



Isotope Report for Eiderdown Processing & Export Ltd.

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BACKGROUND

Stable hydrogen and oxygen isotopes are found in all water. Birds typically drink local water. This local water has a discrete stable isotope ratio based on its location on the Earth. This isotopic signature is manifest in the proteins of down/feathers and cannot be washed out or fundamentally altered during processing. By analyzing the stable isotope ratios in these down/feathers a global location can be estimated.

LIMITATIONS

Climatologically generated isotope ratios at any given location on the globe can vary periodically due to natural cycles in precipitation and ground water. The nature of isotope testing in down and feathers is inherently an exclusive one -- that is, it is better suited for eliminating locations based on isotope results than for verifying locations. However, if the results are consistent with past authenticated data they can be used to predict the location of a given sample with a certain degree of confidence.

RESULTS

Table 1. Stable isotope ratio data & standard deviations relative to VSMOW-SLAP standards.

Identification	IDFL #	Avg. $\delta^2\text{H}$	σ $\delta^2\text{H}$	Avg. $\delta^{18}\text{O}$	σ $\delta^{18}\text{O}$
Eider down sample	09-111616	+11.0‰	4.6	+17.1‰	0.17

Data provided by IsoForensics Inc., Salt Lake City, Utah, USA

Each sample is tested at least two times and standard deviations (σ) are calculated. For hydrogen, standard deviations less than 8.0 indicate homogeneity. For oxygen, standard deviations less than 1.0 indicate homogeneity. The standard deviations for this investigation indicate that the sample analyzed was reasonably homogeneous.



CONCLUSIONS

The following conclusion is based on the data from this sample and the statistical fit with the existing database. The nature of bird farming and the global down/feather market make it nearly impossible to determine the exact geographic origin of down/feathers with absolute certainty. This is not due to problems with the test method. This method is more suited as an exclusionary technique. That said, Table 2 *qualitatively* states the likelihood of a sample originating from a stated location based on the test data and the existing database of samples.

Table 2. Subjective conclusion based on the database of existing authentic samples IDFL has compiled over the past three years.

IDFL #	Country claimed	Subjective Location Conclusion
09-111616	Iceland	Strong indication sample originates from Iceland. Sample does NOT originate from mainland Asia, Africa, continental North America, central Europe, South America, or Australia.

Based on the data for this sample and the data trend from the Stable Isotope Geolocation Database this sample appears to have originated from Iceland. Down and feathers grown in Iceland have a very unique isotopic signature when compared to plumage from other parts of the world. Even though this data lies outside the trend line (see Graph 1) there are very few place on the Earth that have climactic conditions which would result in a very small – or even positive – isotope ratio as is the case with Iceland. This unique signature makes identifying Icelandic down with a high certainty possible.



Citations

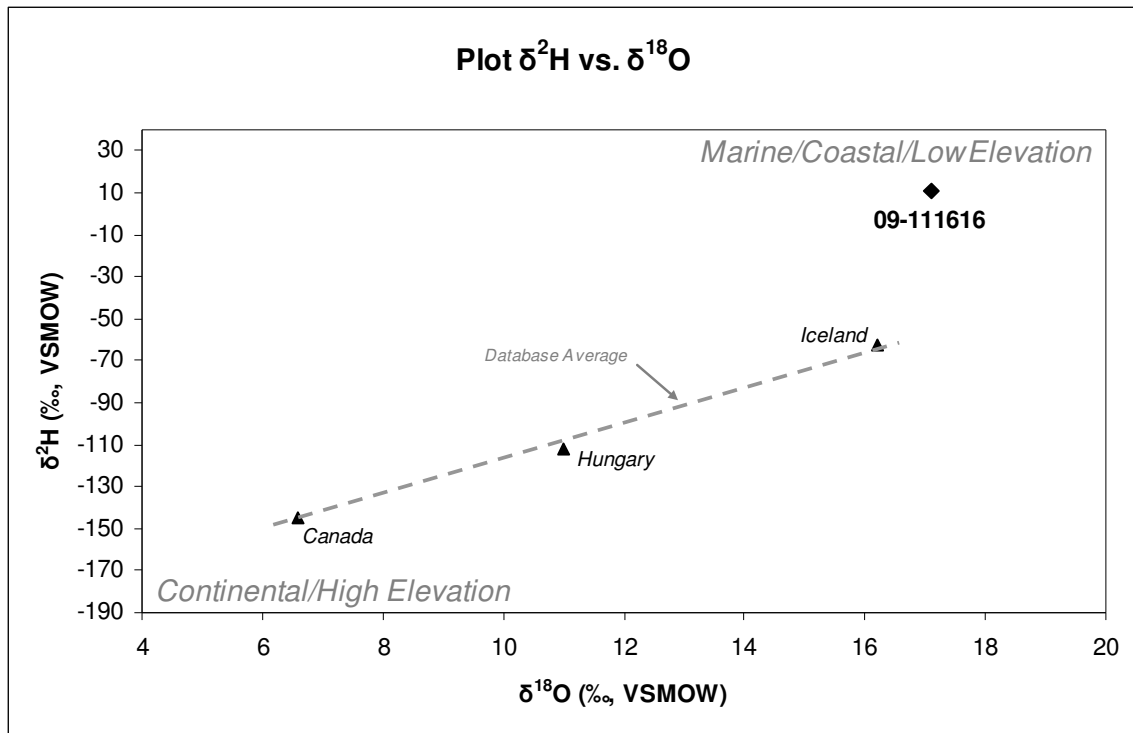
Testing provided by IsoForensics Inc., Salt Lake City, Utah, USA.

Interpretation provided by Braden Andersen, International Down and Feather Laboratory & Institute, Salt Lake City, Utah, USA.

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Appendix



Graph 1. Plot of data point (09-111616). The dashed line represents the average of all data from the IDFL Stable Isotope Geolocation Database. Ideally, results should fall close to this line. Generally down/feathers from continental regions would appear on the lower left portion of the graph, while marine/coastal down/feathers would appear on the upper right.

Standard

Stable isotope ratios are reported in a standard “delta” (δ) notation relative to VSMOW on the VSMOW-SLAP reference scale (an international scale which spans the range of naturally occurring O and H isotope values):

$$\delta = (R_{\text{sample}} / R_{\text{standard}} - 1) \times 1000\text{‰}$$

Where R_{sample} and R_{standard} are the ratio of the heavy to light isotopes in the sample and standard.