III. Fish and Wildlife Contaminants

Introduction

Contaminant concentrations in fish from Lake Huron have been monitored over time in order to assess risk to human and wildlife health. Because certain contaminants bioaccumulate and biomagnify in the food chain, fish are excellent indicators of pollutants in the aquatic ecosystem. Programs have been developed and implemented to monitor contaminant concentrations in the edible portions of sport fish and in whole fish as a way to monitor risk to human and wildlife health respectively.

The Michigan Department of Environmental Quality (MDEQ), the Ontario Ministry of the Environment (OMOE), and EPA's Great Lakes National Program Office (GLNPO) collect and analyze many species of sport fish from the Great Lakes, including the Lake Huron watershed, to determine whether chemicals are present in quantities that may be of concern to those eating commercially- or sport-caught fish. Contaminants such as mercury, toxaphene, dioxins, and polychlorinated biphenyls (PCBs) can accumulate in fish, wildlife and humans and could be harmful to a developing fetus, young child or breast-feeding baby. Michigan Department of Community Health (MDCH) and OMOE determine the available fish contaminant information and place advisories on the consumption of specific species of fish depending on the levels of contaminants found. GLNPO provides Great Lakes sport fish contaminant information to the states to be incorporated into State issued advice.

Long-term (>25 yrs), basin-wide monitoring programs that measure whole body concentrations of contaminants in top predator fish (lake trout and/or walleye) and in forage fish (smelt) are conducted by the U.S. Environmental Protection Agency (USEPA) Great Lakes National Program Office (GLNPO) through the Great Lakes Fish Monitoring Program and Environment Canada (beginning in 2006, previously maintained by the Canadian Department of Fisheries and Oceans (DFO)) through the Fish Contaminants Surveillance Program. Concentrations of historically regulated contaminants such as PCBs, DDT and mercury in most monitored fish species are currently lower than they were in the late 1970s. The concentrations of other contaminants, currently regulated and unregulated, have demonstrated either slowing declines or, in some cases, increases in selected fish communities. The changes are often lake-specific and relate both to the specific characteristics of the substances involved and the biological composition of the fish community.

Contaminant Trends in Whole Fish

Since the 1970s, there have been significant declines in the levels of many persistent, bioaccumulative and toxic (PBT) chemicals, such as PCB, DDT, dieldrin, dioxins, and furans, in the Great Lakes basin due to bans on the use and/or production of harmful substances and restrictions on emissions. However, PBT chemicals, because of their ability to bioaccumulate and persist in the environment, continue to be a significant concern. These significant declines are no longer continuing due to changes in the environment and the sources of contaminants. Present concentrations of contaminants, such as PCBs and DDT, show general declines in Lake Huron with some year to year fluctuation. Continuing sources of contaminants include in-use PCB electrical equipment. Legacy sources are primarily sediments contaminated by historic discharges, airborne deposition, industrial and municipal discharges and land runoff.

Pesticides such as DDT, toxaphene, mirex, chlordane and aldrin/dieldrin have been banned from use in the U.S. and Canada; however, they still cycle within the environment through run-off, sediment resuspension and long range atmospheric transport. The large surface area of Lake Huron, like the other Great Lakes, makes it particularly vulnerable to atmospheric deposition of contaminants. It has relatively few contaminant point sources, and therefore relative pollutant loadings to Lake Huron from water sources are the lowest of all the Great Lakes while atmospheric sources are the highest.

Both GLNPO and DFO/EC programs have observed large fluctuations in total (Σ) DDT concentrations in lake trout in the early years of analysis followed recently by a relatively consistent year-to-year decline. Likewise, Σ DDT concentrations in smelt fluctuated between years; with a recent downward trend.

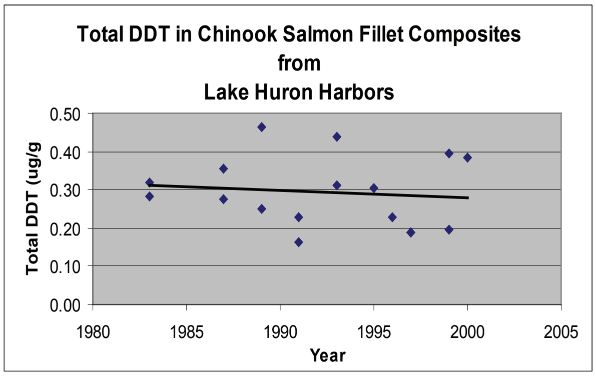

Figure 3.1 Total DDT in Chinook Salmon Fillet Composites from Lake Huron Harbors. Source: GLNPO – Great Lakes Fish Monitoring Program 2008

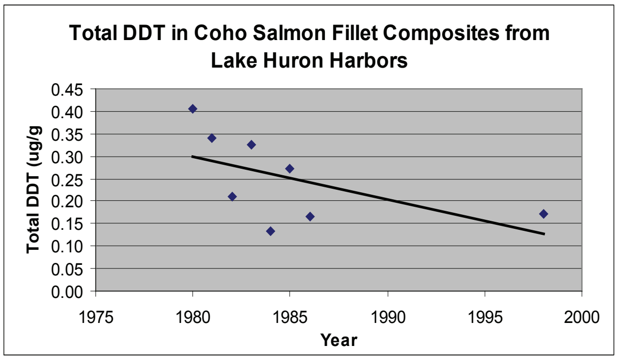

Figure 3.2. Total DDT in Coho Salmon Fillet Composites from Lake Huron Harbors. Source: GLNPO – Great Lakes Fish Monitoring Program 2008.

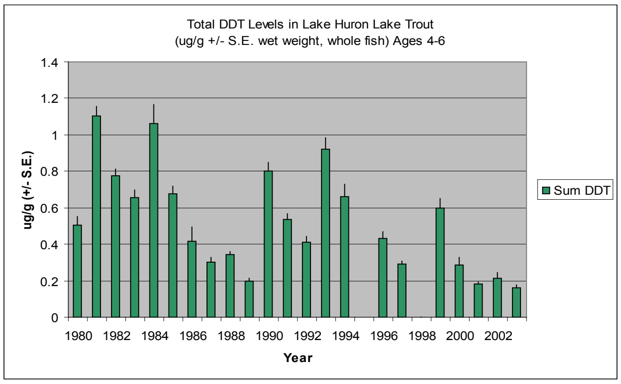

Figure 3.3. Total DDT Levels in Lake Huron Lake Trout (μg/g =/- S.E. wet weight, whole fish) Ages 4-6. Source: DFO, Great Lakes Laboratory for Fisheries & Aquatic Sciences 2005.

Both GLNPO and DFO lake trout data show a general decline in concentrations of PCBs over time. Concentrations in recent DFO lake trout samples were the second lowest ever recorded for the program. PCB concentrations in DFO smelt have fluctuated considerably over time.

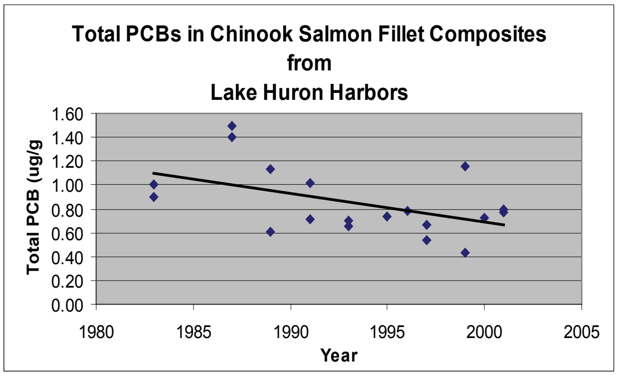

Figure 3.4. Total PCBs in Chinook Salmon Fillet Composites from Lake Huron Harbors. Source: GLNPO – Great Lakes Fish Monitoring Program 2008.

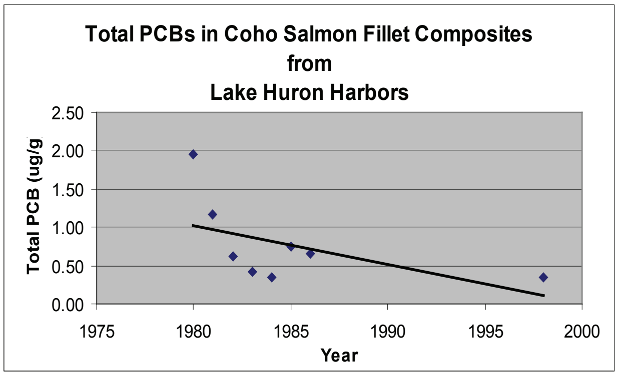

Figure 3.5. Total PCBs in Coho Salmon Fillet Composites from Lake Huron Harbors. Source: GLNPO – Great Lakes Fish Monitoring Program 2008

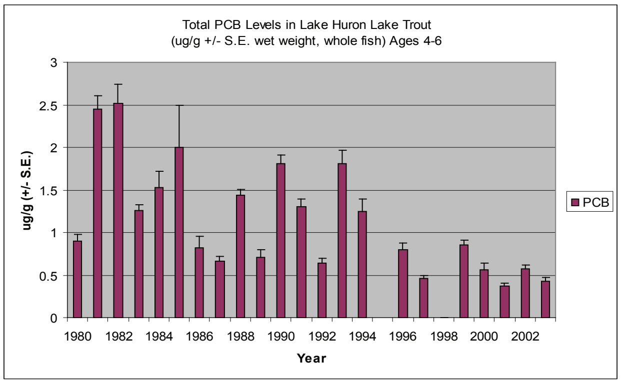

Figure 3.6. Total PCB Levels in Lake Huron Lake Trout (μg/g =/- S.E. wet weight, whole fish) Ages 4-6. Total Source: DFO, Great Lakes Laboratory for Fisheries & Aquatic Sciences 2005.

Mercury concentrations in DFO smelt fluctuated considerably between 1979 and 2003. Smelt collected in 2003 had the highest lake-wide concentration recorded since 1984.

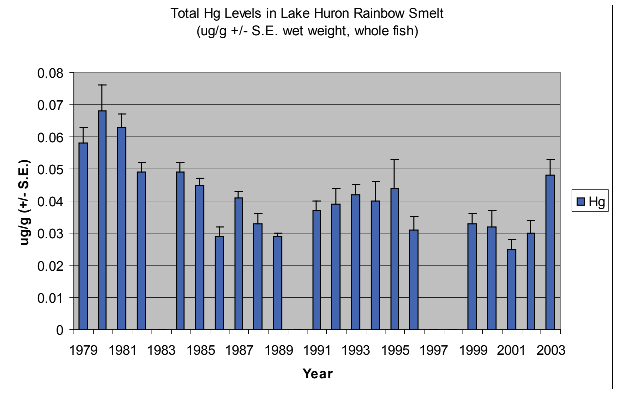

Figure 3.7. Total Mercury Levels in Lake Huron Rainbow Smelt (μg/g +/- S.E. wet weight, whole fish). Source: DFO, Great Lakes Laboratory for Fisheries & Aquatic Sciences 2005.

Contaminant Trends in Sport Fish

In most areas of Ontario, contaminant levels have been declining or are stable due to bans on harmful substances and restrictions on emissions. Ontario sport fish contaminant analyses are based on the skinless dorsal fillet section of the fish, not the entire fish fillet as in Michigan. Ontario advisories are published biennially in the *Guide to Eating Ontario Sport Fish* (*Guide*). Fish consumption can be unrestricted (maximum eight meals per month), restricted to four, two or one meal per month, or totally restricted ("do not eat").

PCB concentrations in sport fish declined significantly in Lake Huron between 1976 and 1990. However, from 1990 to the present, the rate of decrease has diminished. Lake-wide average PCB concentrations for five year intervals in a typical (55 cm) lake trout are shown in Figure 3.6. In the late 1970's, concentrations exceeded the "do not eat" consumption limit of 1220 ng/g for the general population. Current PCB concentrations are within the 4 meal per month range (153-305 ng/g) for both the general and sensitive (women of child-bearing age and children under 15) populations. However, dioxins, furans and dioxin-like PCBs (dl-PCB) are responsible for the majority of the consumption restrictions on lake trout from Lake Huron in the 2007-08 *Guide*.

Lake-wide average dioxin/furan/dl-PCB toxic equivalent (TEQ) concentrations in 55 cm lake trout (light blue bars in Figure 3.8) declined considerably between 1990 and 2001. Analysis and inclusion of dl-PCBs in the total TEQ began in 1997 (dark blue bars figure 3.8) resulting in a significant increase in fish consumption restrictions. It is too early to determine if dl-PCB concentrations have changed significantly from 1997. Continued monitoring for these contaminants is necessary in order to determine such trends. Total TEQs for 55 cm lake trout from all years exceed the first level of consumption restriction (2.7 pg/g) resulting in a four meal per month consumption restriction. Total TEQ measurements since 1997 have also exceeded the "do not eat" consumption restriction guideline of 5.4 pg/g for the sensitive population.

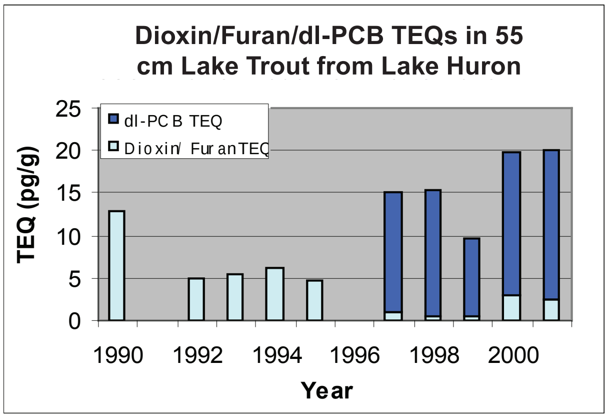

Figure 3.8. Dioxin/Furan/dl-PCB TEQs in 55 cm Lake Trout from Lake Huron. Source: OMOE, Sport Fish Contaminant Monitoring Program, 2005.

Total mercury concentrations in walleye declined considerably between 1977 and 1986 (Figure 3.9). Over the past 20 years, however, concentrations have been relatively stable, ranging from 0.2 to 0.3 µg/g. In Ontario, the unlimited consumption limit for mercury is 0.26 µg/g for the sensitive population and 0.61 µg/g for the general population. Although mercury concentrations in 45 cm walleye have exceeded the guideline for the sensitive population in the past, mercury is not a cause for restrictions in this size of walleye in more recent years. Larger sized walleye as well as other similar species (e.g. northern pike) are restricted for mercury in Lake Huron.

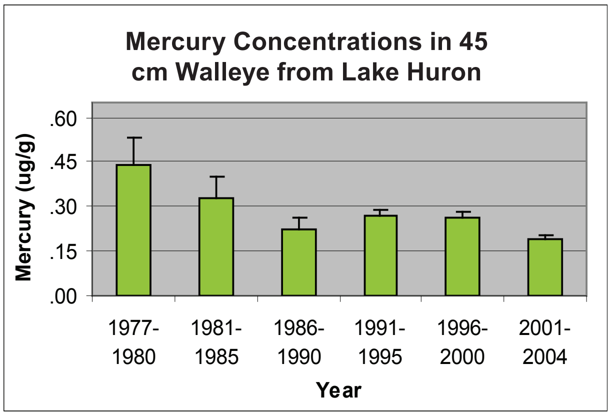

Figure 3.9. Mercury Concentrations in 45 cm Walleye from Lake Huron. Source: OMOE, Sport Fish Contaminant Monitoring Program, 2005.

PCB concentrations in Georgian Bay lake trout are generally lower than those from Lake Huron. Figure 3.10 shows PCB concentrations in typical sized lake trout collected from Georgian Bay. Concentrations in these fish meet or exceed the four-meal-per-month restriction level (153 ng/g) in all years except for 1995 and 2004. Dioxin and furan levels in lake trout from Georgian Bay between 1993 and 2001 range from 0 to 5 pg/g. Again, the addition of dl-PCBs to the TEQ has resulted in increased consumption restrictions and the consumption of 55 cm lake trout is restricted to 0 to 4 meals per month in the 2007-08 *Guide*.

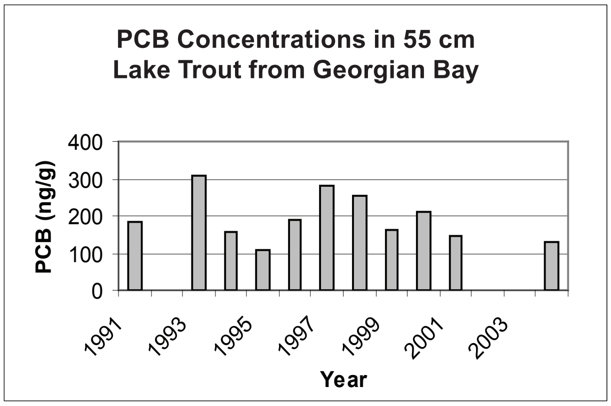

Figure 3.10. PCB Concentrations in 55 cm Lake Trout from Georgian Bay. Source: OMOE, Sport Fish Contaminant Monitoring Program, 2005.

The PCB levels in lake trout in the North Channel have declined since 1983 (Figure 3.11). Recent levels are below the consumption restriction guideline.

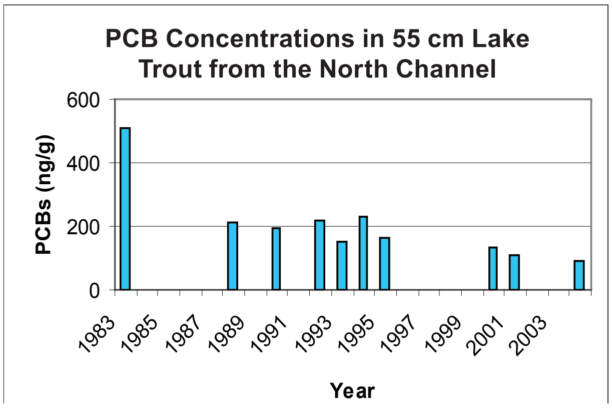

Figure 3.11. PCB Concentrations in 55 cm Lake Trout from the North Channel. Source: OMOE, Sport Fish Contaminant Monitoring Program, 2005.

Toxaphene concentrations in 55 cm lake trout from Georgian Bay exceeded the consumption guideline (235 ng/g) between 1995 and 1997. Since then, toxaphene concentrations have decreased and were not the cause of consumption restrictions in the 2007-08 Guide. Toxaphene concentrations in 55 cm lake trout from the North Channel exceeded the consumption guideline in 1988 but are now below detection.

Overall, the proportion of consumption restrictions for fish from Georgian Bay (22%) is much less than those for Lake Huron (61%). In the North Channel, the proportion of fish consumption restrictions (40%) is also lower than in Lake Huron.

Fish Consumption Advisories

Individual Great Lakes States and Tribes and the Province of Ontario issue specific consumption advice for how much fish and which species are safe to eat for a wide variety of contaminants. Fish consumption advisories are based on guidelines developed through research and review of toxicological data. Recently Health Canada has revised downward their Tolerable Daily Intakes (TDIs) for PCBs and dioxins, which has increased the frequency of consumption restrictions caused by PCBs and dioxins and decreased the frequency of those caused by toxaphene and mirex/photomirex.

In comparison to the other Great Lakes, such as Lake Ontario, contaminant concentrations are relatively low in Lake Huron fish. Nevertheless, fish consumption advisories exist for the open lake and all Areas of Concern (St. Marys River, Saginaw Bay and the Spanish River). On the Ontario side, fish restrictions have increased due to revisions in the consumption guidelines. Advisories differ by species, size and location, so it is important to check advisories in effect for the appropriate area.

In the Ontario waters (including Georgian Bay, North Channel and St. Marys River) generally, the restrictions on trout, salmon, carp and channel catfish are caused by dioxins/furans/dl-PCBs (Figure 3.12). The restrictions on other species (such as walleye and northern pike) are usually caused by mercury. In total, 44 percent of the advice given for Lake Huron sport fish results in some level of consumption restriction (either 4, 2, 1 meals/month or "do not eat").

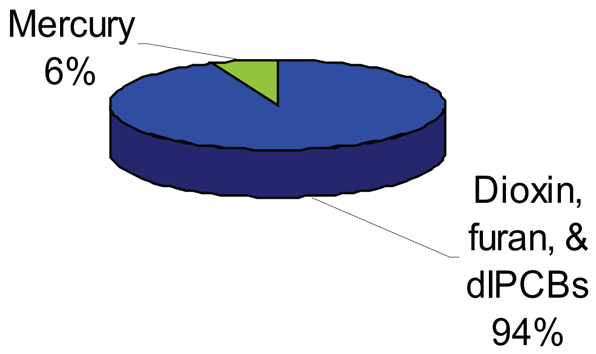

Figure 3.12. Source: OMOE, Sport Fish Contaminant Monitoring Program, 2008.

In the Michigan waters (including Saginaw Bay and the St. Marys River), generally, the restrictions on trout, salmon, carp, channel catfish, burbot, northern pike, walleye, white bass, white suckers, white perch and yellow perch are caused by PCBs. The other restrictions are caused by dioxins or mercury.

Based on the most recent information the current status of sport fish consumption advisories for both Ontario and Michigan are as shown below:

PCBs – In Michigan waters, almost every sample collected from Lake Huron exceeded the trigger level used by the Michigan Department of Community Health to issue sport fish consumption advisories for the protection of women of child bearing age and children under 15. Sport fish consumption advisories cover 15 species of Lake Huron fish. In addition, fish from several Lake Huron tributaries are covered by sport fish consumption advisories due to elevated concentrations of PCBs. The status is similar in the Ontario waters with PCBs causing many of the consumption restrictions.

Toxaphene – Past toxaphene concentrations in several species of Lake Huron fish including lake trout, lake whitefish and brown trout have been above the OMOE sport fish consumption advisory trigger level. However, recent toxaphene concentrations are at or below detection, and cause less than one percent of the consumption restrictions.

Dioxins - Lake trout, lake whitefish, catfish, white bass and carp have dioxin/furan/dl-PCB concentrations that exceed the trigger level used by both the MDCH and the OMOE to issue sport fish consumption advisories. In addition, fish from the Saginaw River watershed are covered by advisories due to elevated dioxin concentrations.

Chlordane - Chlordane concentrations in Lake Huron lake trout on the U.S. side no longer exceed the sport fish consumption advisory trigger level. In Ontario, levels of chlordane are very low and do not cause any fish consumption restrictions.

Mercury - The methylated form of mercury readily bioaccumulates in fish tissue and a number of characteristics influence the methylation of mercury in the aquatic environment. Mercury methylation occurs more readily in inland lakes than in the Great Lakes. Therefore, sport fish consumption advisories due to elevated levels of mercury are more prevalent in fish from inland lakes within the Lake Huron watershed rather than

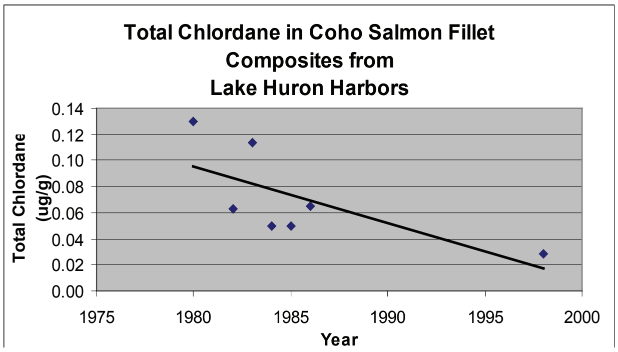

Figure 3.13. Total Chlordane in Coho Salmon Fillet Composites from Lake Huron Harbors. Source: GLNPO – Great Lakes Fish Monitoring Program 2008.

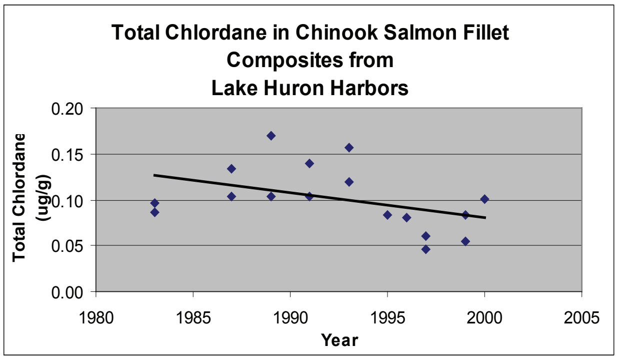

Figure 3.14. Total Chlordane in Chinook Salmon Fillet Composites from Lake Huron Harbors. Source: GLNPO – Great Lakes Fish Monitoring Program 2008.

in fish collected from Lake Huron. Nevertheless, consumption of some species in Lake Huron are restricted due to mercury contamination, such as yellow perch, walleye, rock bass and northern pike in Ontario and walleye in Michigan.

DDT/PBB - Concentrations of DDT and PBB rarely exceed sport fish consumption advisory trigger levels in Lake Huron fish. The only area of the Lake Huron watershed where concentrations are elevated is the Pine River located in the Saginaw River watershed.

Additional Information

For more information regarding the fish consumption advisory programs in Michigan and Ontario go to the following web sites:

- Michigan: www.michigan.gov/mdch-toxics click on “Michigan Fish Advisory”
- Ontario: www.ontario.ca/fishguide

Contaminants in Lake Huron Wildlife

Introduction

In the early 1970s, fish-eating birds nesting in the Lake Huron basin, such as eagles, herring gulls and double-crested cormorants, suffered eggshell thinning, which led to breeding failure and a decline in population levels. Much of the reproductive failure was caused by exposure to various contaminants in the fish that they ate. By the 1990s, concentrations of many persistent toxic contaminants, such as PCBs, had been greatly reduced and most fish-eating bird populations recovered. However, some problems associated with contaminants continue to occur in a small percentage of bird populations in localized areas. It is important to analyze contaminants over time (temporal) and at various locations (spatial) to identify potential problem areas and sources. This information has been compiled and is available in “*Current Status, Trends and Distributions of Aquatic Wildlife along the Canadian Shores of Lake Huron*” K.D. Hughes, CWS Technical Report Series Number 441, 2006.

The Canadian Wildlife Service (CWS) of EC has been monitoring contaminant concentrations in herring gull eggs at up to 15 Great Lakes sites since 1974. The three Lake Huron sites are: Channel-Shelter Island (in Saginaw Bay), Double Island (off Blind River), and Chantry Island (off Southampton) (Figure 3.15). The program tracks temporal and spatial trends in contaminant levels and effects in this top avian aquatic predator.

The MDEQ began a similar annual gull egg monitoring project in 1999 that augmented the CWS work. Michigan sites include the outer Saginaw Bay, Alpena, St. Ignace and Sault Ste. Marie. MDEQ data are reviewed each year and new contaminant parameters are considered for analysis.

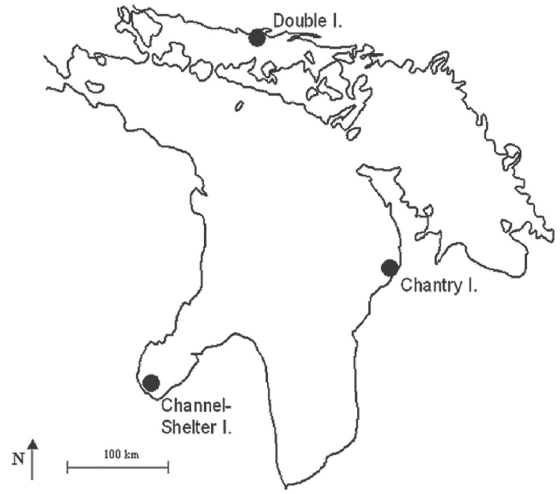

Figure 3.15. Location map of the three Lake Huron herring gull monitoring sites.

In addition to herring gull egg monitoring, the CWS occasionally measures contaminants in eggs from double-crested cormorants, ring-billed gulls, black-crowned night-herons, great black-backed gulls, and several species of terns.

Contaminant Trends in Fish-Eating Birds

Contaminants levels have declined dramatically at all three CWS Lake Huron sites since 1974, although the rates of decline for some compounds slowed during the 1990s. In spite of these declines, PCB and dioxin levels in gull eggs from Channel-Shelter Island continued to remain elevated compared to the other Great Lakes sites. While major point sources of chemical contaminants are not found on the Canadian side of Lake Huron, atmospheric deposition, agricultural runoff, re-suspension of sediments and leaching of soils from landfill sites contribute to the steady state that has been evident since the 1990s. Year-to-year fluctuations in contaminant levels result from changes in food type and abundance, which may be affected by the severity of winter on the Great Lakes.

High concentrations of brominated diphenyl ethers (BDEs) in Great Lakes herring gulls have recently been identified as a concern. BDEs are known to impact thyroid function and growth in some wildlife. Total BDE in herring gull eggs sampled from Double and Chantry Islands in 2000 were low (308-320 µg/kg) in comparison to other Great Lakes sites (1400 µg/kg in Green Bay), largely due to their remoteness from large urban/heavy industrial centres.

In general, the CWS monitoring of double-crested cormorants, ring-billed gulls, black-crowned night herons, great black-backed gulls, and several species of terns has indicated that egg contaminant concentrations at Lake Huron sites were lower than other Great Lakes sites.

Figures 3.16 through 3.21 indicate trends in the levels of contaminants in herring gull eggs at the three CWS Lake Huron sites.

Legend: □ Chantry Island △ Double Island ◇ Channel Shelter Island

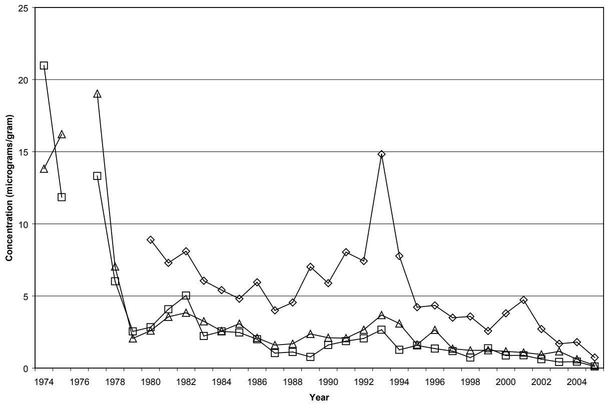

Figure 3.16. DDE concentrations in herring gull eggs at Channel-Shelter Island, Double Island and Chantry Island. Source: Canadian Wildlife Service 2005.

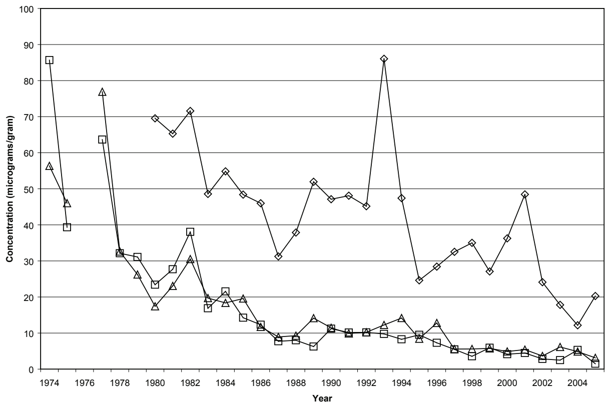

Figure 3.17. PCB 1254-1260 concentrations in herring gull eggs at Channel-Shelter Island, Double Island and Chantry Island. Source: Canadian Wildlife Service 2005.

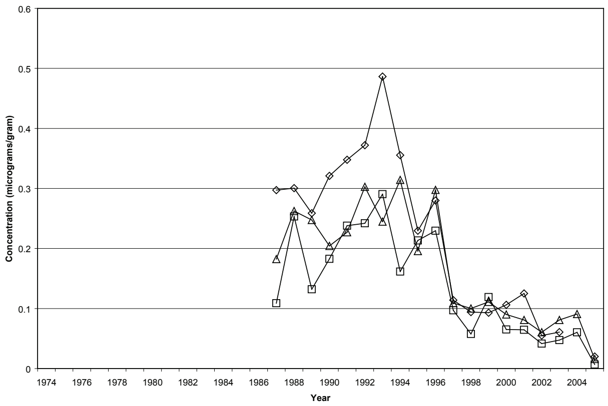

Figure 3.18. Total Chlordane concentrations in herring gull eggs at Channel-Shelter Island, Double Island and Chantry Island. Source: Canadian Wildlife Service 2005.

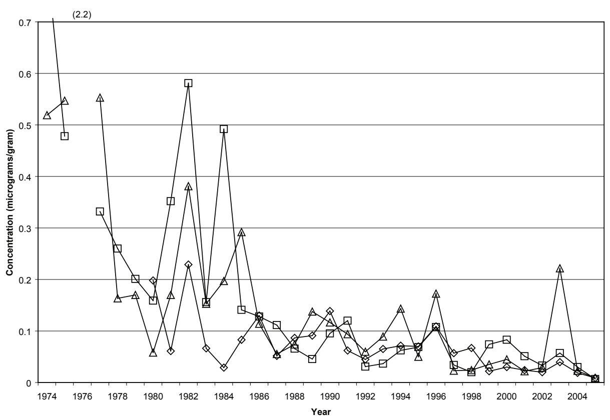

Figure 3.19. Mirex concentrations in herring gull eggs at Channel-Shelter Island, Double Island and Chantry Island. Source: Canadian Wildlife Service 2005.

Legend: □ Chantry Island △ Double Island ◇ Channel Shelter Island

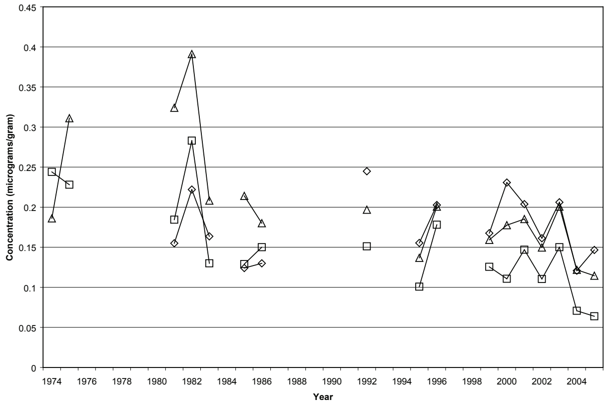

Figure 3.20. Mercury concentrations in herring gull eggs at Channel-Shelter Island, Double Island and Chantry Island. Source: Canadian Wildlife Service 2005.

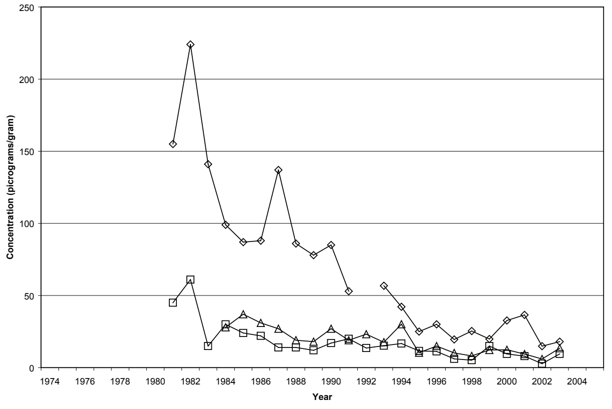

Figure 3.21. 2378-TCDD concentrations in herring gull eggs at Channel-Shelter Island, Double Island and Chantry Island. Source: Canadian Wildlife Service 2005.

Monitoring of waterfowl hunted from Georgian Bay and Sault Ste. Marie found that organochlorines, PCBs and mercury concentrations in pectoral muscle were low and did not pose a risk to wildlife. One exception was a common merganser taken from Sault Ste. Marie, which had the highest PCB concentrations of all waterfowl and game birds collected across Canada from 1987 to 1995. The reason for these high levels is unknown (Braume *et al.* 1999).

Bald Eagles/Osprey

Bald eagles are very sensitive top level predators and often considered the ultimate contaminant indicator species. Eagles are returning to the Great Lakes region, and their blood contaminant concentrations can be used as an indicator of contaminant exposure and trends. In recent years, elevated contaminant concentrations have been found in some eaglet blood samples taken from Georgian Bay and Lake Huron watersheds (e.g., Saginaw River, Shiawassee Cutoff), although 1999-2001 samples were significantly lower than in 1987-1992.

Exposure to heavy metals has been identified as a concern for bald eagles. Several bald eagles found dead in the last few years in Ontario have had elevated levels of both mercury and lead in their bodies. The life span of an adult bird, length of time birds use a given nest site, and the age of new breeding birds are important factors which determine how reproductively successful nesting bald eagles are on the shores of Lake Huron.

Ospreys are often used as local indicators in areas where there are few or no bald eagles. During 1991-1993, DDE concentrations in osprey eggs and blood samples were significantly higher in Georgian Bay than at inland sites in Ontario (Martin et al. 2003). Mean concentrations of DDE were lower than the critical value (4.2 μg/g) associated with significant eggshell thinning; however, 20% of eggs from Georgian Bay were above this level. In terms of heavy metals, all samples taken from the St. Marys River and Georgian Bay (1991-1993) had mercury concentrations below those expected to cause adverse effects on reproduction. With the exception of Georgian Bay, the osprey population on the Canadian side of Lake Huron does not appear to be affected by the current level of contaminants.

<u>Wild Game Contaminants from the Tittabawassee River Flood Plain</u>

The Michigan Department of Community Health (MDCH) has determined that consumption of dioxin-like compounds (DLCs) found in the liver of white-tailed deer and in turkey meat, with and without the skin, harvested from the flood plain area of the Tittabawassee River downstream of Midland, Michigan presents a public health hazard. MDCH determined that consumption of DLCs found in the muscle meat of deer and squirrel harvested from the flood plain area of the Tittabawassee River downstream of Midland present a potential public health hazard to women of childbearing age and children under the age of 15. The Dow Chemical Company (Dow) conducted a study to determine if wild game consumption was a route of human exposure from DLC contamination in flood plain soils and sediments. After reviewing the data from the Dow study, the State of Michigan issued a Wild Game Advisory on September 14, 2004, advising that hunters and their families should not eat deer liver or turkey meat harvested from the flood plain of the Tittabawassee River. The advisory further cautioned women of childbearing age and children under the age of 15 to eat only one meal per week of deer and squirrel muscle meat. Samples of deer muscle and liver, turkey, and squirrel were taken in two areas in the floodplain downstream of Midland and at a comparison location upstream of Midland. Levels of dioxin in the wild game harvested in the floodplain downstream of Midland are higher than levels found in game harvested from a location upstream of Midland (2 to 120 times higher). The data indicates that these toxins are accumulating in land animals that are fairly low on the food chain. As these animals are eaten by their predators, further biomagnification (increased contamination of animals higher on the food chain) is expected. Additional ecological risk assessment work is needed to determine the significance of this contamination and to determine the level of cleanup necessary to protect the ecology of the Tittabawassee River as well as human health.

<u>Other Wildlife</u>

Snapping turtles are ideal indicators of contaminant exposure due to their sedentary nature, their position as a top predator in the food chain, and their ability to accumulate high levels of contaminants over the course of their long lives. Geographic variation in contaminant levels has been shown to be similar to the variation reported for herring gull eggs at Great Lakes sites. Mink and otter are also sensitive indicators of mercury in the aquatic environment, as both live in wetland habitat near the shoreline and consume various amounts of fish in their diet. Mink are one of the most susceptible mammals to PCBs, resulting in reproductive problems and death. Trends in mink populations have followed those of fish-eating birds; the population began to decline in the mid 1950s and was lowest in the early 1970s, but recovered somewhat in the 1980s. Because otter have a lower rate of reproduction they are more susceptible to contaminants, and as a result, populations have been slower to recover.

Total mercury concentrations in otter tissues from near Parry Sound were higher than those in mink tissues, possibly due to their more fish-based diet compared to mink. Mercury levels in otter hair were within the range found in studies in southern Ontario. Levels reported for Lake Huron otter were well below those where negative impacts could have been expected.

<u>Conclusions</u>

In summary, wildlife information has indicated that PCBs, chlordane, dioxins and DDT are a concern in the Lake Huron basin although, with the exception of Saginaw Bay (PCBs, dioxin), concentrations are low compared to the other Great Lakes. Concentrations have declined significantly since the early 1970s, but still remain at levels associated with deformities and reproductive effects in several local watersheds in Michigan, especially Saginaw Bay. Data collected on the Ontario side of Lake Huron indicated that wildlife species contaminant concentrations were generally not at levels of concern, although sporadic elevated measurements support the need for continued ongoing monitoring.

References

Braune, B.M., *et al*. 1999. Chemical residues in waterfowl and gamebirds harvested in Canada, 1987-95. Canadian Wildlife Service Tech. Rep. Ser. No. 326. 422 pp.

Dioxins in Wild Game Taken from the Tittabawassee River Floodplain South of

Midland, Midland and Saginaw Counties, Michigan. EPA ID# MID980994354

April 29, 2005. Prepared by Michigan Department of Community Health under a cooperative agreement with Agency for Toxic Substances and Disease Registry.