*The following supplement accompanies the article*

# Food web structure of a coastal Arctic marine ecosystem and implications for stability

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**Supplement.** Additional data, including detailed pre-stable isotope acid wash procedure, map and photos of sampling location, previously reported diet information for species sampled, and tables containing stable isotope and fatty acid data.

## Pre-stable isotope analysis-acid wash procedure

Based on suggestions by Mateo et al. (2008), acid washing was avoided except for samples with potentially high $CaCO_3$ content (i.e. amphipod *Gammarus oceanicus* due to exoskeleton and periwinkle *Littorina* sp. due to shell). However, due to the importance of copepod *Calanus hyperboreus* $\delta^{15}N$ and $\delta^{13}C$ values as baselines in trophic position models and mixing models to calculate species' percent reliance on phytoplankton (i.e. $\alpha$), we also explored the influence of acid washing on *C. hyperboreus*, which has been performed by previous researchers (e.g. Tamelander et al. 2006).

Removal of carbonates from all samples was achieved using 1M HCl added to samples drop-by-drop until bubbling ceased (Jacob et al. 2005). After addition of HCl, bubbling only occurred with amphipod and periwinkle, and $\delta^{13}C$ decreased by 1.50 ± 0.32‰ (mean ± SD) and 5.36 ± 1.62‰, respectively; the desired effect for carbonate removal. However, $\delta^{15}N$ also decreased following the acid washing procedure (by 1.25 ± 0.67 and 0.33 ± 0.82‰ for amphipod and periwinkle, respectively) and we, therefore, used $\delta^{15}N$ values from non-acid treated samples. When copepod was acid washed, results were consistent with those of Mateo et al. (2008), because acid treated copepods were occasionally enriched in $^{13}C$ by as much as 0.66‰; the opposite than desired result. Further, acid washing only altered $\delta^{13}C$ of copepods by 0.01 ± 0.37‰, and we, therefore, used non acid washed values for copepods.

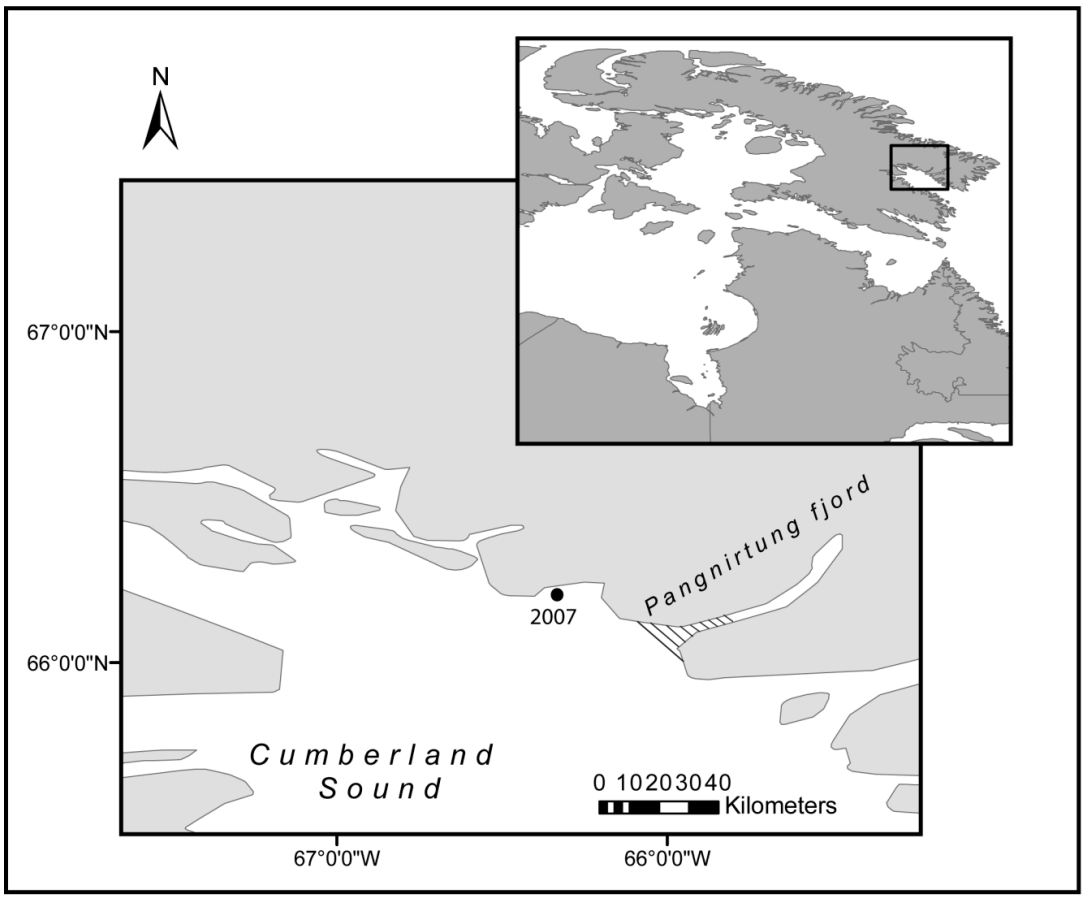


Fig. S1. Map showing sampling location of species within Pangnirtung fjord (stippled area, i.e. all species sampled in 2008 and 2009) or up to 30 km from the mouth of Pangnirtung fjord (i.e. for *Clupea harengus* and *Amblyraja hyperborea* that were sampled in 2007) within Cumberland Sound, Baffin Island, Nunavut, Canada

A

B

Fig. S2. (A) Pangnirtung fjord looking northeast, with town of Pangnirtung and boulder-strewn inter-tidal zone visible in foreground, credit: B. McMeans. (B) A sample coastline of Pangnirtung fjord at low tide showing growths of *Fucus distichus*, credit: R. Currie

Table S1. Major diet items of species sampled from Cumberland Sound. Data are from locations as near to the east coast of Baffin Island as possible

| Functional | Group | Species | Diet items |
|---|---|---|---|
| Zooplankton | Herbivores | *Calanus hyperboreus* | Phytoplankton[a] |
| | | *Mysis oculata* | Phytoplankton, macroalgae[b] |
| | Omnivores | *Aglantha digitale* | Phytoplankton, copepods, detritus[c] |
| | | *Myoxocephalus scorpius* (larvae) | Diatoms, *Balanus* naupulii[d] |
| | | *Stichaeus punctatus*, (larvae) | Bivalve larvae[e] |
| | Carnivores | *Sagitta* sp. | Zooplankton[f] |
| Benthos | Herbivores | *Chlamys islandica* | Phytoplankton, detritus[g] |
| | | *Hiatella arctica* | Phytoplankton, detritus[h] |
| | | *Gammarus oceanicus* | Phytoplankton, macroalgae, detritus[i] |
| | | *Littorina* sp. | Algae[j] |
| | | *Tectura testudinalis* | Algae[j] |
| | Carnivores | *Buccinum cyaneum* | Polychaetes, bivalves, carrion[k] |
| | | Nudibranch (unknown sp.) | Unknown |
| | | Polychaete (unknown sp. but predatory based on large jaws) | Unknown |
| Fish and marine mammals (all carnivores) | | *Somniosus microcephalus* | *Pusa hispida*, *Reinhardtius hippoglossoides*, *Myoxocephalus scorpius*[a] |
| | | *Amblyraja hyperborea* | *Lebbeus polaris*[m] |
| | | *Clupea harengus* | Zooplankton[m] |
| | | *Mallotus villosus* | Zooplankton[n] |
| | | *Salvelinus alpinus* | *Themisto*[o], *Mallotus villosus*[m], *Mysis*[m] |
| | | *Myoxocephalus scorpius*, (<24 cm) | Isopods, *Mysis*[m,p] |
| | | *Myoxocephalus scorpius*, (>24 cm) | *Clupea harengus*[p], crab[m], *Myoxocephalus scorpius*[m] |
| | | *Phoca groenlandica* | *Themisto*, *Mallotus villosus*[m] |
| | | *Pusa hispida* | *Themisto*[m] |

[a]Søreide et al. (2008)
[b]Dunton & Schell (1987)
[c]Pages et al. (1996)
[d]LaRoche (1982)
[e]Pepin & Penney (1997)
[f]Pearre (1973)
[g]Bell & Sargent (1985)
[h]Petersen et al. (2003)
[i]Hudon (1983)
[j]Steneck & Watling (1982)
[k]Himmelman & Hamel (1993)
[l]McMeans et al. (2012)
[m]B .C. McMeans (unpubl. data from Cumberland Sound)
[n]Scott & Scott (1988)
[o]Moore & Moore (1974)
[p]Cardinale (2000)

Table S2. Fatty acids (% of total, mean ± SD) from the total lipid extract of organisms sampled from Cumberland Sound, and used as indicators of reliance on either phytoplankton ($^{P}$) or rockweed ($^{R}$). Percent (%) lipid is on a dry weight basis

| Species | Year | n | Tissue | % Lipid | 16:1n-7$^{P}$ | 18:2n-6$^{R}$ | 20:4n-6$^{R}$ | 22:6n-3$^{P}$ | n-3:n-6$^{P}$ |
|---|---|---|---|---|---|---|---|---|---|
| Primary producers | | | | | | | | | |
| POM[a] | 1999 | | Whole | | 15.5 ± 4.5 | 1.7 ± 0.7 | 0.4 ± 0.3 | 8.5 ± 3.6 | 12.5 ± 3.6 |
| *Fucus distichus* | 2008 | 3 | Leaf | 4.3 ± 3 | 1.9 ± 1 | 13.7 ± 0.4 | 9.9 ± 3.6 | 0.5 ± 0.4 | 0.5 ± 0.1 |
| Zooplankton | | | | | | | | | |
| Herbivores | | | | | | | | | |
| *Calanus hyperboreus* | 2008 | 5 | Whole | 36 ± 3 | 17.3 ± 0.7 | 3.5 ± 0.1 | 0.2 ± 0 | 8.9 ± 1 | 3.9 ± 0.2 |
| *Mysis oculata* | 2009 | 5 | Whole | 10.3 ± 0.7 | 3.8 ± 1.2 | 1.8 ± 0.1 | 1.2 ± 0.1 | 24.1 ± 1.8 | 7.3 ± 1.1 |
| Omnivores | | | | | | | | | |
| *Myoxocephalus scorpius* (larvae) | 2009 | 1 | Whole | 15.1 ± 2.8 | 7.4 ± 4.5 | 1.4 ± 0.7 | 1.0 ± 0.5 | 24.9 ± 5.8 | 9.7 ± 4.7 |
| *Stichaeus punctatus* (larvae) | 2009 | 1 | Whole | 13.9 ± 1.2 | 3.3 ± 0.6 | 0.7 ± 0.1 | 0.5 ± 0.1 | 34.1 ± 3.7 | 16.6 ± 3.3 |
| Benthos | | | | | | | | | |
| Herbivores | | | | | | | | | |
| *Chlamys islandica* | 2008 | 4 | Muscle | 5.3 ± 0.4 | 3.2 ± 0.3 | 1.6 ± 1.2 | 1.5 ± 0.2 | 28.3 ± 1.4 | 13.2 ± 3.8 |
| | 20098 | 5 | Muscle | 5.1 ± 0.2 | 2.7 ± 0.4 | 1.4 ± 0.8 | 1.4 ± 0.2 | 26.1 ± 2.5 | 6 ± 1.3 |
| *Hiatella arctica* | 2008 | 5 | Mantle | 9.4 ± 2 | 16.1 ± 3.2 | 1.8 ± 0.3 | 1.6 ± 0.6 | 14.7 ± 3.6 | 6.1 ± 0.4 |
| *Gammarus oceanicus* | 2008 | 2 | Whole | 10.4 ± 0.3 | 10.8 ± 0.4 | 4.6 ± 0.8 | 1.6 ± 0.2 | 5.1 ± 0.8 | 2.2 ± 0 |
| *Tectura testudinalis* | 2008 | 5 | Foot | 9 ± 3.1 | 4.7 ± 3.8 | 5.0 ± 3.3 | 12.9 ± 4.2 | 0.9 ± 0.2 | 1.1 ± 0.4 |
| Carnivores | | | | | | | | | |
| *Buccinum cyaneum* | 2008 | 7 | Foot | 6.2 ± 0.8 | 1.1 ± 0.3 | 2.9 ± 3.8 | 4.6 ± 0.9 | 9.6 ± 1.3 | 3.3 ± 0.7 |
| Nudibranch | 2008 | 1 | Whole | 10.9 | 1.1 | 8.6 | 8.7 | 18.9 | 2.5 |
| Polychaete | 2008 | 3 | Whole | 8.4 ± 1.2 | 4.7 ± 1 | 2.3 ± 0.3 | 3.4 ± 0.3 | 2 ± 0.1 | 3.3 ± 0.3 |
| Fish and marine mammals | | | | | | | | | |
| *Somniosus microcephalus* | 2008 | 1 | Muscle | 54.6 ± 3.3 | 6.8 ± 0.7 | 1.1 ± 0.1 | 1.5 ± 0.2 | 8.4 ± 0.8 | 4.5 ± 0.3 |
| *Amblyraja hyperborea* | 2007 | 1 | Muscle | 6.5 | 4.4 | 1.3 | 3.7 | 25.6 | 7.1 |
| *Mallotus villosus* | 2008 | 7 | Muscle | 17 ± 10.2 | 7.2 ± 2.9 | 1.2 ± 0.2 | 0.4 ± 0.1 | 24.6 ± 10.4 | 14.9 ± 4.6 |
| *Salvelinus alpinus* | 2008 | 7 | Muscle | 22.7 ± 10.6 | 16.4 ± 6.1 | 1.5 ± 0.5 | 0.4 ± 0.1 | 10.9 ± 2.3 | 6.9 ± 1 |
| *Myoxocephalus scorpius* (<24 cm) | 2008 | 3 | Muscle | 6.4 ± 0.5 | 7.1 ± 1.6 | 1.7 ± 0.4 | 2.3 ± 0.5 | 24.5 ± 3.4 | 8.3 ± 1.9 |
| *Myoxocephalus scorpius* (>24 cm) | 2008 | 4 | Muscle | 5.4 ± 1.1 | 4.6 ± 0.6 | 1.3 ± 0.1 | 4.4 ± 1.5 | 25.1 ± 4 | 6.9 ± 2.9 |
| *Phoca groenlandica* | 2008 | 6 | Blubber | 88.6 ± 18.8 | 18.1 ± 3 | 1.8 ± 0.3 | 0.4 ± 0.1 | 9.3 ± 1.4 | 5.3 ± 0.3 |
| *Pusa hispida* | 2008 | 6 | Blubber | 89.9 ± 8.1 | 22 ± 5.1 | 1.6 ± 0.2 | 0.5 ± 0.3 | 9.5 ± 1.8 | 5.7 ± 1 |

[a]POM data from Stevens et al. (2004) southeast stations of North Water Polyna in surface waters

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