Environment Canada Environnement Canada

GREAT LAKES FACT SHEET

The rise of the Double-crested Cormorant on the Great Lakes: WINNING THE WAR AGAINST CONTAMINANTS

Devastated by toxic chemicals during the 1950s, cormorants are now commonly found throughout the Great Lakes.

The Double-crested Cormorant (Phalacrocorax auritus), a large fish-eating bird now found throughout the Great Lakes, has undergone dramatic changes in population over the last three decades. Devastated by the effects of toxic chemicals, the number of nesting pairs decreased by 86% from approximately 900 in the early 1950s to a mere 125 in 1973. The cormorant disappeared as a nesting bird on Lakes Michigan and Superior and only about ten pairs remained on Lake Ontario. From 1973 to 1993, however, the cormorant population increased over 300- fold to more than 38,000 pairs. The cormorant is now more numerous on the Great Lakes than at any time in its previously recorded history.

This fact sheet examines the history of the Double-crested Cormorant on the Great Lakes - from its initial colonization and conflicts with the fishing industry, to its rapid decline as levels of toxic chemicals rose in its diet, and finally, its explosive return in response to declining levels of contaminants and human-induced changes in fish stocks.

Much of the information presented here has been gathered as part of a larger study started by Environment Canada's Canadian Wildlife Service (CWS) in 1971. This study monitors levels of toxic chemicals in the eggs of Herring Gulls and other fish-eating birds and studies the biological effects of these contaminants on Great Lakes waterbirds. Such monitoring serves as a barometer of the state of our natural environment, and therefore how we as humans may be affected.

The Cormorant or "Crow-Duck"

There are about 30 species of cormorant worldwide, including six in North America, of which the Double-crested Cormorant is the most common and widespread, and the only species which is commonly seen inland around bodies of fresh water.

John Mitchell

The Double-crested Cormorant is a large, greenish-black waterbird with a slender hooked-tip bill, orange facial skin, and webbed feet set well back on its body. It is named for the two small tufts of feathers on either side of its head, which appear on

the adults in spring plumage. The bird can frequently be observed standing erect on rocks or posts, sometimes in a spread-eagle posture; or swimming low in the water, often with only its head and neck exposed. On the water, it can be distinguished from loons by the distinct upward angle of its head and bill. Flocks often fly in “V” formations similar to geese. This behaviour and their general colouring likely led to cormorants being called “crow-ducks” by early European settlers.

In North America, the Double-crested Cormorant nests from southwest Alaska, central Alberta, James Bay and Newfoundland south to the Gulf of Mexico. Populations centered in Florida and along much of the Pacific coast are resident there year-round; birds from Alaska, the North American interior and the Atlantic coast migrate south in winter to the Gulf of Mexico, the Bahamas and the Greater Antilles. Populations nesting on the Great Lakes migrate south via two routes: some go directly south along the Mississippi River drainage while others first travel east to the Atlantic coast and then south to the Gulf Coast. Southward migration begins around the end of August, and most birds return to the Great Lakes the following April.

John Mitchell

A cormorant nesting colony

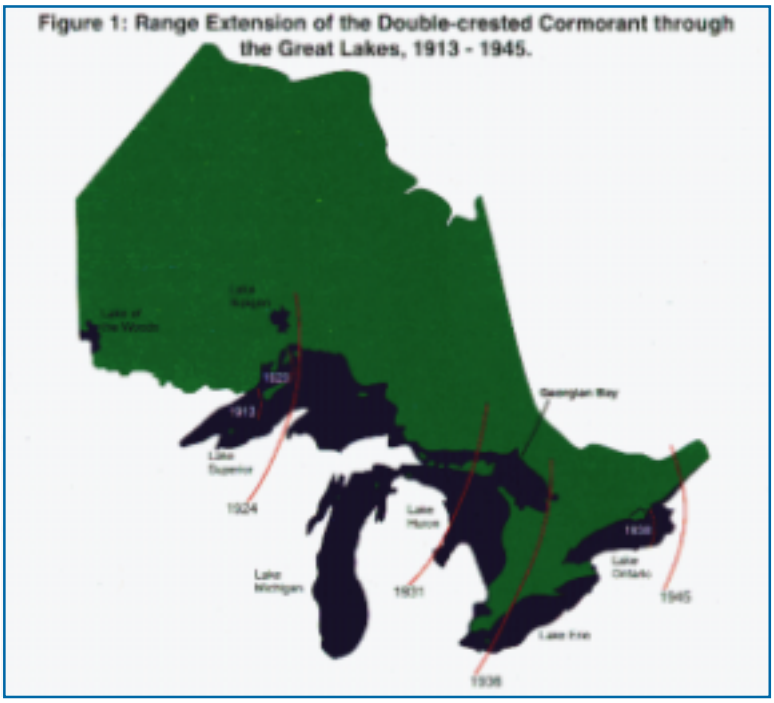
Cormorants are very sociable year-round and almost always nest in colonies. They require undisturbed nesting sites with a convenient food supply, and usually build their nests (consisting of sticks and other drift material) on the ground - on rocks, islets, cliff tops and ledges - or in trees near water. On the Great Lakes, egg laying commences in late April and early May after the birds have gone through courtship and have built their nests. Cormorants usually lay three to four light blue eggs which may be partially covered with a white chalky covering. The eggs hatch after about 25-28 days of incubation. The young become fully independent about ten weeks after hatching, around mid-August. However, the timing of nesting can vary considerably. In June, for example, it is common to see freshly constructed empty nests, nests with well- incubated eggs, and nests with young, all in the same colony. Both the male and female birds share in nest-building, incubation and feeding of the chicks. The birds have the unusual habit of incubating their eggs by wrapping the webs of their feet around them. The cormorant’s diet consists primarily of fish, but sometimes includes small invertebrates such as crayfish.

In the Great Lakes, the population of the Double-crested Cormorant showed an initial 30-year period of colonization (1920s - 1950s) followed by a 20-year decline (1950s - 1970s) and, most recently, a spectacular 20-year resurgence (1970s - 1990s).

Colonization of the Great Lakes: 1920s - 1950s

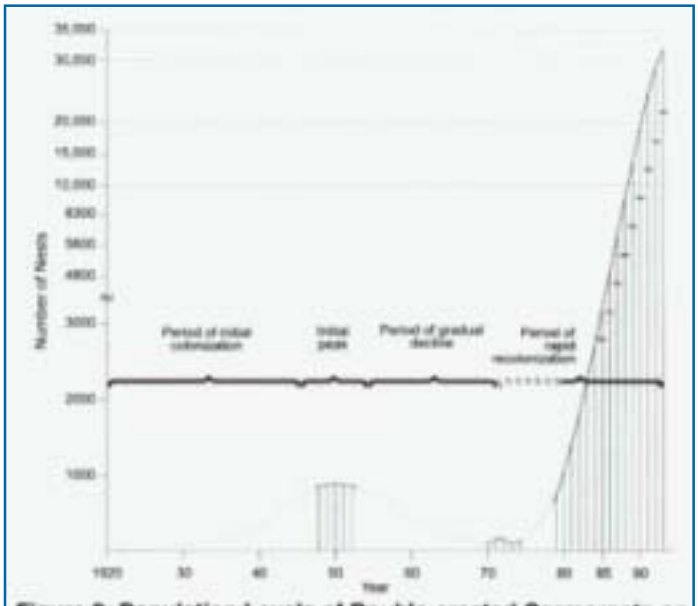
The Invasion

Historically, it is thought that the Double-crested Cormorant did not nest in the Great Lakes. Archaeological excavations in aboriginal settlements have not shown any evidence of the bird. Although cormorants have nested in Lake of the Woods (in northwestern Ontario) for hundreds of years, the first suspected nesting on the Great Lakes did not occur until 1913, at the far western end of Lake Superior. From there colonies spread eastward to Lake Nipigon in the 1920s, to Lake Huron and Georgian Bay in the early 1930s and finally to Lakes Ontario and Erie in the late 1930s (Figure 1: Cormorants first nested on Lake Superior in 1913, and spread eastward to Lake Ontario and the upper St. Lawrence River By 1945 (30K gif).).



Cormorants first nested on Lake Superior in 1913, and spread eastward to Lake Ontario and the upper St. Lawrence River by 1945.

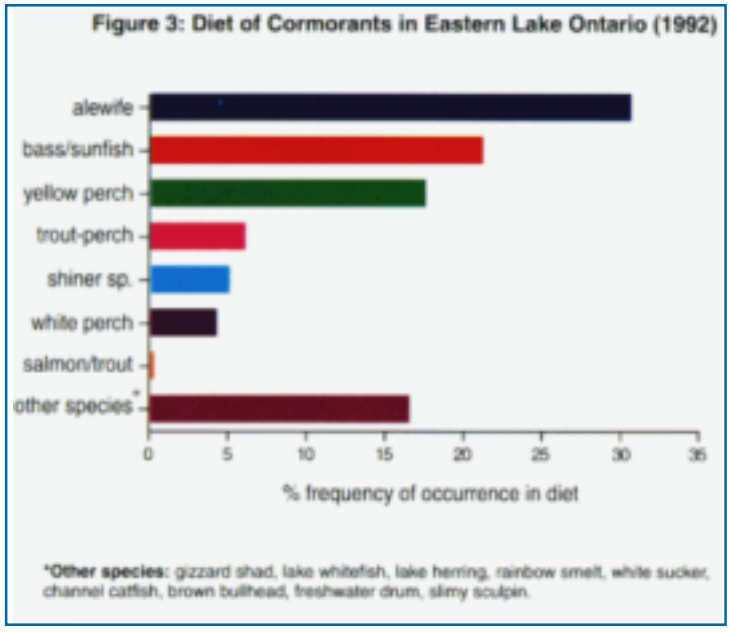
This range expansion coincided with similar cormorant expansions all across North America. However, the order in which the lakes were colonized strongly suggests an eastward expansion of the Great Plains population, rather than a westward spread of the Atlantic population. The cormorant's invasion was successful, as their population increased steadily during the '30s and '40s (Figure 2: Cormorant numbers on the Great Lakes have increased dramatically since 1980(28K gif)). By the late 1940s and early 1950s the cormorant had become so common that control measures were authorized in some areas of Ontario to reduce suspected competition with commercial and sport fisheries.



Cormorant numbers on the Great Lakes have increased dramatically since 1980.

The Concern

Many fish-eating birds, and cormorants in particular, arouse suspicion and even hostility among fish harvesters, who believe that these birds reduce the numbers of commercially and recreationally valuable fish. Anglers and commercial harvesters claim that cormorants consume large quantities of desirable fish. Studies have repeatedly shown that in a natural environment, cormorants feed primarily on small, largely non-commercial, shallow-water fish. On the Great Lakes, these include abundant species such as Alewife (Alosa pseudoharengus), Rainbow Smelt (Osmerus mordax) and Yellow Perch (Perca flavescens). The birds also take much smaller numbers of White Suckers (Catostomus commersoni), Pumpkinseed, crappie, bass (Centrarchidae) and sticklebacks (Figure 3: Cormorants feed primarily on small fish, such as alewife(26K gif)). However, as cormorant numbers continued to steadily increase in the 1940s, fish harvesters in Ontario became increasingly concerned. By 1946 they were calling for a cormorant control program.



Cormorants feed primarily on small fish, such as alewife

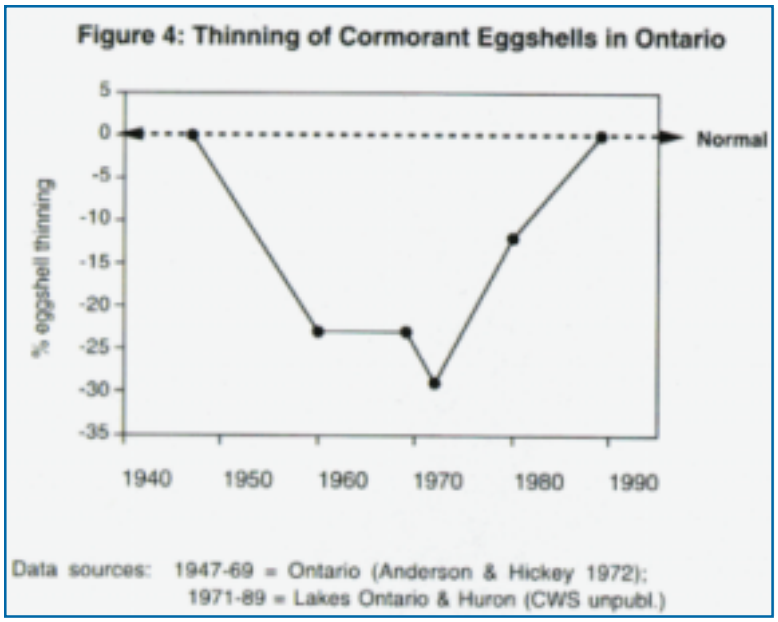
Control Measures

In response to the growing cormorant numbers, a control policy was launched, primarily on Georgian Bay. This remained in effect until 1966. Early local attempts at control included the destruction of all eggs at various colonies. This proved unsuccessful, because the birds responded by laying more eggs, often on different islets, where they could raise their brood before the new site was discovered. Later methods of control avoided this problem by spraying the eggs with a solution of formaldehyde and soap. This cut off the air supply to the developing embryo, causing it to suffocate, but left the eggs intact. This method destroyed all reproduction for the year because by the time a cormorant pair had incubated the sprayed (but intact) clutch for the full incubation period or longer, it was too late in the season for them to attempt another nesting.

Unsanctioned control by fish harvesters also likely began during this period and included organized annual destruction of colonies by shooting adults, and destroying eggs, nests and young. Both sanctioned and unsanctioned controls largely ended by 1960. At best, the controls only slowed the growth of the cormorant population during the 1940s and 1950s; they probably did not reduce its size appreciably.

DECLINE: 1950s - 1970s Reproductive Failure

Despite the end of the control measures, the Double-crested Cormorant population declined dramatically throughout the 1960s and early 1970s (Figure 2). Evidently some other factor was at work. By 1973, the cormorant population in the Great Lakes had declined by 86% and breeding birds had vanished from Lakes Michigan and Superior. During the late 1960s, scientists discovered that the eggshells of cormorants nesting on the Great Lakes had been thinning since about 1955. By the early 1970s, eggshells were nearly 30% thinner than normal (Figure 4: High levels of toxic contaminants in the diet led to severe eggshell thinning during the 1960s and ’70s and a dramatic decline in the cormorant population). This had a devastating impact on the cormorant population. Thin-shelled eggs could not



High levels of toxic contaminants in the diet led to severe eggshell thinning during the 1960s and '70s, and a dramatic decline in the cormorant population.

withstand the weight of the incubating bird and would break before reaching term, killing the embryo. Not surprisingly, scientists also discovered that reproductive success — the number of chicks raised successfully — had declined from a "normal" level of about two chicks per pair to only 0 - 0.2 chicks per pair. For cormorants to maintain a steady population the number of young produced each year and eventually entering the breeding population must match the number of adult deaths. However, this production rate was far too low to balance adult mortality rates, which probably accounted for most of the dramatic decline in population levels. Clearly something was severely wrong with the cormorants on the Great Lakes.

The Role of Toxic Contaminants

At the time, it was suspected that the declining cormorant population was related to the high levels of toxic contaminants, particularly DDE and PCBs, then present in the Great Lakes. The symptoms of the decline — widespread reproductive failure associated with moderate to severe thinning of eggshells, and high frequency of egg breakage — are all characteristic of DDE contamination. Residues of both DDE and PCBs in cormorant eggs from Lake Huron were found to be the highest known for this species in Canada from 1968 to 1972. In 1972 researchers discovered that 95% of the eggs in the Lake Huron colonies had broken or disappeared by the end of the incubation period. Toxic contamination was the most likely cause of the widespread reproductive failure among cormorants on the Great Lakes during this period. Similar declines and reproductive failure were noted in other parts of the cormorants range, including Alberta, Minnesota and Wisconsin.

DDE AND EGGSHELL THINNING

DDT came into widespread use as an insecticide in the late 1940s. The chemical is regulated by Agriculture Canada under the Pest Control Products Act and most uses were banned in 1974. Registration of all DDT products was discontinued in 1985; however, the use and sale of existing stocks of DDT products were allowed until Dec. 31, 1990. DDE (Dichlorodiphenyldichloroethylene) is a "metabolite" or breakdown product of DDT (dichlorodiphenyltrichloroethane). DDE is produced in most animals when the body tries to rid itself of DDT. It is the levels of DDE, and not DDT, which are routinely measured in animals. DDE is the most fat-soluble of the DDT breakdown products, and thus the most commonly found compound in animals.

It is this storage of DDE in the animal's body fat which makes the effect of the pesticide so insidious. When a predator, such as a fish-eating bird, consumes contaminated prey, the chemicals in the fish's tissues are stored in the bird's body. Over a life-time of consuming thousands of fish, the birds can accumulate high levels of chemicals in their bodies.

Reduced productivity and eggshell thinning were the first problems related to contaminants identified in birds on the Great Lakes. Eggshell thinning is strongly correlated with DDE levels — as DDE levels increase, so does the degree of thinning. Thinning is caused by the presence of DDE in female birds. Eggshells are made of calcium carbonate; the calcium is obtained in part from the bird's bones and transferred to the eggshell. DDE inhibits the action of the enzyme needed in the transfer of this compound. As a result, the eggshell does not contain as much calcium carbonate as it should. It is thinner than normal, and cannot support the weight of an incubating bird. Cormorants are very sensitive to the effects of DDE, and are particularly sensitive to the resulting eggshell thinning because they incubate their eggs by wrapping the webs of their feet around them — in effect, standing on them.

The Rise and Fall of Great Lakes Fish Populations

Great Lakes fish populations have undergone some profound changes in the last 60 years. One of these was the dramatic decline of large predatory fish, primarily Lake Trout and, to a lesser extent, Burbot. In Lake Ontario the most dramatic declines of these species occurred in the late 1930s and 1940s, while in Lake Huron they occurred during the 1940s and 1950s. The decline of the predatory fish was caused by many factors, including years of heavy fishing, the invasion of the sea lamprey, the loss of spawning areas. Increased amounts of toxic contaminants entering the lakes may have also been a factor.

With the decline of larger predatory fish, the smaller fish species underwent an unprecedented population explosion. The main species involved in this increase were Rainbow Smelt and Alewife, neither of which was native to the upper Great Lakes. Rainbow Smelt were introduced to the Great Lakes in Michigan in 1912. They spread slowly through the lakes, becoming common in Lakes Michigan and Huron by the 1930s and in Lakes Ontario and Erie by the late 1940s. Alewife were abundant in Lake Ontario by the 1890s but did not become common in Lakes Michigan and Huron until the demise of the Lake Trout in the mid-late 1940s.

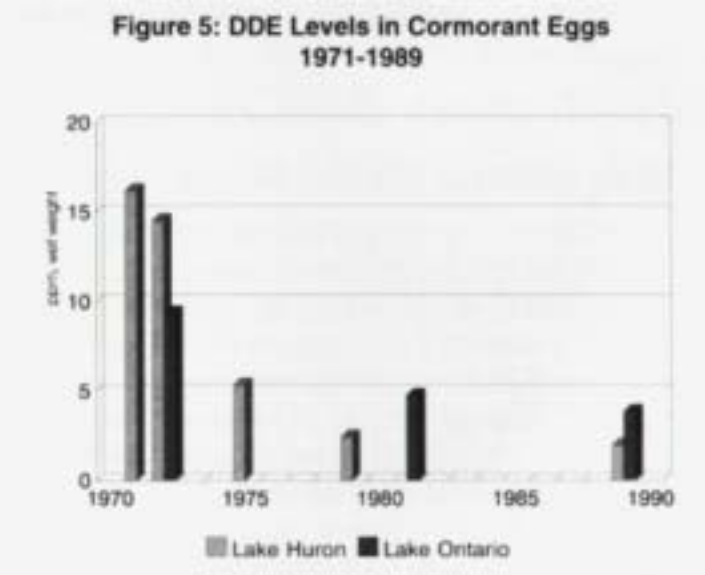
Thus, for a period of 30 years (1950s - 1970s) these smaller prey species increased in a manner more or less unchecked by any predatory fish or birds higher up the food web. The smaller prey fish came under heavy predation pressure in the 1980s, with the massive stocking of salmon and trout in most of the Great Lakes. As a result, the population of smaller fish decreased. However, in spite of this predation, Alewife remained abundant throughout much of the Great Lakes and were fed upon heavily by cormorants during this period.

RESURGENCE: 1970s - 1990s
The Cormorant Explosion

In the mid-1970s, cormorant numbers began a dramatic recovery. From 1973 to 1991, their numbers increased more than 300-fold (Figure 2). During this 18-year period, the average annual rate of increase was approximately 35%, meaning that the cormorant population was doubling every three years. From 1973 to 1993, more than 80 new cormorant colonies were established, including several sites which had been abandoned since the 1970s or earlier. In 1993, the total number of colonies on the Great Lakes was over 100. Eggshell thickness has returned to more normal levels, as has reproductive success. In Lake Ontario, for example, an average of 1.9 young per pair was produced in 1990.

Decreasing Toxic Chemicals

At the same time that reproductive success and population size were improving, contaminant levels were falling. The most regularly monitored sites (colonies in Lake Huron) showed DDE and PCB levels in cormorant eggs decreasing by more than 80% between 1971 and 1989 (
Figure 5: Levels of toxic chemicals in cormorant eggs have fallen sharply since the 1970s(65K gif)). Similarly significant reductions in one or both of these compounds have been recorded in several other species of Great Lakes wildlife, including Herring Gulls, Common and Caspian Terns, Ospreys and Lake Trout. The rapid decline of contaminant levels in the mid and late 1970s was due mainly to regulations that were implemented in the early 1970s restricting the use and production of DDT and related pesticides.



Levels of toxic chemicals in cormorant eggs have fallen sharply since the 1970s.

Cormorant Numbers on the Canadian Great Lakes

The cormorant populations on Lakes Ontario and Erie and the Canadian portions of Lakes Huron and Superior are shown in (Figure 6 (41K gif). Although all areas show an increase, population levels and growth rates are much greater in Lakes Huron and Ontario than in Lakes Erie and Superior. These differences are probably related to the number of possible nesting sites and the availability of food in each lake. Lake Erie is a very productive lake, providing the cormorants with an abundant supply of fish, however the lake has very few uninhabited islands where the birds could nest. At present, cormorants nest only on four islands in Lake Erie. In contrast, Lake Ontario, and particularly Lake Huron, have many potential nesting islands. Neither lake is as productive as Lake Erie but there is still enough fish to support a large cormorant population. Lake Superior has an abundance of isolated islands. However, it is much less productive than the other Great Lakes, supporting fewer fish and only a small population of cormorants.

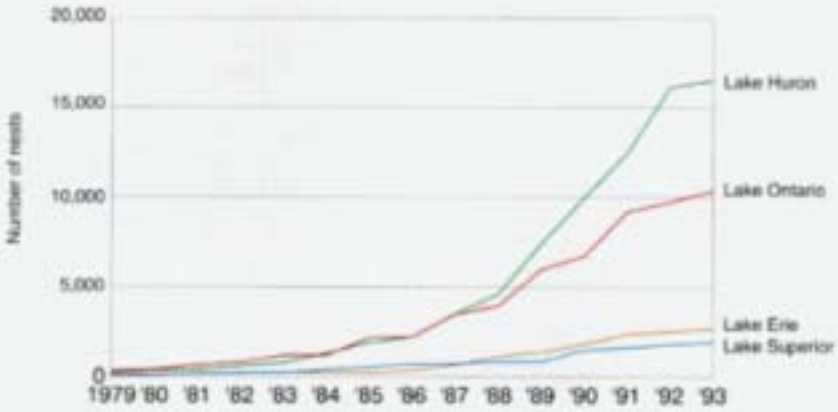


Figure 6: Population Growth of Cormorants in the Canadian Great Lakes

John Mitchell

Cormorant chick

Increasing Food Supply

The dramatic decline in contaminant levels from the mid-1970s to the present day is unlikely the sole factor responsible for the increase in cormorant numbers. Cormorants showed a much slower rate of increase during their initial invasion of the Great Lakes in the 1930s and 1940s, when contaminants would not have affected their population. The dramatic cormorant increase was probably augmented by a rise in the numbers of smaller fish, such as Rainbow Smelt and Alewife, which serve as the bird's primary food source. Since the 1970s, these smaller prey fish have been much more abundant than they were 30 to 40 years earlier. Even though Smelt and Alewife declined during the 1980s, their numbers were still great enough to provide an abundant food supply for the cormorants. These smaller prey fish tend to occur in large schools and inhabit relatively shallow water, providing an ideal food source for the cormorants. Elsewhere around the world, increases in the populations of several fish-eating birds have also been associated with changes in prey abundance.

THE FUTURE
Can they increase forever?

The Double-crested Cormorant clearly demonstrates the "population explosion" phenomenon. This can be expected in any species occupying a large new habitat, such as the Great Lakes. Today, the lakes are even more attractive to these birds: legislation now protects cormorants, commercial fishing has decreased, human persecution has lessened and levels of toxic chemicals are lower.

If the current rate of population growth continues, the Great Lakes

PCBs and DEFORMITIES

Polychlorinated biphenyls (PCBs) have been in use since 1929. There are 209 types of PCBs - a small number of these have toxic properties, and are thought to account for the bulk of PCB contamination in animals. The low flammability of PCBs made them useful as fire retardants in insulating and heat-exchanging fluids used in electrical transformers and capacitors. The same property made them useful as lubricating oils. They were also used as plasticizers and waterproofing agents and in inking processes used to produce carbonless copy paper.

In Canada, uses of PCBs were voluntarily reduced by industrial producers in 1971, and regulated in 1977. Importation of all electrical equipment containing PCBs was banned after 1980, and use of these chemicals was restricted to existing equipment. Transport of PCBs was regulated under the Transportation of Dangerous Goods Act in 1985, and storage of PCBs was controlled in 1988.

In the early 1970s, deformities in several types of waterbirds began to be reported throughout the Great Lakes. These included crossed bills, club feet, extra digits, and eye and skeletal deformities. Bill malformations are one deformity which is clearly developmental (i.e., begun as the embryo develops within the egg) rather than the result of accidents or trauma after the bird has hatched.

Therefore, bill malformations are considered reliable indicators of misfunctions in the normal developmental process and there is strong evidence that PCBs may be responsible. The role of contaminants in the occurrence of these deformities is being investigated by a cooperative Canadian- American study, in which the Canadian Wildlife Service is taking part.

From 1979 to 1987, the frequency of bill defects in Double crested Cormorant chicks on the Canadian Great Lakes ranged from 0 to 6.2 (average = 3.9) in every 10,000 chicks. This is a higher frequency than that found in relatively uncontaminated areas, such as the Canadian prairies where defects are only 0.6 per 10,000; but much lower than that found in extremely contaminated areas, such as Green Bay in Lake Michigan, where deformities approached 52 per 10,000 chicks. From 1988 to 1992, the frequency of bill defects on the Canadian Great Lakes ranged from 0 to 3.2 (average = 1.4) per 10,000; clearly the rate of bill deformities is decreasing in some areas.

John Mitchell

cormorant population would increase to more than three-quarters of a million birds by the year 2000. However, this is unlikely to occur. Most animals which colonize new areas show a period of initial, unrestricted growth, just as we have seen with cormorants over the last 10-15 years. Such growth, however, can not be sustained forever. Eventually, the population outstrips its food supply, outgrows its habitat (or nesting areas), or is reduced by disease or predation. When this happens, the cormorant population can be expected to drop in numbers, until it stabilizes itself again.

In recent years, the explosive growth of the cormorant population has definitely slowed. The largest colony on the Great Lakes, at Little Galloo Island in Lake Ontario, showed a 31% decrease in numbers of breeding pairs between 1992 and 1994. In 1994, the cormorant population of Lake Ontario decreased by 6%. This was the first such decline in over 15 years. In 1992, Newcastle Disease Virus killed up to 30% of the young cormorants in several colonies. These population declines and disease outbreaks are signs that other factors are starting to have an impact on the population. Thus it seems unlikely that the cormorant population will continue to grow as it has during the 1980s and early 1990s.

According to fisheries biologists, stocks of the smaller prey fish have been decreasing dramatically in recent years. This decrease in the cormorants' food supply is probably already contributing to their decline on Lake Ontario.

Too many Cormorants?

Fish harvesters have raised concerns about the rapid increase of cormorants and its potential effect on fish numbers in the Great Lakes. They fear that: 1) cormorants are competing with fish harvesters for large, major sport fish like Lake Trout and salmon; 2) the birds feed on the same prey fish which the large predatory fish need for food; and, 3) cormorants feed on and deplete local supplies of pan fish, such as perch and bass.

The first two concerns do not appear to be valid, since studies of cormorant diets in Lake Ontario show that less than 2% of the prey found in cormorant pellets is Lake Trout or salmon. Also, cormorants consume only about 0.5% of the prey fish, which is insignificant when compared to about 13% taken by sport fish.

The third concern is not such a clear issue. In northern Georgian Bay, fish harvesters feel that recent declines in local catches of yellow perch and smallmouth bass are the result of increased cormorant numbers at nearby colonies. As evidence they cite the ease with which a "meal" of fish was caught ten years ago, before the birds increased. Now, those fish are scarce and good catches are exceedingly rare. They also state that before cormorant numbers increased one could easily observe, when SCUBA diving, large and frequent schools of perch. These schools, too, have now disappeared.

Fish and wildlife officials do not currently have sufficient data to properly evaluate this problem. It is true that cormorant numbers have increased in northern Georgian Bay during the last decade. Cormorants do eat yellow perch and bass, and if these species were locally abundant, they could form the major part of their diet. The Ontario Ministry of Natural Resources and the Michigan Department of Natural Resources, with input from Environment Canada, are now undertaking a major study of the feeding habits of cormorants in Lake Huron in order to shed more light on this question.

There is also concern about the effect of cormorants on the vegetation in their nesting grounds. Cormorants can damage vegetation by stripping leaves from trees. The combined weight of the birds and their nests can even break branches. But perhaps most importantly, their excrement, which rains down to the ground from their nests, kills the ground vegetation and eventually kills the nest tree. In some cases, the loss of these trees can lead to increased erosion. This is of particular concern on sandspits

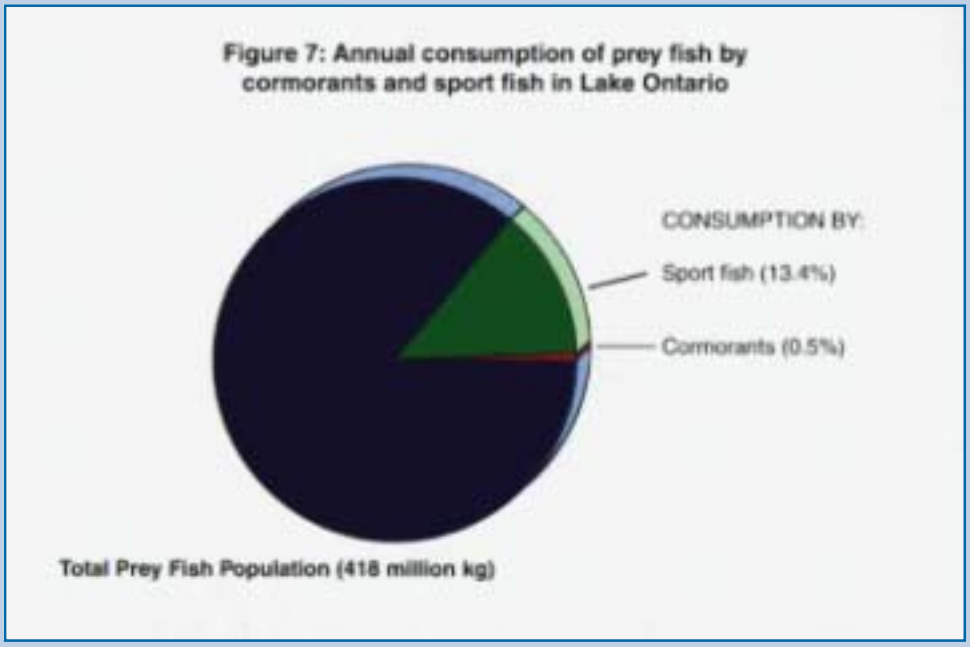
John Mitchell

How Much Fish Do Cormorants Eat? Do They Compete with Sport Fish?

To determine how much fish cormorants eat in a season we have to know how much they eat each day, how long they are present on the Great Lakes and how many cormorants there are in total.

The average cormorant weighs approximately 1.9 kg (4.2 lbs) and will eat about 25% of its weight in fish each day or about 0.48 kg (1.0 lbs). Most adult cormorants reside on the Great Lakes from about mid-April to late August or early September (about 135 days). During that time, one adult cormorant will eat about 65 kg (143 lbs) of fish. Most young cormorants, on Lake Ontario, hatch in late May but do not really start eating their "pound" of fish per day until about mid-June. Most young cormorants remain on the Great Lakes until mid-late September, or for about 100 days. In 1991, for example, over 40,000 cormorants (adults and young) lived on Lake Ontario and consumed about 2.25 million kg (5 million lbs). That sounds like a lot of fish - until you consider how many smaller prey fish and larger sport fish there are in the lake. Fisheries biologists estimated that there are 418 million kg (920 million lbs) of the smaller prey fish in Lake Ontario. Salmon and trout consumed approximately 56 million kg (123 million lbs) of these prey fish. Hence, the sport fish took about 13.4% of the prey fish and the cormorants took 0.5% figure 7(27K gif).

To look at the same question in another light, statistics from the Glenora Fisheries Research Station (Ontario Ministry of Natural Resources) are used. In 1991, for example, there were about 6.1 million sport fish in eastern Lake Ontario. The average annual food consumption by a single Lake Trout is 6.5 kg. The average annual intake of a cormorant on Lake Ontario is 65 kg. In other words one cormorant eats about as much as ten Lake Trout. Approximately 30,000 cormorants fed in eastern Lake Ontario in 1991. Thus, these birds would eat the same amount of fish as 300,000 Lake Trout. Since there are about 6.1 million sport fish in eastern Lake Ontario, this means the cormorants are eating the same amount of fish as only 5% of the sport fish. Hence, scientists and fish managers conclude that the amount of fish which cormorants consume in eastern Lake Ontario is not a serious threat to the sport fish.



Of the total amount of small fish in Lake Ontario, sport fish consume 13.4% will cormorants take less than 1%

and barrier beaches which protect interior wetlands. In other areas, the vegetation may be of unusual natural significance, such as the islands in western Lake Erie which are forested by rare stands of Carolinian woodlands. The large cormorant colonies there could seriously impact or even destroy this vegetation.

These unresolved issues have spawned suggestions that it is time to implement anther control program. However, because the cormorant colonies are so widely distributed, and their numbers so large, it would be difficult to implement an effective large-scale control program using known methods.

The cormorant is a native species in Canada. There is a biological principle that states that the greater the number of different organisms an area can support, i.e. the more diverse the wildlife, the better the area. This is known as biodiversity. The richest areas in the world for biodiversity are the tropics...moist, warm areas the year 'round. The temperate zone areas, where we live and where the Great Lakes are located, are comparatively poor in biodiversity. We have lost many species from the Great Lakes already...the Atlantic Salmon, the Blue Pike, the Passenger Pigeon, the Whooping Crane...we don't need to lose anymore.

Brian Morin

In Conclusion

The return of the cormorant to the Great Lakes has been a tremendous success story. The species almost vanished from the Great Lakes due to the effects of DDE and other toxic chemicals. Through voluntary and legislated controls, levels of this compound and other toxic substances have declined dramatically in the Great Lakes - to a point where the cormorant population can again breed successfully. The cormorant has finally been re-established as an integral component of the Great Lakes ecosystem.

The cormorants' return has been very successful, perhaps even too successful. Some interest groups are voicing concern over cormorant numbers, and the problems they are creating. While biologists have shown that some of these concerns are not well founded, others require further research. However, in recent years, the cormorant population has not grown as rapidly as it once did. In fact, on Lake Ontario, their numbers declined by 6% between 1993 and 1994. This was likely in response to a decrease in the numbers of alewife - a small fish which serves as their main food source.

Finally, changes in reproductive success and the incidence of deformities in Great Lakes waterbirds are two very strong indicators of ecosystem health. Although cormorants are now reproducing at normal levels, the fact that deformities are still occurring suggests that contaminant-related health problems still persist in Great Lakes wildlife. While we have made great headway in cleaning up the Great Lakes, there is still considerable work to be done before we can be assured that the Great Lakes Basin is a healthy environment for all species.

For further reading

Anderson, D.W. and J.J. Hickey. 1972. Eggshell changes in certain North American birds. Proceedings of the 15th International Ornithological Congress. 15: 514-540.

Christie, W.J. 1972. Lake Ontario: Effects of Exploitation, Introductions, and Eutrophication on the Salmonid Community. Journal of the Fisheries Research Board of Canada 29:913-929.

Great Lakes Fishery Commission. 1992. Status of the Lake Ontario offshore pelagic fish community and related ecosystem in 1992. Lake Ontario Committee. Kingston, Ontario, 28-29 July 1992. 33 pp.

Lewis, H.F. 1929. The Natural History of the Double-crested Cormorant (Phalacrocorax auritus Lesson). Ru-Mi-Lou Books, Ottawa.

Ludwig, J.P.1984. Decline, Resurgence and Population Dynamics of Michigan and Great Lakes Double-crested Cormorants. Jack-Pine Warbler 62:91-102.

Price, I.A. and D.V. Weseloh. 1986. Increased Numbers and Productivity of Double-crested Cormorants, Phalacrocorax auritus, on Lake Ontario. Canadian Field-Naturalist 100:474-482.

Weseloh, D.V., S.M. Teeple and M. Gilbertson. 1983. Double-crested Cormorants of the Great Lakes: Egg-laying Parameters, Reproductive Failure, and Contaminant Residues in Eggs, Lake Huron 1972-1973. Canadian Journal of Zoology 61:427-436.

Additional Information:

Additional information on cormorants and monitoring programs for other fish-eating birds and wildlife in the Great Lakes basin may be obtained from the following:

Environmental Conservation Branch
Environment Canada
P.O. Box 5050
Burlington, Ontario
L7R 4A6

Ontario Ministry of Natural Resources
Wildlife Research Section
P.O. Box 5000
Maple, Ontario
L6A 1S9

Information on Great Lakes issues may be obtained from the following address:

Environment Canada
Environmental Conservation Branch
4905 Dufferin St.
Downsview, Ontario.
M3H 5T4

Additional fact sheet in this series:

- ***Contaminants in Herring Gull Eggs from the Great Lakes***
- ***Bringing the Bald Eagle back to Lake Erie***
- ***The Fall and Rise of Osprey Populations in the Great Lakes Basin***

Authors: D.V. Weseloh; Canadian Wildlife Service, Environment Canada and B. Collier (deceased); Long Point Bird Observatory.

Published by Authority of the Minister of Environment

Catalogue No. En 40-222/2-1995E
ISBN 0-662-23280-1

Également disponible en français.

Canada