



Fish and Shellfish Program NEWSLETTER

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

This edition of the Fish and Shellfish Program Newsletter generally focuses on dioxins.

Recent Advisory News



EPA and FDA Issue Final Fish Consumption Advice

On January 18, 2017, the U.S. Environmental Protection Agency (EPA) and the U.S. Food and Drug Administration (FDA) issued final advice regarding fish consumption. This advice is geared toward helping women who are pregnant or may become pregnant—as well as breastfeeding mothers and parents of young children—make informed choices when it comes to fish that are healthy and safe to eat. (This advice refers to fish and shellfish collectively as “fish.”)

To help these consumers more easily understand the types of fish to select, the agencies have created an easy-to-use reference chart that sorts 62 types of fish into three categories:

- “Best choices” (eat 2–3 servings a week)
- “Good choices” (eat one serving a week)
- “Fish to avoid”

Fish in the “best choices” category make up nearly 90 percent of fish eaten in the United States.

An FDA analysis of fish consumption data found that 50 percent of pregnant women surveyed ate fewer than 2 ounces a week, far less than the amount recommended. Because the nutritional benefits of eating fish are important for growth and development during pregnancy and early childhood, the agencies are advising and promoting a minimum level of fish consumption for these groups. The advice recommends 2–3 four-ounce servings of lower-mercury fish per week, for a total of up to 8–12 ounces a week. However, all fish contain at least traces of mercury, which can be harmful to the brain and nervous system if a person is exposed to too much of it over time. The maximum level of consumption recommended in the final advice is consistent with the previous recommended level of 12 ounces per week. The new advice is consistent with the 2015–2020 Dietary Guidelines for Americans.

For adults, a typical serving is 4 ounces of fish, measured before cooking. Serving sizes for children should be smaller and adjusted for their age and total calorie needs. It is recommended that children eat fish once or twice a week, selected from a variety of fish types.

“Fish are an important source of protein and other nutrients for young children and women who are or may become pregnant, or are breastfeeding. This advice clearly shows the great diversity of fish in the U.S. market that they can consume safely,” said FDA Deputy Commissioner for Foods and Veterinary Medicine Stephen Ostroff, M.D. “This new, clear and concrete advice is an excellent tool for making safe and healthy choices when buying fish.” Choices lower in mercury include some of the most commonly eaten fish, such as shrimp, pollock, salmon, canned light tuna, tilapia, catfish, and cod.

When updating the advice, the agencies took a cautious and highly protective approach to allow consumers to enjoy the benefits of fish while avoiding those with higher levels of mercury, which is especially important during pregnancy and early childhood. The average mercury content of each type of fish was calculated based on FDA data and information from other sources. The updated advice cautions parents of young children and certain women to avoid seven types of fish that typically have higher mercury levels: tilefish from the Gulf of Mexico; shark; swordfish; orange roughy; bigeye tuna; marlin; and king mackerel.

For fish caught recreationally, consumers are urged to check for local advisories where they are fishing and gauge their fish consumption based on any local and state advisories for those waters. If no information on fishing advisories is available, consumers should eat just one fish meal a week from local waters and avoid other fish that week. Consumers should clean and trim the fish they catch of fat and skin, since locally-caught fish may contain contaminants besides mercury that can be reduced by proper trimming and cooking, (e.g., broiling instead of frying can reduce some contaminants by letting fat drip away from the fish).

“It’s all about eating and enjoying fish of the right kind and in the right amounts,” said EPA Director for Water Science and Technology, Elizabeth Southerland, Ph.D. “This joint advice not only provides information for fish consumers who buy from local markets, but it also contains good information for people who catch their own fish or are provided fish caught by friends or relatives.”

All retailers, grocers, and others are urged to post this new advice, including the reference chart listing fish to choose, prominently in their stores so consumers can make informed decisions when and where they purchase fish. The agencies will be implementing a consumer education campaign working with a wide array of public and private partners featuring the new advice.

In June 2014, the agencies issued draft advice which encouraged pregnant women and others to eat between 8 and 12 ounces of fish a week of fish “lower in mercury” but did not provide a list showing consumers which fish are lower in mercury. The updated advice also takes into account more than 220 comments received from academia, industry, nongovernmental organizations, and consumers, as well as an external peer review of the information and method used to categorize the fish.

For more information, visit <http://www.fda.gov/fishadvice> or <http://www.epa.gov/fishadvice>.

Source: <https://www.epa.gov/newsreleases/epa-and-fda-issue-final-fish-consumption-advice-0>.



Texas Issues Updated Consumption Advisory for Mountain Creek Lake

On January 13, 2017, the Texas Department of State Health Services (DSHS) updated a fish consumption advisory for Mountain Creek Lake in Dallas County due to unsafe levels of dioxins and polychlorinated biphenyls (PCBs) in certain species of fish.

DSHS tested tissue samples from fish as part of a re-evaluation of the lake. Concentrations of dioxins and PCBs in channel catfish, common carp, flathead catfish, freshwater drum, largemouth bass, smallmouth buffalo, and white bass continue to exceed DSHS health guidelines.

DSHS now recommends people limit or avoid consumption of these species as outlined in the table below.

Contaminants of Concern	Species Affected	Women of Childbearing Age and Children < 12 ¹	Women Past Childbearing Age and Males 12 and Older ²
Dioxins and PCBs	Channel catfish	DO NOT EAT	1 meal/month
	Common carp	DO NOT EAT	DO NOT EAT
	Flathead catfish	1 meal/month	2 meals/month
	Freshwater drum	DO NOT EAT	DO NOT EAT
	Largemouth bass	1 meal/month	3 meals/month
	Smallmouth buffalo	DO NOT EAT	DO NOT EAT
	White bass	DO NOT EAT	1 meal/month

¹ One meal is four ounces of fish.

² One meal is eight ounces of fish.

The recommendations are stronger for children under 12 and women who are nursing, pregnant, or who may become pregnant because the nervous systems of unborn and young children are particularly susceptible to the health effects of toxins.

The updated advisory replaces one issued in 2010 that recommended no one eat any fish from Mountain Creek Lake. Prior to that, the state prohibited people from possessing fish from the lake at all. Elevated levels of dioxins and PCBs in fish do not pose a health risk for people swimming, boating, or participating in other recreational activities.

Source: <http://dshs.texas.gov/news/releases/2017/20170113.aspx>.



Florida Fish Consumption Advisories

Fish consumption advisories are published periodically by the State of Florida to alert consumers about the possibility of chemically contaminated fish in Florida waters. The advisories are meant to inform the public of potential health risks of specific fish species from specific water bodies. The following two advisories in the table below were issued recently.

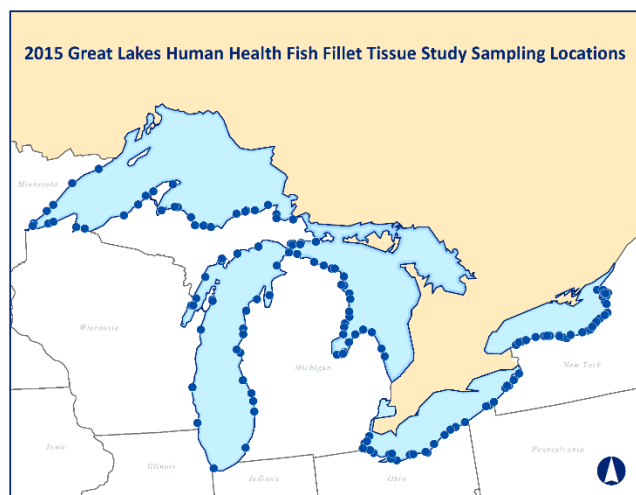
Release Year	Water Body	Contaminant	County	Species	Women of Childbearing Age, Young Children	All Other Individuals
2017	Emeralda Marsh WMA Area 7	Pesticides	Lake	Warmouth Redear sunfish Golden shiner Bluegill, largemouth bass	1 meal/week 1 meal/week 1 meal/month 1 meal/month	2 meals/week 1 meal/week 1 meal/week 1 meal/month
2016	Oriskany Reef	PCBs	Escambia	Bank seabass Scamp grouper	DO NOT EAT DO NOT EAT	2 meals/week 1 meal/month

Source: http://www.floridahealth.gov/programs-and-services/prevention/healthy-weight/nutrition/seafood-consumption/_documents/advisory-brochure.pdf.

EPA News

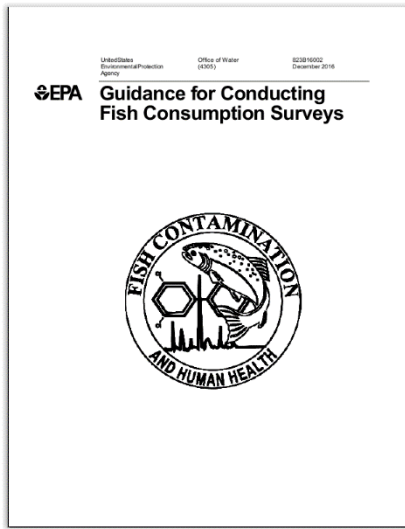
EPA Is Conducting Analysis of Dioxins and Furans in Great Lakes Sport Fish

The U.S. EPA’s Office of Science and Technology and Great Lakes National Program Office are collaborating to conduct the 2015 Great Lakes Human Health Fish Fillet Tissue Study under the Great Lakes portion of the Agency’s 2015 National Coastal Condition Assessment (NCCA). The 2015 NCCA is one of a series of statistically based surveys that EPA is conducting at five-year intervals to assess the condition of U.S. waters. In response to requests from Great Lakes states, EPA is including 17 dioxins and furans on the list of target chemicals for analysis of Great Lakes sport fish fillet samples. State and federal agency field teams used consistent methods to collect fish composite samples of species commonly consumed by humans from a statistically representative subset of 152 nearshore locations in the five Great Lakes (about 30 sampling sites per lake). Fish samples were filleted in the laboratory and the fillet tissue samples were prepared during 2016. In addition to dioxins and furans, the 152 fillet tissue samples are being analyzed for mercury, the full suite of 209 PCB congeners, 13 perfluorinated compounds (including perfluorooctane sulfonate [PFOS] and perfluorooctanoic acid [PFOA]), and 38 fatty acids (including omega-3 and omega-6 fatty acids).



For more information, contact Stahl.Leanne@epa.gov or Murphy.Elizabeth@epa.gov.

EPA Releases Guidance for Conducting Fish Consumption Surveys



In December 2016, the U.S. EPA released *Guidance for Conducting Fish Consumption Surveys*. The purpose of this document is to provide guidance for the design, conduct, and analysis of surveys focused on characterizing contemporary ingestion of fish. The methodologies are also applicable to consumption of other aquatic organisms, such as marine mammals, that may be consumed by populations of interest. Building on the previous 1998 EPA guidance document, the discussion of survey methodologies has been updated to reflect more recent developments in the area of survey research, including use of cellular telephones, the Web, mobile devices, and use of multi-mode data collection designs. To supplement and provide context to the described approaches, this guidance document also covers a broad overview of the numerous and complex issues surrounding the development of a study approach, identification of survey objectives, sampling options, mode

selection, questionnaire development, and operational and analytic considerations. New sections on the topics of consumption suppression and the role of heritage rates, especially among tribal populations, have been added. Also, in recognition of the fact that resources for fish consumption surveys can typically be limited, this document addresses survey design options within the context of budgetary resources to help the researcher make choices that best fit the situation. This document does not provide direct guidance focused on how to collect and analyze fish tissue for contaminants or how to conduct surveys to assess understanding of and compliance with regulations or voluntary programs, even if the surveys are relevant to water bodies with consumption advisories.

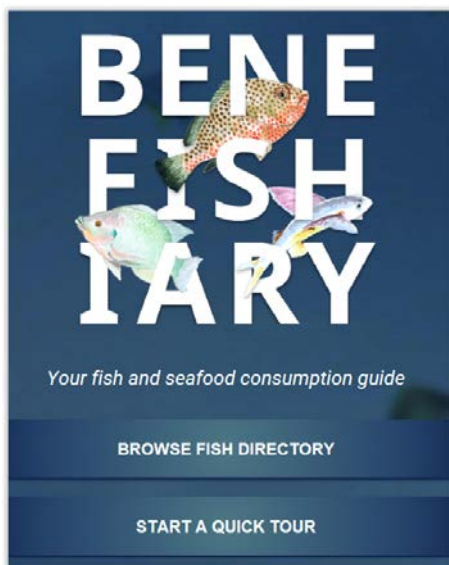
This guidance revises and replaces EPA's 1998 *Guidance for Conducting Fish and Wildlife Surveys* and provides information to assist states, tribes, local governments, and others with the design, conduct, and analysis of surveys for estimating consumption rates of finfish and shellfish.

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

Source: https://www.epa.gov/sites/production/files/2017-01/documents/fc_survey_guidance.pdf.

Other News

The BeneFISHiary App for Bermuda: Balancing the Benefits and Risks of Fish Consumption



Screenshot of the top page of the BeneFISHiary app.

Dr. Catherine Pirkle, an Assistant Professor from the University of Hawaii, and Dr. Philippe Rouja, a co-director of Ocean Human Health Programme, in collaboration with HUACTIVE, developed a free and user-friendly mobile application (app), the BeneFISHiary app, which provides information about nutrients and contaminants found in local fish available in Bermuda. This project was initiated to help healthcare providers and local Bermudians be informed enough about fish in Bermuda to make smart decisions on how much of which fish species to eat.

The BeneFISHiary app contains a fish directory that includes 40 different fish species local to Bermuda. When a user clicks onto the full description of a particular fish species, each fish has an illustration, the scientific name, a brief description of the species, concentrations of mercury, nutrient information, including omega-3 fatty acids, how the fish can be cooked (“taste test”), and “smart substitutions.” “Smart substitutions” are recommendations for an alternative if the particular fish is declining in population or high in mercury concentration, and therefore should be avoided.

Each fish species has color-coded indicators (e.g., green, yellow, orange, red) for mercury concentrations, sustainability rankings, and consumption recommendations. See screenshot of the app below.

For example, mercury concentrations (shown as a circle with the letter “M”) range from low to very high: very high (red) indicates levels greater than 1.00 µg/g, high (orange) indicates levels between 0.51 and 1.00 µg/g, medium (yellow) indicates levels between 0.20 and 0.50 µg/g, and low (green), which are levels less than 0.20 µg/g.

The sustainability of the fish (shown as a circle with the letter “S”) include “depleted” (red), “declining” (orange), “vulnerable” (yellow), “good choice” (green), and “unknown” (gray).

Lastly, the frequency of consumption (shown as a circle with the letter “C”) includes “to be avoided” (red), “monthly” (orange), “weekly” (yellow), and “daily” (green).

This app is being used primarily by residents of Bermuda, including some healthcare providers who work mainly with pregnant women. It appears that there are a number of users residing outside of Bermuda.



Screenshot of the BeneFISHiary app.

The BeneFISHiary app is available at <http://www.benefishiary.com/>.

For more information, contact Dr. Catherine Pirkle (CMPirkle@hawaii.edu).

Ocean Acidification to Hit West Coast Dungeness Crab Fishery, New Assessment Shows

According to research published on January 12, 2017, in the journal *Global Change Biology*, the expected acidification of the ocean will affect the West Coast's marine food web, but not necessarily in the ways you might expect, new research shows.

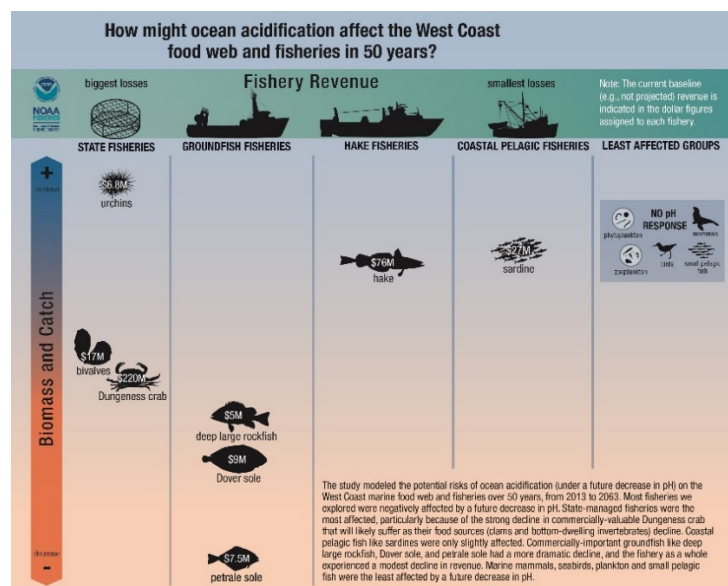
Dungeness crabs, for example, will likely suffer as their food sources decline. Dungeness crab fisheries valued at about \$220 million annually may face a strong downturn over the next 50 years. But pteropods and copepods, tiny marine organisms with shells that are vulnerable to acidification, will likely experience only a slight overall decline because they are prolific enough to offset much of the impact, the study found.

“What stands out is that some groups you'd expect to do poorly don't necessarily do so badly—that's probably the most important takeaway here...this is a testament in part to the system's resilience to these projected impacts,” said the lead author of the study.

While previous studies have examined the vulnerability of particular species to acidification in laboratories, this is among the first to model the effects across an entire ecosystem and estimate the impacts on commercial fisheries.

“The real challenge is to go from experiments on what happens to individual animals in the lab over a matter of weeks, to try to capture the effects on the whole population and understand how vulnerable it really is,” said a research scientist at National Oceanic and Atmospheric Administration (NOAA) Fisheries' Northwest Fisheries Science Center in Seattle.

The research used sophisticated models of the California Current ecosystem off the Pacific Coast to assess the impacts of a projected 0.2 unit decline in the pH of seawater in the next 50 years, which equates to a 55 percent increase in acidity. The California Current is considered especially vulnerable to acidification because the upwelling of deep, nutrient-rich water low in pH already influences the West Coast through certain parts of the year.



The study modeled the potential risks of ocean acidification (under a future decrease in pH) on the West Coast marine food web and fisheries over 50 years, from 2013 to 2063. (Image courtesy of NOAA)

The research built on an earlier effort by NOAA scientists that quantified the sensitivity of various species to acidification. In a novel approach, the researchers weighed the evidence for each species based on its reported sensitivity in the laboratory and relevance to the California Current.

This synthesis identified ten groups of species with highest vulnerability to acidification. The researchers incorporated this into the ecosystem model to examine how acidification will play out in nature. The study particularly examined the effects on commercially important species including Dungeness crab; groundfish such as rockfish, sole and hake; and coastal pelagic fish such as sardines and anchovy over the period from 2013 to 2063.

“This was basically a vulnerability assessment to sharpen our view of where the effects are likely to be the greatest and what we should be most concerned about in terms of how the system will respond,” said a co-author of the research.

Although earlier studies have shown that Dungeness crab larvae is vulnerable to acidification, the assessment found that the species declined largely in response to declines in its prey—including bivalves such as clams and other bottom-dwelling invertebrate species.

Since Dungeness crab is one of the most valuable fisheries on the West Coast, its decline would have some of the most severe economic effects, according to the research. Groundfish such as petrale sole, Dover sole, and deep-dwelling rockfish are also expected to decline due to acidification, according to the assessment. However, fisheries for those species are much less valuable so the economic impact would not be as large.

Coastal pelagic fish were only slightly affected.

Study citation: Marshall, K.N., I.C. Kaplan, E.E. Hodgson, A.J. Hermann, D.S. Busch, P. McElhany, T.E. Essington, C.J. Harvey, and E.A. Fulton. 2017. Risks of ocean acidification in the California Current food web and fisheries: Ecosystem model projections. *Global Change Biology*. doi:10.1111/gcb.13594.

Source:

https://www.nwfsc.noaa.gov/news/features/ocean_acidification_west_coast_dungeness_crab_fishery/index.cfm.

Recently Awarded Research

Sea Grant Announces \$3.4M for Aquaculture Research and Outreach Projects

On October 28, 2016, the National Sea Grant College Program announced \$3.4 million in federal funding to support aquaculture research and outreach. The funding, which leverages all federal dollars 2:1 with state matching funds, will support 11 aquaculture research projects and 23 projects to organize and conduct conferences and workshops to transfer aquaculture information.

New research projects total \$3 million in federal funds. The table on the next page includes a partial list of the funded projects. A complete list of the 11 aquaculture research projects funded in the 2016 competition is [available](#).

Sea Grant Program	Project Title
University of Hawai'i	Elucidating the physiological and epigenetic response of tetraploid and triploid Pacific Oysters (<i>Crassostrea gigas</i>) to environmental stressors
University of Washington	The purple hinged rock scallop, a promising aquaculture species with a toxic algal problem
University System of New Hampshire	Shellfish aquaculture and virus pollution near wastewater treatment plants
Virginia Institute of Marine Science	Managing the complex profile of biotoxins threatening the shellfish industry of Lower Chesapeake Bay
Woods Hole Oceanographic Institution	Integrating mussel and kelp longline culture structures and management

“These projects will begin to address priorities identified in the [10-year vision for aquaculture](#) recently developed by the Sea Grant network in conjunction with industry partners and management professionals...an important and often overlooked area is going beyond research to integrate useable science into people’s everyday lives. The conferences and workshops funded this year will contribute to filling that gap,” said the National Sea Grant Director.

Outreach projects totaling \$400,000 in federal funding will support conferences, workshops, training, and technology transfer efforts focused on advancing aquaculture knowledge, management, and collaboration. The table below includes a partial list of the grant recipients. A complete list of aquaculture conference and training projects funded in the 2016 competition is also [available](#).

Sea Grant Program	Project Title
Maryland Sea Grant	Illustrated guide to disease and parasites of oysters, <i>Crassostrea virginica</i>
South Carolina Sea Grant Consortium	2016 aquaculture Sea Grant conferences and workshops: South Atlantic Shellfish Initiative planning workshop
University of Florida	Red Tide Stinks: Workshop to discuss strategies, safe sustainable commercial shellfish production in areas susceptible to harmful algal blooms
University of Maine System	Blazing the oyster trail of Maine



Eastern oyster (*Crassostrea virginica*).
(Image courtesy of NOAA)

Learn more about Sea Grant’s work on [sustainable aquaculture](#).

Download the [Sea Grant 10 year vision](#) for aquaculture (or download the [summary fact sheet](#)).

Source: <http://seagrant.noaa.gov/News/SeaGrantAnnouncements/TabId/275/ArtMID/731/ArticleID/709/Sea-Grant-announces-34M-for-aquaculture-research-and-outreach-projects.aspx>.

Recent Publications

Journal Articles

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

- ▶ [Influence of non-detect data-handling on toxic equivalency quantities of PCDD/Fs and dioxin-like PCBs: A case study of major fish species purchased in Korea](#)

Barghi, M., S.D. Choi, H.O. Kwon, Y.S. Lee, and Y.S. Chang. 2016. Influence of non-detect data-handling on toxic equivalency quantities of PCDD/Fs and dioxin-like PCBs: A case study of major fish species purchased in Korea. *Environmental Pollution* 214:532–538.

- ▶ [Modelling scenarios on feed-to-fillet transfer of dioxins and dioxin-like PCBs in future feeds to farmed Atlantic salmon \(*Salmo salar*\)](#)

Berntssen, M.H.G., M. Sanden, H. Hove, and Ø. Lie. 2016. Modelling scenarios on feed-to-fillet transfer of dioxins and dioxin-like PCBs in future feeds to farmed Atlantic salmon (*Salmo salar*). *Chemosphere* 163:413–421.

- ▶ [Congener profiles of polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans \(PCDD/Fs\) in sediment, water, and fish at a soil contamination site in Taiwan](#)

Chang, H.J., T.F. Lin, L.M. Whang, and Y.J. Wu. 2016. Congener profiles of polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (PCDD/Fs) in sediment, water, and fish at a soil contamination site in Taiwan. *Journal of Environmental Science and Health, Part A* 51(3):251–261.

- ▶ [High conservation in transcriptomic and proteomic response of white sturgeon to equipotent concentrations of 2,3,7,8-TCDD, PCB 77, and benzo\[a\]pyrene](#)

Doering, J.A., S. Tang, H. Peng, B.K. Eisner, J. Sun, J.P. Giesy, S. Wiseman, and M. Hecker. 2016. High conservation in transcriptomic and proteomic response of white sturgeon to equipotent concentrations of 2,3,7,8-TCDD, PCB 77, and benzo[a]pyrene. *Environmental Science & Technology* 50(9):4826–4835.

- ▶ [A study of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin induced liver injury in Jian carp \(*Cyprinus carpio* var. Jian\) using precision-cut liver slices](#)

Du, J.L., L.P. Cao, Y.J. Liu, R. Jia, and G.J. Yin. 2016. A study of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin induced liver injury in Jian carp (*Cyprinus carpio* var. Jian) using precision-cut liver slices. *Bulletin of Environmental Contamination and Toxicology* 96(1):55–61.

- ▶ [Cross-species comparison of relative potencies and relative sensitivities of fishes to dibenzo-*p*-dioxins, dibenzofurans, and polychlorinated biphenyls in vitro](#)

Eisner, B.K., J.A. Doering, S.C. Beitel, S. Wiseman, J.C. Raine, and M. Hecker. 2016. Cross-species comparison of relative potencies and relative sensitivities of fishes to dibenzo-*p*-dioxins, dibenzofurans, and polychlorinated biphenyls in vitro. *Environmental Toxicology and Chemistry* 35(1):173–181.

- ▶ [Identification of aryl hydrocarbon receptor signaling pathways altered in TCDD-treated red seabream embryos by transcriptome analysis](#)

Iida, M., S. Fujii, M. Uchida, H. Nakamura, Y. Kagami, T. Agusa, M. Hirano, S.M. Bak, E.Y. Kim, and H. Iwata. 2016. Identification of aryl hydrocarbon receptor signaling pathways altered in TCDD-treated red seabream embryos by transcriptome analysis. *Aquatic Toxicology* 177:156–170.

- ▶ [Responses of antioxidant defense system to polyfluorinated dibenzo-*p*-dioxins \(PFDDs\) exposure in liver of freshwater fish *Carassius auratus*](#)

Li, C., L. Qin, R. Qu, P. Sun, and Z. Wang. 2016. Responses of antioxidant defense system to polyfluorinated dibenzo-*p*-dioxins (PFDDs) exposure in liver of freshwater fish *Carassius auratus*. *Ecotoxicology and Environmental Safety* 126:170–176.

- ▶ [Bioaccumulation of mercury and polychlorinated dibenzo-*p*-dioxins and dibenzofurans in salty water organisms](#)

Liao, P.Y., C.W. Liu, and W.Y. Liu. 2016. Bioaccumulation of mercury and polychlorinated dibenzo-*p*-dioxins and dibenzofurans in salty water organisms. *Environmental Monitoring and Assessment* 118:12.

- ▶ [Reduction of dioxin-like toxicity in effluents by additional wastewater treatment and related effects in fish](#)
Maier, D., M. Benisek, L. Blaha, F. Dondero, J.P. Giesy, H.R. Köhler, D. Richter, M. Scheurer, and R. Triebkorn. 2016. Reduction of dioxin-like toxicity in effluents by additional wastewater treatment and related effects in fish. *Ecotoxicology and Environmental Safety* 132:47–58.

- ▶ [Effects of exposure to three environmental chemicals on the selected biochemical parameters of the blood plasma of rainbow trout, *Oncorhynchus mykiss*\(Walbaum\)](#)
Řehulka, J., B. Minařík, and M. Machala. 2016. Effects of exposure to three environmental chemicals on the selected biochemical parameters of the blood plasma of rainbow trout, *Oncorhynchus mykiss* (Walbaum). *Acta Musei Silesiae, Scientiae Naturales* 65(1):15–32.

- ▶ [PCDD/Fs, DL-PCBs and NDL-PCBs in European catfish from a northern Italian lake: the contribution of an alien species to human exposure](#)
Squadrone, S., M. Prearo, R. Nespoli, T. Scanzio, and M.C. Abete. 2016. PCDD/Fs, DL-PCBs and NDL-PCBs in European catfish from a northern Italian lake: the contribution of an alien species to human exposure. *Ecotoxicology and Environmental Safety* 125:170–175.

- ▶ [Embryonic exposure to TCDD impacts osteogenesis of the axial skeleton in Japanese medaka, *Oryzias latipes*](#)
Watson, A.T.D., A. Planchart, C.J. Mattingly, C. Winkler, D.M. Reif, and S.W. Kullman. Embryonic exposure to TCDD impacts osteogenesis of the axial skeleton in Japanese medaka, *Oryzias latipes*. *Toxicological Sciences* 115(1):1–12.

Upcoming Meetings and Conferences

[109th Annual Meeting of the National Shellfisheries Association](#)

March 26–30, 2017
Knoxville, Tennessee

[Impacts of a Changing Environment on the Dynamics of High-latitude Fish and Fisheries](#)

May 9–12, 2017
Anchorage, Alaska

[13th International Conference on Mercury as a Global Pollutant](#)

July 16–21, 2017
Providence, Rhode Island

[10th Biennial Symposium of the Freshwater Mollusk Conservation Society](#)

March 26–30, 2017
Cleveland, Ohio

[11th International Conference on Molluscan Shellfish Safety](#)

May 14–18, 2017
Galway, Ireland

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>.