**Mass extinctions linked to climate change are already underway.**

<http://www.environmentalhealthnews.org/ehs/newscience/2011/08/2011-0829-climate-change-extinctions/>

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New evidence confirms what scientists have long suspected: that climate change is already having major effects on many of the world's species.

Researchers report for the first time that the documented species responses – migration to a higher or cooler climate or changes in population – suggest actual extinction risks linked to climate change are almost double those that were predicted. Just as grim are future outlooks – almost one-third of species will be threatened by 2100.

Temperature, ocean acidity and other climate-related changes can set the stage for widespread extinctions by adding even more pressure to ecosystems already stressed by habitat loss, pollution, disease and other human-related impacts.

**Context**

We are currently witnessing a mass extinction event, the sixth of such thought to have occurred in the Earth’s history. Mass extinctions were responsible for the demise of marine organisms more than 400 million years ago and the fall of the dinosaurs about 65 million years ago – an event which led to the ascent of modern-day mammals.

The causes of these historical extinctions can only be guessed at based on geological records. But, the result then – as now – is a sharp reduction in global diversity of plant and animal species.

The current round of mass extinctions may be triggered by a combination of human-related environmental and ecosystem impacts, experts contend. In general, habitat loss, over harvesting, pollution and invasive species can combine with disease, parasites and other health problems to contribute to decreasing populations.

In addition, climate change is surfacing as a main threat to global biodiversity. The added stress of climate-related changes in temperature, rainfall, sea level or ocean chemistry put many plant and animal species at more risk. Especially hard hit are species that are not able to migrate to areas better suited to their needs.

While there is much debate on the cause of climate change, most scientists agree that the earth’s climate is changing at an accelerated pace. Ecologists have attempted to predict how temperature, ocean acidity or other climate-related changes might affect populations of different species or possibly cause extinctions.

Typically, scientists rely on models to predict the types and rates of extinctions. A new, growing body of studies now documents actual impacts and responses in a variety of species. These new studies make it possible to compare the theoretical with actual, observed responses.

No one knows for sure how many species live on Earth. More than one and a half million species are identified but tens – if not hundreds – of millions of species are estimated to live on the globe.

Biodiversity - the number of plants and animals in the world and their genetic variety – is important for a number of reasons. An organism-rich world provides direct benefits to humans. Many known and many yet-to-be-discovered resources can lead to the development of needed food, energy and medicines. Biodiversity also protects vital ecosystems that contribute to clean water and air against environmental damage from pollution and extreme weather.

**What did they do?**

The scientists compared predictions of species extinction risks to documented observations to determine whether recent climate changes have contributed to the risk of a species going extinct. The scientists took advantage of the recent spate of studies on individual species from all over the world. They included all major groups of plants, animals and other organisms from terrestrial and marine environments.

The researchers collected data from published studies that either measured – 130 studies – or predicted – 188 studies – a variety of species responses specifically due to recent climate change. These responses can lead to extinctions. A species can go extinct in a number of ways, so the scientists included different types of responses, including changes in population size or a species geographic range. Also included were different types of climate impacts, including changes in temperature or sea level.

Extinction risk was estimated from observations gathered from different studies. The scientists used a set of criteria established by the International Union for Conservation of Nature (IUCN) Red List to categorize each of the 305 identified organism groups according to its risk of extinction. The criteria allowed them to express observed ecological responses (such as a decrease in population size) in terms of extinction risk.

The scientists then checked if the observations matched predictions of a single measurement: the average probability that a species will be extinct by the year 2100.

**What did they find?**

They found that no matter how they did the analysis, the actual observed extinction risks were always worse than the predictions.

Predictions of the average probability of extinction ranged from seven to 10 percent, depending on how they did the analysis (such as whether they looked only at certain kinds of climate impacts or geographic regions). Meanwhile, the analysis of observations suggest that extinction risk is actually worse, ranging from 14 to 15 percent. The proportion of taxa that will be threatened by 2100 is almost eight percent according to predictions, but a whopping 32 percent based on actual observations.

The authors note that most studies show threats from changes in temperature and rainfall, while there are far fewer studies on the effects of changes in ocean circulation patterns or ocean acidity. Also, vertebrates are more vulnerable than plants and invertebrates. Marine organisms are at particularly high risk, though this is largely based on coral research.

**What does it mean?**

The number of species going extinct in response to the changing climate outstrip the predictions now, and will continue to do so well into the future. In short, more species than researchers expect may well go the way of the dinosaur.

The findings present a clearer picture of climate change effects on biodiversity. They also reveal the areas where scientists should focus their efforts in order to track the effects of climate change.

The results of the study do not bode well for the species slated for extinction. These organisms are the ones most sensitive to temperature, precipitation and other environmental changes.

The scientists argue that extinction risk based on real observations may be higher because prediction estimates may not fully account for regions of the world that are relatively sensitive to climate change. For example, observations show that marine organisms have an elevated extinction risk. On land, organisms in temperate and high latitude regions are more threatened than those in the tropics.

However, the authors point out that there were fewer studies from the tropics, which are the most diverse, and that marine research tended to focus on corals, which may be relatively sensitive to climate change.

The studies analyzed suggest species are already responding to climate change in various ways. That major insight – in conjunction with higher predicted levels of extinctions – "shows the need to give climate change high priority in conservation planning and to communicate its potentially wide-ranging consequences to policy makers and the wider public," the authors conclude.