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Fish and Shellfish Program NEWSLETTER

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In This Issue

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

This issue of the Fish and Shellfish Program Newsletter generally focuses on PCBs.

Recent Advisory News

2019 Ohio Sport Fish Consumption Advisory

In March 2019, the Ohio Department of Health (ODH), in cooperation with the Ohio Environmental Protection Agency and the Ohio Department of Natural Resources, issued fish consumption advisories for sport fish caught in state waters.

Fish for Your Health: Overall Advice on Fish Consumption

Fish: A Healthy Part of Your Diet

There are many benefits to including fish in a balanced diet for people of all ages. Fish are high in protein, low in fat, rich in many vitamins and minerals, and are the primary food source of healthy oils called omega-3 fatty acids. Studies suggest that omega-3 fatty acids are important during fetal brain and eye development and may help to prevent heart disease in adults. Additionally, fishing can be a rewarding hobby that brings people closer to nature, provides a source of natural food, and can even help with wildlife conservation. Unfortunately, some fish in Ohio's waters are contaminated with harmful chemicals like methylmercury and a group of chemicals called polychlorinated biphenyls (PCBs). Over time, eating contaminated fish can cause health problems. By making safe fish choices, all Ohioans can enjoy the health benefits that fish offer.

Choose Better Fish

In general, some fish tend to be lower in contaminants than others. The following table is a guide to Ohio sport fish consumption choices:

General Ohio Sport Fish Consumption Advice	
Meal Frequency	**Fish Species**
Two meals/week*	Yellow perch Sunfish (e.g., bluegill, green, longear, redear)
One meal/week	All fish not specified in this table
One meal/month	Flathead catfish 23" and over Northern pike 23" and over Steelhead trout from Lake Erie and its tributaries

*Consumption of these species should be limited to one meal/week from: Ashtabula River, Cuyahoga River, Mahoning River, Nesmith Lake, Ohio Canal, Ohio River, and West Branch Reservoir; and as otherwise indicated in the Limit Your Meals from These Waters section of the state's advisory. Always refer to the full *Advisory Table* to determine if there is a more or less restrictive advisory on fish from a certain body of water.

Anglers in Ohio can also use the following general advice to harvest healthier fish with fewer contaminants:

- Choose the smallest fish within the legal size limit. Smaller, younger fish tend to have fewer contaminants built up in their bodies.
- Avoid bottom feeders and suckers.
- Avoid fish from a body of water known to be contaminated.
- Vary the types of fish you catch and eat.

Go to http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index for pictures of common Ohio sport fish.

"Do Not Eat" Advisories

Some species of fish from certain Ohio waters should not be eaten at all. The following table summarizes the Ohio sportfish for which a new Do Not Eat advisory has been issued in 2019:

2019 "Do Not Eat" Advisory			
Body of Water	**Area Under Advisory**	**Species**	**Contaminant**
Great Miami River	Lowhead Dam at Monument Avenue, Dayton, to Main Street, Moraine	Channel Catfish, Common Carp	PCBs

Advisory Table

The following table summarizes new or changed advisories for 2019. Please check the Advisory Table for a complete list of all advisories.

2019 Advisory Table				
Body of Water	**Area Under Advisory**	**Species**	**Meal Frequency**	**Contaminant**
Clark Lake	All waters	Channel Catfish, Common Carp	Two/week	Mercury
Cuyahoga River	State Route 87, Russell Park, to Ohio Edison Dam Pool (Geauga, Portage, Summit Counties)	Rock Bass	Two/week	Mercury
		Black Crappie, Smallmouth Bass	One/month	Mercury
	Ohio Edison Dam Pool to mouth (Lake Erie) (Cuyahoga, Summit Counties)	Rock Bass	Two/week	Mercury
		Brown Bullhead, Channel Catfish, Common Carp, Smallmouth Buffalo	One/month	PCBs
		White Sucker 16" and over, Smallmouth Bass 15" and over	One/month	Mercury
		Freshwater Drum	One/month	Mercury, PCBs
Delaware Lake	All waters	Bluegill Sunfish, Common Carp	Two/week	Mercury
		Black Crappie	One/week	Arsenic
		Channel Catfish	One/week	PCBs
		Largemouth Bass	One/week	Arsenic, Mercury
Great Miami River	Lowhead Dam at Monument Avenue, Dayton, to Main Street, Moraine (Montgomery County)	Channel Catfish, Common Carp	**DO NOT EAT**	PCBs
		Flathead Catfish	One/month**	PCBs, Mercury
		Golden Redhorse, Smallmouth Redhorse	One/month**	PCBs
		Largemouth Bass, Saugeye, Smallmouth Bass, White Bass	One/month**	Mercury

Body of Water	Area Under Advisory	Species	Meal Frequency	Contaminant
Great Miami River (continued)	Main Street, Moraine, to State Route 73 near Middletown (Butler, Montgomery, Warren Counties)	Flathead Catfish	One/month**	PCBs, Mercury
		Channel Catfish, Common Carp, Golden Redhorse, Smallmouth Redhorse	One/month**	PCBs
		Largemouth Bass, Saugeye, Smallmouth Bass, White Bass	One/month**	Mercury
	State Route 73 near Middletown to Harrison Pike, Miamitown (Butler, Hamilton, Warren Counties)	Striped Bass Hybrid	One/two months**	PCBs, Lead
		Flathead Catfish	One/month**	PCBs, Mercury
		Channel Catfish, Common Carp, Freshwater rum, Smallmouth Redhorse	One/month**	PCBs
	Harrison Pike, Miamitown, to mouth (Ohio River) (Hamilton County)	Striped Bass Hybrid	One/two months**	*PCBs, Lead
		Flathead Catfish	One/month**	PCBs, Mercury
		Channel Catfish, Common Carp, Smallmouth Redhorse	One/month**	PCBs
Hocking River	Rock Mill Road, Rock Mill, to State Route 33, The Plains (Athens, Fairfield, Hocking Counties)	Common Carp	One/month	PCBs, Mercury
		Smallmouth Bass	One/month	Mercury
		Black Crappie	Unrestricted	–
	State Route 33, The Plains, to U.S. Route 50/State Route 32, Athens (Athens, Hocking Counties)	Freshwater Drum	One/month	PCBs
		Walleye, Smallmouth Bass, Spotted Bass	One/month	Mercury
		Black Crappie	Unrestricted	–
	U.S. Route 50/State route 32, Athens, to mouth (Ohio River) (Athens County)	Freshwater Drum	One/month	PCBs
		Spotted Bass	One/month	Lead
		Smallmouth Bass	One/month	Mercury
		Rock Bass	Two/week	Mercury
Kokosing River	County Road 13/Green Valley Road, Mount Vernon, to mouth (Walhonding River) (Coshocton, Knox Counties)	Rock Bass 8" and over, Smallmouth Bass	One/month	Mercury
Lake La Su An	All waters (Williams County)	Largemouth Bass	One/month	Mercury
		Bluegill Sunfish	One/week	Mercury
Leesville Lake	All waters (Carroll County)	Black Crappie, Bluegill Sunfish, Channel Catfish, Common Carp, Yellow Perch	Two/week	Mercury
		Saugeye	One/month	Mercury
Little Cuyahoga River	State Route 532 near Mogadore to mouth (Cuyahoga River) (Summit County)	Common Carp	One/month	PCBs
		Yellow Bullhead	One/month	Lead
Stonelick Lake	All waters (Clermont County)	Bluegill Sunfish, Channel Catfish	Two/week	Mercury
Tinkers Creek	East Idlewood Drive, near Twinsburg, to Cuyahoga River (Cuyahoga, Summit Counties)	Common Carp	One/month	Mercury
Tycoon Lake	All waters (Gallia County)	Black Crappie, Bluegill Sunfish, Channel Catfish	Two/week	Mercury

**Chemical that drives the advisory*
***Changed from "Do Not Eat"*
PAHs = Polycyclic Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls

Do Not Wade or Swim in These Waters

The ODH, as part of its advisory, also stresses that the waters and/or sediments in areas where fish consumption advisories are issued have high levels of contaminants. It is recommended that a person not swim or wade in the water body sections listed in the table below.

"Do Not Wade or Swim" Advisories		
Body of Water	**Area Under Advisory**	**Contaminant**
Dicks Creek	River mile 4.1 (1 mile downstream from North Branch Dicks Creek), Middletown to the Great Miami River (Butler County)	PCBs
Little Scioto River	State Route 739, near Marion to Holland Road, near Marion (Marion County)	PAHs
Mahoning River	NW Bridge Road (Warren) to Pennsylvania State Line (Mahoning, Trumbull counties)	PAHs, PCBs

PAHs = Polycyclic Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls

For more information about the Ohio fish consumption advisories for 2019, contact:

- Ohio Environmental Protection Agency at (800) 755-4769 or fishmail@epa.ohio.gov (Website: www.epa.ohio.gov.)
- Ohio Department of Health at (614) 728-9452 or BEH@odh.ohio.gov (Website: www.odh.ohio.gov.)
- Ohio Department of Natural Resources at 1-800-WILDLIFE (945-3543) or wildinfo@dnr.state.oh.us (Website: http://ohiodnr.gov/.)

Source: https://epa.ohio.gov/portals/35/fishadvisory/fishadvisory_pamphlet.pdf

EPA News

Final Second Five-Year Review Report for the Hudson River PCBs Superfund Site

Background

On April 11, 2019, U.S. Environmental Protection Agency (EPA) Region 2 published the "Final Second Five-Year Review Report for the Hudson River PCBs Superfund Site." The purpose of this second five-year review (FYR) is to determine whether the remedial actions at the Hudson River PCBs Superfund Site (Site) are protective of public health and the environment and functioning as designed. This FYR was conducted for both the Remnant Deposits and the in-river sediments of the Upper Hudson River, which is the approximately 40-mile stretch of the river between Fort Edward and the Federal Dam at Troy. EPA continues to collect and analyze data on an ongoing basis as it is received.

The EPA is addressing the Site in discrete phases or components known as operable units (OUs). The FYR addresses the remedial actions for the Remnant Deposits (OU1) and the second OU (OU2). EPA's remedy for OU1 includes in-place capping of the Remnant Deposits (areas of PCB-contaminated sediments that became exposed when the Fort Edward Dam was removed in 1973 and the river's water level dropped).

Major components of the OU2 remedy include:

1. removal of PCB-contaminated sediments via environmental dredging within areas targeted for remediation, followed by placement of backfill or in limited areas capping;

2. Monitored Natural Attenuation (MNA) of PCB contamination that remains in the river after dredging;

3. monitoring of fish, water, and sediment to determine when remediation goals are reached;

4. habitat reconstruction and associated monitoring; and

5. implementation of appropriate institutional controls such as fish consumption advisories and fishing restrictions by the responsible authorities.

The 2002 Record of Decision (ROD) (EPA, 2002) for OU2 selected dredging to address PCB-contaminated sediments of the Upper Hudson River, along with MNA of PCB contamination that remains in the river after dredging. General Electric Company (GE) is implementing the OU2 remedy pursuant to a 2006 Consent Decree with the United States. Dredging was conducted in two phases and completed in 2015; in total, GE reported that 2.75 million cubic yards of sediment were dredged from the river, processed, and shipped via train to approved landfills for disposal during the two dredging phases (Phase 1 and Phase 2). Demobilization of the sediment processing facility was largely completed in December 2016 although certain demobilization activities, including sampling associated with the filter presses and their removal, were not completed until April 2017. The project is currently transitioning from the active remedial action phase to the Operation, Maintenance & Monitoring (OM&M) phase during the MNA period of the remedy.

OU2 data reviewed for this FYR included water, fish, and sediment data, as well as any other applicable data collected as part of the remedial action. These data have been collected throughout the various phases of the project, including pre-design information, the baseline monitoring program, remedial design data collection, the remedial action monitoring program, and monitoring under the OM&M program. The data collected up through 2016 reflect conditions less than a year after completion of dredging and are still influenced by dredging-related impacts. Source control actions at the former GE plant and the reductions in sediment PCBs from the dredging have also led to declines in surface water concentrations in the Upper Hudson. EPA is anticipating a similar reduction in PCB levels in fish, followed by continued but more gradual declines in fish tissue concentrations during the post-dredging MNA period. Further monitoring will be required to verify remedy effectiveness, but the analyses presented in this report demonstrate that the models used to support decision making were well-designed, remedial action objectives (RAOs) were appropriately developed, and remedy implementation is proceeding as planned.

Institutional Controls

The 2002 ROD (OU2) included institutional controls in the form of fish consumption advisories and fishing restrictions until the relevant remediation targets and goals are met. These controls are designed to prevent or limit exposure to PCBs through consumption of contaminated fish.

In 1976, as a result of PCB contamination in the Hudson River, the New York State Department of Environmental Conservation (NYSDEC) banned all fishing in the Upper Hudson and most commercial fishing in the Lower Hudson. In 1995, NYSDEC reopened the Upper Hudson River (from Baker's Falls in the Village of Hudson Falls to the Federal Dam in Troy) to sport fishing on a catch-and-release basis only. The mid- and lower regions of the Hudson River are not subject to the catch-and-release regulation. They are, however, subject to a sportfish consumption advisory issued by the New York State Department of Health (NYSDOH). This advisory is an institutional control that seeks to limit human exposure to PCBs through the consumption of fish and crab from the Hudson River.

The NYSDOH River Fish Advisory Outreach Project has been established to promote awareness of the fish advisories and regulations and to encourage people to adhere to them. Various outreach initiatives, including placing signs at major fishing access sites to warn people of the dangers of consuming fish from the Hudson River, are being implemented.

Technical Assessment

OU1: The caps on the Remnant Deposits are intact and functioning as intended to prevent potential contact with contaminated PCB sediment.

OU2: The remedial action was implemented consistent with the expectations of the ROD, and while human health and ecological remedial goals have not yet been achieved, the limited post-dredging data indicates that the remedy is consistent with modeling analyses and expectations presented in the feasibility study and ROD. The following summarizes of the status of the OU2 remedy:

- NYSDEC and NYSDOH have maintained the fishing restrictions and advisories, with modifications as appropriate, and those departments continue to conduct public outreach to minimize human consumption of fish.
- Remedial work at GE's Fort Edward and Hudson Falls plants, overseen by NYSDEC, has resulted in reduced water column PCB concentrations entering the project area, at or below the levels anticipated in the ROD.
- Fish, sediment and water data at this early time are not sufficient to identify post-dredging trends with a high degree of confidence, and likely reflect continued impacts from dredging operations. Additional years of monitoring data are needed. As noted in the ROD (e.g., pp 68-69), EPA's expectation was that following dredging, the system would require at least a year or more to equilibrate to post-dredging conditions and exposures.

- Monitoring of water, fish, and sediment will continue under the OM&M program to confirm that natural attenuation continues to occur, and that the remedy is functioning as intended.

- Limited data collection from the Lower Hudson River indicates that recovery rates are slower than in the Upper Hudson River. While the link between Upper Hudson River and Lower Hudson River impacts has reduced over time, GE sources in the Upper Hudson River have been the primary source of PCBs in the Lower Hudson River. EPA plans further studies to better understand the extent of PCB contamination in the sediments of the Lower Hudson River.

This FYR is based on post-dredging data up to December 2016 for sediment, water column and fish tissue PCB concentrations, and provides preliminary indications of system response to implementation of the remedy.

Protectiveness

OU1: The remedy at the Remnant Deposits (OU1) currently protects human health and the environment as the in-place containment and cap system prevents human exposure, and as perimeter fencing and signage continue to be maintained. However, in order for the remedy to be protective in the long-term, an institutional control needs to be implemented to ensure that the future use of the areas with the Remnant Deposits does not compromise the integrity of the cap system or result in unsafe exposures. EPA is working to establish site ownership so that institutional controls can be fully implemented.

OU2: A protectiveness determination of the remedy at OU2 cannot be made until further information is obtained. There is not enough data available since the completion of dredging and related project activities in 2015 to determine if the remedy will be protective within the time frame anticipated by the ROD. There is also not sufficient data available to assess whether the interim targets identified in the ROD will be reached in the time frames estimated at the time the ROD was issued in 2002. A critical factor needed for the protectiveness determination is a reliable calculation of the rate of decline in post-dredging fish tissue PCB levels. It is necessary to examine the annual record over a longer period of time in order to calculate this rate with statistical certainty. EPA estimates that as many as eight or more years of post-dredging fish tissue data are needed. This information will be obtained through the collection and evaluation of fish tissue data along with the water and sediment data collected as part of the long-term monitoring program. Once statistically relevant rates of decline in post-dredging fish tissue PCB levels can be established, EPA will estimate the rates of recovery and determine if they are reasonably consistent with those predicted in the ROD. It is anticipated that this additional information will be obtained with the results of the 2024 fish data (which will be available in 2025) after which time a protectiveness determination could be made. Remedial activities completed to date have substantially reduced PCB source materials in the Upper Hudson River. Natural attenuation is ongoing within the Upper Hudson River, and these processes are expected to result in the River eventually reaching the long-term remediation goal for the protection of human health with regard to fish consumption (0.05 mg/kg PCBs in species-weighted fish fillet). As EPA indicated in the ROD, EPA believes it likely that improvement will occur gradually over more than five decades. In the interim, the State of New York has in place fishing restrictions and advisories against consumption of fish to control human exposure pathways that could result in unacceptable risks. EPA acknowledged in the ROD that the consumption advisories are not fully

effective in that they rely on voluntary compliance in order to prevent or limit fish consumption. EPA will continue to work with New York State to ensure the ongoing maximum effectiveness of the advisories.

For more information, contact Gary Klawinski (EPA Hudson River Project Director) at klawinski.gary@epa.gov

Source: https://www.epa.gov/ny/final-second-five-year-review-report-hudson-river-pcbs-superfund-site-report-text-appendices

References

EPA (United States Environmental Protection Agency). 2002. Record of Decision for the Hudson River PCBs Superfund Site. U.S. Environmental Protection Agency. February 2002.

Other News

A Chemical Contaminant Characterization of Waters Surrounding Cocos Island, Guam, Using Polyethylene Devices

In September 2017, the National Oceanic and Atmospheric Administration (NOAA) began assessing the scope and extent of land-based sources of dissolved chemical contaminants in the marine waters surrounding Cocos Island, Guam. This assessment is ongoing. Previous studies by NOAA's National Centers of Coastal Ocean Science (NCCOS) identified a need to assess dissolved concentrations of chemical contaminants in the waters surrounding Cocos Island, which this project will fill to better inform management decisions about the island and its marine waters. NOAA's Coral Reef Conservation Program is funding this study.

Why This Is Important

Cocos Lagoon is an atoll-like coral reef lagoon located off the southwestern coast, at the southern tip, of the island of Guam. A series of fringing reefs and barrier islands surround the lagoon, of which Cocos Island is the largest. Cocos Lagoon is a popular area for recreational activities such as fishing, boating, and diving, along with subsistence fishing.

Cocos Lagoon, Guam. *(Photo courtesy of NOAA.)*

Between 1944 and 1963, the U.S. Coast Guard (USCG) operated a Long Range Navigation (LORAN) station on Cocos Island. People have found components from this LORAN station, including several transformers and capacitors containing PCBs, both on land and in nearby waters. The Coast Guard has since removed the PCB-containing transformers and capacitors, along with a substantial amount of contaminated soil, but there is evidence that these chemicals have migrated into several marine matrices, including fish and nearshore sediments, which concerns local natural resource managers and the public.

Exposure to PCBs can lead to a range of toxic responses according to animal studies, including reduced growth, reproductive impairment, and vertebral abnormalities. PCBs have also caused cancer in animals. In 2006, following USCG-funded research that detected PCBs in fish, Guam agencies issued a fish consumption advisory for Cocos Lagoon. In 2015, local natural resource managers asked NCCOS for help in assessing chemical contaminants in sediments and fish to understand the extent of contamination in Cocos Lagoon.

What Is Being Done

In September of 2017, NCCOS scientists and their partners from the Guam EPA deployed polyethylene devices (PEDs) in Cocos Lagoon. These PEDs remained in situ for approximately one month accumulating hydrophobic organic compounds like PCBs present in the water column. The research team recovered the PEDs and is currently analyzing them for a suite of organic chemical contaminants, including PCBs and the organochlorine pesticide DDT.

Benefits of the Work

Data generated from this study will fill the gap identified by previous NCCOS studies in the area. Previous studies identified elevated levels of PCB s and DDT from the area. Sediment samples from the region were unable to give a good spatial distribution of PCB and DDT concentrations, due to the coarse nature of the sediment not binding organic contaminants well. In conjunction with the results from the previous study, the data products from this study will help inform future management decisions about the lagoon by identifying spatially where PCB and other chemical contaminants may be entering the environment.

Next Steps

The team is currently analyzing the PEDs deployed during the September 2017 field mission for a suite of organic contaminants. Once completed, project data will be available online via the National Status and Trends database, and will be synthesized, including statistical and geospatial analysis, in a technical memorandum.

For more information, contact Andrew Mason at Andrew.mason@noaa.gov.

Source: https://coastalscience.noaa.gov/project/chemical-contaminant-characterization-waters-surrounding-cocos-island-guam-using-polyethylene-devices/

Research Brief 293: Study Sheds Light on Breakdown of PCBs to Potentially Harmful Metabolites in Humans

On May 1, 2019, new research out of the University of Iowa Superfund Research Program (SRP) Center, identified specific cytochrome P450 (CYP) enzymes and underlying mechanisms involved in the breakdown, or metabolism, of PCBs into compounds that may be more toxic. PCBs are a large and complex group of chemicals that often occur in mixtures and can contaminate soil, groundwater, and air. Exposure to PCBs has been linked to a range of health impacts, including metabolic diseases, developmental neurotoxicity, and cancer.

CYP enzymes play a role in metabolizing many different chemicals, including those that occur naturally within the body, pharmaceuticals, and potentially harmful pollutants. While there are thousands of CYP enzymes, humans have about 50 variants. Several larger classes of CYP enzymes, CYP1A, CYP2A, and CYP2B, are known to break

down some PCBs, but the process is not well studied. The team, led by Hans-Joachim Lehmler, Ph.D., and Eric Uwimana, Ph.D., an Iowa SRP Center graduate student at the time, used a series of experiments to uncover more information about this important process that has implications for how PCBs may harm human health.

Using Computers to Make Predictions

The team used computer-based methods to predict which CYP enzymes are most likely to be involved in metabolizing PCBs into hydroxylated PCBs (OH-PCBs), wherein an oxygen atom is inserted at one of several possible locations in the chemical structure. Previous studies have identified health effects of OH-PCBs, including their potential toxicity to the developing brain. Looking at nine different forms of the CYP enzyme and four specific PCB chemicals, the research team used two advanced computer software techniques to make predictions based on information about the chemical structure and specific chemical reactions that may be involved in chemical breakdown.

While the two computer approaches varied in their predictions, overall the software suggested that CYP1A2, CYP2A6, CYP2B6, CYP2E1, and CYP2A4 play a role in PCB metabolism. The authors note that CYP1A1 and CYP2B enzymes tend to break down PCBs in animals, such as rodents. This information was used to inform their more complex studies using human CYP enzymes and human liver microsomes, a specific part of the liver cell where PCB breakdown is known to occur.

A Closer Look at CYP Enzymes

To confirm whether the predicted CYP enzymes play a role in the metabolism of PCBs to OH-PCBs in humans, the team used human CYP1A2, CYP2A6, CYP2B6, CYP2E1, and CYP2A4 to test their metabolism of the same four PCB chemicals used in the computer simulation.

They found that OH-PCBs were detected only in tests with CYP2A6, CYP2B6, and CYP2EA, indicating that the other predicted CYP enzymes do not hydroxylate PCBs. According to the authors, the computer-based approach was relatively poor at predicting the metabolism of PCBs, but it was able to identify some of the major CYP enzymes involved.

Through these experiments, the team identified which OH-PCB metabolites were formed by each CYP enzyme and their relative abundance for each PCB chemical. They also determined specific chemical reactions by which CYP enzymes metabolized PCBs to OH-PCBs and where on the chemical structure the oxygen atom is incorporated.

In general, the authors reported that CYP2A6 played the largest role in the metabolism of PCBs to OH-PCBs, followed by CYP2B6 and CYP2E1. They also identified differences in the underlying mechanisms of hydroxylation of different PCBs by the same CYP enzyme and between the different CYP enzymes.

Preliminary Tests Using Human CYP Enzymes

To better understand how CYP2A6, CYP2B6, and CYP2EA contribute to PCB metabolism under more realistic conditions, the team compared the OH-PCB profiles formed in the experiments with CYP enzymes with OH-PCB profiles formed by human liver microsomes. Liver microsomes are the part of liver cells that contain mixtures of CYP enzymes and, therefore, more accurately represent the complex metabolism of chemicals in the human liver.

While there was greater variability in these experiments, the team was able to identify which CYP enzymes are most likely responsible for the formation of specific OH-PCBs. Similar to their findings in the previous experiments, their results suggested that different CYP enzymes play a role in the formation of different OH-PCBs.

Overall, they reported that CYP2A6 is the primary enzyme involved in hydroxylating PCBs in human liver microsomes, followed by smaller contributions from CYP2B6 and CYP2E1. The authors point out that this is different from studies in rodents, where CYP2B enzymes play a larger role in PCB metabolism.

According to the authors, this study provides new insight into how PCBs are metabolized to potentially neurotoxic OH-PCBs in humans and contributes supporting evidence for observed differences between OH-PCB profiles in humans versus rodents. They suggest that future studies should include cutting-edge non-targeted metabolomic approaches to better understand the complex PCB metabolites formed in living organisms.

For more information, contact Hans-Joachim Lehmler, Ph.D. at 319-335-4414 or hans-joachim-lehmler@uiowa.edu.

Source: https://connect.niehs.nih.gov/srp/1/ResearchBriefs/PDFs/SRP_ResearchBrief_293_508.pdf

Recently Awarded Research

FY19 Successful Saltonstall-Kennedy Grant Applicants

On March 6, 2019, NOAA Fisheries announced recommendations to fund five projects for almost $1.3 million under the 2019 Saltonstall-Kennedy Competitive Grants Program. The projects fall into the three priority categories for 2019: Promotion, Development, and Marketing; Marine Aquaculture; and Support of Science that Maximizes Fishing Opportunities, Revenue, and Jobs in U.S. Fisheries While Ensuring the Long-Term Sustainability of Marine Resources.

Harvesting oysters. *(Photo courtesy of NOAA.)*

The following is the list of recommended projects:

Recommended Projects				
Proposal Number	**Applicant**	**Project Title**	**Funding Priority**	**Requested Federal Share: Total**
19AKR007-019	Alaska Fisheries Development Foundation	Alaska Mariculture Initiative - Phase 2	Marine Aquaculture	$287,680.00
19SER009-020	Florida Atlantic University	Development of a Fishermen Operated Pilot-Scale Queen Conch (*Lobatus gigas*) Hatchery and Nursery Facility for Sustainable Seafood	Marine Aquaculture	$299,949.00
19WCR012-028	Wild Fish Conservancy	Developing an Alternative Model for Sustainable Commercial Salmon Fisheries of the Lower Columbia River Sub-basin.	Promote, Development and Marketing	$285,646.00
19GAR053-106	Ward Aquafarms, LLC	Reducing risk for shellfish farmers through real-time, automated, harmful algal bloom monitoring and mitigation	Marine Aquaculture	$297,172.00

19PIR-005-018	Poseidon Fisheries Research, LLC	Mark-recapture as a tool to assess Kona crab, *Ranina*, post-release mortality and local population estimates for the Main	Support of Science that Maximizes Fishing Opportunities, Revenue and Jobs in	$91,189.00

At the announcement phase in the selection process, application approval and obligation was not final. Final approval is subject to funding availability as well as final review and approval by both NOAA Grants Management Division and Department of Commerce Financial Assistance Law Division.

Source: https://www.fisheries.noaa.gov/content/fy19-successful-saltonstall-kennedy-grant-applicants

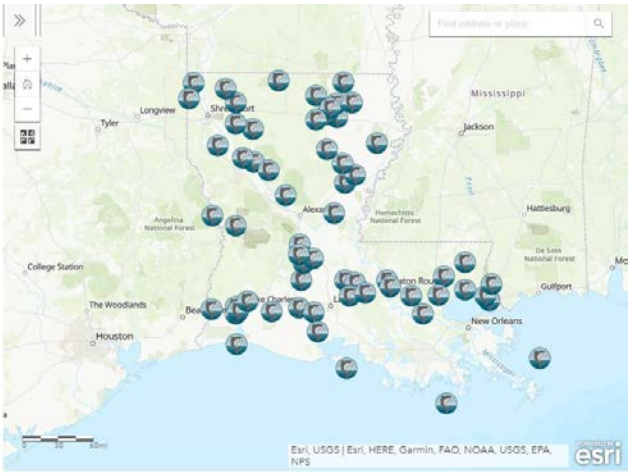
Tech and Tools

Louisiana DEQ Releases a Fish Consumption and Swimming Advisories Interactive Map

Louisiana now has their Interactive Fish Consumption and Swimming Advisories Map. Click on any fish icon to view information such as advisory type, meal recommendations, and issue date for each area. As the user zooms into the map, a waterbody layer will appear showing the larger streams and lakes. The legend panel expands using the toggle button (top left corner). Use the search tool (top right corner) to quickly locate an area of interest (e.g., a specific lake or river).

As mentioned in the October 2018 EPA Fish and Shellfish Newsletter, the Louisiana Departments of Health, Environmental Quality, and Wildlife and Fisheries issued a series of fish consumption advisories for nine bodies of water. Information about these advisories, as well as any changes up to February 2019, are available on the Interactive Fish Consumption and Swimming Advisories Map.

For more information regarding mercury and other fish consumption advisories, visit www.ldh.la.gov/EatSafeFish or contact the LDH hotline at 1-888-293-7020 or call the LDEQ at (225) 219-3189.



Louisiana DEQ Fish Advisory Map. *(Photo courtesy of Louisiana DEQ.)*

Source: https://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories

Recent Publications

Journal Articles

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

- Dietary exposure to polychlorinated biphenyls and risk of heart failure – A population-based prospective cohort study
  Åkesson, A., C. Donat-Vargas, M. Berglund, A. Glynn, A. Wolk, and M. Kippler. 2019. Dietary Exposure to Polychlorinated Biphenyls and Risk of Heart Failure – A Population-based Prospective Cohort Study. *Environment International* 126: 1-6.

- Food safety using NMR-based metabolomics: Assessment of the Atlantic Bluefin Tuna, *Thunnus Thynnus*, from the Mediterranean Sea
  Cappello, T., A. Giannetto, V. Parrino, G. De Marco, A. Mauceri, and M. Maisano. 2018. Food safety using NMR-based metabolomics: Assessment of the Atlantic Bluefin Tuna, *Thunnus Thynnus*, from the Mediterranean Sea. *Food and Chemical Toxicology* 115: 391-97.

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Upcoming Meetings and Conferences

2019 Gulf and South Atlantic Shellfish Conference
August 4-7, 2019
Savannah, Georgia

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

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.