Population Trends in invertebrate and plant populations

Little by little, almost imperceptibly, the natural world is becoming a less diverse and interesting place – even here in the Kawarthas. Ironically, if the losses were happening faster, we might be able to respond more effectively to their many causes. But, for most people, species loss is not even on the radar. And how can we blame them. We are reminded almost minute-by-minute about how the various measures of economic "well-being" are doing – the Toronto Stock Exchange, the price of oil, the value of the Loonie - but only sporadically how the biosphere – which supports all life and is the source of so much beauty and wonder – is faring. Even in-depth weather reports like those presented on the Weather Network almost never mention the biggest threat of all - climate change - in a repeated, constant fashion, backed up by examples of how much warmer a given season or year was as compared to the long-term average and how plant and animal populations are potentially being affected. We are therefore left with the impression that all is basically well.

In my past two columns, I described the disturbing declines in nearly all of our turtle species, many of our snakes, and several of our fishes. I also discussed the huge threat of white nose syndrome to bats and the worrisome decline in two groups of birds, namely aerial foragers (species that feed on the wing) and those that depend on grassland habitat. It was reassuring to report, however, that amphibian and mammal (other than bats) populations appear healthy – at least for now. This week I'd like to turn my attention to our invertebrates and plants.

With the possible exception of the monarch butterfly, insects and other invertebrates are rarely mentioned when it comes to species loss. For many of us, they really don't even exist, since the vast majority of invertebrate species require a special effort to see and appreciate. However, for anyone who has taken time to study them - especially groups like butterflies, moths, dragonflies and beetles - they are every bit as beautiful and interesting as any other part of the natural world. In fact, the insights Charles Darwin gained from his study of barnacles, a marine invertebrate, were pivotal in the development of his theory of evolution. You might be surprised to know that the invertebrates that seem to be experiencing the greatest decline in Ontario are actually cousins of the barnacle, namely fellow crustaceans known as freshwater mussels.

Freshwater mussels live on the bottom of streams, rivers, lakes, and ponds throughout the Kawarthas. These long-lived organisms feed by drawing in water through their inhalent siphon and passing it across their gills to filter out small food particles such as deitrus. In this way, they are natural water purifiers. Mussels are also an important food source for river otters, mink, raccoons, and especially muskrats. Their life cycle, too, is fascinating. During spawning, males release sperm into the water. Females living downstream take in the sperm through their siphons. The sperm then fertilizes eggs which have passed from the female's ovaries to her gills. The embryos remain in the gills until they reach the larval stage. When

conditions are right, the female releases the larvae into the water where they must attach quickly to the gills or fins of the appropriate host fish. Some mussel species have even evolved specialized internal structures to attract their host fish. Female rainbow mussels have a spectacular “lure” that looks like a crawling crayfish. Another species has a flap that takes the form of a minnow with an eyespot and all! Once successfully attached, the larval mussels become parasitic on the fish and derive nourishment from its body fluids. During this time, they transform into juvenile mussels and eventually fall to the lake or river bottom where they live as independent adults.

No less than 28 of Ontario’s 41 native mussel species are showing signs of decline. Some of the main threats include habitat loss and degradation, climate change, and aquatic invasive species such as zebra mussels. Native mussels have been found with so many zebra mussels attached to them that they are unable to open their shell to eat. Native mussels have already been nearly eliminated from much of Trent-Severn, Rideau and St. Lawrence rivers. The fawnsfoot mussel and the eastern pondmussel are both designated as endangered in Ontario, while the rainbow mussel is considered to be threatened. The latter two species have a range that includes parts of Peterborough County. At least for now, some species of native mussels are still quite common in central Ontario. These include the wonderfully-named creek heelsplitter and the fatmucket. The latter is often abundant in lakes. Mussels can be identified to the species level based on external and internal features of the shell. Empty shells are easier to identify than live animals because you can see the inside. The shells can often be found along lake and river shorelines. The Photo Field Guide to the Freshwater Mussels of Ontario is an excellent resource for anyone interested in this fascinating group of invertebrates.

Several insects have also been designated as species at risk in Ontario. The rapids clubtail, a species of dragonfly, is listed by the Ministry of Natural Resources as endangered while the West Virginia white and the monarch butterflies are both designated as species of special concern. The primary threat to the rapids clubtail is the degradation of river habitats such as activities that alter the quantity and quality of the water. Such degradation has already resulted in the apparent demise of this dragonfly from the Credit River, one of only four rivers in eastern and southern Ontario where it has been found.

The decline of the monarch butterfly is due to factors on both the wintering grounds in Mexico (e.g., illegal logging) and on the summering grounds in North America. The planting of HT (herbicide tolerant) engineered corn and soy, followed by the use of the herbicide glyphosate to control weeds, has meant that milkweed has been almost completely eliminated from fields where these crops grow. Before the introduction of HT crops, milkweed would persist in the fields and provide an excellent resource for monarchs since this is the only plant on which they lay their eggs. According to Chip Taylor at monarchwatch.org, the total area covered by HT crops is now larger than that of any state except Texas and Alaska.

Every December, when fall migration is over and the monarchs have arrived in their Mexican winter colonies, scientists measure the surface area each butterfly colony covers. In this way, they arrive at an estimation of the size of the overwintering population. A monarch colony contains 10-50 million butterflies in one hectare of forest. This year, according to Taylor, the prediction is for the lowest overwintering population ever. Summer reproduction levels were already low in many areas of North America, including Ontario. Now, southbound migrants are having to navigate "a 1000 miles of hell – a nearly flowerless/nectarless and waterless expanse of central Kansas, Oklahoma, Texas and northeastern Mexico" which was stricken by drought this summer. Most observers are linking the drought to the influence of La Nina. However, according to climate scientist Richard Seager of Columbia University's Lamont Doherty Earth Observatory, climate change is also part of the picture. When natural variability (e.g., la Nina) is superimposed on the on-going "background drying" caused by global warming, the effects can be disastrous. The drought means that even those monarchs that do survive the migration will arrive on the wintering grounds in relatively poor shape and have a reduced reproductive capacity next spring when females start heading north, laying eggs as they go.

When it comes to the health of plant populations, the main concern right now is with several tree species. Butternut, a medium-sized tree of the walnut family, has joined the ranks of the American chestnut and American elm as a species devastated by an exotic fungal disease. It has been classified as endangered both provincially and nationally and is protected by Ontario's Endangered Species Act The threat comes from Butternut Canker, a fungal disease that is thought to have arrived in North America in infected plant material imported from overseas. Most trees in the Kawarthas are already infected and countless numbers have died. The fungus makes sunken cankers – deep grooves in the bark that often ooze a black jelly-like material containing the spores of the fungus - which expand and girdle the branch or trunk, killing everything above the canker. There is no known cure for infected trees. However, studies are underway across the range of the butternut to try to locate disease-resistant trees.

As many readers are probably well aware, an invasive species is also threatening ash trees. Emerald ash borer (*Agrilus planipennis*), a type of beetle, has now spread from southwestern Ontario to Toronto and Ottawa. Encroaching upon us from nearly all directions, it will probably only be a matter of time before the insect finds its way to the Kawarthas and to potentially devastate local ash tree populations. Traps to identify the beetle's presence here have been set in ash trees throughout the area, but I'm not aware of any beetles that have yet been caught. Adult borer beetles are metallic green, slender, and only measure from about 9 to 14 mm in length. In the caterpillar-like larval form, the borer feeds in an S-shaped pattern just under the bark of ash trees. This disrupts the tree's transportation of water and nutrients and will effectively kill the tree within two or three years. Top branches usually die off first. After overwintering in the tree, the larvae transform into adult beetles and chew their way out of the

tree through D-shaped exit holes. All native ash species and sizes of tree are susceptible to invasion.

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