

Massachusetts butterflies advance

A recent article in *Biological Conservation* (Polgar et al. 2013) uses reports of first sightings of several species in the Lycaenidae butterfly family to examine whether these species are showing any response to the warming temperatures New England has seen in the past century. The team used citizen science data from 1986-2009, as well as museum records covering the years 1893-1985.

There are many points of interest in this study. The most obvious is that the 10 species (in groups called elfins and hairstreaks) do in fact show clear evidence that the rising temperatures are related to earlier and earlier appearance of these insects. For each degree C of warming, the species appeared from one to 5 days earlier (depending on the species).

But the story has interesting complications. First, people tend to be on the lookout for signs of insect activity more intensively during the early part of the season, so the researchers found that the most complete data over time are available for about the first 20% of the "emergence season." People who are tracking the behavior of some species of plant, insect, bird, or amphibian, should bear this in mind, and try to continue their data collection throughout the period of the phenological phase they are observing.

Second, the data for about half of the study species show some variation in New England depending on the location. For example, the paper notes that elfins, which appear earlier, tend to emerge later in inland Massachusetts than along the coast — probably because the cold lasts longer away from the seacoast. By contrast, the hairstreaks, coming later, encounter inland temps that have warmed faster than the coast, and they emerge sooner inland. This kind of variation according to small-scale geography is turning out to be a very interesting area of research, in the effort to understand the impacts of climate change on animals and plants (and we will soon report on some other recent work in that line).

Finally, the paper is interesting because by now, there has been a fair amount of research on the phenology of several groups of organisms in New England — plants, birds, bees, and some butterflies (We described an earlier paper on butterflies on this site last September: "Massachusetts butterflies weigh in"). All the organisms that are most responsive to local conditions — insects, plants, and some but not all bird species— are telling essentially the same story, but in each case, the biology and biogeography of these organisms introduces interesting variations and puzzles, whose answers remain to be worked out or confirmed.