

For more information, contact Mary Lou Soscia at 503-326-5873, Soscia.Marylou@epa.gov, or for technical information, please contact Lon Kissinger at 206-553-2115, Kissinger.Lon@epa.gov.

Other News

NOAA Funds Harmful Algal Bloom Forecast System Development in Pacific Northwest

The National Oceanic and Atmospheric Administration's (NOAA's) National Centers for Coastal Ocean Science (NCCOS) are funding development of a harmful algal bloom (HAB) forecast in the Pacific Northwest to support management of shellfisheries, clamming beaches, and human health. The experimental monitoring and forecasting system will launch in 2017, with forecast bulletins predicting bloom location and concentration several days in advance.

Annual outbreaks of the toxic algae *Pseudo-nitzschia* produce the neurotoxin domoic acid, which builds up in exposed shellfish and can cause amnesic shellfish poisoning (ASP) in humans. Commercial and recreational shellfisheries are therefore monitored for HAB toxins, and closed to prevent outbreaks of ASP. These closures can result in millions of dollars in lost harvests. For example, a massive west coast-wide *Pseudo-nitzschia* bloom in 2015 saw closures to the valuable Dungeness crab, rock crab, and razor clam fisheries. The initial estimate for losses in tourism-related spending from Washington's lost razor clam harvest in 2015 is $22.7 million.

"We have the technology to monitor and forecast HABs, and are excited to engage stakeholders in developing a product that protects public health and safeguards our coastal economies," said former NCCOS Director, Mary Erickson.

NOAA's Northwest Fisheries Science Center (NWFSC) and members of the Makah Tribe will conduct near-real-time monitoring of offshore conditions, collecting and analyzing samples at two-week intervals beginning in the spring of 2017.

"This partnership with the new center of excellence at the Makah Tribe will bring the most powerful technologies for algae and toxin detection to our partners who are directly impacted by these blooms," said NWFSC biologist Vera Trainer. "This will help the tribe and all coastal managers make rapid, informed decisions about seafood safety."

Scientists with the University of Washington will generate the forecast with their LiveOcean model, integrated with information from other project partners, including beachside monitoring of toxin levels and real-time data from NOAA's "lab in a can," the Environmental Sample Processor (ESP). The ESP was deployed last May by the University of Washington, NOAA, and partners with funding by the U.S. Integrated Ocean Observing System (IOOS).

Ultimately, the team plans to produce a map-based assessment of domoic acid toxicity risk leading up to each scheduled razor clam dig, in the form of a Pacific Northwest HAB Bulletin for coastal resource managers. All of these components will come together to provide more reliable predictions of when and where these toxic blooms will be expected and ensure safe access to the region's seafood.

"This will be a sort of 'weather forecast' for Pacific Northwest HABs," said Parker MacCready, a University of Washington professor of oceanography. The goal is for forecasts to be produced and disseminated as bulletins in partnership with NOAA's U.S. IOOS partner, the Northwest Association of Networked Ocean Observing Systems.

In addition to the University of Washington, project partners include NOAA's Northwest Fisheries Science Center, the University of Strathclyde, and the Oregon Department of Fish and Wildlife. This project is part of the NCCOS Monitoring and Event Response for Harmful Algal Blooms research program.

The Pacific Northwest HAB forecast system is part of a NOAA ecological forecasting initiative that aims to deliver accurate, relevant, timely, and reliable ecological forecasts directly to coastal resource managers and the public. NOAA is also providing or developing HAB forecasts for the Gulf of Maine, Texas, Florida, and Lake Erie, and hypoxia forecasts for the Gulf of Mexico and the Chesapeake Bay.

For more information, contact Marc Suddleson at Marc.Suddleson@noaa.gov.

Source: https://coastalscience.noaa.gov/news/coastal-pollution/water-quality/noaa-funds-harmful-algal-bloom-forecast-system-development-pacific-northwest/.

The Complexity of Communicating Risk in the Context of Fish Consumption, Partnerships for Environmental Public Health

Despite decades of research, evidence-based findings, and publicity about the benefits of eating fish, dietary intake of long-chain polyunsaturated fatty acids (LCPUFAs) in the United States and Canada is low compared with recommendations. Fish are naturally rich in LCPUFAs but are also a dietary source of heavy metals, polychlorinated biphenyls (PCBs), and persistent organic pollutants. A webinar held on June 16, 2016 highlighted three researchers who are exploring the challenge of communicating risk about eating fish from waters known to contain high levels of pollutants while simultaneously conveying the benefits of fish consumption for human health.

The complexity of communicating risk is compounded further by social and cultural factors among those who are subsistence fishers or who consume fish from polluted waters on a regular basis. The webinar, therefore, also highlighted the cultural considerations of Native Americans in the Great Lakes region; Asians living along urban waterways in the Midwest; and African Americans, Cajuns, and Asians living along the Gulf of Mexico.

Image of the first slide of the webinar. *(Image courtesy of National Institute of Environmental Health Services)*

The first presentation—Risk Communication with Tribal Communities—described the cultural significance of certain types of fish among the Anishinabe people (Native American tribes who inhabit the Upper Laurentian Great Lakes). These tribes are traditionally known as a fishing culture with fish making up 65 percent of the protein in their diet. Community-based research is being conducted with the Anishinabe to develop risk messaging that will be delivered via mobile phone platforms and that will help tribal members determine how much traditional fish they can safely consume.

The second presentation—Promoting Healthy Seafood Choices in Asian Communities—highlighted Asian Americans in Chicago, who, based on their cultural background, consume various parts of fish that are not normally tested for contaminants. This study explores the challenge of communicating the risk of consuming fish high in PCBs to those with limited English proficiency and/or low literacy.

The third presentation—Public Perception and Risk Messaging Among Gulf Coast Residents After the Deepwater Horizon Oil Spill—highlighted efforts made to communicate the safety of fish caught in the Gulf of Mexico in months following the Deepwater Horizon oil spill. In this study, the challenge was to communicate the safety of the fish to communities who not only perceived themselves at risk from the oil spill's chemicals but who also represented several distinct ethnic/racial sub-populations with varying degrees of literacy and proficiency in English.

Together, these presentations highlighted the innovative ways in which risk/benefit health messaging can be developed and the importance of community engagement to ensure that such messaging is appropriately conveyed to affected communities.

Presentations

- Risk Communication with Tribal Communities—Matthew Dellinger, Ph.D.
- Promoting Healthy Seafood Choices in Asian Communities—Susan Buchanan, M.D.
- Public Perception and Risk Messaging Among Gulf Coast Residents After the Deepwater Horizon Oil Spill—Andrew Kane, Ph.D.

Source:
https://www.niehs.nih.gov/research/supported/translational/peph/webinars/fish_consumption/index.cfm.

Southern Utes Evaluating Bioaccumulation of Selected Metals in Fish

The Southern Ute Indian Tribe (SUIT) Division of Wildlife Resources and the Environmental Programs Division Water Quality Program (WQP) are working collaboratively to better understand bioaccumulation of mercury and selenium in fish populations within surface water bodies on the Southern Ute Indian Reservation (SUIR). Historically, within the San Juan Basin, mercury and selenium pose the most significant threat to human health and aquatic life, respectively. In addition, long-term deposition and the 2015 acute Gold King Mine spill originating from the upper Animas drainage near Silverton, Colorado are of concern for human health and aquatic life within the Animas River flowing through the SUIR.

Fish consumption advisories have been issued for mercury at many of the area's reservoirs warning anglers to limit their consumption of fish, especially piscivorous species.

One of the objectives in the *Sampling and Analysis Plan* (2017) is that in 2017, the WQP will collect fish species most commonly eaten by humans from three major rivers (Animas, Piedra, and San Juan rivers) within the exterior boundaries of the SUIR and have them assessed for concentrations of mercury and selenium. Rainbow and brown trout, kokanee salmon, large/small mouth bass, and channel catfish would be sampled by extracting muscle plugs to be evaluated by a contract laboratory.

Another objective outlined in the *Sampling and Analysis Plan* is for the tribe to conduct studies to determine the long-term effects of the Gold King Mine spill on and adjoining the Animas River within the reservation.

Because the SUIT WQP had advance warning that the spill was moving downstream, the tribe was able to monitor the spill's effect on water quality and to assess its effects on aquatic life. Fish muscle plugs taken approximately two weeks prior to the spill were assessed to provide a baseline condition from which to compare post-spill evaluations of potential bioaccumulation effects to aquatic life.

In partnership with SUIT's Division of Wildlife Resources, in 2017, the WQP will repeat a 2015 evaluation within the Animas River. The study's objective is to determine whether the long-term effects of the Gold King Mine spill had significant effects to affected aquatic life inhabiting the Animas River within the reservation. To accomplish this objective, the WQP will collect both game (trout) and native fish from the Animas River and fish species most commonly consumed by humans from two rivers and two small reservoirs. The samples will be assessed for mercury, selenium, aluminum, arsenic, beryllium, cadmium, cobalt, copper, mercury, manganese, nickel, lead, selenium, uranium, and zinc.

For further information contact Curtis Hartenstine at charten@southernute-nsn.gov.

Southeast Alaska Tribes Trained in Minimizing Risk of Shellfish Toxins

In September 2016, NOAA's NCCOS scientists instructed environmental personnel from the southeast Alaska tribes in toxic phytoplankton sampling and identification techniques during the Fourth Workshop of the Southeast Alaska Tribal Toxins (SEATT) Partnership in Sitka, Alaska. The NCCOS Phytoplankton Monitoring Network developed these techniques.

Participants of the Southeast Alaska Tribal Toxins Partnership Workshop held in Sitka, Alaska. *(Image courtesy of NOAA/NCCOS)*

Also at the workshop, NCCOS scientists provided technical and program development guidance to the Sitka Tribe of Alaska Environmental Research Laboratory (STAERL), which recently implemented a NCCOS-developed shellfish toxin testing method to support monitoring conducted by SEATT members. Regulatory managers from Alaska and Washington present at the workshop received a demonstration of this testing method—approved by the Interstate Shellfish Sanitation Conference—for their consideration as an alternative to the mouse bioassay, which uses live animal testing.

SEATT was formed in 2013 to mitigate the threat of eating shellfish tainted with algal-based toxins during traditional subsistence shellfish harvests. Training STAERL personnel in shellfish toxin analysis is a multi-year project funded by the EPA Indian General Assistance Program and the Administration for Native Americans' Environmental Regulatory Enhancement Program, with the goal of having the facility FDA-certified for algal toxin testing by 2017.

For more information, contact Steve Morton at Steve.Morton@noaa.gov or Tod Leighfield at Tod.Leighfield@noaa.gov.

Source: https://coastalscience.noaa.gov/news/coastal-resilience/alaskan-tribal-communities-trained-minimizing-risk-shellfish-toxins/.

Recent Publications

Journal Articles

The list below provides a selection of research articles focusing on tribal issues associated with fish and shellfish.

- Assessment of sodium channel mutations in Makah tribal members of the U.S. Pacific Northwest as a potential mechanism of resistance to paralytic shellfish poisoning
  Adams, N.G., A. Robertson, L.M. Grattan, S. Pendleton, S. Roberts, J.K. Tracy, and V.L. Trainer. 2016. Assessment of sodium channel mutations in Makah tribal members of the U.S. Pacific Northwest as a potential mechanism of resistance to paralytic shellfish poisoning. *Harmful Algae* 57(Part B):26–34.

- Altered fine motor function at school age in Inuit children exposed to PCBs, methylmercury, and lead
  Boucher, O., G. Muckle, P. Ayotte, E. Dewailly, S.W. Jacobson, and J.L. Jacobson. 2016. Altered fine motor function at school age in Inuit children exposed to PCBs, methylmercury, and lead. *Environment International* 95:144–151.

- Dietary assessment of domoic acid exposure: What can be learned from traditional methods and new applications for a technology assisted device
  Boushey, C.J., E.J. Delp, Z. Ahmad, Y. Wang, S.M. Roberts, and L.M. Grattan. 2016. Dietary assessment of domoic acid exposure: What can be learned from traditional methods and new applications for a technology assisted device. *Harmful Algae* 57(Part B):51–55.

- What is a meaningful role? Accounting for culture in fish and wildlife management in rural Alaska
  Brooks, J.J., and K.A. Bartley. 2016. What is a meaningful role? Accounting for culture in fish and wildlife management in rural Alaska. *Human Ecology* 44(5):517–531.

- Future impacts of hydroelectric power development on methylmercury exposures of Canadian indigenous communities
  Calder, R.S.D., A.T. Schartup, M. Li, A.P. Valberg, P.H. Balcom, and E.M. Sunderland. 2016. Future impacts of hydroelectric power development on methylmercury exposures of Canadian indigenous communities. *Environmental Science & Technology* 50(23):13115–13122.

- An ecological and human biomonitoring investigation of mercury contamination at the Aamjiwnaang First Nation
  Cryderman, D., L. Letourneau, F. Miller, and N. Basu. 2016. An ecological and human biomonitoring investigation of mercury contamination at the Aamjiwnaang First Nation. *EcoHealth* 13(4):784–795.

- Mercury risks versus nutritional benefits of tribal commercial fish harvests in the Upper Laurentian Great Lakes
  Dellinger, M.J., and M.P. Ripley. 2016. Mercury risks versus nutritional benefits of tribal commercial fish harvests in the Upper Laurentian Great Lakes. *Human and Ecological Risk Assessment: An International Journal* 22(4):1036–1049.

- Acute and chronic dietary exposure to domoic acid in recreational harvesters: A survey of shellfish consumption behavior
  Ferriss, B.E., D.J. Marcinek, D. Ayres, J. Borchert, and K.A. Lefebvre. 2017. Acute and chronic dietary exposure to domoic acid in recreational harvesters: A survey of shellfish consumption behavior. *Environment International* 101:70–79.

- *Ojibwe Gichigami* ("Ojibwa's Great Sea"): An intersecting history of treaty rights, tribal fish harvesting, and toxic risk in Keweenaw Bay, United States
  Gagnon, V.S. 2016. *Ojibwe Gichigami* ("Ojibwa's Great Sea"): An intersecting history of treaty rights, tribal fish harvesting, and toxic risk in Keweenaw Bay, United States. *Water History* 8(4):365–384.

- The association between razor clam consumption and memory in the CoASTAL cohort
  Grattan, L.M., C. Boushey, K. Tracy, V.L. Trainer, S.M. Roberts, N. Schluterman, and J.G. Morris, Jr. 2016. The association between razor clam consumption and memory in the CoASTAL cohort. *Harmful Algae* 57(Part B):20–25.

- Re-envisioning state and tribal collaboration in fishery assessment and restoration
  Holtgren, J.M., and N.A. Auer. 2016. Re-envisioning state and tribal collaboration in fishery assessment and restoration. *Fisheries* 41(5):244–257.

- Mercury diminishes the cardiovascular protective effect of omega-3 polyunsaturated fatty acids in the modern diet of Inuit in Canada
  Hu, X.F., B.D. Laird, and H.M. Chan. 2017. Mercury diminishes the cardiovascular protective effect of omega-3 polyunsaturated fatty acids in the modern diet of Inuit in Canada. *Environmental Research* 152:470–477.

- Perception of risk for domoic acid related health problems: A cross-cultural study
  Roberts, S.M., L.M. Grattan, A.C. Toben, C. Ausherman, V.L. Trainer, K. Tracy, and J.G. Morris, Jr. 2016. Perception of risk for domoic acid related health problems: A cross-cultural study. *Harmful Algae* 57(Part B):39–44.

- Communicating results of a dietary exposure study following consumption of traditionally smoked salmon
  Rohlman, D., G. Frey, M.L. Kile, B. Harper, S. Harris, O. Motorykin, S.L.M. Simonich, and A.K. Harding. 2016. Communicating results of a dietary exposure study following consumption of traditionally smoked salmon. *Environmental Justice* 9(3):85–92.

- Communities advancing the studies of tribal nations across their lifespan: Design, methods, and baseline of the CoASTAL cohort
  Tracy, K., C.J. Boushey, S.M. Roberts, J.G. Morris, Jr., and L.M. Grattan. 2016. Communities advancing the studies of tribal nations across their lifespan: Design, methods, and baseline of the CoASTAL cohort. *Harmful Algae* 57(Part B):9–19.

Upcoming Meetings and Conferences

Impacts of a Changing Environment on the Dynamics of High-latitude Fish and Fisheries
May 9–11, 2017
Anchorage, Alaska

6th Global Summit on Aquaculture & Fisheries
May 25–26, 2017
Osaka, Japan

World Aquaculture
June 26–30, 2017
Cape Town, South Africa

American Fisheries Society 147th Annual Meeting
August 20–24, 2017
Tampa, Florida

11th International Conference on Molluscan Shellfish Safety
May 14–18, 2017
Galway, Ireland

SeaWeb Seafood Summit
June 5–7, 2017
Seattle, Washington

13th International Conference on Mercury as a Global Pollutant
July 16–21, 2017
Providence, Rhode Island

Additional Information

This monthly newsletter highlights current information about fish and shellfish.

For more information about specific advisories within the state, territory, or tribe, contact the appropriate state agency listed on EPA's National Listing of Fish Advisories website at https://fishadvisoryonline.epa.gov/Contacts.aspx.

For more information about this newsletter, contact Sharon Frey (Frey.Sharon@epa.gov, 202-566-1480).

Additional information about advisories and fish and shellfish consumption can be found at https://www.epa.gov/fish-tech.