EPA United States Environmental Protection Agency

Fish and Shellfish Program NEWSLETTER

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In This Issue

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

Recent Advisory News

Louisiana Departments of Health, Environmental Quality, and Wildlife and Fisheries Update Fish Consumption Advisories

On July 31, 2021, the Louisiana Departments of Health (LDH), Environmental Quality (LDEQ), and Wildlife and Fisheries (LDWF) issued a series of updates to six existing fish consumption advisories. The state has issued precautionary advisories when unacceptable levels of mercury are detected in fish or shellfish.

LDEQ conducts fish sampling and LDH then uses this data to determine the need for additional advisories or to modify existing advisories. Each advisory lists the specific fish, makes consumption recommendations and outlines the geographic boundaries of the affected waterways.

Amite River Drainage Basin

- ***Includes Amite River from the Mississippi State Line to its confluence with Lake Maurepas, Colyell Creek, the Amite River Diversion Canal, and the Petite Amite River.***
- Women of childbearing age and children less than 7 years of age should consume no more than one meal per month* of bowfin (choupique, grinnel), freshwater drum (gaspergou), largemouth bass and warmouth combined from the advisory area; or should consume no more than two meals per month of bigmouth buffalo, crappie (sac-au-lait), flathead catfish, redear sunfish and spotted bass combined from the advisory area.
- Other adults and children 7 years of age and older: no advisory.

Bayou Liberty

- ***Includes Bayou Liberty only.***
- Women of childbearing age and children less than 7 years of age should not consume black crappie; and should consume no more than one meal per month of

**** A meal is considered to be half a pound of fish for adults.***

bowfin (choupique, grinnel), flathead catfish, largemouth bass and white crappie combined from the advisory area; or should consume no more than two meals per month of bluegill, freshwater drum (gaspergou), redear sunfish and white bass combined from the advisory area.

- Other adults and children 7 years of age and older should consume no more than two meals per month of black crappie; or no more than three meals per month of flathead catfish.

Blind River

- ***Includes the Blind River only.***
- Women of childbearing age and children less than 7 years of age should not consume more than one meal per month of bowfin (choupique, grinnel), largemouth bass and freshwater drum (gaspergou) combined from the advisory area; or should consume no more than two meals per month of any other species from the advisory area.
- Other adults and children 7 years of age and older should consume no more than three meals per month of bowfin (choupique, grinnel) from the advisory area.

Tangipahoa River

- ***Includes the Tangipahoa River from the Louisiana/Mississippi state line to Lake Pontchartrain.***
- Women of childbearing age and children less than 7 years of age should consume no more than one meal per month of bowfin (choupique, grinnel), flathead catfish, freshwater drum (gaspergou), largemouth bass and spotted bass combined from the advisory area; or should consume no more than two meals per month of all other species combined from the advisory area.
- Other adults and children 7 years of age and older should consume no more than three meals per month of largemouth bass from the advisory area.

Bogue Falaya and Tchefuncte Rivers

- ***Includes the Bogue Falaya River from its headwaters to its confluence with the Tchefuncte River, and the Tchefuncte River from its headwaters to Lake Pontchartrain. All oxbow lakes associated with these sections of the Bogue Falaya and the Tchefuncte Rivers are included in this advisory.***
- Women of childbearing age and children less than 7 years of age should consume no more than one meal per month of black drum, crappie (sac-au-lait), flathead catfish, freshwater drum (gaspergou), largemouth bass and spotted bass combined; or should consume no more than two meals per month of bigmouth buffalo, bluegill, bowfin (choupique, grinnel) and striped bass combined from the advisory area.
- Other adults and children 7 years of age and older should consume no more than three meals per month of flathead catfish, freshwater drum (gaspergou), largemouth bass and spotted bass combined from the advisory area.

Tickfaw River Drainage Basin

- ***Includes the Tickfaw River from the Mississippi-Louisiana state line to Lake Maurepas; the Natalbany River, the Blood River, Lizard Creek, and Ponchatoula Creek.***
- Women of childbearing age and children less than 7 years of age should consume no more than one meal per month of bigmouth buffalo, bowfin (choupique, grinnel), flathead catfish, freshwater drum (gaspergou), largemouth bass and white crappie combined from the advisory area; or should consume no more than two meals per month of any other species from the advisory area.

- Other adults and children 7 years of age and older should consume no more than three meals per month of freshwater drum (gaspergou) and largemouth combined from the advisory area.

Because of mercury contamination, there are now fish consumption advisories for 49 waterways in Louisiana and one for the Gulf of Mexico.

Louisiana fish consumption advisories are based on the estimate that the average resident eats four meals of fish per month. Consuming more than this from local water bodies may increase health risks.

Mercury is an element that occurs naturally in the environment. Consequently, there are small amounts of mercury in the sediments of streams, lakes, rivers, and oceans. Nearly all fish contain trace amounts of mercury. They absorb mercury as they feed on aquatic organisms. Larger predator fish contain more mercury than smaller fish. It is recommended that smaller fish be consumed instead of larger ones.

People are exposed to low levels of mercury throughout their lives. Eating contaminated fish is one way we are exposed to mercury. Health effects from harmful levels of mercury can include nervous system and kidney damage. Young children and developing fetuses are more sensitive to the toxic effects of mercury. Therefore, consumption advisories are issued at lower fish tissue concentrations for women of childbearing age and children under 7 years of age.

The full text for each advisory is posted online at www.ldh.la.gov/EatSafeFish or by calling toll-free 1-888-293-7020. You may also access the information by downloading the Department of Environmental Quality's new app which is available through Google Play (DEQ Fish Advisories) and the App Store (LA Fish Advisories).

For more information, contact Shannon Soileau at shannon.soileau@la.gov.

Source: https://www.katc.com/news/covering-louisiana/wildlife-and-fisheries-ldh-update-fish-consumption-advisories-in-louisiana

EPA News

An Evaluation of Fish Tissue Monitoring Alternatives for Mercury and Selenium: Fish Muscle Biopsy Samples Versus Homogenized Whole Fillets

On July 30, 2021, a peer-reviewed study comparing two methodologies for monitoring fish fillet tissue for mercury and selenium was published in the *Archives of Environmental Contamination and Toxicology*. Fish contaminant studies with human health protection objectives typically focus on muscle tissue, recognizing that fillets are the commonly consumed tissue fraction. Muscle biopsy punch (or fillet plug) sampling for mercury analysis has recently been used as an alternative to harvesting fish for fillets; however, there is limited information comparing fillet plug results to whole fillet results. This study was conducted to address that data gap and to test the applicability of plugs for monitoring associated with the U.S. Environmental Protection Agency's (EPA) fish tissue-based mercury and selenium water quality criteria. The mercury phase included 300 fillet homogenates and 300

field-extracted plug samples from 60 fish, and the selenium phase included 120 fillet homogenates and 120 plugs from 30 fish. Both phases showed that there were no statistically significant differences between fillet plug and homogenized fillet results at the community level; however, a selenium plug monitoring alternative must employ a sufficiently sensitive analytical method and consider total solids. Plug and fillet sampling alternatives have inherent advantages and disadvantages. Fillet sampling provides sufficient mass to consider multiple contaminants. Plug sampling only provides adequate mass for a single analyte but may allow fish survival; however, additional research is needed on fish survival following plug removal.

For more information, contact Leanne Stahl at Stahl.Leanne@epa.gov.

Source: https://doi.org/10.1007/s00244-021-00872-w

Accepting Public Comments on Proposed Information Collection Request Renewal for EPA's National Fish Program

On August 3, 2021, EPA published a notice in the *Federal Register* asking for public comment on the renewal of an information collection request (ICR) for the National Fish Program and specific aspects of the proposed information collection are described below. Public comments must be submitted on or before October 4, 2021. EPA is planning to submit this ICR to the Office of Management and Budget for final review and approval in accordance with the Paperwork Reduction Act. This is a proposed extension of the ICR, which is currently approved through April 30, 2022.

This ICR proposed for renewal is for voluntary information collection under the national fish advisory program to help EPA advance equitable and effective fish advisory programs that protect recreational and subsistence fishers and other underserved populations from consumption of contaminated fish. This information is collected under the authority of section 104 of the Clean Water Act, which provides for the collection of information to be used to protect human health and the environment. The information to be collected on a voluntary basis would include the following: fish advisory information and fish tissue data collected to assist in making advisory decisions; state or tribal fish program information for the National Fish Advisory Program Evaluation; and technical program information from time to time. EPA will analyze this information to determine what science, guidance, technical assistance, and nationwide information are needed to help state and tribes have equitable and effective fish advisory programs. In addition, EPA will use the information provided to facilitate information sharing and to ensure guidance documents are useful and technically accurate.

For more information, contact Samantha Fontenelle at fontenelle.samantha@epa.gov.

Source: https://www.regulations.gov/document/EPA-HQ-OW-2014-0350-0021

Putting the Brakes on Water Pollution: A Story of Industry and Government Collaboration for Copper-Free Brakes

EPA is announcing a webinar that will take place on October 6, 2021 at 02:00 PM Eastern Time.

Register here: https://www.zoomgov.com/webinar/register/WN_9-hJVcs_Rm-Ummof1HG3BA

In January 2015, EPA, states, and the motor vehicle industry signed an agreement to reduce the use of copper and other materials in motor vehicle brake pads. The agreement calls for reducing copper in brake pads nationwide to no more than 0.5 percent by weight by 2025. In addition to copper, this voluntary initiative reduces mercury, lead, cadmium, asbestiform fibers, and chromium-six salts in motor vehicle brake pads. The initiative will reduce runoff of these pollutants from roads into the nation's streams, rivers, and lakes. The webinar will explore how this voluntary initiative and these partnerships developed, the roles of the signatories, and the progress made so far. Speakers will highlight lessons learned and considerations for organizations considering future voluntary source control partnerships. For more information about the copper-free brake initiative, visit Copper-Free Brakes (https://www.epa.gov/npdes/copper-free-brake-initiative). This webinar will be recorded and posted at a later date; a notification with the URL will be sent to all registrants once it is available.

The speakers are:

- Rachel Urban, U.S. Environmental Protection Agency
- Laurie Holmes, Motor & Equipment Manufacturers Association
- Leigh Merino, Motor & Equipment Manufacturers Association
- Aaron Lowe, AutoCare Association
- Don Welsh, Environmental Council of the States

For more information, contact Heather Goss at goss.heather@epa.gov.

Other News

Potential Toxicity of Pesticides to Aquatic Life in U.S. Rivers is Widespread

On May 24, 2021, a new U.S. Geological Survey (USGS) study of pesticides in U.S. rivers and streams reported that, on average, 17 pesticides were detected at least once at the 74 river and stream sites sampled 12 to 24 times per year during 2013–2017. Herbicides were detected much more frequently than insecticides and fungicides.

The number of pesticides detected at a site over the study mirrored the intensity of pesticide use in the region where the site was located. Pesticide use intensity was greatest in the Midwest (49 kg/km^2), where 25 pesticides were detected, on average, at each site. Herbicides were heavily used in agricultural settings and were consistently detected in surface waters at concentrations >100 ng/L (nanograms per liter). In contrast, insecticides had lower agricultural-use intensities and surface-water detection frequencies at concentrations >100 ng/L were rare.

An EPA chronic aquatic-life benchmark—estimates of the concentrations below which pesticides are not expected to represent a risk to aquatic life—was exceeded at least once at more than half of the stream sites in every region—Midwest, South, Northeast, West, and Pacific. Such exceedances indicate the potential for harmful effects to aquatic life such as fish, algae, and invertebrates like aquatic insects. However, an EPA human-health benchmark was exceeded only four times (1.1% of samples).

Of the 221 pesticides measured, just 17 were responsible for the aquatic-life benchmark exceedances. Many of these 17 were herbicides, which frequently occurred at relatively high concentrations that exceeded benchmarks for fish, invertebrates, and plants. Others were insecticides, which occurred at lower concentrations, but which are much more toxic to aquatic invertebrates than herbicides.

For more information, contact Sarah Stackpoole at sstackpoole@usgs.gov.

Source: https://www.usgs.gov/center-news/potential-toxicity-pesticides-aquatic-life-us-rivers-widespread?qt-news_science_products=1#qt-news_science_products

New Virus Identified in Melanistic Skin Lesions on Smallmouth Bass from the Chesapeake Bay Watershed

In a study published in 2020, scientists determined the risk factors associated with smallmouth bass melanistic skin lesions on smallmouth bass in the Susquehanna and Potomac Rivers, in the Chesapeake Bay watershed. A new virus, which appears to be a member of an emerging viral family, the *Adomaviridae*, was identified in the lesions. Questions remain about the full characterization of the virus and the role of environmental factors, such as temperature and chemical contaminants, in initiation, progression, and health effects of the lesions.

Smallmouth Bass Skin with Melanistic Lesions. (*Photo courtesy of Vicki Blazer, USGS National Fish Health Research Laboratory. Public domain.)*

Background

Smallmouth bass (*Micropterus dolomieu*) are important game fish and a top predator species in the Susquehanna and Potomac Rivers. Smallmouth bass disease and population decline in portions of the Susquehanna and Potomac River watersheds have raised concern among the fishing public and resource managers about the long-term sustainability of fish populations. In addition, visible skin lesions have been observed, including black areas of skin discoloration called melanistic hyperpigmentation or "blotchy bass syndrome." Although the melanistic lesions have been recognized for many years, the causative factors are currently unknown.

Between 2012 and 2018, scientists used a combination of routine fish population surveys, fish health monitoring surveys, tissue collections, and genetic and microscopic analyses to better understand the prevalence, mechanisms of development, and potential risk factors associated with melanistic lesions in smallmouth bass.

Findings and Next Steps

Eleven of 55 genes analyzed were differentially expressed between melanistic and normal skin tissues. Three of those were unique gene sequences, two of which were unidentified, and one was a viral gene. The viral gene was detected in 12 of the 16 melanistic areas and in no normal skin samples. The viral gene sequence indicated a similarity to a newly recognized viral family, *Adomaviridae*, that has been associated with disease in other fish species.

Further research is underway to fully characterize the virus and understand the mechanisms involved in the formation of melanistic lesions and to determine the role of environmental factors, such as temperature and chemical contaminants, in initiation and progression of the lesion.

This research was funded by the Pennsylvania Fish & Boat Commission, the Pennsylvania Sea Grant College Program, and the USGS Environmental Health Program (Contaminants Biology and Toxic Substances Hydrology) of the USGS Ecosystems Mission Area, and the Environments and Fisheries Program.

For more information, contact Vicki Blazer at vblazer@usgs.gov.

Source: https://www.usgs.gov/ecosystems/contaminant-biology/science/new-virus-identified-melanistic-skin-lesions-smallmouth-bass?qt-science_center_objects=0#qt-science_center_objects

Bioaccumulation of Mercury in Fish Varied by Species and Location in the Chesapeake Bay Watershed—Summary of Existing Data and a Roadmap for Integrated Monitoring

On April 2, 2021, a peer-reviewed study about mercury bioaccumulation in freshwater fish was published in *Ecotoxicology*. Fish mercury data from state monitoring programs and research studies within the Chesapeake Bay were compiled and summarized to provide a comprehensive overview of the variation in fish mercury concentrations among species and habitats within the watershed. These data are put into context with existing health benchmarks for humans, birds, and fish. Scientists also provide a roadmap for an integrated monitoring program.

Background and Issue

The Chesapeake Bay, along the mid-Atlantic coast of North America, is the largest estuary in the United States and supports ecologically diverse freshwater and estuarine habitats. The Chesapeake Bay watershed is also home to economically important industrial, agricultural, and urban infrastructure and land uses. Contaminants in the watershed are a concern because of their potential to have adverse effects on fish, wildlife, and human health. Mercury and polychlorinated biphenyls in fish tissues are the primary contaminants that result in fish consumption advisories in the bay and its watershed.

Chesapeake Bay is the Nation's largest estuary. The USGS provides scientific information for this vital ecosystem. (*Public Domain).*

Identifying and prioritizing mitigation strategies to reduce exposure and health risks posed by mercury requires an understanding of its occurrence and of the processes that control bioaccumulation through the food chain. Various jurisdictions regularly monitor fish mercury concentrations in the watershed to inform impairments of waterbodies and fish consumption advisories, offering an untapped resource to understand larger scale patterns of mercury concentrations and potential risks to fish, wildlife, and humans.

USGS scientists compiled fish mercury data from state monitoring programs and recent research efforts into an integrated dataset for the freshwater habitats across the watershed. The dataset consisted of nearly 8,000 mercury measurements in fish tissue from 600 locations, which were collected between 1990 and 2017 in freshwater portions of the watershed. The study did not include mercury concentrations in fish from tidal waters. Using these data, scientists provided a comprehensive overview of the variation in fish mercury concentrations among 61 fish species and two freshwater habitats (rivers and streams; ponds and lakes) across the watershed and put those data into context with existing benchmarks of health impairment to humans, wildlife, and fish.

Findings

Mercury concentrations in fish were variable across areas and among species within the freshwater portions of the watershed (landlocked individuals not migratory estuarine individuals). These results indicate that local variation in sources, environmental conditions, and species ecology contributes to mercury accumulation across the watershed.

The USGS has prepared a map-based narrative, which was released in April 2021, to further communication the results of the study. View this story map for a visualization of the study results.

Specific findings include the following:

- The mean concentration of mercury in all fish species was 0.22 microgram per gram, with a range that spanned four orders of magnitude.
- For individual fish species residing in the freshwater portions of the, the highest concentrations of mercury were measured in striped bass (*Morone saxatilis*), bowfin (*Amia calva*), walleye (*Sander vitreus*), largemouth bass (*Micropterus salmoides*), flathead catfish (*Pylodictis olivaris*), and smallmouth bass (*Micropterus dolomieu*). The lowest concentrations were present in several trout species, including brook trout (*Salvelinus fontinalis*) and creek chub (*Semotilus atromaculatus*).
- Mean concentrations of mercury in fish were greatest in the Susquehanna watershed, followed by the Potomac watershed and coastal drainages, with lowest mean concentrations in the York, Rappahannock, and James watersheds.
- Fish mercury concentrations were lower, but the proportion of fish exceeding health guidelines were comparable or higher in Chesapeake Bay fish in comparison to other regions with extensive mercury data syntheses (Northeastern United States, Canada, and the Western United States).
- Forty-five, 48, and 35 percent of fish mercury concentrations in the present study exceeded benchmarks for human, avian, and fish health risks, respectively.
- The pattern of fish mercury concentrations was not consistent with regional pattern in atmospheric mercury wet deposition, which supports previous findings that biogeochemical and ecological drivers are important determinants for fish mercury bioaccumulation that confound the linkage with inorganic mercury loading from the atmosphere.

Implications and Next Steps

One of the benefits of this study is the understanding it provides of mercury bioaccumulation across numerous fish species and habitats within the watershed. An additional benefit could, in the future, be the ability to answer broader questions about factors driving mercury bioaccumulation in fish. In this context, the authors provide a roadmap for an integrated monitoring program that could allow agencies to meet their current goals while also providing the ability to answer broader questions to streamline additional mitigation actions if needed to minimize exposures and health risks. The USGS is continuing research on contaminant sources and pathways in the environment and the potential effects on fish, wildlife, and humans through its Chesapeake Science Plan.

Brook trout, as shown in the image, had some of the lowest mercury concentrations in their tissues. (*Credit: R. Hagerty. Public Domain).*

This study was a coordinated effort between the USGS Contaminant Biology and Toxic Substances Hydrology Programs and the USGS Chesapeake Bay studies to document the extent, severity, and biological impacts of chemical contaminants in the watershed and produce science to develop strategies to reduce identified impacts.

The USGS is continuing research on contaminant sources and pathways in the environment and the potential effects on fish, wildlife, and humans through its Chesapeake Science Plan.

This research was funded by the USGS Environmental Health Program (Contaminants Biology and Toxic Substances Hydrology) of the USGS Ecosystems Mission Area, and Environments Programs. USGS acknowledges the efforts of the state agencies who collected and provided data to support the analyses.

For more information, contact Collin Eagles-Smith at ceagles-smith@usgs.gov.

Source: https://www.usgs.gov/ecosystems/environmental-health-program/science/bioaccumulation-mercury-fish-varied-species-and?utm_source=Newsletter&utm_medium=Email&utm_campaign=geohealthusgs-newsletter-april-2021&utm_term=Title&qt-science_center_objects=0#qt-science_center_objects

Recently Awarded Research

Four Fisheries Research Projects to Connect Chesapeake Bay Fish, Changing Habitat

On July 19, 2021, the National Oceanic and Atmospheric Administration (NOAA) announced four projects that have been recommended for a total of more than $850,000 in funding as part of the Chesapeake Bay Fisheries Research program. The projects will support research into how key Chesapeake Bay fisheries species change their behavior to deal with changing habitat and climate. Funded projects will also improve understanding of how nearshore habitat supports local communities and fisheries in the Middle Peninsula area of Virginia. There are many habitat conservation and shoreline restoration efforts under way there. These projects support NOAA's priority to advance ecosystem-based fishery management.

The projects recommended for funding are:

- The Virginia Institute of Marine Science's project, "Valuation of Ecological and Social Benefits Provided by Natural and Restored Nearshore Habitat for Communities and Fisheries," addresses improving social science for fisheries and habitat, including focusing on ecological services provided to the Middle Peninsula of Virginia from natural and restored shorelines. This project is recommended to receive a two-year total of $248,476.
- The University of New Hampshire's project, "Leveraging Multispecies and Multiyear Telemetry Datasets to Identify Seasonal, Ontogenetic, and Interannual Shifts in Habitat Use and Phenology of Chesapeake Bay Fishes," addresses synthesis and analysis of existing information that connects living resource responses to changing habitat, climate, and other environmental conditions. This project is recommended to receive a two-year total of $249,017.
- The Virginia Polytechnic Institute & State University's project, "Striped Bass and Summer Flounder Abundance Trends and Influencing Factors in the Chesapeake Bay: An Ecosystem-based Evaluation," will quantitatively assess the environmental, habitat variability, and fishing intensity impacts on summer flounder and striped bass species abundance, distribution, and productivity in the Chesapeake Bay. This project is recommended to receive a two-year total of $116,036.
- Morgan State University's project, "The Economic Impacts of Oyster Restoration and Seagrass Habitats of the Middle Peninsula, Virginia," will develop new ecological models for the York and Piankatank River systems and couple the new models to regional economic impact analyses to project both ecological and

socioeconomic metrics for a range of potential habitat scenarios. This project is recommended to receive a two-year total of $250,000.

The grant process encouraged research projects that employ and educate undergraduate or graduate students from groups underrepresented in marine science careers, including minorities. An overview of previously funded projects is available on the NOAA Fisheries website.

Source: https://www.fisheries.noaa.gov/feature-story/four-fisheries-research-projects-connect-chesapeake-bay-fish-changing-habitat?utm_medium=email&utm_source=govdelivery

Tech and Tools

Artificial Intelligence to Monitor Water Quality More Effectively

Published in June 2021, the "Meta-classification of remote sensing reflectance to estimate trophic status of inland and nearshore waters" study covers artificial intelligence that can enhance remote water body monitoring.

Source: https://www.sciencedirect.com/science/article/pii/S0924271621000988?via%3Dihub

Application Developed with Indigenous Communities Fosters Safe Fish Consumption

Researchers at the Medical College of Wisconsin partnered with The Chippewa Ottawa Resource Authority by using an app they developed to study how cultural fish consumption patterns may affect Indigenous health.

For more information, contact Matthew Dellinger at mdellinger@mcw.edu.

Source: https://www.sciencedirect.com/science/article/abs/pii/S0380133020301842

Recent Publications

Journal Articles

The list below provides a selection of research articles.

- Biofilm inhibition and antimicrobial properties of silver-ion-exchanged zeolite A against *Vibrio spp* marine pathogens
  Amin, Z., N.A. Waly, S.E. Arshad. 2021. Biofilm inhibition and antimicrobial properties of silver-ion-exchanged zeolite A against *Vibrio spp* marine pathogens. *Applied Science* 11:5496.

- Utilization of the zebrafish model to unravel the harmful effects of biomass burning during Amazonian wildfires
  Babić, S., L. Čižmek, A. Maršavelski, O. Malev, M. Pflieger, I. Strunjak-Perović, N. Topić Popović, R. Čož-Rakovac, P. Trebše. 2021. Utilization of the zebrafish model to unravel the harmful effects of biomass burning during Amazonian wildfires. *Scientific Reports* 11:2527.

- Evaluation of the effect of local water chemistry on trace metal accumulation in Puget Sound shellfish shows that concentration varies with species, size, and location
  Bates, E.H., L. Alma, T. Ugrai, A. Gagnon, M. Mahner, P. McElhany, J.L Padilla-Gamiño. 2021. Evaluation of the effect of local water chemistry on trace metal accumulation in Puget Sound shellfish shows that concentration varies with species, size, and location. *Frontiers in Marine Science* 8:1-23.

- Comparison of Recreational Fish Consumption Advisories Across the USA
  Cleary, B.M., M.E. Romano, C.Y. Chen, W. Heiger-Bernays, K.A. Crawford. 2021. Comparison of Recreational Fish Consumption Advisories Across the USA. *Current Environmental Health Reports*. 8: 71–88.

- Climate change threatens Chinook salmon throughout their life cycle
  Crozier, L.G., B.J. Burke, B.E. Chaso, D.L. Widener, R.W. Zabel. 2021. Climate change threatens Chinook salmon throughout their life cycle. *Communications Biology*. 4: 222.

- Quantification and valuation of nitrogen removal services provided by commercial shellfish aquaculture at the subwatershed scale
  Dvarskas A., S. Bricker, G. Wikfors, J. Bohorquez, M. Dixon, and J. Rose. 2020. Quantification and Valuation of Nitrogen Removal Services Provided by Commercial Shellfish Aquaculture at the Subwatershed Scale. *Environmental Science & Technology* 54:16156–16165.

- Fish consumption and awareness of fish advisories among Burmese refugees: A respondent-driven sampling study in Milwaukee, Wisconsin
  He, X., M. Raymond, C. Tomasallo, A. Schultz, and J. Meiman. 2021. Fish consumption and awareness of fish advisories among Burmese refugees: A respondent-driven sampling study in Milwaukee, Wisconsin. *Environmental Research* 197:110906.

- Hiding in plain sight: Shellfish-killing phytoplankton in Washington State
  King T., N. Nguyen, G. Doucette, Z. Wang, B. Bill, M. Peacock, S. Madera, R. Elston, and V. Trainer. 2021. Hiding in plain sight: Shellfish-killing phytoplankton in Washington State. *Harmful Algae* 105:102032

- Effects of wastewater treatment plant effluent in a receiving stream on reproductive behavior of fathead minnows (*Pimephales promelas*)
  Leese, J.M., J. McMahon, and J.C. Colosi. 2021. Effects of wastewater treatment plant effluent in a receiving stream on reproductive behavior of fathead minnows (*Pimephales promelas*). *Fishes* 6:14.

- Survival, growth, and development in the early stages of the tropical gar *Atractosteus tropicus*: Developmental critical windows and the influence of temperature, salinity, and oxygen availability
  Martínez, G., E. Peña, R. Martínez, S. Camarillo, W. Burggren, A. Álvarez. 2021. Survival, growth, and development in the early stages of the tropical gar *Atractosteus tropicus*: Developmental critical windows and the influence of temperature, salinity, and oxygen availability. *Fishes* 6: 5.

- Differential effects of a catastrophic wildfire on downstream fish assemblages in an aridland river
  Reale, J.K., T.P. Archdeacon, D.J. Van Horn, E.J. Gonzales, R.K. Dudley, T.F. Turner, and C.N. Dahm. 2021. Differential effects of a catastrophic wildfire on downstream fish assemblages in an aridland river. *Aquatic Ecology*. 55:483-500.

- Big wildfires mobilize mercury. What are the risks to surface water?
  Sever, M. 2021. Inner Workings: Big wildfires mobilize mercury. What are the risks to surface water? *Proceedings of the National Academy of Sciences* 118.

- PFAS accumulation in indigenous and translocated aquatic organisms from Belgium, with translation to human and ecological health risk
  Teunen, L., L. Bervoets, C. Belpaire, M. De Jonge, and T. Groffen. 2021. PFAS accumulation in indigenous and translocated aquatic organisms from Belgium, with translation to human and ecological health risk. *Environmental Sciences Europe* 33:1-19.

Upcoming Meetings and Conferences

World Fisheries Congress
September 20-24, 2021
Adelaide, Australia

19Th International Conference on Harmful Algae
October 10-15, 2021
Virtual

Texas Society for Public Health Education (TSOPHE) 2021 Virtual Conference
October 18-19, 2021
Virtual

26th Biennial Coastal and Estuarine Research Federation Conference
November 1-4 and 8-11, 2021
Virtual

American Fisheries Society 151st Annual Meeting
November 6-10, 2021
Baltimore, MD

SETAC North America 42nd Annual Meeting
November 14-18, 2021
Virtual

2nd Annual Harmful Algal Bloom Virtual Symposium
January 6-7, 2022
Virtual

12th International Conference on Toxic Cyanobacteria
May 22-27, 2022
Toledo, OH

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.