DNA from old insects -- no need to destroy the specimen

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In a new study published April 1 in the online, open-access, peer-reviewed journal *PLoS ONE*, ancient DNA (aDNA) is retrieved from various insect remains without destruction of the specimens.

Together with eight other authors, Philip Francis Thomsen and Eske Willerslev, from the Centre for Ancient Genetics and Environments, Natural History Museum, University of Copenhagen, use a previously published non-destructive DNA extraction method (Gilbert et al. 2007) to retrieve DNA from ancient macrofossils from permafrost sediments and historical museum beetle specimen.

DNA is successfully retrieved from Siberian macrofossils up to 26,000 years old and dried museum beetle specimens up to 188 years old. This reveals that the method has great potential for aDNA research.

Despite the massive diversity of the group, insects are almost neglected in aDNA studies, which have focused mainly on vertebrates, plants and—to a lesser extent—microbes, revealing aDNA research as a powerful tool for testing hypotheses in biology.

A major constraint on the use of historical, and particularly ancient, insect specimens in aDNA research, is the destructive nature of the sampling procedure. Obviously, this is a problem related to many aDNA sources, but is of particular concern with small specimens, such as insects, where even limited sampling may destroy important morphological characters. So far, most ancient genetic studies on insects

have suffered from such destructive sampling procedures.

The results obtained with the non-destructive sampling method in this study, suggests that destruction of specimens is no longer necessary to include insects in aDNA studies.

The use of historical museum specimens has important applications in population genetic studies, where historical specimens could reveal former genetic structures, undetectable with modern material only. Ancient insect macrofossils hold potentials in studies on former ecosystems and climates.

Finally the study applies a classic DNA extraction method for sediments, to look for insect DNA in temperate soil from New Zealand around 1,800-3,000 years ago. DNA from a beetle and a moth or butterfly is obtained from the soil, which includes no visible insect remains. Hence, the DNA is extracted directly from the soil. Retrieval of insect DNA from sediments, have applications for reconstruction of ancient biodiversity, unobtainable in any other way.

More information: Thomsen PF, Elias S, Gilbert MTP, Haile J, Munch K, et al. (2009) Non-Destructive Sampling of Ancient Insect DNA. PLoS ONE 4(4): e5048. doi:10.1371/journal.pone.0005048, dx.plos.org/10.1371/journal.pone.0005048

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