Unravelling the secrets of North Atlantic blue whales using DNA extracted from museum bones

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At 30 metres in length and 170 tonnes or more in weight, blue whale is the largest animal known to have ever lived on Earth. Blue whales were abundant in nearly all the oceans until the beginning of modern whaling in late nineteenth century. Due to their enormous body size this species became favourite catch for modern whalers. For over a century, they were hunted almost to extinction.

Today the blue whale is classified as being endangered and we still know very little about these giants. Due to their broad distribution and underwater lifestyle sampling living whales is difficult and expensive. Most genetic information about blue whales that is available comes from individuals observed in the Southern hemisphere. Nowadays they are very rare in the North Atlantic because of the intensive whaling in the past. However, museums and other natural history collections worldwide house many blue whale skeletons, mostly generated by whaling industry, which can provide precious genetic information and important link to past biodiversity.

The aim of this project was to gain more information about genetic structure of North Atlantic blue whales and their relation to other blue whale populations. We extracted DNA from museum bone samples from the North Atlantic and Southern hemisphere dated from the early 19^{th} to the mid-20^{th} century in a laboratory specially designed for work with very old samples. We designed a system that can identify sex of the individual using DNA extracted from the bone sample. To gain as much genetic information as possible from our samples, we tried to amplify different parts of the genome: mitochondrial DNA that is inherited only from the mother, and two different kinds of nuclear DNA markers: Y chromosome that is inherited only from the father, and microsatellites that are inherited from both parents. Mitochondrial DNA revealed unique genetic diversity in historical populations from both North Atlantic and Antarctic that had not been found previously in any of the worldwide blue whale populations, as well as possible connection between the North Atlantic, and South Atlantic and Antarctic region.

The unexpected relationship between North Atlantic and other modern populations and the unique mitochondrial genetic diversity found in the North Atlantic demonstrate the value of ancient samples in better understanding genetic diversity of whale species. We suggest that future research should aim at additional genetic information from nuclear genome which could advance future analyses beyond the rough estimates possible using only mitochondrial data.

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