

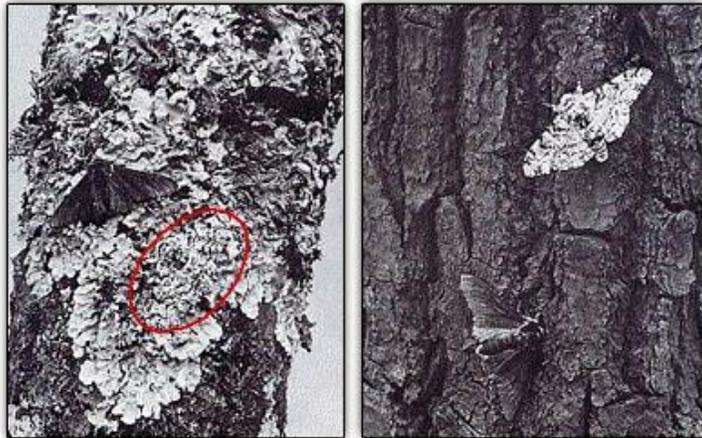
The Peppered Moth: An Evolutionary Case Study

Analysing Changes in Species Due to Environmental Variations

The Common Peppered Moth (*Biston betularia*) is an insect prevalent among the Birch tree forests of England. It lives upon the bark of these trees. The moth exhibits wide variations in its general appearance; its overall pigmentation ranges from very dark to very light, including many shades in between.

The population of the Peppered Moth was originally, prior to the Industrial Revolution, mostly composed of the lighter phenotypes (called the *typica* form). The selection pressure within the environment that produced this mainly “light” population was that the bark the moths lived upon: The whitish lichen allowed lighter moths to camouflage from predators, hence increasing its chances of survival.

During the Industrial Revolution of the late 18th century, unchecked pollution and excessive carbon-based



emissions caused the bark of the Birch trees to darken with soot. It was observed by many scientists during this time that the darker version of the moth (called the *carbonaria* form) was increasing in its numbers. By 1895, it was reported that 98% of Peppered moths in Manchester were of the *carbonaria* variety. Scientists theorised that the darker moths were better able to camouflage upon the sooty bark, as compared to lichen covered bark. The light colour of the *typica* variety had become a disadvantage. It was also

observed that Peppered moths in the unpolluted countryside were still predominantly lighter coloured.

Later, when the negative effects of pollution were recognised by the general community, the government passed various Clean Air legislations, and the levels of soot upon the bark began to decline. The numbers of dark moths declined rapidly, and many biologists hypothesise that the darker moth may become extinct within a few decades. As the bark of the trees the Peppered moths resided upon became light again, the darker moths became more apparent to birds and were an easier target. As stated in a popular biological study of the Peppered moth:

"Differential bird predation of the typica and carbonaria forms, in habitats affected by industrial pollution to different degrees, is the primary influence on the evolution of melanism in the peppered moth."

(P. 116, **Melanism - Evolution in Action**, M. E. N. Majerus, Oxford University Press, New York, 1998).

In summary, it can be stated that the main factor in the shift in the colouration of the Common Peppered moth from the light, *typica* form to the dark, *carbonaria* form was predation by birds. However, it was not the predator that had changed, but rather the environment they lived in. As the environment changed from lighter trees to darker trees, the appearance of the general population of the moth changed from light to dark. This is how the species can change due to a change in the environment.

Bibliography:

http://en.wikipedia.org/wiki/Peppered_moth_evolution
<http://www.millerandlevine.com/km/evol/Moths/moths.html>
<http://emporium.turnpike.net/C/cs/peppered.htm>
<http://sisu.typepad.com/sisu/pepperedmothslichen.jpg>