Global Warming:

The Impact on Insects

Ashish Meloottu
What Does Global Warming Do Again?

This is a global increase of roughly two degrees Celsius on the landmasses.
This IPCC image is the basis of my studies, and the image you have to remember throughout the presentation. Look at where all the dark red is: over land. The landmasses will see an approximate overall warming of about 2-3 degrees Celsius.

What we’re going to see are the effects this warming will have on insects worldwide.
Insects in the Tropics

“In the tropics many species appear to be living at or near their thermal optimum, a temperature that lets them thrive... But once temperature gets above the thermal optimum, fitness levels most likely decline quickly and there may not be much they can do about it.”

-Joshua Tewksbury, University of Washington

Tropical insects are already adapted to their current climates, and any changes to it could prove harmful.

Not only would this harm this insects, but the plants they pollinate and the animals they feed.

Intrinsic rates of population growth are expected to decrease by up to 20%:

**Overall Population Fitness Decreases**

-Deutsch et al 2008
Since tropical species usually experience a constant temperature throughout the year, they can’t easily adapt to a warmer climate, resulting in the extinction of several species.

Not only is this bad for the insect, but it upsets the entire tropical ecosystem; extinct insects won’t be able to pollinate the plants, resulting in a lack of food for creature who feed on the insects and the plants. (Deutsch et al 2008)

Unfortunately, insects are some of the most numerous species on the planet. And the tropics are some of the most biologically diverse places on the planet... (Deutsch et al 2008)

Population growth rates for tropical insects are expected to decrease by ~20%:

Their fitness rate will decrease! (Deutsch et al 2008)

See this guy don’t you care about him it’s so cute
Bugs in Temperate Climates (like Washington)

They can adjust to temperatures, but now:

- Winters are warmer
- Spring comes sooner
- Summer lasts longer
- They have higher reproductive rates

Overall Population Fitness Increases

And...
Unfortunately for us here in Seattle, their temperate counterparts have a pretty good time. Insects in temperate climates can not only adjust to warming temperatures (Bale et al 2002), but:

Since winters are warmer, they won’t all die out like they do now. (Bale et al 2002)

Since spring starts earlier, their children will come back for revenge even earlier. (Bale et al 2002)

Since summer lasts longer, we’ll have fend off the attack for a month or so longer than we do now.

Since many insects can reproduce better in warmer climates, their reproduction rates will increase. With all of this, global warming can be expected to increase the fitness of temperate insects. (Deutsch et al 2008)

And...
Other Insects Would Migrate

“Models based on the paleoecological record predict that animals in temperate regions will respond to global warming by migrating poleward to remain within their temperature tolerance ranges.”

-Thomas P. Rooney, 1996

Camille Parmesan, University of Texas at Austin: “Sooty Copper” butterfly, whose northern range ended in Austria, can now be found in Estonia.
Because of the warmer climates, many species, not just insects, would migrate northward to find a climate similar to their old one (Rooney et al 1996).

(Read quote)

Camille Parmesan, from the University of Texas at Austin, did a study on thousands of species’ migrations over the course of several decades. Most striking was the pattern of the Sooty Copper butterfly, whose northern range ended in Austria. At the end of the study, it could be found in Estonia, where it had never been seen before (Esterbrook 2003).

So, because of global warming, some species of insects would adapt by migrating. However, not all of them will have such an easy time...
Problems with Migration

Some species have long maturation periods – the climate will warm the eggs so that they hatch before mature.

Some migrating insects will find that they must compete with other native insects for food.

There may also be new predators...

Or even new types of diseases! (think: Europeans and Native Americans)

Inability to adapt could lead to extinction... or, just a sharp drop in total population.
Some species have problems with the migration itself. If there are too many days above the average temperature, they eggs will hatch before the insects are fully mature, only to be killed off in the Autumn frost. Thus, they cannot move around easily (Rooney et al 1996).

Of course, there are also insects that won’t have to move as much, and when they migrating bugs arrive, they will have to compete with them for food and other resources (Cannon 2004).

Similarly, they may also find new predators that they have to deal with – and will be unable to, because they haven’t fully adapted to the region (Cannon 2004). Can you imagine moving somewhere where you have to fend off these things? (bird lovers be warned)

Not only predators, but exposure to new forms of disease may inhibit the effectiveness of their migration (Cannon 2004), kind of like how the Native Americans didn’t have immune systems that could resist the European diseases, so many of them died.

Inability to adapt to these changes could severely impede the species’ migration, but like the Native Americans, not all of them died.
What can we DO???

Mitigation:
- Raise more bugs
- Buy more bugspray
- Just stop global warming in general.

Adaptation:
- Move to Canada.
What can we do to stop this terror? Well, we could try breeding more tropical bugs. That would work for a little bit, allow the tropical ecosystem to survive a bit longer. We could use more bugspray to try and keep temperate insects away from us. Then again, that would probably just hurt the migrating bugs even more. Or, we could just reduce our CO$_2$ emissions and take other necessary steps to prevent global warming so the overall effect wouldn’t be so bad and we wouldn’t have to deal with the bugs.

If we don’t feel like doing that, and just want to adapt, we could all move to Canada.

Image: freakingnews.com
I made up everything else