

**Fig. 1. Monthly global surface temperature anomaly (°C) relative to 1880-1920 mean.**

## March Temperature Update & Butterfly Report

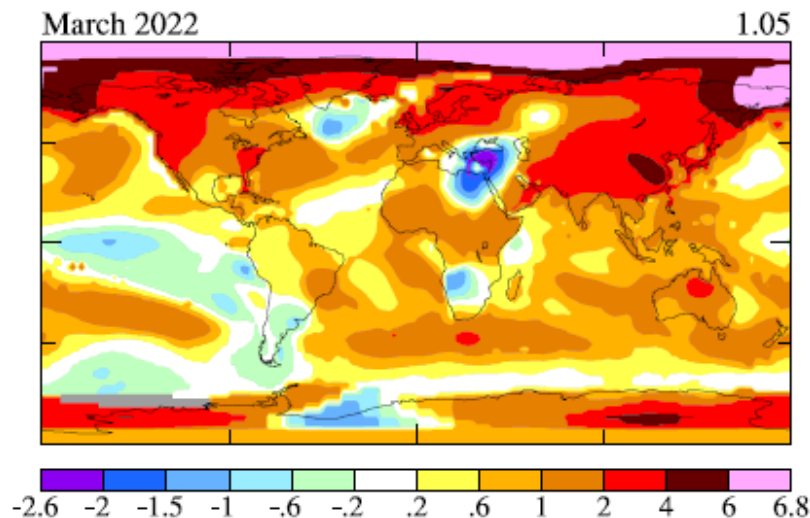
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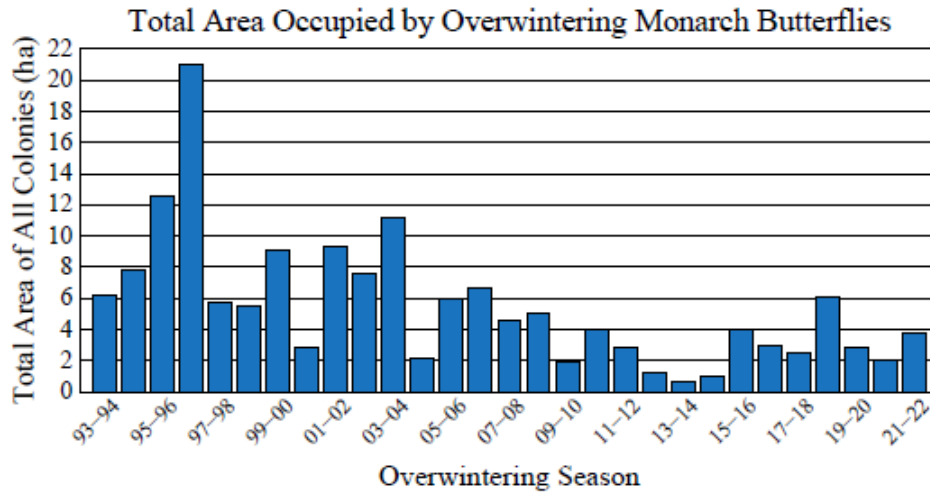
March was notably warm (Fig. 1), more than 1.3°C warmer than the average March in 1880-1920, despite continued La Nina cooling of the Pacific. Because of the present planetary energy imbalance – discussed in prior posts – we expect 2022 to be substantially warmer than 2021. The imbalance is due to surging growth rates of GHGs (greenhouse gases), solar irradiance rising from its recent minimum, and perhaps the aerosol forcing becoming less negative, although the latter remains speculative given the absence of measurements of the global aerosol forcing.

The imbalance – excess energy coming in – is not enough to push the 2022 annual temperature above the 2020 record, but it will soon do that. Meanwhile, models forecasting the tropics favor continuation of the La Nina this summer, which favors strong tropical storms.

Note that monthly temperature anomalies on land now commonly exceed +2°C (+3.6°F), with the Arctic anomaly often exceeding +5°C (+9°F) -- see the map (Fig. 2).



**Fig. 2. March surface temperature anomaly relative to 1951-1980 mean.**



**Fig. 3. Measure of monarch population.**

Let's cheer thing up with some good news. The population of monarchs overwintering in Mexico doubled this past winter to 4 hectares (1 ha = 2.5 acres of fir trees densely covered amounts to about 20 million butterflies), which is about 80 million monarchs. There are large weather-dependent interannual variations in the population, but for the past decade it seems to have at least stabilized, probably thanks to the efforts of all the people who have worked to maintain the milkweed food source for the monarchs and the natural efforts of the species – epitomized by the [broken-wing female](#) who flitted about our yard for several weeks in 2011.<sup>1</sup>

As for other species, some of the frogs are doing fine – [Jeremiah](#)<sup>2</sup> or his offspring are croaking happily after overwintering in the culvert under the road. Another species (humans), as noted in that report, suffered a setback when Jim Depeso was fitted with concrete shoes. Republicans for Environmental Protection sank with him, and during the subsequent decade the fossil fuel industry has been able to bribe enough politicians to avert the one (cost-free) policy (carbon fee & dividend) that could rapidly phase down fossil fuel use, despite heroic efforts of Citizens Climate Lobby.

JEH claims that he will have enough information on what the Biden administration is and is not doing that he will finish *Sophie's Planet* later this year – after we finish an overdue research paper.



**Fig. 4. Broken-wing female monarch on butterfly bush in summer 2011.**

<sup>1</sup> Hansen, J.: [It's a Hard-Knock Butterfly's Life](#), communication 28 September 2011.

<sup>2</sup> Hansen, J.: [Butterfly Report + Jeremiah, the Frog](#), 1 November 2012.