

## Topic 14: Applied Ecological Genetics.

There are no formal lecture notes for this Topic. Chapter 7 in Conner and Hartl is excellent and very clear. That text, combined with the slides, will be the main source for technical information for this Topic. However, I am also posting text from the popular media and other sources to highlight the applied aspects of the topics that we have covered in this class. You will be responsible for this material. The first two items are from 1) a newspaper article, and 2) a popular-science magazine, and they relate to today's topic "Conservation Genetics".

Mass Extinction Underway, Majority of Biologists Say  
Washington Post

Tuesday, April 21, 1998

By Joby Warrick  
Staff Writer

A majority of the nation's biologists are convinced that a "mass extinction" of plants and animals is underway that poses a major threat to humans in the next century, yet most Americans are only dimly aware of the problem, a poll says.

The rapid disappearance of species was ranked as one of the planet's gravest environmental worries, surpassing pollution, global warming and the thinning of the ozone layer, according to the survey of 400 scientists commissioned by New York's American Museum of Natural History.

The poll's release yesterday comes on the heels of a groundbreaking study of plant diversity that concluded that at least one in eight known plant species is threatened with extinction. Although scientists are divided over the specific numbers, many believe that the rate of loss is greater now than at any time in history.

"The speed at which species are being lost is much faster than any we've seen in the past -- including those [extinctions] related to meteor collisions," said Daniel Simberloff, a University of Tennessee ecologist and prominent expert in biological diversity who participated in the museum's survey. [Note: the last mass extinction caused by a meteor collision was that of the dinosaurs, 65 million years ago.]

Most of his peers apparently agree. Nearly seven out of 10 of the biologists polled said they believed a "mass extinction" was underway, and an equal number predicted that up to one-fifth of all living species could disappear within 30 years. Nearly all attributed the losses to human activity, especially the destruction of plant and animal habitats.

Among the dissenters, some argue that there is not yet enough data to support the view that a mass extinction is occurring. Many of the estimates of species loss are extrapolations based on the global destruction of rain forests and other rich habitats.

Among non-scientists, meanwhile, the subject appears to have made relatively little impression. Sixty percent of the laymen polled professed little or no familiarity with the concept of biological diversity, and barely half ranked species loss as a "major threat."

The scientists interviewed in the Louis Harris poll were members of the Washington-based American Institute of Biological Sciences, a professional society of more than 5,000 scientists.

## Earth faces sixth mass extinction

- \* 19:00 18 March 2004
- \* NewScientist.com news service
- \* Anil Ananthaswamy

The Earth may be on the brink of a sixth mass extinction on a par with the five others that have punctuated its history, suggests the strongest evidence yet.

Butterflies in Britain are going extinct at an even greater rate than birds, according to the most comprehensive study ever of butterflies, birds, and plants.

There is growing concern over the rate at which species of plants and animals are disappearing around the world. But until now the evidence for such extinctions has mainly come from studies of birds. "The doubters could always turn around and say that there's something peculiar about birds that makes them susceptible to the impact of man on the environment," says Jeremy Greenwood of the British Trust for Ornithology in Norfolk, and one of the research team.

Now there is concrete evidence that insects - which account for more than half the described species on Earth, are disappearing faster than birds.

"If we can extrapolate that pattern of the British butterflies to other British insects, and indeed to invertebrates across the planet, we are obviously looking at a very serious biodiversity crisis," says team member Mark Telfer of the Royal Society for the Protection of Birds in Bedfordshire, UK.

### Major ecosystems

Six large sets of data collected over the past 20 to 40 years in England, Wales, and Scotland were analysed by Jeremy Thomas of the Natural Environment Research Council Centre for Ecology and Hydrology in Dorchester, UK and colleagues. More than 20,000 volunteers submitted over 15 million records of species.

The researchers found that populations of 71 percent of the butterfly species have decreased over the last 20 years, compared to 56 percent for birds and 28 percent for plants. Two butterfly species (3.4 percent of total) became extinct, compared to six (0.4 percent) of the plant species surveyed. None of the native breeding birds went extinct in the last 20 years.

Crucially, the decline in populations happened in all the major ecosystems and was distributed evenly across Britain, rather than in just a few heavily degraded regions.

The crisis could be foreshadowing a sixth mass extinction, warn the researchers. Life on Earth has already seen five mass extinctions in its four billion year old history. The last one, which wiped out the dinosaurs, happened 65 million years ago at the end of the Cretaceous period and was possibly caused by a giant meteor collision.

The current extinction is being precipitated by the widespread loss of habitats because of human activity, according to Tefler. The remaining habitats are small and fragmented, and their quality has been degraded because of pollution.

#### Nitrogen pollution

This claim is strongly supported, at least for plants, by a second study published alongside Thomas' paper in Science. Carly Stevens of the Open University in Milton Keynes, UK, and her colleagues studied the diversity of plants in 68 grassland sites in the UK. The number of species in each site varied greatly, from a mean of 7.2 to 27.6 species per site. Nitrogen pollution was found to blame for this variability.

"We found strong evidence that the decline in the species richness of grasslands within the UK was linked to nitrogen pollution," says Stevens. "In areas of high nitrogen pollution the species richness was much lower than in areas of low pollution, such as the Scottish highlands."

Atmospheric nitrogen pollution is caused mainly by the burning of fossil fuels and from intensive agriculture, especially from the volatilisation of animal waste. This nitrogen is deposited on the soil, favouring the growth of some species to the cost of others.

"Evidence of a global extinction crisis has come into stark focus with these important results," comments Mark Collins of the United Nations Environment Programme's World Conservation Monitoring Centre in Cambridge, UK.

Journal reference: Science (vol 303, p 1879)

#### Related Articles

- \* Global warming threatens millions of species
- \* <http://www.newscientist.com/article.ns?id=dn4545>
- \* 7 January 2004
- \* Suffocation suspected for greatest mass extinction
- \* <http://www.newscientist.com/article.ns?id=dn4138>
- \* 9 September 2003
- \* Red alert over rare species
- \* <http://www.newscientist.com/article.ns?id=dn3265>
- \* 16 January 2003

#### Weblinks

- \* Centre for Ecology and Hydrology, Natural Environment Research Council
- \* <http://www.ceh.ac.uk/>
- \* World Conservation Monitoring Centre, UN Environment Programme
- \* <http://www.unep-wcmc.org/>
- \* Science
- \* <http://www.sciencemag.org/>

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