**Supplementary material: Structure and function of the western Baffin Bay coastal and shelf ecosystem**

Text S1. Ecopath inputs

*Sources and calculation of input parameters*

We considered seven marine mammal functional groups in the model area (Table S1). All of these groups contain only one species except for *Other seals*. The biomass *B* of each group/species was calculated as the number of animals multiplied by the average weight (in tonnes) and divided by the area used (km2) (Table S2). The *P/B* was calculated as the sum of natural mortality *Z* and harvest mortality. Natural mortality rates for marine mammals were calculated based on values from life history tables and estimates of longevity based on equations from (Boveng and Barlow, 1991). The authors calculated *Z* over all life stages up to a maximum age using survivorship as an inverse of natural mortality based on life histories of fur seals, monkeys and humans (full equations and parameters for P/B calculations are available below). Harvest mortality was calculated as catch over biomass, based on reported catches. When no bioenergetics models were available for the species, the Q/B for marine mammals was calculated based on the following energetic equation as a first step (Williams et al., 2020):

1.

where *FMR* is the field metabolic rate in kcal/day and *M* is mean body weight in kg. After, FMR in kcal/day was converted to Q/B in a /year rate based on the average energy density of prey items previously reported (Guénette et al., 2005; Harter et al., 2013; Hunt et al., 2000; Pagano et al., 2018), and diet composition of marine mammals (Table S4).

Although there are more seabird species in the model area, we only considered those that are more abundant as representative, and for which there were more data available (Table S1). Biomass and P/B calculations for seabirds were similar to marine mammals, i.e., biomass was calculated as number of individuals times weight per km2, while P/B was calculated as the sum of reported natural mortality and harvest mortality rates (Table S2). The Q/B was calculated using the daily energy requirements calculations according to reported field metabolic rates (Table S2). After, we used the average energy density of prey items previously reported (Guénette et al., 2005; Harter et al., 2013; Hunt et al., 2000) and diet composition of seabirds (Table S4) to calculate their consumption rates.

We included 10 fish groups, of which three include only one species (Table S1). Natural mortality for fish was estimated from the empirical relationship linking mortality, the parameters of the von Bertalanffy Growth Function (VBGF) and mean environmental temperature (Pauly, 1980):

where *M* is natural mortality (/year), K is the curvature parameter of the VBGF (/year), *L∞* is the asymptotic length (cm) and *Tc* is the mean ambient temperature (°C). We used the life-history tool in Fishbase (fishbase.org) to do these calculations for the different fish species (Froese and Pauley, 2008). Surface water temperatures in Western Baffin Bay can vary from 0 to 5 °C in summer, while deeper waters usually remain around 0°C (Treble, 2011; Wang et al., 1994). Thus, for fishes that inhabit the bottom at deeper waters, we used a temperature of 0.1 °C, for pelagic fish and fish in more coastal areas, we used a temperature of 1 °C, while for anadromous fishes we considered a temperature of 4 °C, which is about the lower end of their preferred temperature.

Greenland halibut comprises the only commercial fishery in the area, while Arctic char is a key species for substance harvest for local communities. Fishing mortality was taken from fishery catch reports when available or considered negligible when these studies were not available in the area.

For species which there is no published information on feeding, empirical formulae implemented in the life-history routine of Fishbase was used (Palomares and Pauly, 1998):

where *W∞* is the asymptotic weight (kg), *T´* is 1000/Kelvin (Kelvin = °C + 273.15), *A* is the aspect ratio (height2 (cm)/ surface area (cm) of the caudal fin), *h* is a dummy variable expressing food type (1 for herbivores, 0 for detritivores or carnivores) and *d* is a dummy variable also expressing food type (1 for detritivores, and 0 for herbivores and carnivores).

Calanoid copepods are the most abundant type of zooplankton in Arctic waters. The zooplankton biomass in the Arctic is dominated by *Calanus glacialis* and Calanus *hyperboreus*, which range between 3 to 11 mm. Other species such as *Calanus finmarchicus*, Pseudocalanus spp., *Metridia longa*, *Triconia borealis* and *Microcalanus* spp. are also present. *Calanus* copepods are herbivores and graze on large amounts of phytoplankton and ice algae, especially during the spring bloom. These species are important sources of energy in the food web as they convert carbon from primary producers into energy-rich lipid reserves. Amphipods, which are typically between 12 and 25 mm, comprise a diverse group of crustacean zooplankton. The two main families in the Arctic are Gammaridae and Hyperiidae. Gammaridae are primarily found beneath the sea ice and on the sea bottom, while Hyperiidae are surface-dwelling and most common in open waters. Pteropods are a zooplankton group of free-swimming molluscs. One of the most abundant species is the shelled species *Limacina helicina*, which can get to up to 8 cm, and feeds as an omnivorous filter feeder. Here, zooplankton species were separated according to their feeding habits (Tables S1, S4). Zooplankton species were collected during the Green Edge project in spring/summer of 2015-2016, following the sea-ice retreat in Baffin Bay, as well as in an ice-camp site on the west coast of Baffin (Massicotte et al., 2020, 2019; Saint-Béat et al., 2020). Average weights per species were calculated based on length-weight relationships and conversion factors from literature (Table S6). Production and consumption rates, as well as diet composition, were calculated in Saint-Béat et al. (2020).

Abundance and production of phytoplankton and sea ice algae, bacteria and detritus were also measured during the Green Edge project in open water of Baffin Bay, and under the ice in the ice-camp off the west coast of Baffin Island (Massicotte et al., 2020, 2019; Saint-Béat et al., 2020).

*Pedigree classification*

The criteria for grading data quality, or pedigree, for each parameter is reported in Table S7. Each ranking and corresponding data characteristics are specified in the Ecopath software (Table S8).

*Ecopath ENA compared to enaR outputs*

Ecopath-estimated indicators for the WBB ecosystem were: TST = 3,562 ton km-2 yr-1, APL = 3.62, FCI = 0.124, AMI = 1.16, ascendency = 4,219 flowbits, and relative ascendency = 0.232. Except for APL TST, and FCI, which ranged from 3.22 to 4.16, 2,796 to 4,955 ton km-2 yr-1, and 0.118 to 0.220, respectively, all of the Ecopath values were lower and outside the interval estimated in the uncertainty analysis: AMI ranged from 1.45 to 1.67, ascendency ranged 5,831 to 10,061, relative ascendency ranged 0.290 to 0.349, and IFI ranged from 0.445 to 0.576. We tested using different levels of uncertainty for the flows to calculate TST and FCI within enaR to verify if the Ecopath-derived ENA indices fell within these distributions (Figure S3), which was not the case for the most part. This is likely due to the way in which the model is described in the SCOR format compared to Ecopath (Ulanowicz and Kay, 1991), and possibly the formulas used to calculate ENA indices, which can vary among software. In the SCOR-formatted model, respiration flows, and gross primary production are inputs, while respirations are outputs of Ecopath (or not defined in the case of primary producers), and gross primary production cannot be obtained within Ecopath. Nevertheless, the values were not very different.

Table S1. Species included as representative of each functional group and relevant references on distribution and ecology.

|  |  |  |
| --- | --- | --- |
| **Functional group** | **Species included** | **References** |
| **1** | **Killer whale** | *Orcinus orca* | Higdon, 2007; Lefort et al., 2020 |
| **2** | **Polar bear** | *Ursus maritimus* | SWG, 2016 |
| **3** | **Narwhal** | *Monodon monoceros* | NAMMCO, 2018 |
| **4** | **Bowhead whale** | *Balaena mysticetus* | COSEWIC, 2009 |
| **5** | **Ringed seal** | *Pusa hispida* | Kelly et al., 2010; Ogloff et al., 2021 |
| **6** | **Other seals** | Bearded seal (*Erignathus barbatus*), harp seal (*Pagophilus groenlandicus*), hooded seal (*Cystophora cristata*) | NAMMCO, 2016 |
| **7** | **Walrus** | *Odobenus rosmarus rosmarus* | COSEWIC, 2017 |
| **8** | **Seabirds** | Black-legged kittiwake (*Rissa tridactyla*), northern fulmar (*Fulmarus glacialis*), thick-billed murre (*Uria lomvia*) | Mclaren, 1982; Mallory, 2006; Frederiksen et al., 2016; Mallory et al., 2019 |
| **9** | **Greenland shark** | *Somniosus microcephalus* | Yano et al., 2007; Hussey et al., 2018 |
| **10** | **Greenland halibut** | *Reinhardtius hippoglossoides* | Treble, 2020 |
| **11** | **Arctic char** | *Slavelinus alpinus* | - |
| **12** | **Arctic/Polar cod** | *Boreogadus saida*, *Arctogadus glacialis* | Mecklenburg et al., 2011 |
| **13** | **Small pelagic fish** | lanternfishes and smelts e.g., glacier lanternfish (*Benthosema glaciale*) and goiter blacksmelt (*Bathylagus euryops*) | Nunavut Department of Environment Fisheries and Sealing Division., 2018 |
| **14** | **Sculpins/Eelpouts** | Atlantic hookear sculpin (*Artediellus atlanticus*), bigeye sculpin (*Triglops nybelini*), ribbed sculpin (*Triglops pingelii*), polar sculpin (*Cottunculus microps*), Arctic eelpout (*Lycodes reticulatus*), doubleline eelpout (*Lycodes eudipleurostictus*), pale eelpout (Lycodes pallidus) | Jørgensen et al., 2011 |
| **15** | **Small demersal fish** | lumpsuckers, poachers, snailfishes and flounders, e.g., sea tadpole (*Careproctus reinhardt*), gelatinous sea snail (*Liparis fabricii*), Atlantic spiny lumpsucker (*Eumicrotremus spinosus*), Atlantic poacher (*Leptagonus decagonus*) and Arctic flounder (*Pleuronectes glacialis*). | Jørgensen et al., 2011 |
| **16** | **Large demersal fish** | grenadiers and other gadiformes, redfishes, rays and wolffishes, e.g., roughhead grenadier (*Macrourus berglax*), threadfin rockling (*Gaidropsarus ensis*), Arctic skate (*Amblyraja hyperborean*) and thorny skates (*Amblyraja radiate*), deepwater redfish (*Sebastes mentella*) and spotted wolffish (*Anarhichas minor*) | Nunavut Department of Environment Fisheries and Sealing Division., 2018 |
| **17** | **Large crustaceans** | shrimps and crabs with *Pandalus* spp. as the representative species due to their abundance in Baffin Bay and importance as a food item | Reeves, 1998; Hammill and Stenson, 2000; DFO, 2019 |
| **18** | **Cephalopods** | *Rossia palpebrosa* and *R. moelleri* (sepiolids), and *Gonatus steenstrupi* (pelagic squid) | Xavier et al., 2018 |
| **19** | **Carnivorous zooplankton** | *Aglantha digitale*, *Eukrohnia hamata*, *Gaetanus tenuispinus*, *Heterorhabdus norvegicus*, *Paraeuchaeta* spp. and *Themisto abyssorum* | Massicotte et al., 2019; Saint-Béat et al., 2020 |
| **20** | **Omnivorous zooplankton** | *Boroecia maxima*, *Discoconchoecia elegans*, *Heterostylites major*, *Limacina helicina*, *Metridia longa*, *Microcalanus*, *Oithona similis*, *Oncaea notopus*, *Pseudocalanus* spp., *Spinocalanus longicornis* and *Triconia borealis* | Massicotte et al., 2019; Saint-Béat et al., 2020 |
| **21** | **Calanus copepods** | *Calanus glacialis*, *Calanus hyperboreus* and *Calanus finmarchicus* | Massicotte et al., 2019; Saint-Béat et al., 2020 |
| **22** | **Microzooplankton** | heterotroph, flagellate and ciliate microzooplanktonic species | Massicotte et al., 2019; Saint-Béat et al., 2020 |
| **23** | **Polychaetes** | polychaetes (polychaetes) and sipunculids e.g., *Nothria conchylega*, *Aglaophamus malmgreni* and *Jasmineira schaudinni* | Thomson, 1982; Janjua et al., 2015 G. Yunda-Guarin, unpublished data |
| **24** | **Echinoderms** | starfish (Asteroidea), brittle stars (Ophiuroidea), sea urchins, (*Strongylocentrotus sp.*) and sea cucumbers (Holothuroidea), common in Baffin Bay. Some common species include *Ophiopholis aculeate* and *Ophioscolex glacialis* | Aitken and Fournier, 1993; Sifred, 2005 |
| **25** | **Bivalves** | *Portlandia artica, Hiatella arctica, Chlamys islandica, Axinopsida orbiculata, Similipecten greenlandicus, Mya truncata* | Aitken and Fournier, 1993; Sifred, 2005 |
| **26** | **Other benthos** | sea anemones (Cnidaria), sea pen (Pennatulacea), corals (*Duva florida*, Nephtheidae), sponges (*Craniella cranium*) and agglutinated foraminifera | Aitken and Fournier, 1993; Janjua et al., 2015 |
| **27** | **Bacteria** | - | Massicotte et al., 2019; Saint-Béat et al., 2020 |
| **28** | **Sea ice algae** | - | Deal et al., 2011; Massicotte et al., 2019; Saint-Béat et al., 2020 |
| **29** | **Phytoplankton** | - | Van Leeuwe et al., 2018; Oziel et al., 2019; Randelhoff et al., 2019; Saint-Béat et al., 2020 |

Table S2. Values used for estimating biomass, P/B and Q/B values for marine mammals and seabirds in the Baffin Bay coastal and shelf ecosystem model. CV – coefficient of variation; CI – confidence intervals.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Functional group | **Population size** | **Average weight kg** | **Longevity years** | **Natural mortality year-1** | **Harvest mortality** **ton km-2** | **P/B** **year-1** | **Q/B year-1** |
| **1. Killer whale** | 163 ± 27 SD | Lefort et al., 2020 | 2,280.5 | Trites and Pauly, 1998 | 80 | Ford, 2002 | 0.030 | - | - | 0.030 | 9.11 | Lefort et al., 2020 |
| **2. Polar bear** | 2,826 (95% CI 2,059-3,593) | SWG, 2016 | 300 | Stirling and Parkinson, 2006 | 25 | Stirling, 2002 | 0.096 | 0.0001 | SWG, 2016 | 0.15 | 6.00 | Williams et al., 2020 |
| **3. Narwhal** | 17,555 (CV 0.35) individuals | DFO, 2015a | 874 | Laidre et al., 2004 | 115 | Garde et al., 2015 | 0.024 | 0.0014 | NAMMCO, 2018 | 0.031 | 19.8 | Laidre et al., 2004 |
| **4. Bowhead whale** | 6,745 (CV 0.22) individuals | COSEWIC, 2009; Wiig et al., 2011 | 31,076 | Trites and Pauly, 1998 | 200 | George et al., 1999 | 0.013 | 0.0001 | DFO, 2015b | 0.013 | 14.2 | Laidre et al., 2007; Banas et al., 2021 |
| **5. Ringed seal** | 1.46 individuals per km2 | Kingsley, 1998; Reeves, 1998 | 73.5 | Ferguson et al., 2018 | 43 | Ferguson et al., 2018 | 0.065 | 0.0087 | Priest and Usher, 2004 | 0.146 | 15.3 | Ochoa-Acuña et al., 2008 |
| **6. Other seals** | 8,203,500 individuals | Hammill and Stenson, 2006; Cameron et al., 2010; Hammill et al., 2015 | 138.9 | Trites and Pauly, 1998 | 30 | Trites and Pauly, 1998 | 0.088 | 0.00088 | Priest and Usher, 2004; Hammill and Stenson, 2006; Hammill et al., 2014 | 0.091 | 39.6 | Ochoa-Acuña et al., 2008; Williams et al., 2020 |
| **7. Walrus** | 18,900 individuals | Hammill et al., 2016 | 586.5 | Trites and Pauly, 1998 | 33 | Trites and Pauly, 1998 | 0.083 | 0.00002 | https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/walrus-atl-morse/walrus-nunavut-morse-eng.html | 0.085 | 30.4 | Acquarone et al., 2006 |
| **8. Seabirds** | 353,800 individuals | Gaston et al., 2012; Mallory et al., 2019 | 0.638 | Hunt et al., 2000 | 26 | Schreiber and Burger, 2001; Aydin et al., 2007 | 0.023 | 0.00002 | Merkel and Barry, 2008 | 0.235 | 254 | Bech et al., 2002; Welcker et al., 2010; Elliott et al., 2013; Mallory and Forbes, 2013 |

Table S3. Values used for estimating biomass, P/B and Q/B values fish groups in the Baffin Bay coastal and shelf ecosystem model.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Abundance** **ton km-2** | **Length at infinity** **cm** | **Temperature °C** | **K** | **Aspect ratio** | **Natural mortality year-1** | **Landings** **ton km-2** | **P/B****year-1** | **Q/B year-1** |
| **8. Greenland shark** | - | - | 546 | 1 | 0.007 | 1.63 | 0.007 | 0.0007 | Jørgensen and Treble, 2016 | 0.007 | 0.29 |
| **9. Greenland halibut** | 2.83 | Treble, 2017 | 92.7 | 1 | 0.108 | 1.32 | 0.15 | 0.1034 | Treble and Nogueira, 2020 | 0.14 | 1.65 |
| **10. Arctic char** | - | - | 61.6 | 4 | 0.06 | 1.32 | 0.11 | 0.05 | M. Y. Janjua, per. Comm. | 0.19 | 2.3 |
| **11. Arctic/Polar cod**  | 5.74 | J. Herbig, unpublished data | 28-34 | 1 | 0.24-0.39 | 1.32 | 0.44-0.50 | 0 | - | 0.44-0.50 | 2.7-3.8 |
| **12. Sculpins/Eelpouts** | - | - | 12.9-54.4 | 0.1-1 | 0.11-0.54 | 1.32 | 0.16-0.73 | 0 | - | 0.16-0.73 | 1.9-4.5 |
| **13. Small demersal** | - | - | 12.5-39.8 | 0.1-1 | 0.33-0.99 | 1.32 | 0.11-1.17 | 0 | - | 0.11-1.17 | 2.4-4.8 |
| **14. Large demersal** | - | - | 44.3-181 | 0.1-1 | 0.04-0.13 | 1.32 | 0.07-0.18 | 0 | - | 0.07-0.18 | 0.9-2.0 |
| **16. Small pelagic** | - | - | 8.6-13.8 | 0.1 | 0.26-0.45 | 1.32-1.9 | 0.56-0.7 | 0 | - | 0.56-0.70 | 3.9-5.8 |

Table S4.a) Diet composition of functional groups in the Baffin Bay coastal and shelf ecosystem model

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Functional group** | **Diet composition** | **References**  |
| **1** | **Killer whale** | 32.5 % narwhal, 15.2 % bowhead whale, 10 % ringed seal, 6.7 % other seals, 0.7 % walrus, 1 % large demersal fish, 0.3 % cephalopods; 1 % Greenland shark, 32.6 % import (beluga and other whales) | Higdon, 2007; Ferguson et al., 2012; Higdon et al., 2012; Lefort et al., 2020 |
| **2** | **Polar bear** | 47.5 % ringed seal, 1 % walrus, 51.8 % other seals, 1 % narwhal, 1 % Arctic char, 1 % seabirds, 30 % import (beluga whale) | Mallory et al., 2009; Thiemann et al., 2011; Mckinney et al., 2013; Galicia et al., 2015; Galicia et al., 2021 |
| **3** | **Narwhal** | 56.38 % Arctic/polar cod, 36.6 % Greenland halibut, 1 % small demersal fish, 6.92 % cephalopods, 1 % crustaceans. A 25 % import was added to account for more intense feeding in wintering grounds, outside the model area | Finley and Gibb, 1982; Laidre et al., 2004 |
| **4** | **Bowhead whale** | 14.79 % omnivorous zooplankton, 47.62 % carnivorous zooplankton, 6.97 % *Calanus* copepods, and 30.6 % import (euphausiids) | Pomerleau et al., 2012 |
| **5** | **Ringed seal** | 31 % Carnivorous zooplankton, 2.55 % Omnivorous zooplankton, 50.45 % Arctic/polar cod, 10 % sculpins/eelpouts, 6 % large crustaceans | Holst et al., 2001; Yurkowski et al., 2016 |
| **6** | **Other seals** | 56.94 % Arctic/polar cod, 9.5 % Greenland halibut, 5.64 % sculpin/eelpout, 5.38 % small demersal fish, 2.8 % omnivorous zooplankton, 1.2 % large crustaceans, 0.95 % cephalopod, 0.08 % bivalves, 0.02 % polychaetes, 17.4 % import (euphausiids) | Finley and Evans, 1983; Kapel, 2000 |
| **7** | **Walrus** | 94.11 % bivalves, 0.97 % polychaetes, 4.53 % echinoderms, 0.14 % omnivorous zooplankton | Fisher and Stewart, 1997 |
| **8** | **Seabirds** | 16.52 % omnivorous zooplankton, 2 % *Calanus* copepods, 13.23 % carnivorous zooplankton, 10.05 % Arctic/polar cod, 14.74 % small pelagic fish, 2.64 % small demersal fish, 3.59 % sculpin/eelpouts, 15.00 % shrimp, 2 % cephalopods, 20.23 % import (euphausiids) | Bradstreet and Cross, 1982; Gaston and Bradstreet, 1993; Karnovsky et al., 2008; Leblanc et al., 2019 |
| **9** | **Greenland shark** | 23.16 % large demersal fish, 3.34 % Greenland halibut, 4.01 % small demersal fish, 0.34 % sculpins/eelpouts, 1.14 % Greenland shark, 13.97 % other seals, 0.71 % ringed seal, 0.05 % polar bear, 45.19 % cephalopods, 1 % large crustaceans, 1.1 % seabirds, 3.99 % echinoderms, 2 % other benthos | Nielsen et al., 2019 |
| **10** | **Greenland halibut** | 24.25 % Arctic/polar cod, 2 % Greenland halibut, 5 % sculpin/eelpouts, 24.5 % small demersal fish, 13.75 % cephalopods, 17.75 % large demersal fish, 2.13 % carnivorous zooplankton, 1.075 % omnivorous zooplankton, 0.025 % *Calanus* copepods, 7.525 % large crustaceans, 2 % polychaetes | Orr and Bowering, 1997; Giraldo et al., 2018 |
| **11** | **Arctic char** | 33.765 % carnivorous zooplankton, 45.055 % omnivorous zooplankton, 2 % *Calanus* copepods, 3.18 % Arctic/polar cod (replaced from capelin), 3 % sculpins/eelpouts, 3 % small demersal fish, 1 % polychaetes | Spares et al., 2012 |
| **12** | **Arctic/Polar cod** | 46.15 % omnivorous zooplankton, 12.1 % carnivorous zooplankton, 41.75 % *Calanus* copepods | Matley et al., 2013 |
| **13** | **Small pelagic fish** | 47.58 % *Calanus* copepods, 19.10 % omnivorous zooplankton, 33.03 % carnivorous zooplankton | Sameoto, 1980; Sweetman et al., 2014 |
| **14** | **Sculpins/Eelpouts** | 18.725 % omnivorous zooplankton, 34.175 % carnivorous zooplankton, 0.33 % *Calanus* copepods, 7.81 % Arctic cod/polar cod, 3.88 % small demersal fish, 14.40 % polychaetes, 5 % bivalves, 7.65 % large crustaceans, 2.62 % cephalopods, 3 % echinoderms, 2.12 % other benthos; 0.2 % sculpin/eelpouts | Eriksen et al., 2020 |
| **15** | **Small demersal fish** | 25.35 % omnivorous zooplankton, 50.56 % carnivorous zooplankton, 14.22 % polychaetes, 1.33 % bivalves, 3.93 % *Calanus* copepods, 1.18 % large crustaceans, 1.25 % echinoderms, 6.58 % other benthos, 0.61 % small demersal fish | Atkinson and Percy, 1991; Dolgov, 1994; Eriksen et al., 2020 |
| **16** | **Large demersal fish** | 13.32 % other benthos, 8.55 % omnivorous zooplankton, 6.13 % *Calanus* copepods, 2.88 % bivalves, 14.26 % echinoderms, 4.53 % polychaetes, 13.21 % carnivorous zooplankton, 0.59 % sculpins/eelpouts, 21.30 % large crustaceans, 4.22 % large demersal fish, 3.29 % small demersal fish, 2.44 % Arctic/polar cod, 2.54 % cephalopods, 2.54 small pelagic fish | Eriksen et al., 2020 |
| **17** | **Large crustaceans** | 5% *Calanus* copepods, 12.5% omnivorous zooplankton, 12.5% carnivorous zooplankton, 5% other benthos, 5% echinoderms, 10% polychaetes, 5% phytoplankton, 45% detritus | Shumway et al., 1985; Hopkins et al., 1989 |
| **18** | **Cephalopods** | 10 % carnivorous zooplankton, 10 % omnivorous zooplankton, 10 % *Calanus* copepods, 10 % Arctic cod, 10 % sculpins/eelpouts, 10 % small demersal fish, 15 % small pelagic fish, 5 % cephalopods, 20 % large crustaceans | Xavier et al., 2018 |
| **19** | **Carnivorous zooplankton** | 7.3 % microzooplankton, 62.9 % *Calanus* copepods, 19.8 % omnivorous zooplankton | Saint-Béat et al., 2020 |
| **20** | **Omnivorous zooplankton** | 66.0 % sea ice algae, 15.2 % phytoplankton, 0.4 % bacteria, 2.1 % microzooplankton, 16.4 % detritus | Saint-Béat et al., 2020 |
| **21** | **Calanus copepods** | 24.1 % sea ice algae, 51.4 % phytoplankton, 1.7 % microzooplankton, 22.9 % detritus | Saint-Béat et al., 2020 |
| **22** | **Microzooplankton** | 48.4 % phytoplankton, 1.7 % bacteria, 49.9 % detritus | Saint-Béat et al., 2020 |
| **23** | **Polychaetes** | 1 % *Calanus* copepods, 4 % omnivorous zooplankton, 3 % carnivorous zooplankton, 3 % microzooplankton, 1 % polychaetes, 1 % echinoderms, 10 % other benthos, 4 % phytoplankton, 12 % ice algae, 61 % detritus | Hoover et al., 2013 |
| **24** | **Echinoderms** | 3.5 % omnivorous zooplankton, 4.5 % carnivorous zooplankton, 1 % *Calanus* copepods, 3 % microzooplankton, 10 % polychaetes, 1 % echinoderms, 10 % bivalves, 15 % other benthos, 3 % phytoplankton, 8 % ice algae, 41 % detritus | Hoover et al., 2013 |
| **25** | **Bivalves** | 3% omnivorous zooplankton, 5% carnivorous zooplankton, 5% microzooplankton, 5% phytoplankton, 12% ice algae and 70% detritus | Hoover et al., 2013 |
| **26** | **Other benthos** | 1% omnivorous zooplankton, 1% carnivorous zooplankton, 1% microzooplankton, 1% polychaetes, 1% echinoderms, 1% bivalves, 1% other benthos, 5% phytoplankton, 22% ice algae, and 66% detritus | Hoover et al., 2013 |
| **27** | **Bacteria** | 100 % detritus | Saint-Béat et al., 2020 |

Table S4.b) Diet matrix used in the Ecopath balanced model. Adjusted values are in bold

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Prey \ predator | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 1 | Killer whale |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | Polar bear |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 | Narwhal | 0.33 | 0.01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 | Bowhead whale | 0.15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | Ringed seal | 0.10 | 0.36 |  |  |  |  |  |  | 0.01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | Other seals | 0.07 | **0.19** |  |  |  |  |  |  | **0.05** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 | Walrus | 0.01 | 0.01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Seabirds |  | 0.01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 | Greenland shark | 0.01 |  |  |  |  |  |  |  | 0.01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 | Greenland halibut |  |  | **0.19** |  |  | **0.06** |  |  | 0.03 | 0.02 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 | Arctic char |  | 0.01 |  |  |  | **0.00** |  |  |  | 0.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 | Arctic/Polar cod |  |  | 0.44 |  | **0.45** | **0.39** |  | 0.10 |  | 0.24 | 0.03 |  |  | **0.08** |  | 0.02 |  | 0.10 |  |  |  |  |  |  |  |  |  |
| 13 | Small pelagic fish |  |  |  |  |  | **0.09** |  | 0.15 |  |  |  |  |  |  |  | 0.02 |  | 0.15 |  |  |  |  |  |  |  |  |  |
| 14 | Sculpins/Eelpouts |  |  |  |  | 0.10 | 0.06 |  | 0.04 |  | 0.05 | 0.03 |  |  | 0.00 |  | 0.01 |  | 0.10 |  |  |  |  |  |  |  |  |  |
| 15 | Small demersal fish |  |  | 0.01 |  |  | 0.05 |  | 0.03 | 0.04 | 0.25 | 0.03 |  |  | 0.04 | 0.01 | 0.03 |  | 0.10 |  |  |  |  |  |  |  |  |  |
| 16 | Large demersal fish | 0.01 |  |  |  |  |  |  |  | 0.23 | 0.18 |  |  |  | 0.00 |  | 0.01 |  |  |  |  |  |  |  |  |  |  |  |
| 17 | Large crustaceans |  |  | 0.01 |  | 0.06 | 0.01 |  | 0.15 | 0.01 | 0.08 |  |  |  | 0.08 | 0.01 | 0.21 |  | 0.20 |  |  |  |  |  |  |  |  |  |
| 18 | Cephalopods | 0.00 |  | 0.05 |  |  | **0.03** |  | 0.02 | 0.45 | 0.14 |  |  |  | 0.03 |  | 0.03 |  | 0.05 |  |  |  |  |  |  |  |  |  |
| 19 | Carnivorous zooplankton |  |  |  | 0.48 | **0.36** | **0.06** |  | 0.13 |  | 0.02 | 0.37 | 0.12 | 0.33 | 0.34 | 0.46 | 0.13 | 0.13 | 0.10 |  |  |  |  | 0.03 | 0.05 | 0.05 | 0.01 |  |
| 20 | Omnivorous zooplankton |  |  |  | 0.15 | 0.03 | 0.03 |  | 0.17 |  | 0.01 | 0.50 | 0.46 | 0.19 | 0.19 | 0.25 | 0.09 | 0.13 | 0.10 | 0.30 |  |  |  | 0.04 | 0.04 | 0.03 | 0.01 |  |
| 21 | Calanus |  |  |  | 0.07 |  |  |  | 0.02 |  | 0.00 | 0.02 | 0.42 | 0.48 | 0.00 | 0.04 | 0.06 | 0.05 | 0.10 | 0.63 |  |  |  | 0.01 | 0.01 |  |  |  |
| 22 | Microzooplankton |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.07 | 0.02 | 0.02 |  | 0.03 | 0.03 | 0.05 | 0.01 |  |
| 23 | Polychaetes |  |  |  |  |  | 0.02 | 0.01 |  |  | 0.02 | 0.01 |  |  | 0.14 | 0.14 | 0.08 | 0.10 |  |  |  |  |  | 0.01 | 0.10 |  | 0.01 |  |
| 24 | Echinoderms |  |  |  |  |  |  | 0.05 |  | 0.04 |  |  |  |  | 0.03 | 0.01 | 0.14 | 0.05 |  |  |  |  |  | 0.01 | 0.01 |  | 0.01 |  |
| 25 | Bivalves |  |  |  |  |  | 0.02 | 0.94 |  |  |  |  |  |  | 0.05 | 0.01 | 0.03 |  |  |  |  |  |  |  | 0.10 |  | 0.01 |  |
| 26 | Other benthos |  |  |  |  |  |  |  |  | 0.02 |  |  |  |  | 0.02 | 0.07 | 0.13 | 0.05 |  |  |  |  |  | 0.10 | 0.15 |  | 0.01 |  |
| 27 | Bacteria |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.02 |  |  |  |  |  |
| 28 | Ice algae |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.66 | 0.24 |  | 0.12 | 0.08 | 0.12 | 0.22 |  |
| 29 | Phytoplankton |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.05 |  |  | 0.15 | 0.51 | 0.48 | 0.04 | 0.03 | 0.05 | 0.05 |  |
| 30 | Detritus |  |  |  |  |  |  |  |  | **0.10** |  |  |  |  |  |  |  | 0.45 |  |  | 0.16 | 0.23 | 0.50 | 0.61 | 0.41 | 0.70 | 0.66 | 1.00 |
|  | Import | **0.33** | **0.42** | **0.30** | 0.31 |  | 0.17 |  | 0.20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Table S5. Pedigree classification (and corresponding confidence intervals %) in the WBB Ecopath model.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Group name | Biomass  | P/B | Q/B | Diet composition | Catch |
| 1 | Killer whale | 5 (30) | 4 (50) | 6 (30) | 4 (50) | - |
| 2 | Polar bear | 6 (10) | 4 (50) | 6 (30) | 5 (30) | 6 (10) |
| 3 | Narwhal | 6 (10) | 4 (50) | 6 (30) | 6 (10) | 6 (10) |
| 4 | Bowhead whale | 5 (30) | 4 (50) | 6 (30) | 5 (30) | 6 (10) |
| 5 | Ringed seal | 4 (50) | 4 (50) | 6 (30) | 6 (10) | 6 (10) |
| 6 | Other seals | 4 (50) | 4 (50) | 6 (30) | 5 (30) | 5 (30) |
| 7 | Walrus | 5 (30) | 4 (50) | 6 (30) | 5 (30) | 6 (10) |
| 8 | Seabirds | 5 (30) | 4 (50) | 6 (30) | 5 (30) | 5 (30) |
| 9 | Greenland shark | 1 (80) | 4 (50) | 4 (50) | 5 (30) | 5 (30) |
| 10 | Greenland halibut | 6 (10) | 8 (10) | 4 (50) | 5 (30) | 6 (10) |
| 11 | Arctic char | 1 (80) | 4 (50) | 4 (50) | 5 (30) | 5 (30) |
| 12 | Arctic/Polar cod | 6 (10) | 4 (50) | 4 (50) | 6 (10) | - |
| 13 | Small pelagic fish | 1 (80) | 4 (50) | 4 (50) | 5 (30) | - |
| 14 | Sculpins/Eelpouts | 1 (80) | 4 (50) | 4 (50) | 5 (30) | - |
| 15 | Small demersal fish | 1 (80) | 4 (50) | 4 (50) | 5 (30) | - |
| 16 | Large demersal fish | 1 (80) | 4 (50) | 4 (50) | 5 (30) | 5 (30) |
| 17 | Large crustaceans | 1 (80) | 3 (60) | 3 (60) | 4 (50) | - |
| 18 | Cephalopods | 1 (80) | 3 (60) | 3 (60) | 4 (50) | - |
| 19 | Carnivorous zooplankton | 6 (10) | 8 (10) | 8 (10) | 5 (30) | - |
| 20 | Omnivorous zooplankton | 6 (10) | 8 (10) | 8 (10) | 5 (30) | - |
| 21 | Calanus | 6 (10) | 8 (10) | 8 (10) | 5 (30) | - |
| 22 | Microzooplankton | 6 (10) | 8 (10) | 8 (10) | 5 (30) | - |
| 23 | Polychaetes | 5 (30) | 3 (60) | 3 (60) | 2 (80) | - |
| 24 | Echinoderms | 5 (30) | 3 (60) | 3 (60) | 2 (80) | 5 (30) |
| 25 | Bivalves | 1 (80) | 3 (60) | 3 (60) | 2 (80) | - |
| 26 | Other benthos | 1 (80) | 3 (60) | 3 (60) | 2 (80) | 5 (30) |
| 27 | Bacteria | 6 (10) | 8 (10) | 8 (10) | 6 (10) | - |
| 28 | Ice algae | 5 (30) | 8 (10) | - | - | - |
| 29 | Phytoplankton | 5 (30) | 8 (10) | - | - | - |
| 30 | Detritus | 5 (30) | - | - | - | - |

Table S6. Pedigree qualitative classification from Ecopath.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Index | Biomass  | P/B and Q/B | Diet composition | Catch |
| 1 | Estimated by Ecopath | Estimated by Ecopath | General knowledge of related group/species | Guesstimate |
| 2 | From other model | Guesstimate | From other model | From other model |
| 3 | Guesstimate | From other model | General knowledge for same group/species | FAO statistics |
| 4 | Approximate or indirect method | Empirical relationship | Qualitative diet composition study | National statistics |
| 5 | Sampling/locally, low precision | Similar species, similar system, low precision | Quantitative but limited diet composition study | Local study, low precision/incomplete |
| 6 | Sampling/locally, high precision | Similar species, same system, low precision | Quantitative, detailed, diet composition study | Local study, high precision/complete |
| 7 |  | Same species, similar system, high precision |  |  |
| 8 |  | Same species, same system, high precision |  |  |

Zooplankton conversion equations

Table S7. Weight-length relationships for zooplankton species. Relationships are given in dry weigth (DW), carbon (C), ash-free dry weight (AFWD) to length (L).

|  |  |  |
| --- | --- | --- |
| Species | Weight-length relationship | Source |
| *Calanus glacialis*  | Cµg = 4.742 x Lmm 3.452 | Forest et al., 2011 |
| *Calanus hyperboreus* | DWmg = 0.003 x Lmm3.718 | Ashjian et al., 2003 |
| *Calanus finmarchicus* | Cmg = 0.0048 x Lmm3.5687 | Madsen et al., 2001 |
| *Boroecia maxima*  | AFDWmg = 0.0228 x Lmm2.3698 | Mumm, 1991 |
| *Discoconchoecia elegans* | AFDWmg = 0.0228 x Lmm2.3698 | Mumm, 1991 |
| *Heterostylites major* | log(Cµg) = 3.07 x log(Lµm)-8.37 | Uye, 1982 |
| *Limacina helicina* | DWmg = 0.137 x Lmm1.5005 | Bednarsek et al., 2012 |
| *Metridia longa* | Cmg = 7.498 x Lmm3.225 | Forest et al., 2011 |
| *Microcalanus* | log(Cµg) = 3.07 x log(Lµm)-8.37 | Uye, 1982 |
| *Oithona similis* | Cµg = 9.4676 x 10-7 x Lµm2.16 | Sabatini and Kiørboe, 1994 |
| *Oncaea notopus* | log(AFDWµg) = 3.16 x log(Lµm) - 8.18 | Hopcroft et al., 2005 |
| *Pseudocalanus* spp. | log10(Dwµg) = -7.62 + 2.85 x log10(Lµm) | Liu and Hopcroft, 2008 |
| *Spinocalanus longicornis* | log(Cµg) = 3.07 x log(Lµm)-8.37 | Uye, 1982 |
| *Triconia borealis* | Cµg = 9.4676 x 10-7 x Lµm2.16 | Sabatini and Kiørboe, 1994 |
| *Aglantha digitale* | DWmg = 0.00194 x Lmm3.05 | Hopcroft et al., 2005 |
| *Eukrohnia hamata* | DWmg = 0.00032 x Lmm3.00 | Hopcroft et al., 2005 |
| *Gaetanus tenuispinus* | AFDWmg = 0.0089 x Lmm3.4119 | Mumm, 1991 |
| *Heterorhabdus norvegicus* | AFDWmg = 0.0031 x Lmm4.7164 | Mumm, 1991 |
| *Paraeuchaeta* spp. | AFDWmg = 0.0075 x Lmm3.274 | Mumm, 1991 |
| *Themisto abyssorum* | DWµg = 0.0049 x Lmm2.957 | Hopcroft et al., 2005 |

Table S8. Conversion factors for zooplankton weight estimates from Kiørboe (2013). Conversions between dry weight (DW), carbon (C), ash-free dry weight (AFWD) and wet weight (WW).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | DW (% WW) | AFDW (% dry) | C (% DW) | C (% WW) |
| Copepods | 16.2 ± 2.4 | 7.6 ± 1.8 | 48 ± 1.4 | 9.95 ± 1.49 |
| All crustaceans | 18.3 ± 1.9 | 11.5 ± 2.4 | 43.5 ± 1.3 | 9.61 ± 0.01 |
| Amphipods | 23.9 ± 9.0 | 20.7 ± 6.7 | 34.5 ± 3.2 | 8.41 ± 1.38 |
| Pteropods | 23.0 ± 19.4 | 30.9 ± 93.1 | 28.9 ± 4.8 | 5.3 ± 5.5 |
| Cnidarians\* | 4.1 ± 0.3 | 52.4 ± 6.4 | 13.2 ± 2.1 | * 1. ± 0.13
 |

\*the only cnidarian sampled was *A. digitale*. Compared to other zooplankton species, a larger portion of Cnidarians’ body mass is water. When converting carbon to wet weight, the biomass value for *A. digitale* was unreasonably large and therefore we assumed the same conversion factor as for all crustaceans instead, which produced more ecologically sound results.

Table S9. Percent change (%) made to input values during model balance. Positive or negative signs indicate if we increased or decreased the value, respectively.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Group name | B | P/B | Q/B | Landings |
| 2 | Polar bear | -24 |  |  |  |
| 3 | Narwhal |  | +29 |  | -29 |
| 9 | Greenland shark |  | +614\* | +38 |  |
| 10 | Greenland halibut |  | +264 | +39 |  |
| 12 | Arctic/Polar cod |  | +38 |  |  |
| 19 | Carnivorous zooplankton | -48 |  |  |  |
| 20 | Omnivorous zooplankton | -37 |  |  |  |
| 21 | Calanus | -27 |  |  |  |
| 22 | Microzooplankton | +93 |  |  |  |
| 29 | Ice algae | +117 |  |  |  |

\* The P/B estimate by Fishbase for Greenland shark is very low. It is based on the calculation of VBGF K as 0.007, which is unrealistic for 392 years maximum age. These age estimates are currently being re-evaluated. Assuming a maximum age of 100 years is more realistic and closer to the adjusted value (M. Y. Janjua, pers. Comm.).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Prey \ predator | Killer whale | Polar bear | Narwhal | Ringed seal | Other seals | Greenland shark | Sculpins/Eelpouts |
| Other seals |  | -64 |  |  |  | -64 |  |
| Greenland halibut |  |  | -49 |  | -42 |  |  |
| Arctic char |  |  |  |  | +0.5 |  |  |
| Arctic/Polar cod |  |  |  | -11 | -31 |  | +0.1 |
| Small pelagic fish |  |  |  |  | +9 |  |  |
| Cephalopods |  |  |  |  | +211 |  |  |
| Carnivorous zooplankton |  |  |  | +17 | +6 |  |  |
| Detritus |  |  |  |  |  | +10 |  |
| Import | +42 | +19 | +0.1 |  |  |  |  |

Table S10. Percent change made to input values in the diet matrix during model balance. Positive or negative signs indicate if we increased or decreased the value, respectively.

Table S11. Trophic levels reported for marine mammal and seabird species present in the West Baffin Bay coastal and shelf ecosystem.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Functional group** | **Species** | **Scientific name** | **Trophic level** | **Source** |
| **Killer whale** | Killer whale | *Orcinus orca* | 4.5 | Trites et al., 1995 |
| **Polar bear** | Polar bear | *Ursus maritimus* | 5.1; 5.5 | Hobson and Welch, 1992; Hobson et al., 2002 |
| **Narwhal** | Narwhal | *Monodon monoceros* | 3.7; 4.1 | Hobson and Welch, 1992; Hobson et al., 2002 |
| **Bowhead whale** | Bowhead whale | *Balaena mysticetus* | 3.4; 2.8 ± 0.1 | Hobson et al., 2002; Hoekstra et al., 2003 |
| **Ringed seal** | Ringed seal | *Pusa hispida* | 4.1; 4.4 & 4.6 | Hobson and Welch, 1992; Hobson et al., 2002 |
| **Other seals** | Bearded seal | *Erignathus barbatus* | 4.0; 4.3 | Hobson and Welch, 1992; Hobson et al., 2002 |
|  | Harp seal | *Pagophilus groenlandicus* | 3.8 | Trites et al., 1995 |
|  | Hooded seal | *Cystophora cristata* | 4.2 | Trites et al., 1995 |
| **Walrus** | Atlantic walrus | *Odobenus rosmarus rosmarus* | 2.9; 3.2 | Hobson and Welch, 1992; Hobson et al., 2002 |
| **Seabirds** | Black-legged kittiwake | *Rissa tridactyla* | 4.0; 3.9 | Hobson and Welch, 1992; Hobson et al., 2002 |
|  | Northern fulmar | *Fulmarus glacialis* | 3.9; 4.0 | Hobson and Welch, 1992; Hobson et al., 2002 |
|  | Thick-billed murre | *Uria lomvia* | 4.1; 4.0 | Hobson and Welch, 1992; Hobson et al., 2002 |

Table S12. Trophic levels reported for fish species present in the West Baffin Bay coastal and shelf ecosystem from [fishbase.org](https://www.fishbase.se/search.php) (based on results from literature).

|  |  |  |  |
| --- | --- | --- | --- |
| **Functional** **group** | **Species** | **Scientific name** | **Trophic level (±SE)** |
| **Greenland shark** | Greenland shark | *Somniosus microcephalus* | 4.4 ± 0.57 |
| **Greenland halibut** | Greenland halibut | *Reinhardtius hippoglossoides* | 4.4 ± 0.14 |
| **Arctic char** | Arctic char | *Salvelinus alpinus* | 4.4 ± 0.51 |
|  |  |  | \*3.1 ± 0.1  |
| **Arctic/Polar cod** | Polar cod | *Arctogadus glacialis* | 3.3 ± 0.33 |
| Arctic cod | *Boreogadus saida* | 3.1 ± 0.11 |
| **Small pelagic fish** | Goiter blacksmelt | *Bathylagus euryops* | 3.3 ± 0.38 |
| Glacier lanternfish | *Benthosema glaciale* | 3.0 ± 0.29 |
| **Sculpins/eelpouts** | Atlantic hookhear sculpin | *Artediellus atlanticus* | 3.4 ± 0.44 |
| Bigeye sculpin | *Triglops nybelini* | 3.3 ± 0.22 |
| Ribbed sculpin | *Triglops pingelii* | 3.4 ± 0.26 |
| Polar sculpin | *Cottunculus microps* | 4.1 ± 0.22 |
| Doubleline eelpout | *Lycodes eudipleurostictus* | 3.5 ± 0.50 |
| Arctic eelpout | *Lycodes reticulatus* | 3.5 ± 0.53 |
| Pale eelpout | *Lycodes pallidus* | 3.1 ± 0.36 |
| **Small demersal fish** | Atlantic poacher | *Leptagonus decagonus* | 3.2 ± 0.30 |
| Atlantic spiny lumpsucker | *Eumicrotremus spinosus* | 3.5 ± 0.49 |
| Sea tadpole | *Careproctus reinhardti* | 3.8 ± 0.58 |
| Gelatinous seasnail | *Liparis fabricci* | 3.3 ± 0.42 |
| Arctic flounder | *Liopsetta glacialis or Pleuronectes glacialis* | 3.4 ± 0.06 |
| **Large demersal fish** | Roughhead grenadier | *Macrourus berglax* | 3.6 ± 0.53 |
| Deepwater redfish | *Sebastes mentella* | 4.1 ± 0.66 |
| Spotted Wolffish | *Anarhichas minor* | 3.6 ± 0.51 |
| Arctic skate | *Amblyraja hyperborea* | 4.3 ± 0.54 |
| Thorney skate | *Amblyraja radiata* | 4.2 ± 0.27 |

\*Value reported for Arctic char in the Beaufort-Chukchi Sea (Hoekstra et al., 2003)

Table S13. Trophic levels reported for invertebrate species present in the West Baffin Bay coastal and shelf ecosystem.

|  |  |  |  |
| --- | --- | --- | --- |
| **Functional** **group** | **Species** | **Trophic level (±SE)** | **Source** |
| **Large crustaceans** | *Pandalus* sp. | 3.4 | Hobson et al., 2002 |
| **Cephalopods** | *Rossia palpebrosa* | 3.6 ± 0.1 | Golikov et al., 2019 |
| **Carnivorous zooplankton** | *Aglantha digitale* | 2.3 | Hobson and Welch, 1992 |
|  | *Themisto abyssorum* | 2.6 | Hobson et al., 2002 |
| **Omnivorous zooplankton** | *Metridia longa* | 2.5 | Hobson et al., 2002 |
| **Calanus copepods** | *Calanus hyperboreus* | 2.0 | Hobson and Welch, 1992 |
|  | *Calanus glacialis* | 2.3 | Hobson et al., 2002 |
| **Polychaetes** | *Lumbrineris* sp. | 3.6 | Hobson et al., 2002 |
|  | *Phyllodoce mucosa* | 3.2 | Hobson et al., 2002 |
|  | *Phascolosoma eremeta* | 3.1 | Hobson et al., 2002 |
| **Echinoderms** | *Crossaster papposus* | 3.8 | Hobson and Welch, 1992 |
|  | *Leptasterias* sp*.* | 2.6 | Hobson and Welch, 1992 |
| **Bivalves** | *Mya truncata* | 2.1 | Hobson and Welch, 1992 |
|  | *Astarte elliptica* | 2.2 | Hobson et al., 2002 |
|  | *Serripes groenlandica* | 1.9 | Hobson and Welch, 1992 |
|  | *Buccinum* sp. | 2.9 | Hobson and Welch, 1992 |
| **Other benthos** | *Mertensia ovum*  | 3.2 | Hobson and Welch, 1992 |
|  | *Anemone urticina* | 3.3 | Hobson and Welch, 1992 |



**Figure S1. Theoretical curve representing the balance between resiliency and redundancy properties of an ecosystem.** Values are robustness A/C)\*logA/C) against relative ascendency A/C. Adapted from Fath, 2015).



**Figure S2. SUpportive Role to Fishery ecosystems (SURF index calculated for prey species in the West Baffin Bay food web.** These calculations exclude primary producers and top predators. The orange line indicates the threshold above which functional groups are considered key prey species in the ecosystem.based on (Plagányi and Essington, 2014).

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