



Fish and Shellfish Program NEWSLETTER

June 2019
EPA 823-N-19-005

In This Issue

Recent Advisory News..... 1

EPA News..... 6

Other News 7

Recently Awarded Research..... 9

Tech and Tools 10

Recent Publications 11

Upcoming Meetings
and Conferences 12



This newsletter provides information only. This newsletter does not impose legally binding requirements on the U.S. Environmental Protection Agency (EPA), states, tribes, other regulatory authorities, or the regulated community. The Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency has approved this newsletter for publication. Mention of trade names, products, or services does not convey and should not be interpreted as conveying official EPA approval, endorsement, or recommendation for use.

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

Recent Advisory News



West Virginia Fishing Regulations Summary 2019

The West Virginia Department of Health and Human Resources (DHHR) released the current West Virginia Sport Fish Consumption Advisory for 2019. West Virginia DHHR partners with the West Virginia Department of Environmental Protection (DEP) and the Division of Natural Resources (DNR) to develop consumption advisories for fish caught in West Virginia. Fish consumption advisories are reviewed annually and help West Virginia anglers make educated choices about eating the fish they catch.

Health Benefits of Eating Fish

Fish are nutritious and good to eat. When properly prepared, fish provide numerous health benefits, especially for the heart. The American Heart Association recommends eating two to three fish meals each week.

The benefits of eating fish include:

- Fish offer high-quality protein with fewer calories than a similar-sized portion of meat.
- Fish are low in sodium and are food sources of potassium, vitamins, and other minerals.
- Fish are generally low in cholesterol and saturated fats, which have been associated with high blood pressure and heart disease.

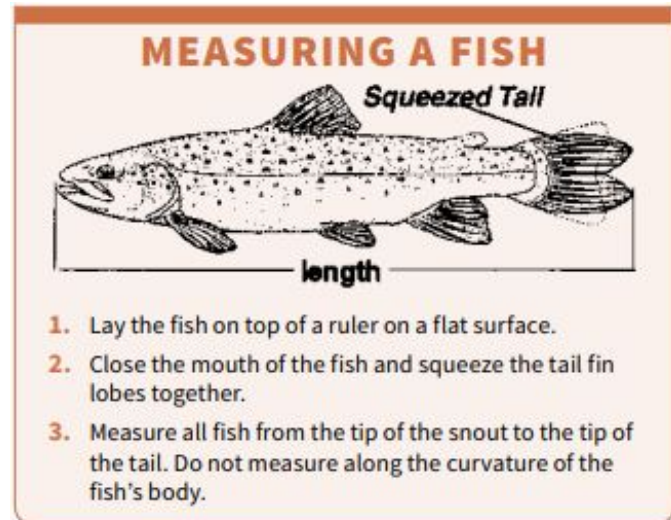
While the benefits of fish on nutrition are still being studied, much of the current research is focused on various kinds of beneficial fats in fish, particularly omega-3 fatty acids found in some fish and fish oils. Some studies have indicated that eating these fatty acids have favorable effects on health conditions such as high blood cholesterol levels, high blood pressure and hardening of the arteries.

Keeping and Cleaning Fresh Fish

If interested in the best ways to keep fish fresh and how to clean fish, see page 24 of the [West Virginia Fishing Regulations Summary for 2019](#).

Fish Consumption Advisories

The 2019 West Virginia Fish Consumption Advisories are intended to allow individuals to receive the nutritional benefits from eating fish while keeping the level of contaminants from fish at levels in the body low enough so that health problems are not likely. Fish advisories are not intended to discourage individuals from eating fish but should be used as a guide to eating fish in the proper amounts so as not to adversely impact an individual's health. People who eat fish can reduce risks by eating fish less likely to contain contaminants, cleaning and cooking them properly, and eating portions that correspond to that individual's body weight.



Infographic of how to measure a fish (Image courtesy of WVDNR)

Contaminants in Fish

Some fish take in contaminants, polychlorinated biphenyls (PCBs) for example, from the water they live in and the food they eat. These contaminants build up in the fish over time. Eating contaminated fish can result in a buildup of these chemicals in the body, so it is important to keep exposure as low as possible. The meal advisory is intended to protect people, especially pregnant and nursing women, women who may become pregnant in the next few years, and small children from potential health problems from eating contaminants in fish.

The [Statewide Consumption Advisories](#) are based on analysis of fish collected from waters across the state. Mercury levels drive the majority of the consumption advisories, with PCBs being much less widespread. Selenium has been measured from certain waters at low levels that do not require consumption restrictions beyond those in place for other contaminants.

Which fish are less likely to contain contaminants?

Some fish such as sunfish, crappie and trout eat insects and other aquatic life and are less likely to contain contaminants at levels that might affect human health. If eating walleye, bass, and other predatory fish, eat the smaller, younger fish that are less likely to contain contaminants. Eat fewer fish like carp and catfish, which feed on the bottom of lakes and rivers and are more likely to contain contaminants.

How should I prepare and cook fish to reduce the amount of contaminants in the fish?

PCBs and dioxin are contaminants that usually build up in a fish's fat deposits and just underneath the skin. Removing the skin and fat before cooking can reduce the levels of these chemicals. Mercury and selenium collect in the fish's muscle and cannot be reduced by cleaning and cooking methods.

To reduce PCBs and dioxin contaminants:

- Fillet fish and throw away the fat, skin and internal organs (where contaminants are most likely to accumulate) before cooking them. Fat is concentrated on the belly, the middle of the back, the line along the sides, and under the skin.
- Cooking does not destroy the contaminants, but heat from cooking melts some of the fat and allows some of the contaminated fat to drain away. Broil, grill or bake the trimmed, skinned fish on a rack so the fat drops away. Throw away the fat that comes from cooking fish.

WV Statewide Consumption Advisories

2019 WV General Consumption Advisories			
Water Body	Species	Limit fish meals to:	Contaminants
All Waters in West Virginia Except where listed in the Specific Consumption Advisories	White Bass	1 meal a month	Mercury PCBs
	Black Bass (largemouth, smallmouth, spotted)	2 meals a month	
	Channel Catfish greater than 17"		
	Flathead Catfish		
	Hybrid Striped Bass		
	Walleye, Sauger and Saugeye		
	Rock Bass	1 meal a week	
	Channel Catfish less than 17"		
	All Suckers		
	All Other Species		
	Rainbow Trout	No Limit	

PCBs: Polychlorinated Biphenyls

How to Use this Advisory

Follow the advice, noting the differences between the General Advisories for all West Virginia waters above and the Specific Advisories below. Find the meal advice for the fish caught. "Do Not Eat" means no one should eat those fish because of very high contamination. The other groups ("One Meal a Week," "Two Meals a Month," "One Meal a Month," and "Six Meals a Year") are advice for how often to eat a fish meal. The size of the fish meal depends on a person's body weight. To adjust serving sizes, follow the advice in the meal size table.

Women of childbearing age, children and people who regularly eat fish are particularly susceptible to contaminants that build up over time. People in these categories should be especially careful to follow the meal sizes and space fish meals out according to the advisory tables.

The human body can get rid of some contaminants over time. Spacing the meals out helps prevent the contaminants from building up to harmful levels in the body. For example, if the fish is in the "One Meal a Month Group," wait a month before eating another meal of fish from any restricted category. Occasionally eating fish in quantities slightly greater than the advisories recommend, such as during an annual fishing vacation, should not present a health hazard.

Meal Sizes	
A person weighing between	Should eat no more than this amount per meal
Pounds	Ounces of precooked fish
20 or less	1
21 - 35	1.5
36 - 50	2
51 - 70	3
71 - 90	4
91 - 110	5
111 - 130	6
131 - 150	7
151 and over	8

Remember that 3 ounces of precooked fish is about the size of the palm of your hand or a deck of cards

Remember that 1.5 ounces of precooked fish is about one-half the size of the palm of your hand or one-half the size of a deck of cards

DISCLAIMER: Advisories are based on fish tissue gathered for specific fish species in specific streams or lakes. Fish move throughout the year and may travel many miles in one day. Unless there are man-made or natural barriers, fish carrying contaminants may move into upstream or downstream reaches, or into tributaries. Therefore, it is recommended to be aware of potential fish movement in the fish consumption advisories.

2019 WV Specific Consumption Advisories			
Water Body	Species	Limit fish meals to:	Contaminants
Bluestone River	Carp	1 meal a month	PCBs
Fish Creek	Smallmouth Bass, all sizes	1 meal a month	Mercury
Kanawha River Downstream of I-64 bridge in Dunbar down to Winfield Lock and Dam including all backwaters, Armour Creek, Heizer Creek, Manila Creek, lower two miles Pocatalico River, Coal River mouth to Lower Falls	Flathead Catfish, all sizes	Do not eat	Dioxin* Mercury PCBs
	Channel Catfish, all sizes		
	Carp		
	Hybrid Striped Bass		
	Suckers	1 meal a month	
All other species	1 meal a month		
Little Kanawha from mouth upstream to Wells Lock	Sauger	1 meal a month	Mercury
Hughes River from mouth upstream to North and South forks			
R.D. Bailey Lake	Channel Catfish greater than 17 inches	1 meal a month	PCBs
Shenandoah River	Carp	Do not eat	Mercury PCBs*
	Smallmouth Bass	1 meal a month	Mercury
Summersville Lake	Flathead Catfish, all size	1 meal a month	Mercury
	Walleye	1 meal a month	Mercury
Sutton Lake	Black Bass, greater than 12 inches	1 meal a month	Mercury
Mount Storm Lake	Striped Bass	1 meal a month	PCBs

Note: *Contaminant- Meal Limits are determined by the chemical with asterisk. Other chemicals, such as dioxin, (Hg) methyl mercury may have an advisory at a less restrictive level.

PCBs: Polychlorinated Biphenyls

Ohio River Consumption Advisories

The protocol used to determine the recently released 2019 Ohio River fish consumption advisories is the product of the efforts of a multi-agency workgroup consisting of representatives from the six main stem states (Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia), the U.S. Environmental Protection Agency (EPA), and the Ohio River Valley Water Sanitation Commission (ORSANCO). The protocol establishes consistent fish advisories along the Ohio River main stem. The table below summarizes the part of the Ohio River advisory that is applicable to West Virginia. The full advisory is available online at <http://216.68.102.178/comm/fishconsumption/default.asp>.

2019 Ohio River Consumption Advisories			
Ohio River Segment	Species	Limit fish meals to:	Contaminant(s)*
Pennsylvania Border (East Liverpool) to Belleville Lock (Brooke Hancock, Marshall Ohio, Pleasants Tyler, Wetzel, and Wood Counties)	Channel Catfish 18 inches and greater	Do Not Eat	PCBs
	Channel Catfish less than 18 inches, Common Carp, Striped Bass Hybrid, White Bass	6 meals a year	
	Flathead Catfish, Freshwater Drum, Largemouth Bass, Sauger, Saugeye, Smallmouth Bass, Smallmouth Buffalo, Spotted Bass, All Suckers, Walleye	1 meal a month	
Belleville Lock to the Kentucky Border (Jackson, Mason, Wayne Counties)	Channel Catfish 18 inches and greater, Striped Hybrid Bass, Striped Bass	6 meals a year	PCBs
	Channel Catfish less than 18 inches, Common Carp, Flathead Catfish, Freshwater Drum, Largemouth Bass, Smallmouth Bass, Spotted Bass, All Suckers, White Bass	1 meal a month	
Note: *Contaminant- Meal Limits are determined by the chemical with asterisk. Other chemicals, such as dioxin, (Hg) methyl mercury may have an advisory at a less restrictive level. PCBs: Polychlorinated Biphenyls			

The advisory listing was current at the time this summary was released, but other fish consumption advisories may have been issued or lifted since that time. For further information consult:

- WVDNR at <http://www.wvdnr.gov/Fishing/regs19/advisory.pdf> for 2019 advisories or call (304) 558-2771.
- WVDEP at www.dep.wv.gov or call (304) 926-0495.
- EPA at www.epa.gov/choose-fish-and-shellfish-wisely.

Source: http://www.wvdnr.gov/Fishing/regs19/2019_fishingRegs.pdf

EPA News

EPA-FDA Advice about Eating Fish and Shellfish

In July 2019, the EPA and the U.S. Food and Drug Administration (FDA) released a new version of [advice on eating fish and shellfish](#).

While it is important to limit mercury in the diets of women who are pregnant or breastfeeding and young children, many types of fish are both nutritious and lower in mercury. The revised advice highlights the many nutritional components in fish, many of which have important roles in growth and development during pregnancy and early childhood. It also highlights the potential health benefits of eating fish as part of a healthy eating pattern, particularly for heart health benefits and lowering the risk of obesity.

The advice is intended to help women who are or might become pregnant, breastfeeding mothers, and parents of children over 2 years of age make informed choices about fish that are nutritious and safe to eat. While the advice categorizing fish based on their mercury levels has not changed, the revised document further promotes the science-based recommendations of the [Dietary Guidelines for Americans](#) on the importance of fish in healthy eating patterns. It retains the easy-to-use reference chart that sorts more than 60 types of fish and shellfish into three categories, based on their levels of mercury:

- “Best Choices”
- “Good Choices”
- “Choices to Avoid”

The FDA/EPA advice about eating fish and shellfish has been expanded to highlight:

- Recommendations of the 2015-2020 Dietary Guidelines for Americans
- Nutritional value of fish
- Potential health benefits of eating fish

The advice still recommends that women and children eat two to three servings (8 to 12 ounces for adults and children over age 10, smaller amounts for younger children) of a variety of fish and shellfish each week and still includes answers to frequently asked questions.

- [Advice Chart](#)
- [Frequently Asked Questions and Answers About the Advice](#)

The advice was revised in accordance with the Consolidated Appropriations Act, 2019.

For more information, contact William Jones at William.Jones@fda.hhs.gov or Lisa Larimer at Larimer.Lisa@epa.gov.

Sources: www.epa.gov/fish-tech/epa-fda-advice-about-eating-fish-and-shellfish, www.fda.gov/food/consumers/advice-about-eating-fish, www.federalregister.gov/documents/2019/07/09/2019-14524/advice-about-eating-fish-for-women-who-are-or-might-become-pregnant-breastfeeding-mothers-and-young

Other News

Mercury Concentrations in Lake Powell Higher in Lower Portion

On March 18, 2019, U.S. Geological Survey (USGS) released [a report](#) which found that mercury concentrations within Lake Powell are highest in side canyons within the lower portion of the reservoir. This finding is part of a study to better understand why mercury concentrations in striped bass are higher in the lower part of the reservoir.

“Results of this study may provide a basis for the identification and evaluation of remediation activities related to mercury,” said lead author and USGS scientist David Naftz. “Findings indicate that more limited areas within Lake Powell, such as side canyons and river arms, could be targeted by resource managers for remediation strategies, if deemed necessary.”

Lake Powell serves as a critical Western U.S. reservoir and source of power generation. It attracts more than 3 million visitors a year, many of whom are striped bass anglers. Findings from an earlier study resulted in a 2012 [fish consumption advisory for striped bass](#) for the lower portion of Lake Powell. Striped bass in the lower half of the lake consistently exceeded the EPA human consumption advisory limits for mercury.

[In the recent study](#), USGS scientists collected water, plankton, and sediment samples from Lake Powell in May/June 2014 and August 2015. Fish tissue samples were collected during November 2014 by the Utah Division of Wildlife Resources and analyzed by the [USGS Mercury Research Lab](#). Data were compared to previous fish surveys to gain a better understanding of mercury dynamics within the reservoir.

“We know mercury concentrations differ in certain parts of the lake. Our focus was to better understand the conditions that tend to promote higher or lower levels of toxic methylmercury in sediment, water, fish, and plants,” said Mark Marvin-DiPasquale, a leading USGS mercury scientist working on the project.

Mercury is a naturally occurring metal that can pose a threat to humans, fish, and wildlife if they are exposed to elevated levels of its most toxic form, methylmercury. In aquatic systems, methylmercury is created from inorganic mercury by microorganisms under particular environmental conditions, such as low oxygen. Therefore, the movement of inorganic mercury from the atmosphere or land to the water does not always result in equivalent levels of methylmercury in fish and wildlife unless environmental conditions are favorable for methylmercury production.

Results show levels of methylmercury generally increased from the upper reservoir to the lower reservoir. Narrow side canyons in the lower half of Lake Powell also showed higher levels of methylmercury. Mercury concentrations were found to be higher in tissue samples from striped bass collected from Wahweap Bay, located at the lower end of Lake Powell, than bass from Good Hope Bay at the upper end. Results also indicated that fish tissue samples collected in the San Juan Arm of Lake Powell contained higher mercury concentrations than fish tissue samples collected from the lower reservoir. The same factors that influence higher mercury concentrations in the lower reservoir likely influence higher mercury concentrations in the arms compared to the main stem.

Conditions in the lower part of the reservoir were found to be more conducive for methylmercury production. Findings show that inflowing water from the Colorado River at the upper end of Lake Powell carries suspended sediment, which blocks light from penetrating very deep into the water. This limits the production of microscopic algae, or [phytoplankton](#), in the upper portion of Lake Powell. As water moves farther downstream, the flow slows and suspended sediment settles to the bottom, allowing more light penetration. Increased light enhances phytoplankton production, resulting in oxygen consumption by microorganisms that feed on phytoplankton, which creates favorable low-oxygen conditions for methylmercury production.

Critical work remains to be done in Lake Powell related to mercury trends during different times of the year, geographic areas, and habitat types as well as gaining a better understanding of the relative contribution of sediment versus water-column mercury methylation.

This study was funded by the [USGS/National Park Service \(NPS\) Water Quality Partnership program](#). The goal of scientific studies associated with this program is to provide results to guide policy and management actions by the NPS that are aimed at protecting and improving water quality within NPS-administered lands.

For more information, contact:

- Jennifer LaVista (Public Affairs Specialist, USGS Office of Communications) at 303-202-4764 or jlavista@usgs.gov.
- David L. Naftz (Research Hydrologist, Wyoming-Montana Water Science Center) at 406-457-5945 or dlnaftz@usgs.gov.

Source: <https://www.usgs.gov/news/mercury-concentrations-lake-powell-higher-side-canyons>

NC Fish Forum Brings Stakeholders Together to Improve Fish Consumption Advisory Process

In March 2019, stakeholders from a variety of organizations across North Carolina met to talk about setting, communicating, and improving fish consumption advisories. The focus was on risks that are known from mercury and emerging contaminants such as GenX and other per- and polyfluoroalkyl substances (PFAS). Attendees provided ideas of ways that the fish consumption advisory process could be improved. According to Duke University's Nicholas School of the Environment, findings and recommendations that come out of the discussion will be available at a later date.

Source: <https://sites.nicholas.duke.edu/superfund/fish-forum-2019/>

Recently Awarded Research

NFWF Announces More Than \$724,000 in Grants to Conserve Lahontan Cutthroat Trout

On November 30, 2018, the National Fish and Wildlife Foundation (NFWF) announced \$724,905 in grants for two projects creating large interconnected strongholds of Lahontan cutthroat trout that are resilient to drought, fire, and stream warming in eastern California, northern Nevada, and southern Oregon. The grants will generate \$734,000 in matching contributions for a total conservation impact of more than \$1.45 million.



Lahontan cutthroat trout (Photo courtesy of USGS)

The grants were awarded to Trout Unlimited and USGS Forest and Rangeland Ecosystem Science Center through the Lahontan Cutthroat Trout (LCT) program, a partnership between NFWF and Bureau of Reclamation, the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the Bureau of Land Management.

“Over the past eight years, the [Lahontan Cutthroat Trout](#) program has made major gains in enabling trout to survive and thrive in critical streams in California, Nevada, and Oregon,” said Jeff Trandahl, executive director and CEO of NFWF. “The grants announced today will help cement NFWF’s impact in the region by establishing networked stream systems to sustain Lahontan cutthroat trout strongholds and support research to inform ongoing management of protected streams long into the future.”

Trout Unlimited will utilize its grant to reduce the threat of non-native fish in occupied and historic Lahontan cutthroat trout habitats, conduct genetic and population monitoring to evaluate the species’ overall health, expand hatchery work, and support key capacity needs of partners working throughout the Lahontan cutthroat trout range. The USGS Forest and Rangeland Ecosystem Science Center will analyze field data to evaluate the sensitivity of Lahontan cutthroat trout to temperature and drought conditions in critical streams range-wide. Results of this work will inform future recovery strategies.

Established in 2010, the LCT program protects existing pure populations of Lahontan cutthroat trout from contact with non-native trout, sustains Lahontan cutthroat trout populations in lakes, connects isolated populations into larger, more resilient populations, and increases Lahontan cutthroat trout angling opportunities.

Lahontan cutthroat trout are the only native trout in the Great Basin. Following decades of decline, the species was listed under the Endangered Species Act in 1973. Since the LCT program began, nine populations of Lahontan cutthroat trout have been secured through a combination of reintroduction and barrier placement protecting from non-native trout invading recovery streams. To date, non-native trout have been removed from 267 miles of Lahontan cutthroat trout habitat.

A complete list of the 2018 grants made through the LCT program is [available here](#).

For more information, contact Rob Blumenthal at 202-857-0166.

Source: <https://www.nfwf.org/whoweare/mediacenter/pr/Pages/nfwf-announces-more-than-724-000-in-grants-to-protect-lahontan-cutthroat-trout-2018-1130.aspx>

Tech and Tools

FDA Released Training Video on Marine Biotoxin Management

On February 21, 2019, FDA released a [training video on marine biotoxin management](#) to provide a better understanding of specific biotoxin concepts in the National Shellfish Sanitation Program (NSSP), as described in the *NSSP Guide for the Control of Molluscan Shellfish: 2017 Revision*. The video, comprising three learning modules, is a tool to help the seafood industry and state and federal agencies understand biotoxin sources and geographic distributions, develop or improve marine biotoxin management and control plans, and determine the appropriate laboratory methods for specific applications.



Screenshot of training video (Image courtesy of FDA)

For more information, contact Stacey McLeroy, Ph.D. at 240-402-1470 or Stacey.McLeroy@fda.hhs.gov.

Source: <https://www.fda.gov/food/resources-you-food/seafood>

Recent Publications

Journal Articles

The list below provides a selection of research articles focusing on acidification.

- ▶ [Acidification impacts and goals for gauging recovery of brook trout populations and fish communities in streams of the western Adirondack Mountains, New York, USA](#)
Baldigo, B., S. George, G. Lawrence, and E. Paul. 2019. Acidification impacts and goals for gauging recovery of brook trout populations and fish communities in streams of the western Adirondack Mountains, New York, USA. *Transactions of the American Fisheries Society* 148(2):373-392.
- ▶ [The impact of ocean acidification on the gonads of three key Antarctic benthic macroinvertebrates](#)
Dell'Acqua, O., S. Ferrando, M. Chiantore, and V. Asnaghi. 2019. The impact of ocean acidification on the gonads of three key Antarctic benthic macroinvertebrates. *Aquatic Toxicology* 210:19-29.
- ▶ [The impact of ocean acidification on the byssal threads of the blue mussel \(*Mytilus edulis*\)](#)
Dickey, G., B. Preziosi, C. Clark, and T. Bowden. 2018. The impact of ocean acidification on the byssal threads of the blue mussel (*Mytilus edulis*). *PLoS ONE*, 13(10): e0205908
- ▶ [Eco-physiological responses of copepods and pteropods to ocean warming and acidification](#)
Engstrom-Ost, J., O. Glippa, R.A. Feely, J.E. Keister, S.R. Alin, B.R. Carter, A.K. McLaskey, K.A. Vuori, and N. Bednarsek. 2019. Eco-physiological responses of copepods and pteropods to ocean warming and acidification. *Scientific Reports* 9:4748.
- ▶ [Seawater acidification and temperature modulate anti-predator defenses in two co-existing *Mytilus* species](#)
Kong, H., J. Clements, S. Dupont, T. Wang, X. Huang, Y. Shang, W. Huang, J. Chen, M. Hu, and Y. Wang. 2019. Seawater acidification and temperature modulate anti-predator defenses in two co-existing *Mytilus* species. *Marine Pollution Bulletin* 145:118-125.
- ▶ [A negative correlation between behavioural and physiological performance under ocean acidification and warming](#)
Laubenstein, T., Rummer, J., McCormick, M. and Munday, P. (2019). A negative correlation between behavioural and physiological performance under ocean acidification and warming. *Scientific Reports* 9(1):4265.
- ▶ [Living in a multi-stressors environment: An integrated biomarker approach to assess the ecotoxicological response of meagre \(*Argyrosomus regius*\) to venlafaxine, warming and acidification](#)
Maulvault, A., C. Camacho, V. Barbosa, R. Alves, P. Anacleto, P. Pousão-Ferreira, R. Rosa, A. Marques, and M. Diniz. 2019. Living in a multi-stressors environment: An integrated biomarker approach to assess the ecotoxicological response of meagre (*Argyrosomus regius*) to venlafaxine, warming and acidification. *Environmental Research* 169:7-25.
- ▶ [Linking social preferences and ocean acidification impacts in mussel aquaculture](#)
Sam Martin, V., S. Gelcich, F. Vasquez Lavin, R. Ponce Oliva, J. Hernandez, N. Lagos, S. Birchenough, and C. Vargas. 2019. Linking social preferences and ocean acidification impacts in mussel aquaculture. *Scientific Reports* 9(1):4719.
- ▶ [Divergent responses of Atlantic cod to ocean acidification and food limitation](#)
Stiasny, M., M. Sswat, F. Mittermayer, I. Falk-Petersen, N. Schnell, V. Puvanendran, A. Mortensen, T., Reusch, and C. Clemmesen. 2019. Divergent responses of Atlantic cod to ocean acidification and food limitation. *Global Change Biology* 25(3):839-849.
- ▶ [Oysters as sentinels of climate variability and climate change in coastal ecosystems](#)
Thomas, Y., C. Cassou, P. Gernez, and S. Pouvreau. 2018. Oysters as sentinels of climate variability and climate change in coastal ecosystems. *Environmental Research Letters* 13(10):104009.

► [Ecological-economic sustainability of the Baltic cod fisheries under ocean warming and acidification](#)

Voss, R., M. Quaas, M. Stiasny, M. Hänsel, G. Stecher Justiniano Pinto, A. Lehmann, T. Reusch, and J. Schmidt. 2019. Ecological-economic sustainability of the Baltic cod fisheries under ocean warming and acidification. *Journal of Environmental Management* 238:110-118.

Upcoming Meetings and Conferences

[International Conference on Molluscan Shellfish Safety](#)

September 13, 2019
Ensenada, Baja California

[American Fisheries Society & The Wildlife Society 2019 Joint Annual Conference](#)

September 29 – October 3, 2019
Reno, Nevada

[Organization of Fish and Wildlife Information Managers Annual Conference](#)

October 6-10, 2019
Shepherdstown, West Virginia

[Atlantic International Chapter Meeting](#)

September 22–24, 2019
Prince Edward Island, Canada

[2019 Interstate Shellfish Sanitation Conference \(ISSC\) Biennial Meeting](#)

October 5-10, 2019
San Diego, California

[Salish Sea Ecosystem Conference](#)

April 19–22, 2020
Vancouver, British Columbia, Canada

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>.