WHY CHIMNEY SWIFTS ARE IN TROUBLE

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SPECIES AT RISK in Ontario

Introduction

Up until at least the 1950s, Chimney Swifts were a common nesting species across both urban and rural landscapes of southwestern Ontario. For the province, during the 45 years from 1970 to 2015, Chimney Swift populations declined by 94% (Environment Canada, Breeding Bird Survey data). Between 2005 and 2015, the decline was 47%. Two Ontario Breeding Bird Atlases (1981–1985 and 2001–2005) confirmed the downward trend and also identified that the situation was more serious in agricultural landscapes than in urban areas. Today swifts are largely absent from the countryside and are uncommon in urban centres such as London. BBS data place the current annual decline rate at about 6% both provincially and nationally.

The post-war use of DDT is thought to be the most likely trigger that set in motion swift population declines. Chemical pesticides caused changes in the structure of insect communities, obliging swifts to expend more energy to obtain a given amount of nutrition. The swifts' problems have more recently been exacerbated by a number of other factors.

A study of a Kingston, Ontario chimney shed light on the swifts' historic food supply and how it was impacted by DDT. A 2-metre-deep deposit of swift guano and egested insect remains was analysed for the years 1944 to 1992. As DDT levels rose, beetles, initially the mainstay of the swifts' diet, were replaced by true bugs, which more readily develop resistance to pesticides. Because true bugs tend to be small and yield fewer calories per bug than do beetles, more had to be captured. The dietary change was significant because swifts are on tight energy budgets, especially when feeding young.

By the 1960s, when a decline in swift populations was first noticed, a new equilibrium had been established in the insect community, one that was not reversed when DDT was banned in North America in the 1970s. Swift populations had been launched on a downward trajectory, which has continued.

Unfortunately, in the past decade or so, a new class of chemical pesticides known as neonicotinoids has come into widespread use. The increasing use of neonics, combined with ever-expanding monoculture plantings of crops such as corn, wheat and soybeans, are thought by many to be driving more recent decreases in insect populations, including vast numbers of non-target insect species.

Habitat loss and fragmentation by other means are also significant issues to both insects and swifts. See Box 1 for a sampling of essential ecosystem services provided by insects.

Even as swifts carry on with surviving and reproducing on a less-than-optimal diet, the causes of their difficulties are believed to be far more complex than the poisoning of the food supply and habitat loss. The following sections will examine a number of factors that are believed to play a role in swift declines, with an emphasis on issues relating to food supply.

BOX 1

THE IMPORTANCE OF INSECTS IN THE ECOSYSTEM

Since insects are the basis of thousands of food chains, their decline can affect the fate of many other species higher up the chain, including fish, birds, mammals (e.g., bats) and amphibians. While aerial insectivores such as swifts eat insects as both adults and young, many land bird species that are seed-eaters as adults raise their families on insects. It has been calculated that 8,000 caterpillars are needed to raise one nest of chickadees. Up to 12,000 flying insects a day may need to be captured to meet the needs of a nestful of young swifts.

Insects are vital to the creation and support of healthy ecosystems. In addition to being essential food sources for countless species besides swifts, insects provide many other ecosystem services. These include pollination, nutrient cycling, soil aeration and enrichment, keeping populations of pest insects in check, and the processing of dead plant and animal material.

1. Problems with the Swifts' Food Supply (Scarcity of Optimal Species/Groups When Most Needed)

In the absence of long-term monitoring of insect populations, it has been difficult, until recently, to establish that a serious decline in insect abundance is underway. Anecdotal evidence, however, is readily available. Think back 50 years or more: a drive in the countryside on a summer afternoon frequently resulted in a car windshield and grill plastered with insect splatters, many of them large and juicy. Such an event now occurs much more rarely and, when it does, the splats are usually much smaller. A logical interpretation is that densities of insects in the air are considerably less today and that individual insects are considerably smaller than half a century ago.

A number of recent studies have amassed scientific evidence documenting insect loss and how it affects the survival of other species that depend on insects for food. As insect diversity and abundance decline, major disruptions are occurring in food webs and ecosystem functioning. Some 80% of wild plants depend on insects for pollination and 60% of birds depend on insects for food. These figures illustrate the crucial role of this group of invertebrates. For more information on insect declines, see Box 2 for links to several articles, mostly from the popular media.

The studies described in the accounts firmly establish that a decline in insects is real, ongoing and, in many cases, monumental in proportion. Since insects are the only food eaten by swifts and other aerial insectivores, it is not surprising that all aerial insectivores are declining. When flying insects disappear, so do the birds that eat them. A compounding factor is that some bird species require particular insect prey for adequate nutrition.

Reasons for insect declines mainly fall into two broad categories: widespread use of pesticides that kill insects, and loss of habitat that supports insects (via the elimination of the food plants and/or habitats needed by insect larval stages).

1.1. Widespread Use of Insecticides (and other Pesticides)

While only a relatively few species of pest insects are the actual targets of most pesticides, countless other insect species, many of them native, die as well and become part of the collateral damage. Some authors refer to what is currently going on as a widespread poisoning of the landscape. See the next page for some of the ways chemical pesticides are having a negative effect on native insects as well as on biodiversity and the health of the entire landscape.

BOX 2

SELECTED ARTICLES RELATED TO INSECT DECLINES

Bug Diet of Birds Has Dramatically Declined in Quality, Researchers Find
Mar 14, 2018 [Whip-poor-wills from Ont museums show modern W-P-Ws eat smaller, less nutritious insects that 100 years ago.]
http://www.cbc.ca/news/canada/new-brunswick/whip-poor-will-study-aerial-insectovores-1.4575617

'Catastrophe' as France's Bird Population Collapses Due to Pesticides
March 21, 2018 [Farm country bird numbers fell 1/3 in 15 years due to pesticides killing insects on which they feed.]
https://www.theguardian.com/world/2018/mar/21/catastrophe-as-frances-bird-population-collapses-due-to-pesticides?CMP=share_btn_tw

Insect Decimation Upstages Global Warming
Mar 27, 2018, Counterpunch [Massive loss of insects related to 3 generations of industrialized farming and the vast tide of poisons.]
https://www.counterpunch.org/2018/03/27/insect-decimation-upstages-global-warming/

What's Causing the Sharp Decline in Insects and Why it Matters
July 6, 2016, Yale Environment 360 [Chief causes: ubiquitous pesticides, spread of monoculture crops, urbanization, habitat loss.]
http://e360.yale.edu/feature/insect_numbers_declining_why_it_matters/3012/

More than 75 Percent Decline over 27 Years in Total Flying Insect Biomass in Protected Areas
Oct 18, 2017 [In Germany there is a massive decline in insects in protected areas that are surrounded by farm fields.]
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809

The Silence of the Bugs
May 26, 2018, New York Times [Pesticides are the likely culprit and humanity is also at risk.]
www.nytimes.com/2018/05/26/opinion/sunday/insects-bugs-naturalists-scientists.html

Hyperalarming Insect Loss in Puerto Rico
Oct 15, 2018, Washington Post [Climate change is likely cause of insect crash in pristine forest.]
https://www.washingtonpost.com/science/2018/10/15/hyperalarming-study-shows-massive-insect-loss/?utm_term=.46a84a0fced5

Global Insect Decline May See 'Plague of Pests'
Feb 11, 2019, BBC News, Science & Environment [40% of insect species undergoing "dramatic rates of decline" around the world]
https://www.bbc.com/news/science-environment-47198576

- ♦ After World War II, the proliferation of DDT plus the many other insecticides that followed in its wake marked the launch of all-out war on the insect world, unleashing an arsenal of lethal tools such as had never been previously seen. Whole groups of insects have been knocked back, affecting many other organisms, including bats and birds, by decimating their food supplies and disrupting the food chains of which they are a part.
- ♦ Most insecticides are used with the intent of controlling insect pests on farm crops but their effects usually do not stop there. While often only a few insect species are the actual targets of pesticide applications, many, many more non-target insect species are taken out along the way.
- ♦ When intensive use of pesticides is combined with vast tracts of monocultures, the impact on insects and all forms of wildlife can be particularly deadly.
- ♦ Heavy use of nitrogen fertilizer favors a few crop plants but creates incompatible conditions for the majority of other plants and their associated native insects.
- ♦ Herbicides and other pesticides intended to reduce competition for crops or to suppress unwanted species may eliminate plants that native insects depend on for food.
- ♦ In recent decades, neonicotinoids and other pesticides kill insects throughout the lifetime of a plant. These agents have a negative effect on many species of native insects that are integral parts of food webs and provide services such as pollination.
- ♦ Chemical pesticides are widely used in the forestry industry, directly killing insects as well as the plants on which they feed.
- ♦ The legislated ban on the cosmetic use of pesticides has been a positive for native insects, but a considerable amount of pesticide for cosmetic purposes is still used in urban centres and in farm country (e.g., lawns, gardens, horticultural and landscaping businesses).
- ♦ Placing pesticides in catch basins and treating vernal ponds by public health officials to combat the spread of West Nile virus reduces the number of insects available to salamanders and birds, even when such applications are not chemically based.
- ♦ Blanket or spot spraying of pesticides to improve recreational experiences by reducing the presence of biting insects (e.g., black flies and mosquitoes) reduces food for native birds and other wildlife. "Natural" insecticides and zappers achieve the same effect.

1.2. Loss and Degradation of Insect-producing Habitat

Like all living things, native insects need adequate quantities of healthy habitat in order to thrive. Here are some practices and factors that have been steadily decreasing the amount and quality of habitat available to insects, the plants they feed on, and other wildlife:

- ♦ Expanding urbanization and road construction.
- ♦ Fragmentation of natural habitat leading to reduced quality of the remaining habitat.
- ♦ Agricultural intensification – more crop production achieved per acre.
- ♦ Shrinking of woodlands due to timber harvesting and clearance.
- ♦ Drainage of wetlands (including swamp forests, vernal ponds and low-lying fields), altering habitat where insects could live and reproduce.
- ♦ Decrease in health of many remaining swamp forests and other rural woodlands through the lowering of the water table by tile drainage in nearby agricultural lands.
- ♦ Expansion of agricultural land under tile drainage to enlarge acreage under cropland and to increase production on existing farmland, in part driven by incentives for farmers to grow more corn to produce ethanol to feed cars.
- ♦ Land management practices that reduce the health of watercourses where many insects begin life as aquatic larvae.
- ♦ Abandonment of practice of allowing fields to periodically lie fallow.

Installation of tile drainage on a farm field adjacent to a woodland.

- ♦ Elimination of hedgerows and fence lines.
- ♦ Expansion of areas under mono-crops as farm fields increase in size.
- ♦ Increase in use of chemical fertilizers on tilled land.
- ♦ Expanded mowing of ditches and roadside verges.
- ♦ Decrease in meadow and pastureland.
- ♦ Expansion of industrial agriculture with livestock restricted to small hubs.
- ♦ Increase in monocultures of crop plants with integrated pesticide treatments.
- ♦ Growth in acreage devoted to row crops.
- ♦ Pollution of waterways due to runoff (e.g., manure, fertilizer, pharmaceuticals, sewage, road salt, heavy metals, vehicle residues; these negatively affect wetland and stream health and aquatic insects).
- ♦ Proliferation of non-native trees, shrubs and wildflowers, which support few insects and take up space that could be more productively used by native host plants that provide food for native insects.
- ♦ Existence of recreational facilities such as golf courses that cultivate many acres of non-native grasses, thereby removing that acreage from the production of plants that feed insects.
- ♦ Maintenance by many urban and rural property owners of lawns and mega-lawns consisting of non-native grasses that do little or nothing to support native insects; such areas, if planted (or partly planted) in native plants or trees could help support native insects.

1.3. Changes in Timing of Peak Insect Abundance

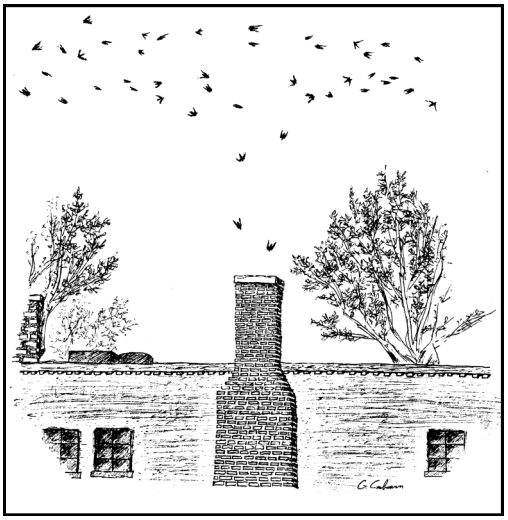
- ♦ With earlier springs becoming more routine, the timing of peak abundance of insects may have shifted and be out of synch with the time when nestlings need maximum food availability.

1.4. Less-than-optimal Diet Provided by Available Insect Species

- ♦ Compared to the insects favoured by swifts in the early 1950s, insect species now available are smaller and less abundant, causing swifts to expend more energy to obtain fewer calories. Some insect species that provide crucial nutrients may also be in short supply.

2. Stressors Related to Nesting and Roosting Sites

- ♦ With the virtual elimination of old-growth forests, few large-diameter hollow trees (traditionally used for nesting and roosting by swifts) are now available to swifts.
- ♦ Few unlined brick chimneys of the kind favoured by swifts have been constructed since the 1960s. Those that remain are gradually deteriorating or disappearing. In London, 60 of 180 swift chimneys identified in 2003 or later had been capped or demolished by 2020.
- ♦ Although work is ongoing, prototypes for artificial chimney towers that are acceptable to Ontario swifts are still under development and one costs many tens of thousands of dollars.
- ♦ Although a shortage of chimneys suitable for swift use seems not to be a limiting factor in London at present, the problem is expected to worsen as older chimneys continue to disappear.
- ♦ Swifts mate for life and return to the same chimney annually; if loss of their home chimney occurs during the nesting season, no young will survive that year.
- ♦ Some chimneys that would otherwise be suitable for swift occupancy may be appropriated by subsidized and abundant species of urban wildlife such as squirrels, raccoons or starlings, which may prey on or harass swifts or take over their chimney.
- ♦ Some conservation organizations advocate that all unused chimneys be capped in order to prevent wildlife from entering and becoming trapped; while well intentioned, such a practice reduces opportunities for swifts to access suitable nesting or roosting chimneys.



Many old brick chimneys used by swifts are being lost to capping or demolition.

3. Increases in Fluctuating and Extreme Weather

- ♦ Unduly cold or wet weather in the spring after swifts have returned, if of sufficient duration, can suppress insect availability and possibly decrease the fitness level of adult swifts as they prepare to nest.

- ♦ Inclement weather in the spring may delay nesting, making young less fit for departure at the time of fall migration.
- ♦ Heavy rains can wash flying insects from the air and disrupt feeding.
- ♦ Torrential downpours during the nesting season can wash away nests.
- ♦ Changing climate patterns can result in mismatched timing of peak abundance of insects on which swifts depend to feed their young.
- ♦ Unduly hot dry weather can significantly suppress the production of flying insects and negatively affect nestling fitness.
- ♦ Hurricanes while swifts are migrating can cause significant mortality.

4. Stressors during Migration or while Overwintering

Little or no research has been carried out on swifts during the seasons when they are away from their breeding range in southern Canada and the eastern United States. Many areas of Central and South America through which swifts migrate or where they spend the winter are experiencing rapid ecosystem changes. Some of the problem situations swifts may encounter during the off-season are

- ♦ Logging, which may eliminate roost trees and reduce quality of foraging habitat.
- ♦ Land clearance, which removes the vegetation that supports insects.
- ♦ Fires, which greatly alter the landscape and its ability to produce food for swifts.
- ♦ Wetland drainage, which degrades or eliminates habitat for many insect species that might become food for swifts.
- ♦ Traditional practices of hunting swifts for use as food by humans.
- ♦ Use of chemical pesticides banned in North America; in addition to reducing the swifts' food supply, some of these pesticides may have negative physiological effects on swifts.
- ♦ Rapidly expanding human populations, which result in expansion of road systems, urban centres and agricultural operations at the expense of natural habitat.

5. Other Stressors

- ♦ Especially during fall migration, Merlin may hunt swifts as they reduce speed to drop into roosts for the night. Merlin are also known to pursue adult swifts tending nests and young swifts just learning to fly.
- ♦ Sharp-shinned Hawks and Herring Gulls are known to sometimes hunt swifts at or near roosts.
- ♦ Swifts seem to like to nest in a cluster of nearby occupied swift chimneys (one family per chimney), which allows them to forage and socialize as a group. As swift populations decline, it is possible an area may be abandoned if the presence of neighbouring swifts falls below a desired level.
- ♦ If chimney cleaning or other maintenance is done when swifts are in residence, the nest may be lost.
- ♦ Creosote accumulating in an uncleaned chimney increases the possibility a swift nest becomes detached.
- ♦ Home owners, annoyed by the food-begging calls of nestling swifts, have been known to stick broom handles or poles up chimneys to knock down swift nests. Sometimes the youngsters from such nests are taken to wildlife rehab centres, but many times that may not be the case.
- ♦ Collisions with motor vehicles kill billions of insects each year in North America, removing them from the pool of food available to swifts.
- ♦ Although designated a Threatened species both provincially and nationally, Chimney Swifts receive very little protection from species-at-risk legislation. Federal legislation applies only to federal properties and is not always enforced. Provincially, government policy results in little or no protection for swift habitat, whether used for nesting and roosting or for food production. The primary de facto protection for the Chimney Swift is the same as for a common species such as the American Robin.
- ♦ South of the United States, swifts have no legal protection in the countries through which they migrate and where they spend the winter.

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