



U.S. Fish & Wildlife Service

Chesapeake Bay Field Office

Tumors in Catfish from the South River, Anne Arundel County, MD

Brown bullheads

The brown bullhead (*Ameiurus nebulosus*) is a species of catfish that lives in rivers, lakes, and ponds. In tidal waters, they can tolerate salinities up to about 15 parts per thousand (about half that of the ocean). Bullheads feed on worms, insect larvae, and small crustaceans living in the mud. These fish often develop liver and skin tumors after exposure to cancer-causing chemicals that accumulate in sediments. They also have a small home range. Thus, bullhead tumor surveys have been used as an indicator for measuring habitat quality in the Great Lakes and Chesapeake Bay watersheds.

The South River

The South River is a tributary of the Chesapeake Bay that extends about 12 miles from just above Route 50 to its mouth. With population growth in Anne Arundel County, the watershed is being developed. There has been a concerted effort by state and local government and citizens groups to maintain and improve water quality. Important resources in the South River include submerged aquatic vegetation, oysters, fish, and birds.

South River, Anne Arundel County, Maryland



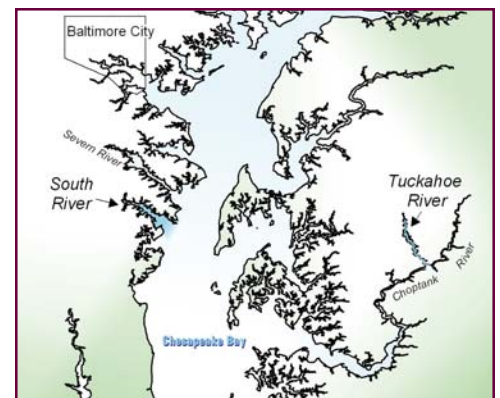
Brown Bullhead, (*Ameiurus nebulosus*) with lip tumors. All photos by Fred Pinkney, USFWS.

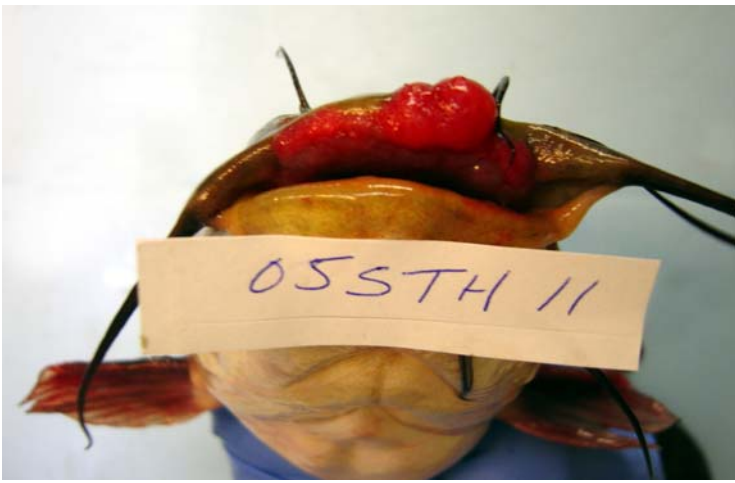
The Survey

In the spring of 2005, the U.S. Fish and Wildlife Service set two fyke nets along the shoreline of the South River just below the Route 50 Bridge. The goal was to catch, measure, and count the numbers of fish (especially yellow perch) as part of an annual monitoring program. Several of the scientists noticed that the brown bullheads often had red, fleshy bumps along their lips. Next, the Service collected a random sample of 30 bullheads that were greater than about 10 inches (260 mm) for a fish health study. This size minimum is important for tumor surveys, because tumors take time to develop and are rarely observed in smaller, younger fish.

Of the 30 bullheads, 16 (53%) had these visible skin lesions. Laboratory analysis of the tissues (histopathology) indicated that all 16 had tumors. Thirteen were invasive tumors known as squamous

carcinomas. Three fish had non-invasive tumors called epidermal papillomas. The livers, which did not look abnormal to the naked eye, were also examined histopathologically. Six of the 30 (20%) had liver tumors, all of which were invasive. Scientists consider areas to be highly contaminated when skin tumor rates are above about 12% and liver tumor rates are above about 5%. Therefore,





Brown bullheads from the South River with skin tumors diagnosed as squamous cell carcinomas.

these rates, about four times higher than each suggested criterion, are alarming.

What This Means

The Service has developed a data base of tumor information on bullheads in the tidal Potomac (including the Anacostia River), areas near Baltimore, and (as a reference) the Tuckahoe River on the Eastern Shore. Compared with bullhead tumor surveys in other Bay tributaries, the South River bullheads had the highest percentage of skin tumors and the second highest of liver tumors. Photos of the skin and liver tumors are shown. The percentages in the South River bullheads were much higher than in the Tuckahoe bullheads, which had a long-term average of 4% liver tumors and 1% skin tumors.

We know that these tumors occur as a result of exposure to cancer-causing chemicals in the sediments and/or water. In sediments of other Bay tributaries where there were high tumor rates, we found high concentrations of polynuclear aromatic hydrocarbons (PAHs), formed from the burning of gasoline, coal, and fuel oil and a major component of asphalt and tar. They enter the river by running off roads into storm water pipes throughout the watershed. Once in the river, PAHs in sediments can be resuspended during storms.

However, the available monitoring data for the South River do not indicate high concentrations of these compounds in sediments. In fact, the average concentration of PAHs in South River and Tuckahoe River sediments near the fish collection sites were nearly equal. No other data are available that suggest which chemicals may be contributing to the high rate of tumors in the South River.

Questions

- The high tumor rates are a symbol of a river in trouble and a challenge for all of us to work to improve the environment. The following questions remain:
- Are the bullheads exposed to carcinogens in the South River or are they moving between several bay tributaries?
- Is the South River unique or do other western shore tributaries such as the Rhode River and Severn River show a similar pattern in tumor rates?
- What data are needed to rule out PAHs as major contributors to the tumors?
- Are there other chemicals that should be investigated?

Tumor Prevalence in Brown Bullheads (*Ameiurus nebulosus*) from the South River, Anne Arundel County, MD. Pinkney, A.E. and J.C. Harshbarger. 2005. CBFO-C05-04. U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, 177 Admiral Cochrane Drive, Annapolis, MD 21401. Reports and fact sheets can be downloaded from the CBFO web site: <http://www.fws.gov/chesapeakebay>

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