

Galling



Downy Woodpecker Goldenrod Gall

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The first days of autumn send many birds south. For those who remain—what birders politely refer to as ‘our winter residents’—life becomes a daily challenge to find enough energy-rich food to carry them through the chilly days of winter. The fleshy sweet berries are long gone; so come the fall, it’s time to grub for grubs or whatever is available.

What, I wonder, was going through the mind of the first downy woodpecker that bothered to

check out a swelling on the stem of a common fall wildflower called goldenrod? The sprays of bright yellow flowers are certainly an attraction to our species, and, at least to me, signify the tail end of summer. But to a downy woodpecker, the chickadees, and several other intrepid winter residents, what was the cue? Did they hear an insect larva wiggling inside the swelling? Whatever the signal, downy woodpeckers have known ever since that fall means it is time to start hunting for such larvae of the goldenrod gall fly.

The back story of that instinct begins with an adult female fly, *Eurosta solidaginis* (*Solidago* being the genus of goldenrods), that lays her eggs on a stem of the plant. About a week after hatching, the larva starts to feed on the plant tissues, migrating to a preferred spot at the base of the goldenrod bud. The larva’s irritation of the surrounding tissue induces the goldenrod to create a gall. A gall is a growth on a plant, kind of like a benign tumor. Gall creation is under the metabolic control of the invading, egg-laying adult or the larvae that secretes chemicals to enact a takeover of surrounding plant tissue.

The gall can harden, and starches form in the gall to nourish the larvae. This new winter home for the larvae provides a steady food source and a winter retreat from the elements. But — and here is the interesting part that piqued the interest of animal physiologists — the goldenrod gall offers shelter from rain and wind but it’s a refuge with no insulation. In other words, the grubs could still freeze their larval tootsies off when the temperature drops below 32° F.

Enter evolution by natural selection: when the temperature plummets and the plant tissues around its bunker start to wither, the larva starts synthesizing molecules like sorbitol and glycerol that act as a kind of larval anti-freeze, enabling it to survive the cold, and thus, overwinter. Similar adaptations, though using other anti-freeze chemical compounds, occur in species as different from gall fly larvae as Greenland sharks, Antarctic fishes, and wood frogs. When temperatures warm in the spring, the larva molts into an adult, leaves its winter bivouac, and joins the world anew.

That is, if over the winter the gall hunters don’t find them first. The woodpeckers land on the goldenrod stems and peck the galls apart to yank out the tasty grubs. Other predators, such as parasitic wasps, bore into the plants in late summer or early fall to attack the larvae either before the larva stimulates the goldenrod to form a gall or after it has hardened. Here is where the wonder of natural selection enters yet again: survival of the larvae is greatest among the galls in the mid-sized range. Galls that are particularly small and with thin walls fall victim to wasp attacks. The largest galls, on the other hand, attract bird predators that perhaps equate large galls with king-size grubs. This is when evolution resembles Kipling’s “Just-So” stories, too fantastical to invent.

Goldenrods are a diverse genus in our local flora with almost 30 species having been recorded for the D.C. area. But for some reason the gall fly targets only three species, including Canadian or tall goldenrod, ubiquitous in our area. Perhaps the three species, some of the most robust in the genus, offer the sturdiest stems to use for gall-making. Why they don’t make use of all the goldenrods is a mystery, but one of the many unanswered questions about

the interaction between gall fly, goldenrod, and the gall fly's predators that make it the subject of many field studies in ecology and evolutionary biology.

That remains an intellectual pursuit conducted by human observers. For the active downy woodpeckers, it is a time for catch as catch can, when natural selection places its thumb on the scales of winter survival to favor the most resourceful. — 