**Lymphosarcoma - Esocid virus**

**Esocid lymphosarcoma** is a malignant cancer of northern pike, *Esox lucius*, and muskellunge, *Esox masquinongy*, that is most likely caused by a virus. Lesions or large tumors on the skin are the most visible signs of the disease. Other fish species such as black crappie and bluegill can also have sarcomas (lesions and tumors), but the virus and type of cells that are affected are different than those found in esocid lymphosarcoma. There is little evidence to suggest that lymphosarcoma is linked to environmental degradation or contaminants. Fish with lymphosarcoma lesions have been documented even in lakes with good water quality. It has been present in Wisconsin for at least 25 years and has been documented elsewhere in the world for at least 100 years. This disease is not known to be a human health concern.

*Where has lymphosarcoma been found?* Infected northern pike have been found in Wisconsin, Minnesota, Michigan, Vermont, New York, Ontario, Manitoba, Quebec, France, Netherlands, Ireland, Sweden, and Finland. Infected muskellunge have been found in: Wisconsin, the St. Lawrence River, Kawartha Lakes Region of Ontario, Rainy Lake Region of Ontario, and Georgian Bay of Lake Huron.

*What does lymphosarcoma look like?* Lesions can begin as raised, red sores on the skin and then develop into large, ulcerated lesions or ball-shaped tumors on the body or head of the fish. Lymphosarcoma can also occur in the “gum” tissue and the growths will eventually surround the teeth, likely affecting the ability of the fish to catch prey.

*How do northern pike and musky get this disease?* Transmission of the virus that causes lymphosarcoma is likely transferred when fish are concentrated and a fish with lesions has direct contact with another fish, for example, during spawning, or when an affected fish is netted and the same net is used to handle different fish. Cells that contain
the virus are sloughed from the growths and although the exact route of transmission is not known, the virus is released and infects a new fish. It is also possible the the virus is present inside the eggs of an infected fish, and the offspring may already be infected at the time the eggs hatch. Lesions or tumors may not develop for 6 to 18 months. Therefore, fish that appear healthy may, in fact, be infected. Tumors occur most often on the sides of the fish, near the fins and toward the tail, where contact would be most likely during spawning. Tumors may also occur on the head and in the gill cavity.

What proportion of the fish population gets the disease? In any given body of water, lymphosarcoma has been documented in up to 21% of northern pike and 16% of muskellunge. In April of 2006, Wisconsin DNR crews documented lesions or tumors in 8 of 325 northern pike (2.5%) in the Chippewa Flowage, but there were no signs of lymphosarcoma in muskellunge (Update: There were no signs of lymphosarcoma in muskellunge in 2010 or 2013).

Can infected fish recover? Northern pike can recover from this disease. The tumors will slough from the skin and new skin will close the wound. The skin color pattern and scale pattern "swirls" in fish that survive compared to uninfected fish. Lymphosarcoma is considered much more likely to be fatal in muskellunge.

Is this disease worse during some seasons than others? During mid summer, very few muskies exhibit lymphosarcoma lesions beginning to heal on a northern pike (darker new skin is starting to grow on the edges of the lesion). Photo: Tom Jones

Can eating infected fish be harmful to humans? Although the disease is highly infectious to northern pike and musky, there is no evidence to suggest that the disease presents a human health hazard. In general, we recommend not eating fish that have lesions or look abnormal for any reason.

What can be done to prevent the spread of this disease? Do not move northern pike or muskies from one body of water to another. If you use a landing net or live well in a lake where lymphosarcoma is present, thoroughly dry or disinfect the net in 1 cup bleach mixed with 5 gallons water for 10 minutes before using the net or live well in another location.

SPREAD THE WORD, NOT THE DISEASE!