**Water Quality Centre**
**Trent University**
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Laboratory report for analysis of $\delta^{13}C$ and $\delta^{15}N$ by EA-IRMS

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| Samples submitted by: | Sandra Klemet-N'guessan and Dr. Maggie Xenopoulos |
| Analysis date: | Feb 8-9, 2023 |
| Instrumentation: | EuroVector EA coupled to Nu Horizon IRMS |
| Analyst | Mathew Teeter, PhD |

**Summary of Analytical Methods**

Samples and accompanying standard reference materials were wrapped in tin capsules. These samples were loaded into an auto-sampler and combusted in the elemental analyzer with excess oxygen. After reduction with elemental copper and separation in a GC column, the resulting $N_2$ and $CO_2$ gasses were introduced to the ion source of the Nu Horizon IRMS. The elemental (%C and %N) and isotopic ($\delta^{13}C$ and $\delta^{15}N$) compositions were determined for the samples and a suite of standards.

The $\delta^{13}C$ and $\delta^{15}N$ values were calibrated relative to AIR and VPDB using a two-point calibration anchored by USGS40 (glutamic acid; $\delta^{13}C$ = −26.39 ‰, $\delta^{15}N$ = −4.52 ‰) and USGS63 ($\delta^{13}C$ = −1.17 ‰, $\delta^{15}N$ = +37.83 ‰) **or** USGS66 ($\delta^{13}C$ = −0.67 ‰, $\delta^{15}N$ = +40.83 ‰). The variation in these standards observed through the analytical session or sessions associated with the submitted samples are summarized in Table 1.

Table 1. Standard deviation and number of quality assurance (calibration/normalization) standards analyzed alongside submitted samples.

| Standard Name | N | $\delta^{13}C \pm (1\sigma)$ | $\delta^{15}N \pm (1\sigma)$ |
|---|---|---|---|
| USGS40 | 5 | ±0.08 | ±0.23 |
| USGS63 | 5 | ±0.16 | ±0.13 |

Analytical uncertainty was monitored using a series of in-house standards with established isotopic compositions. These standards were selected to approximate the elemental composition of the analyzed samples and cover the range of possible isotopic compositions that may have been observed in the samples. The observed isotopic compositions as well as the long-term average values for these standards are summarized below in Table 2.

Table 2. Comparison of the established and measured isotopic compositions of the quality control standards analyzed alongside the submitted samples.

| Standard Name | Material Type | N | Measured | | Established | |
|---|---|---|---|---|---|---|
| | | | $\delta^{13}C \pm (1\sigma)$ | $\delta^{15}N \pm (1\sigma)$ | $\delta^{13}C \pm (1\sigma)$ | $\delta^{15}N \pm (1\sigma)$ |
| SRM-1 | Caribou collagen | 4 | −19.38±0.04 | +1.87±0.19 | −19.39±0.09 | +1.84±0.20 |
| SRM-14 | Polar bear collagen | 4 | −13.58±0.14 | +21.55±0.25 | −13.63±0.09 | +21.58±0.28 |
| SRM-26 | Commercial fish collagen | 7 | −16.20±0.18 | +14.85±0.20 | −16.17±0.07 | +14.69±0.19 |
| SRM-28 | Alanine | 5 | −16.24±0.06 | −1.96±0.39 | −16.26±0.08 | −1.95±0.17 |