

Redfish Pharmaceutical Contaminants Study

photo: Pat Ford

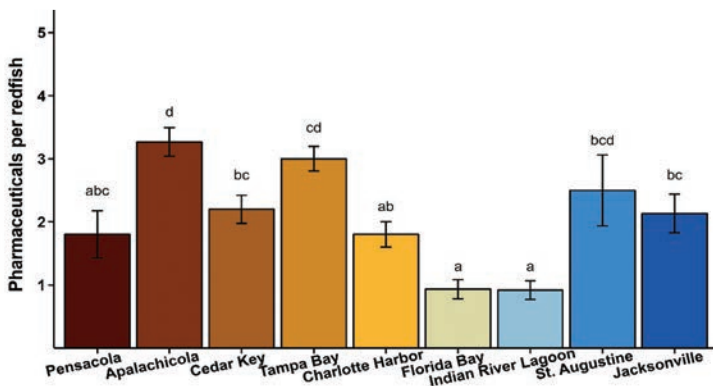


A recently completed study found that redfish sampled throughout Florida's estuaries are contaminated with pharmaceuticals. Given the importance of redfish to the \$13.9 billion recreational fishery in Florida, and the negative impacts of pharmaceuticals on fish, this is an urgent concern. This research follows a prior study that discovered pharmaceutical contaminants in 100% of bonefish sampled from Biscayne Bay and the Florida Keys, and shows that pharmaceutical contamination is a statewide issue.

The **Redfish Pharmaceutical Contaminants Study** was a year-long research project funded by **Bonefish & Tarpon Trust** and conducted by **Florida International University's Coastal Fisheries Research Lab**. The Redfish Pharmaceutical Contaminants Study builds on the previous bonefish study by providing the first assessment of pharmaceutical pollution at a broad spatial scale for estuarine waters in the state of Florida.

The goal of the study was to determine the occurrence of pharmaceutical contaminants in redfish in nine important estuaries throughout Florida. These waterborne contaminants pose a significant threat to Florida's recreational saltwater fishery, which directly supports more than 120,000 jobs

- Researchers sampled 113 Florida redfish for 94 commonly prescribed pharmaceuticals.
- Redfish blood plasma samples were collected at nine Florida estuaries: Pensacola, Apalachicola, Cedar Key, Tampa Bay, Charlotte Harbor, Florida Bay, Indian River Lagoon, St. Augustine, and Jacksonville.
- On average, researchers detected 2.1 pharmaceuticals per redfish; only seven redfish had zero pharmaceuticals.
- Across all samples, a total of 17 unique pharmaceuticals were detected, comprising eight pharmaceutical classes.
- Across estuaries, the number of pharmaceutical detections was highest in Apalachicola and Tampa Bay, intermediate in Charlotte Harbor, Cedar Key, Pensacola, St Augustine, and Jacksonville, and lowest in Florida Bay and Indian River Lagoon. The averages are as follows - Apalachicola = 3.3, Tampa Bay = 3.0, St. Augustine = 2.5, Cedar Key = 2.2, Jacksonville = 2.1, Charlotte Harbor = 1.8, Pensacola = 1.8, Florida Bay = 0.9, Indian River Lagoon = 0.9.



Mean number of pharmaceuticals detected per redfish across the 9 Florida estuaries sampled. Shades of brown denote west coast estuaries, while shades of blue denote east coast estuaries and darker is north for both. Letters indicate significant differences ($p < 0.05$) per contrasts with a Bonferroni correction.

- Cardiovascular medications, opioid pain relievers, and psychoactive medications were most commonly detected (from highest to lowest detections).
- A total of 12 pharmaceuticals accounted for over 97% of detections. Harmful effects on fish have been documented for 7 of these 12 pharmaceuticals. These include, tramadol, caffeine, donepezil, diclofenac, diphenhydramine, sertraline, and ranitidine while the effects of the remaining 5 pharmaceuticals (felodipine, flecainide, flutamide, flupentixol, and clotrimazole) remain unassessed.

- The antiarrhythmic agent flecainide led detections, with 60 detections (53.1% of all redfish), while the synthetic opioid analgesic tramadol had 59 detections (52% of all redfish). Three other pharmaceuticals were commonly detected: caffeine (43.3% of samples), the psychoactive flupentixol (21.2% of samples), and the psychoactive donepezil (9.7% of samples).
- Exposure to pharmaceuticals by redfish may occur by inhalation (via water/sediment) or through prey.

Despite these concerning findings, there is good news. Research in Europe shows that most pharmaceuticals can be removed from the wastewater treatment process by applying ozone treatment to wastewater. Florida's efforts to upgrade and update wastewater infrastructure to remove nutrients (which contribute to Harmful Algal Blooms like red tide) should also include retrofitting existing wastewater treatment plants with additional treatment (like ozone) to address contaminants of emerging concern, requiring new wastewater treatment facilities to include these additional treatment steps, converting septic systems to residential wastewater treatment, and ensuring that wastewater facilities have the capacity to support current and future inputs.

Florida's \$13.9 billion recreational fisheries depend upon healthy habitats and good water quality. The study's results provide more evidence of the ongoing need for significant investment in Florida's water infrastructure, including employing additional innovative wastewater treatment solutions, like ozonation, to address pharmaceuticals and other contaminants of emerging concern.

Help BTT ensure clean water and healthy fisheries! Join us in advocating for efforts to upgrade wastewater treatment facilities with advanced technology that removes contaminants like pharmaceuticals, increase the capacity of current wastewater treatment infrastructure, and convert septic systems to sewage treatment.

Bonefish & Tarpon Trust

An international non-profit organization based in Miami, Florida, Bonefish & Tarpon Trust (BTT) is focused on conserving bonefish, tarpon and permit—the species, their habitats and the larger fisheries they comprise. The organization, which pursues its mission through science-based conservation, education and advocacy, was founded in 1997 by grassroots volunteers seeking to reverse the declines they were witnessing in bonefish and tarpon populations in the Florida Keys. Today, BTT continues a comprehensive research and conservation program in the Keys and has expanded its work to other locations in Florida, and across the Caribbean basin to include staffed programs in The Bahamas, Belize, and Mexico as well as grant-funded research projects in Cuba and other locations. [Learn more at BTT.org](https://www.btt.org).

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Florida International University

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