Michigan Department of Natural Resource
Fisheries Division

Managing Chinook Salmon in Lake Huron
Current Findings and Proposed Management Options
July 2011

SUMMARY OF FINDINGS:

- The Lake Huron food web has radically changed during the previous 10-15 years.
- The forage base (prey fish) is no longer dominated by alewife and smelt.
- Recruitment of wild lake trout and walleye is increasing in Lake Huron, a sign that native species are adapting to major ecological changes caused by zebra and quagga mussel infestation. Increasing populations of lake trout and walleye are contributing to post-stocking predation and mortality on spring fingerling Chinook salmon.
- Based on data collected from 2000-2009, it is estimated that more than 80% of the Chinook salmon in Lake Huron are naturally-reproduced.
- In recent years, the returns of stocked Chinook salmon to the creel (angler harvest) and the Swan River weir have been at record low levels.
- Many anglers and organized fishing groups understand the drastic changes to the Lake Huron ecosystem and support a significant reduction in Chinook salmon stocking.
- A Chinook salmon stocking reduction is a defensible approach to managing the fishery in Lake Huron and should be viewed as adaptive management in the face of historic changes to the ecology of Lake Huron.

COMMITMENT TO EVALUATION

In 2005, the Department of Natural Resources (Department) produced a document entitled "Lake Huron Management in Times of Change, August 2005". The report outlined trends in the Lake Huron ecosystem, including key attributes of the offshore prey base and Chinook salmon fishery. The 2005 report recommended a 50% reduction in Chinook salmon stocking that was eventually adopted by the Department and implemented in the spring of 2006. The report also recommended stocking at a reduced rate for five years, with a commitment to monitor the fishery throughout that time period and report back to stakeholders after the five years elapsed.

The year 2010 marked the fifth year of the reduced stocking plan. Monitoring of the ecosystem and fishery over the past five years indicates that the lake has, in fact, experienced a large food-web shift most likely linked to invasive zebra and quagga mussels. Prey fish populations, and especially alewife (the key forage fish for Chinook salmon) are at an all-time low. The 2010 harvest of Chinook salmon was the lowest recorded in the past twenty-five years. While the extent of the changes in Lake Huron may not be fully understood, the preponderance of scientific evidence suggests that a significant change in Chinook salmon management is warranted.

The basis for decision in 2011 is quite different than in 2005. Then, the decision to reduce stocking was made under a premise of uncertainty surrounding the reasons for the decline in prey fish abundance and Chinook salmon survival and harvest. At that time, it was unknown

whether there was a temporary imbalance between predators and prey or a permanent food web shift. The 2006 stocking reduction was a reasonable response to the ecosystem changes being witnessed and also served as a "test" to answer the question of whether it was a predator/prey imbalance or a food web shift.

Today, we better understand that the food web change is more permanent and that the traditional forage base for Chinook salmon is virtually nonexistent. We also know that stocked fish are not surviving to be harvested as they once did. As a result, the question being asked is not necessarily one of establishing a balance between predator and prey levels, but rather the efficacy of stocking Chinook salmon in the face of an altered lake ecosystem.

CHANGES IN LAKE HURON ECOYSTEM

Lake Huron has undergone unprecedented change over the past decade. Invasive species, specifically zebra and quagga mussels, appear to have disrupted the historic food web of Lake Huron. Phytoplankton, or single-celled plants that form the foundation of the food web, have been reduced by nearly 90% of historic levels as the non-native mussels (which live on the bottom of the lake and filter the phytoplankton out of the water) have consumed much of the available nutrients. The result is that there is very little food for prey species such as alewife, bloaters, and smelt that historically dominated the offshore waters of Lake Huron.

Data collected by United States Geological Survey (USGS) shows that the 2010 main basin prey fish biomass was the second lowest estimate in the time period 1976-2010 and less than five percent of the maximum biomass found in 1987 (Roseman, et al. 2010). According to Roseman et al., adult alewife abundance and age-0 alewife density and biomass remain near all-time low levels**.** Other key prey species such as smelt and bloaters followed the same trend as alewife, and today are at a fraction of their historic abundance (Figure 1).

In 2004, alewife populations in Lake Huron effectively disappeared from the USGS surveys. While forage fish populations tend to fluctuate over time, the alewife collapse in 2004 was extraordinary. Not surprisingly, the harvest of Chinook salmon followed a similar trend. The estimated Chinook salmon harvest from Lake Huron in 2010 was fewer than 3,200 fish, the lowest level recorded in the time series from 1986-present.

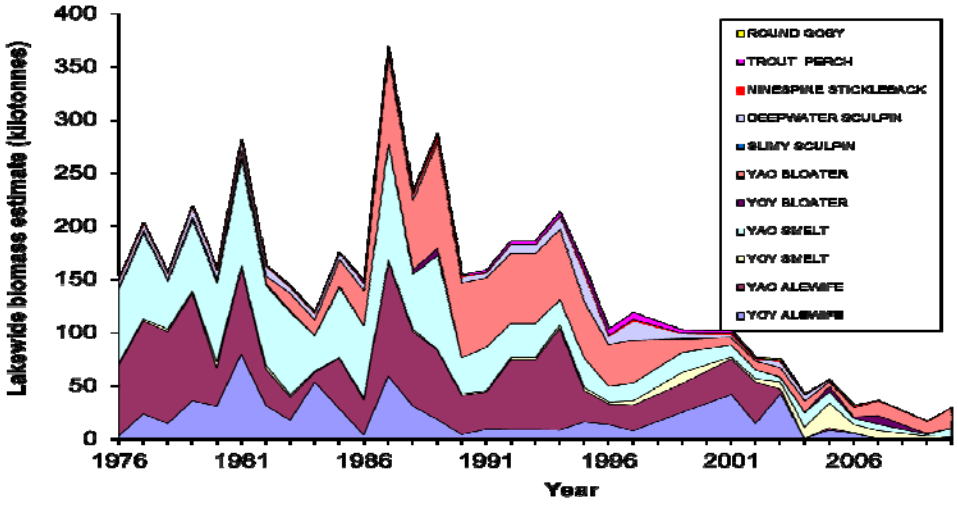

Figure 1. Bottom trawl forage fish survey data, 1976-2010 (Source: USGS Great Lakes Science Center).

Top Down and Bottom Up Effects

Scientists and fisheries managers studying changes to the Lake Huron ecosystem often refer to the environmental impacts using the terms *Top-Down* or *Bottom-Up* effects. *Top-D*own effects refer to the impacts predators (such as lake trout and Chinook salmon) have on the ecosystem. As predator numbers increase through natural reproduction, stocking events, increased survival, or a combination of these factors, they consume more of the available forage fish in the lake. Over time, this can lead to a system out of balance between number of predators and available prey. Eventually, prey items become too scarce to support the number of predators, and predator populations begin to decrease.

Populations of Lake Huron predators such as lake trout, Chinook salmon, and walleye increased throughout the late 1990s and into the first decade of the new millennium. For lake trout, targeted sea lamprey control treatments in the St. Marys River resulted in noticeable decreases in adult sea lamprey abundance, ultimately improving lake trout survival. Also, a reduction in the amount of gill net gear in northern Lake Huron, a result of negotiations with Native American Tribes in the 1836 Treaty-ceded waters of the Great Lakes, has contributed to a reduction in net-induced adult lake trout mortality. Perhaps most important to lake trout recovery was the decline in alewife abundance. Lake trout diets high in alewife result in a Vitamin B deficiency, which in turn negatively impacts lake trout reproductive success (referred to as Early Mortality Syndrome). As lake trout diets became less dominated by alewife, their reproductive success improved substantially, a trend that continued through 2010.

Also contributing to increased predator abundance in Lake Huron was a substantial increase in wild Chinook salmon reproduction. In 2000 the Department, in cooperation with Ontario Ministry of Natural Resources, initiated a study to determine the amount of natural reproduction occurring in the lake. Results from that study show that from 2000-2009 more than 80% of the Chinook salmon in the creel were wild. Also, it is estimated that wild production of age-0 Chinook salmon during 2000-2003 totaled approximately 10-15 million fish. During this same time period, nearly 2.8 million Chinook salmon spring fingerlings were stocked annually by the State of Michigan, with another 2 million stocked each year by Ontario, so the combined contribution of stocked and naturally reproduced Chinook salmon to the lake was tremendous.

Bottom-Up effects describe the impacts that occur at the bottom of the food chain, referred to as lower trophic levels. Phytoplankton form the foundation of the aquatic food web. Zooplankton, tiny free-swimming invertebrate animals that represent a critical food source for most small prey fishes, rely on phytoplankton as their main food source. If phytoplankton populations collapse, then zooplankton are greatly reduced in numbers, which in turn negatively impacts the many prey fish that feed on zooplankton. As prey fish populations decline, there is less available food for predator fish such as Chinook salmon.

Invasive zebra and quagga mussels also rely on phytoplankton as their primary food. With population numbers now estimated to be in the trillions, the mussels' abundance and feeding behavior have effectively removed the foundation of the entire food web. This impact starts at the bottom of the food chain and work its way upwards, thus the term *Bottom-Up* effects. Consequently, zooplankton populations declined, impacting important prey fish species such as alewife and smelt. Eventually, the high numbers of predators and the devastating impacts to the lower food web resulted in a system out of balance between predators and prey.

HISTORY OF CHINOOK SALMON STOCKING

Both the State of Michigan and the province of Ontario have a long history of stocking Chinook salmon into Lake Huron, with Michigan initiating their stocking efforts in 1968. Beginning in the early 1980s and continuing for almost a decade, total lakewide stocking of Chinook salmon increased significantly, peaking in 1989 at nearly 5 million fish (Figure 2). Since then, two stocking reductions lowered annual stocking to 1.8 million fish. From 2000-2005, nearly 2.9 million spring fingerling Chinook salmon were stocked each year by the State of Michigan, with another 550,000 stocked each year by Ontario. Beginning in 2006, an average of 1.45 million Chinook salmon has been stocked annually into Lake Huron by the State of Michigan.

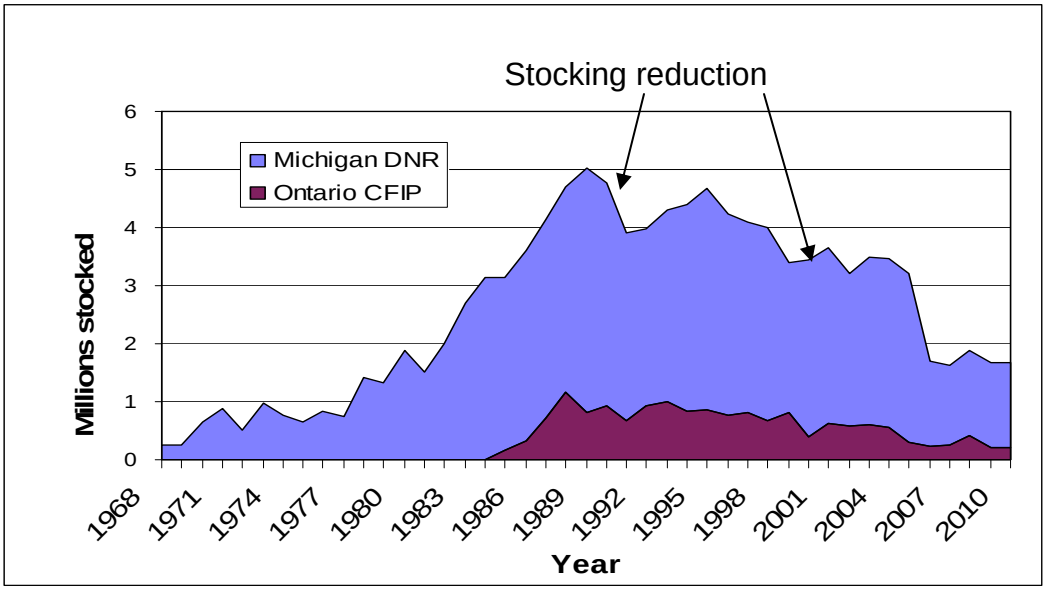

Figure 2. Lake Huron Chinook salmon stocking (Source: MDNR, Ontario Ministry of Natural Resources).

While anglers certainly have benefitted from historic stocking events, there is no significant correlation between stocking levels and angler harvest of Chinook salmon (Figure 3). Post-stocking survival, wild fish contribution, and forage fish abundance are just a few of the factors that may influence the overall fishery more than the number of fish stocked.

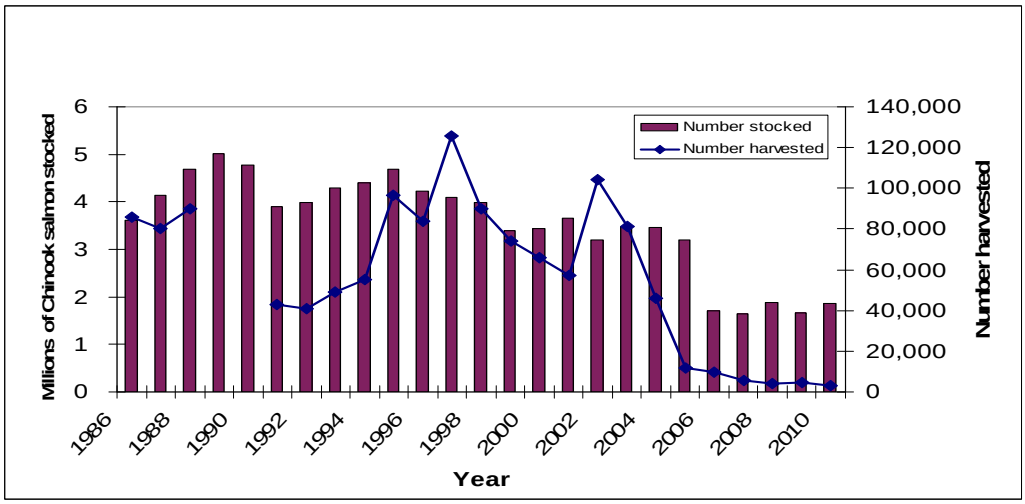

Figure 3. Stocking and harvest of Chinook salmon in Lake Huron (Source: MDNR).

MONITORING THE FISHERY

To assess the fishery, the Department monitors and evaluates several key biological indicators. Collectively, these serve as an index of how well stocking programs are performing and contributing to the overall fishery in Lake Huron. The indicators allow managers to track the success of previous decisions and provide them with information they need to alter management direction if necessary. The indicators that the Department monitors include: harvest, catch rate, weir returns, stocked vs. wild production, growth, and age of fish.

Harvest/Return to Creel

Each year the Department surveys anglers at several ports on Lake Huron. Called creel data, these surveys provide useful information on the number, size, and species of fish harvested by anglers. In the years 1986-2004 anglers harvested an average of approximately 74,000 Chinook salmon and more than 100,000 Chinook salmon in 2003, just prior to the documented alewife collapse (Figure 4). Beginning in 2005, the harvest of Chinook salmon from Lake Huron began a downward trend, and during the period 2005-2010 the average annual harvest was only 6,643. The final year of data, 2010, showed an estimated angler harvest of 3,198 Chinook salmon from 10 "index" ports on Lake Huron (index ports are sampled each year and used to document trends in angler behavior and harvest over time). Of this total, only 1,068 were determined to be of hatchery origin: a return rate of less than one tenth of one percent of fish stocked at these locations. While the downward trend in harvest applies to the entire lake, it is important to note that anglers in the northernmost ports on Lake Huron did experience higher catches than anglers in ports south of Rogers City (Table 1).

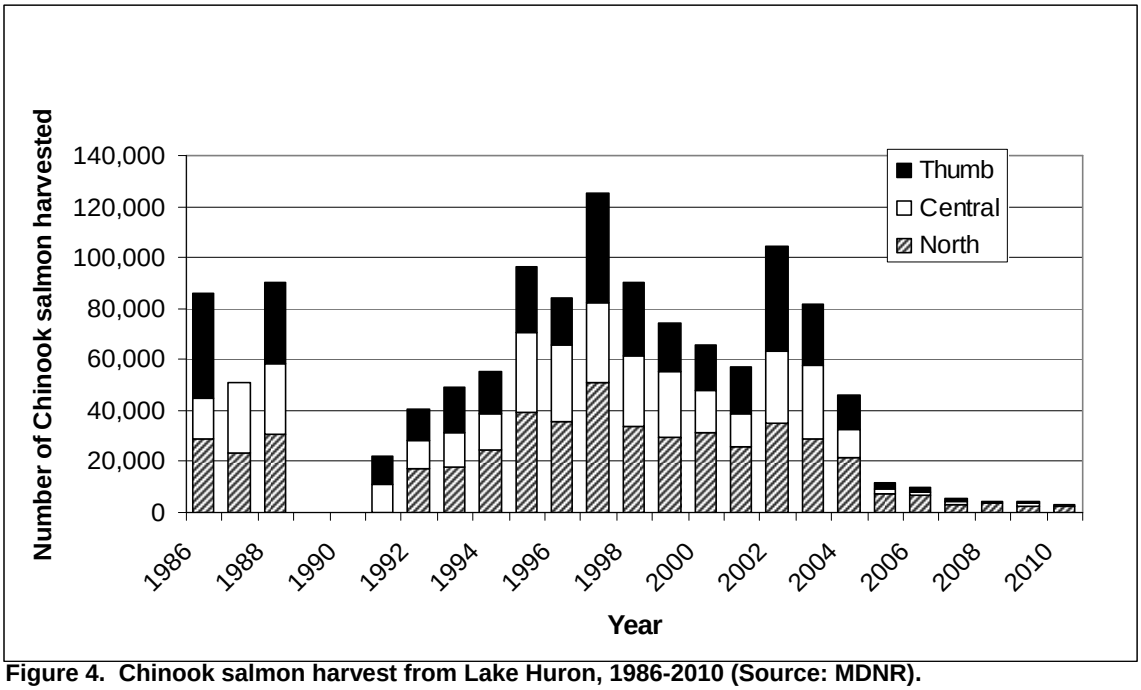

Figure 4. Chinook salmon harvest from Lake Huron, 1986-2010 (Source: MDNR).

Table 1.–Chinook salmon stocking by location, and estimated number of Chinook salmon harvested by year 2006-2010 (Source: MDNR stocking and creel survey data).

Location	County	Number stocked (2006-2009) [a]	Number Chinook salmon harvested 2006	2007	2008	2009	2010
Nunn's Creek	Mackinac	250,000	–	–	–	–	–
St. Ignace	Mackinac	40,000	–	–	–	–	659
Cheboygan R.	Cheboygan	65,000	–	–	–	–	–
Rogers City	Presque Isle	470,000	3,919	1,401	2,119	1,760	2,144
Rockport	Presque Isle	0	1,441	955	686	455	225
Alpena	Alpena	0	1,363	826	679	373	343
Harrisville	Alcona	110,000	577	409	117	351	266
Oscoda	Iosco	190,000	764	889	126	511	37
Tawas	Iosco	27,000	43	0	15	18	9
Port Austin	Huron	70,000	414	235	90	51	19
Harbor Beach	Huron	160,000	560	58	114	56	46
Port Sanilac	Sanilac	35,000	335	401	187	354	31
Lexington	Sanilac	35,000	404	207	14	478	78

[a] Number stocked at each location is the average annual number for the years.

Catch Rate

Angler catch rate, or the number of fish caught per angler during a standard period of time, is another indicator of fishery performance. In 2002, just prior to the 2004 alewife collapse, there was a spike in Chinook salmon catch rates to nearly 9 fish/100 hours of fishing (Figure 5). This catch rate represents the highest level since 1986 when the Department began keeping records on this statistic. By 2004, the catch rate had dropped to 5 fish/100 hours, and by the time the most recent stocking reduction was implemented in 2006, Chinook salmon catch rates had fallen to 1.7 fish/100 hours. This trend continued in the ensuing years and in both 2009 and 2010, the catch rate was only 1.3 fish/100 hours, the lowest level recorded during the past 25 years. The catch rate was only 0.2 fish/100 hours at those index ports from Grindstone City southward.

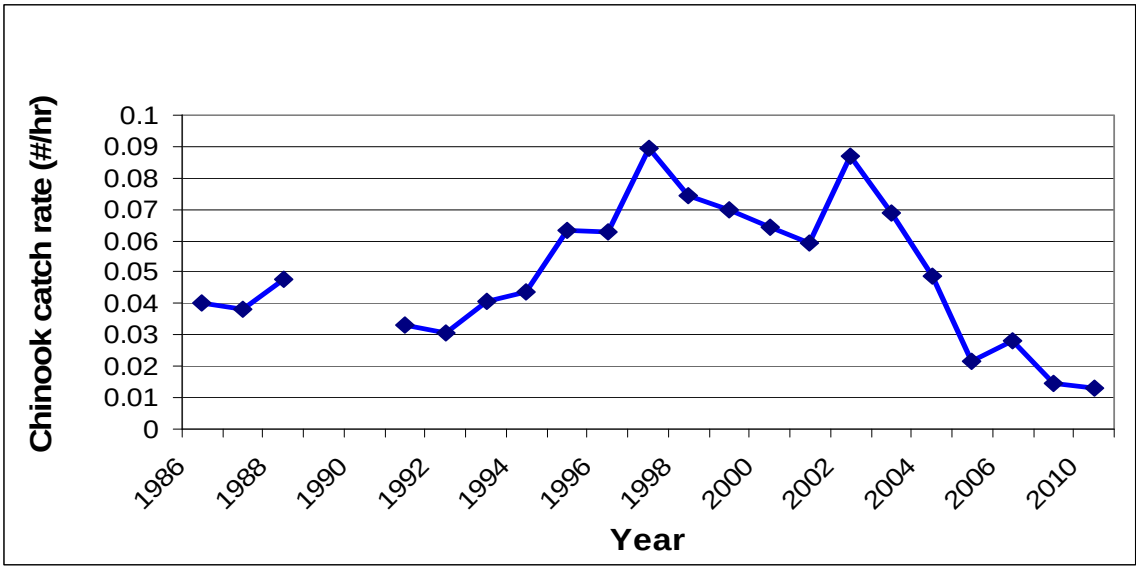

Figure 5. Chinook salmon catch rates in Lake Huron, ten index ports (Source: MDNR).

Weir Returns

The Department operates three blocking weirs on Great Lakes tributaries that serve as broodstock collection points for returning adult Chinook salmon. Two weirs are located on Lake Michigan tributaries and one is located on Lake Huron on the Swan River, Presque Isle County. At these weirs the Department harvests eggs and milt from migrating salmon each fall. The fertilized eggs are transferred to State-operated fish hatcheries and young salmon are reared for approximately 7 months before they are stocked into rivers throughout the state. Since the Department does not have the ability to survey Chinook salmon populations in the Great Lakes to directly measure total abundance, weir returns of adult salmon are used as an indicator of salmon abundance. From 1989-2003 the return rate of stocked Chinook salmon to the Swan River weir averaged approximately 2.4%, which is slightly below the expected return rate that ranges from 3-5%. In 2004, this rate declined to only 0.84% and by 2007 reached a record low of 0.22%. For the most recent three year period of 2008-2010, the Swan River weir return rate averaged 0.76%.

Stocked vs. Wild

Based on assessment work, it is estimated that during 2000-2003 the number of wild Chinook salmon entering Lake Huron from tributary streams was approximately 15 million/year (Johnson et al, 2010). Estimates are not available for the years following 2003, but indications are that natural reproduction and recruitment of Chinook salmon has remained high. To better understand the contribution of wild and stocked Chinook salmon to the Lake Huron fishery, the Department worked in cooperation with the Ontario Ministry of Natural Resources to mark all Chinook salmon stocked in Lake Huron from 2000-2008 (nearly 24 million fish). Based on this work, it is estimated that more than 80% of the Chinook salmon in the creel were wild, thus bringing into question the value and discretion of stocking Chinook salmon into Lake Huron at current levels.

Growth

Weight of fish at a given age can be used as a measure of fish growth when compared among years. From 1986-1996, age-2 Chinook salmon caught during July and August averaged 7.5 pounds, and age-3 Chinook salmon averaged 14.3 pounds. By 2003, the average weight of age-2 Chinook salmon had declined to only 5.4 pounds and age-3 fish averaged 11.3 pounds. In the period following the alewife collapse, 2004-2006, the average weights were 5.2 and 8.1 pounds, respectively, for age-2 and age-3 fish. In 2010, average weights for Chinook salmon increased from prior years to 6.6 and 11.5 pounds, respectively, for age-2 and age-3 fish, but still were well below the 1986-1996 average.

Age of Fish

The age of fish in the population can be an indicator of how well fish are surviving or possibly as a predictor of future abundance. Typically, the life cycle for Chinook salmon is four years from hatching to return to birthplace. While Chinook salmon returning to weirs can be 1-4 years of age, in a healthy population most returning adults are 3-4 years old, and there is some correlation between available prey and the number of 4-year old fish in the population. In 2010, only 5.3% of Chinook salmon harvested were age 4, suggesting very poor survival. However, age-1 Chinook salmon comprised 52% of the harvest, suggesting a very strong year class of wild fish, better survival of stocked fish, or possibly an increase in available forage that has not yet been measured in assessment work.

PREDATOR DIET STUDY AND THE IMPACTS OF ALEWIFE

In recent years, scientists have analyzed the diets of predators in Lake Huron. Roseman et al, 2010, collected angler-caught walleye, lake trout, Chinook salmon, steelhead, and other

gamefish species and looked at their stomach contents. The results revealed few alewives in Chinook salmon diets. Instead, the most numerous prey item in Chinook salmon stomachs was the spiny water flea, an invasive zooplankton that often clumps on fishing lines and downrigger cables. Smelt were also found in significant numbers of Chinook salmon stomachs. In contrast to a similar diet study performed in the 1990s, analyses of current lake trout and walleye stomachs show significant numbers of round gobies (another invasive species) and stocked salmonids. It appears that in the absence of alewife, lake trout, walleye, smallmouth bass and other predators in Lake Huron now include stocked Chinook salmon and brown trout in their diet.

PUBLIC INPUT

Evidence from creel surveys and feedback from stakeholders at workshops and public meetings reveal a strong desire to modify Chinook salmon stocking practices, with the main rationale being that current stocking rates represent a poor use of anglers' license dollars. As recently as 2000, the offshore fishery was dominated by Chinook salmon representing 58% of the catch. However, since 2004 Lake Huron anglers have reported a poor fishery for Chinook salmon and in 2010 the combined harvest of walleye (49%) and lake trout (27%) represented more than 75% of the total harvest of key predator species, with Chinook salmon representing only 8% of the harvest. Anglers understand that the ecosystem and fishing opportunities have changed, and they are concerned about future management of Chinook salmon and other key salmonids.

In developing this proposal, the Department worked closely with an external advisory committee called the Lake Huron Citizens Fishery Advisory Committee (LHCFAC). The LHCFAC is comprised of representatives of statewide and local fishing organizations that have an interest in Great Lakes fisheries. The Department meets regularly with the LHCFAC and this group provides important feedback on management proposals including Chinook salmon management on Lake Huron. The LHCFAC recognizes the need to modify Chinook salmon stocking on Lake Huron and is generally supportive of significant reductions throughout the lake.

In addition to continuing discussions with the LHCFAC, the Department will seek input from other stakeholder groups and anglers, who may not necessarily be formally connected to an organized fishing group, about the current state of Lake Huron and its fisheries. Public input on this proposal and process is anticipated and welcomed, and a website (see below) has been established to receive comments. In addition, three (3) public meetings will be held in August to discuss this information with anglers and concerned citizens.

JOINT MANAGEMENT OF LAKE HURON FISHERIES

The Lake Huron fishery is managed through a cooperative process called "A Joint Strategic Plan for Management of the Great Lakes Fisheries" (Great Lakes Fishery Commission 1980, revised 1997). This plan, which was developed by fishery management agencies in the Great Lakes basin, outlines the goal of creating stable, self-sustaining stocks that are supplemented by the judicious stocking of hatchery fish with the objective of providing food for people, recreational opportunities, employment and income, and a healthy human environment. This umbrella goal guides the direction of management in the lake and has been agreed to by the fishery management agencies for Lake Huron, including Michigan Department of Natural Resources, Ontario Ministry of Natural Resources (OMNR), and the Chippewa Ottawa Resource Authority (CORA).

Guiding Management Principles for Lake Huron (Desjardine et al. 1995) include the following:

- Habitat preservation and restoration must be recognized in this ecosystem approach and humans and human impacts are part of this system.
- Naturally reproducing fish populations (native and naturalized) provide sustainable benefits with minimal long term cost to society.
- Stocked fish are recognized as an integral part of the system as a rehabilitation tool, maintaining biological integrity of the fish community, and for providing fishing opportunities.
- Species diversity contributes to balance and stability of the fish community.
- Socioeconomic values (recreation and commercial fishing interests) are a priority in making management decisions.
- Fisheries are part of the cultural heritage.
- Good management is based on the best available scientific knowledge, including social values.

The overall objective for Lake Huron, as outlined in the Fish Community Objectives (Desjardine et al. 1995), is to ***restore an ecologically balanced fish community dominated by top predators and consisting largely of self-sustaining native and naturalized species.*** The main top predators in Lake Huron now include lake trout, Chinook salmon, walleye, burbot, brown trout, and steelhead.

Specifically, the objectives for salmon and trout are to establish stocks capable of providing a fishery by 2015 in which lake trout are the dominant species while salmon and steelhead have a prominent place in the fishery. Because lake trout are a long-lived species that evolved in the Great Lakes, they are more likely to provide the balance and long-term sustainability in the predator base. However, salmon and steelhead are also recognized for their ability to help achieve balance in the face of burgeoning alewife populations and they are recognized for their high social value. Current Department goals for stocking Chinook salmon in Lake Huron are to produce sustainable and stable populations that:

- diversify and enhance the lake fishery,
- provide for a return fishery at selected locations,
- establish a brood stock return location, and
- control the alewife population.

STOCKING OPTIONS

The body of scientific data available to managers now suggests that a major shift in the ecology of the lake has occurred, rather than a single low point that could have been considered to be natural variability. It is the job of professional fishery managers to ensure that management actions are prudent and that thoughtful responses to changes observed in the lake are implemented. Taking into account the many biological and social factors discussed above, including a high amount of wild recruitment of Chinook salmon, three scenarios for future Chinook salmon stocking have been considered by fisheries managers. These are presented below and include estimated benefits and risks.

1) **Maintain current Chinook salmon stocking numbers and locations on Lake Huron:** Recent data shows that the forage base in Lake Huron is currently suppressed to extremely low levels. However, by nature fish populations are typically resilient to major changes and shifts in food availability, weather patterns, and other environmental factors. Native species such as lake trout and walleye, for example, are experiencing

good to excellent natural reproduction and recruitment in spite of the food web changes. Also, forage fish assessments conducted in 2010 suggest that rainbow smelt populations increased over the previous year's levels. Whereas one year of data does not necessarily indicate a trend, it suggests that a rebound of forage fish in a short amount of time is certainly possible. While data suggests that stocked Chinook salmon are not surviving to be harvested in significant numbers, a benefit of continued stocking is that fish would be present in the lake and able to take immediate advantage of large increases in forage fish populations should this occur. The most obvious risk associated with this option is that forage fish populations remain suppressed and survival and harvest of stocked Chinook salmon continues to be poor. *Based on an analysis of the indicators and trends discussed above, maintaining current stocking rates is not recommended at this time.*

2) **Maintain Chinook salmon stocking at all current locations on Lake Huron, but reduce by 50% the number stocked at each location:** In 2006 the Department implemented a Chinook salmon stocking reduction of 50% while maintaining several traditional stocking locations in Lake Huron. One of the primary goals of the reduction was to lower overall predator numbers given the declining prey fish populations. This management strategy was selected at the time when pelagic (open-water) prey fish species, while clearly on the decline, were still available to Chinook salmon. It was assumed that prey fish populations were high enough to support stocked fish at each port and that these fish would continue to provide return fisheries at those locations. Today, adult alewife are absent from assessment trawls and the prey fish biomass is at the lowest level recorded in the past twenty five years. More importantly, the harvest and catch rate of stocked Chinook salmon from most ports on Lake Huron are at historic lows, especially from mid-lake and southern ports. Wild recruitment of Chinook salmon is substantial and may be contributing more to Lake Huron than the total number of stocked fish. Also, predation of stocked Chinook salmon by lake trout and walleye is increasing as the populations of these predators increase. Considering the greatly reduced forage base and data indicating that stocked Chinook salmon are not surviving long enough to be harvested by anglers, a 50% stocking reduction at each of the current stocking locations is not a prudent management decision. *Consequently, this option is not recommended at this time.*

3) **Maintain Chinook salmon stocking at Nunn's Creek and Swan River, and suspend Chinook salmon stocking at all other Lake Huron locations:** The Nunn's Creek stocking location (St. Martin's Bay) is identified in the 2000 Consent Decree, and per the provisions in this agreement the State of Michigan is obligated to stock this location annually with 250,000 spring fingerlings for the duration of the Consent Decree. Any modifications to the Nunn's Creek stocking effort must be made according to decision processes identified in the Decree. Therefore, this proposal does not include a recommendation to modify the St. Martin's Bay stocking effort at Nunn's Creek. In regards to the Swan River, the State of Michigan has maintained this site as both a stocking location and Chinook salmon egg-collection station for many years. While not the primary source for Chinook salmon eggs, the Swan River is important as a backup location during those years when Chinook salmon returns to other weir locations is low. Stocked fish "imprint" at the location of release, which means that they should return as adults to the same location where they were stocked as spring fingerlings, and this behavior is critical to the success of egg take operations throughout the state. Fish stocked at the Swan River also have contributed to an open water fishery over the years. While there is no mandate to stock the Swan River, eliminating it as a stocking location could have significant future impacts to the Department's egg-take capabilities. *Therefore, this option is an acceptable management strategy and maintaining some*

level of stocking at the Swan River location is recommended. A decision to discontinue Chinook salmon stocking at all other current locations on Lake Huron would result in an annual stocking reduction of approximately 630,000 fish.

COMMITMENT TO MONITORING

The Department works with several partner agencies on the Great Lakes to monitor the Chinook salmon fishery in Lake Huron, and these partnerships will continue into the future as management decisions are put into action. Because decisions made today may not become evident in the fishery for several years, it is critical to continue the annual monitoring and assessment of the fishery. Assessment tools are continually being developed and/or improved that allow managers to make better informed resource decisions. These tools can help guide managers in assessing future management direction and making management decisions, including decisions that may result in modifications to stocking efforts. These tools include:

- A decision support model to look at future management options
- More sensitive measures for estimating changes in energy/food web balance
- Marking studies to estimate numbers of hatchery versus wild Chinook salmon
- Determining the amount of forage consumption by Chinook salmon

If stocking changes are implemented in 2012, a reasonable time frame for collection of data and assessing the impacts of the reduction is five to six years before discussing changes to future management direction. The reason is that any measurable affects to Chinook salmon fishing will most likely not become apparent for at least three years after implementation. The five to six year time frame for data collection provides fisheries managers a minimum of three full years of assessment and evaluation. In addition to continued monitoring and assessment of the key biological indicators discussed above, the Department also will evaluate other aspects of the fishery that may provide some indication of whether future stocking changes are warranted. These include population trends of open water prey fish species and the performance of other key stocked salmonids such as steelhead.

DECISION TIMELINE

Beginning in late September and continuing through mid-October, the Department annually harvests returning adult Chinook salmon at blocking weirs on the Little Manistee River (Lake Michigan), the Boardman River (Lake Michigan), and the Swan River (Lake Huron). Eggs collected at these sites are fertilized and sent to fish hatcheries operated by the State of Michigan where they are raised for approximately 7 months and released as spring fingerlings in May of the following year. Due to this rearing cycle, it is imperative that decisions affecting the number of fish to be stocked in 2012 are made in time to adjust fall egg take. Consequently, a decision affecting the 2012 stocking of Chinook salmon must be made by October of 2011 before egg take is completed.

Angler input is encouraged and will be accepted through August 31. At that time, the Department will evaluate the input and prepare a final recommendation in time to meet the October 2011 deadline. Anglers are asked to submit their comments on this proposal and associated stocking options by visiting the Department's website at: www.michigan.gov/fishpublicinput

Written comments can be mailed to:

Lake Huron Chinook Salmon Stocking Proposal
Michigan Department of Natural Resources, Fisheries Division
PO Box 30446
Lansing, MI 48909

Lead author:
Todd Grischke, Acting Lake Huron Basin Coordinator

Contributing Editors:
Jim Johnson, Supervisor, Alpena Fisheries Research Station
Tammy Newcomb, PhD, Research Program Manager
Jim Baker, Southern Lake Huron Management Unit Supervisor
Dave Borgeson Jr., Northern Lake Huron Management Unit Supervisor

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