Text S1.

Reconstruction of prey biomass and length of polar cod (*Boreogadus saida*)

Equations for reconstructing prey biomass of different taxa and sources are given in Table A1. Otolith length (OL) to body mass (W) equation for polar cod was acquired by using undamaged otoliths (n = 982) taken from whole fish collected during the study and fitting an exponential curve to the data using linear regression of log-transformed W (g) against OL (mm). The equation for calculating total length (TL) from OL was acquired by fitting a simple linear regression on untransformed data. Equations for estimating W from TL for various invertebrate taxa were derived using individual prey items showing minimal signs of digestion. These invertebrate taxa included Decapoda (excluding crabs; n = 187), Amphipoda <12 mm (n = 104), Amphipoda >12 mm (n = 86), Euphausiidae (n = 34) and Mysidae (n = 27) found in the stomachs of Atlantic cod. For decapods, an exponential curve was fitted through linear regression, using log-transformed prey weight (g) as the dependent variable and TL (mm) as the independent variable. A simple linear regression model was applied to the untransformed data for the other species.
Average prey weights calculated by IO PAS were applied to stomach contents of polar cod.

Table S1. Equations for reconstructing body mass of different prey taxa found in stomachs of polar cod (*Boreogadus saida*) and Atlantic cod (*Gadus morhua*), and sources of the equations. *W* = body mass (g), TL = total length (mm), OL = otolith length (mm). IO PAS = Institute of Oceanology of the Polish Academy of Sciences, IMR = the Norwegian Institute of Marine Research.

Taxon	Equation	Source
Polar cod	$W = e^{(-0.229 + 0.538 * OL)}$	This study
Polar cod	$W = 0.5$	IO PAS (unpubl. data)
Polar cod	$TL = 1.1249 + 2.3648 * OL$	This study
Atlantic cod	$W = 0.0294 * OL^{3.5377}$	IMR (unpubl. data)
Capelin (*Mallotus villosus*)	$W = 1.163 * OL^{2.742}$	Härkönen (1986)
Atlantic herring (*Clupea harrengus*)	$W = e^{(-5.755 + 3.225 * \log(\frac{TL}{10}))}$	Johansen et al. (2004)
Atlantic herring	$W = 1.538 * OL^{2.778}$	Windsland et al. (2007)
Cottidae	$W = e^{(-11.5589 + 3.025 * \log(\frac{TL}{10}))} * 1000$	Wigley et al. (2003)
Cottidae	$W = 0.2261 * OL^{3.496}$	(Härkönen 1986)
Stichaeidae	$W = e^{(-6.76 + 3.64 * \log(\frac{TL}{10}))}$	Meyer Ottesen et al. (2011)
Stichaeidae	$W = 3.7735 * OL - 1.3259$	IMR (unpubl. data)
Liparidae	$W = 0.4411 * OL^{6.0788}$	IMR (unpubl. data)
Ammodytidae	$W = 0.6041 * OL^{2.763}$	Härkönen (1986)
Juvenile fish	$W = 0.25$	IO PAS (unpubl. data)
Fish larvae	$W = 0.1$	IO PAS (unpubl. data)
Decapoda	$W = 0.0197 * e^{(0.0705 * TL)}$	This study
Decapoda larvae	$W = 0.001$	IO PAS (unpubl. data)
*A*mphipoda <12 mm	$W = -0.012 + 0.003 * TL$	This study
Amphipoda >12 mm	$W = 0.0022 + 0.0041 * TL$	This study
Hyperiidea	$W = 0.04$	IO PAS (unpubl. data)
Oedicerotidae	$W = 0.02$	IO PAS (unpubl. data)
Lysianassidae	$W = 0.02$	IO PAS (unpubl. data)
Euphausiidae	$W = -0.0364 + 0.0043 * TL$	This study
Thysanoessa longicaudata	$W = 0.08$	IO PAS (unpubl. data)
Thysanoessa spp.	$W = 0.1$	IO PAS (unpubl. data)
Mysidae	$W = -0.0124 + 0.022 * TL$	This study
Copepoda	$W = 0.002$	IO PAS (unpubl. data)
Errantia	$W = 0.1$	IO PAS (unpubl. data)

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Table S2. Dietary indices and number of individuals of different prey taxa found in the stomachs of polar cod collected during Polar Night (*n* = 475) and summer (*n* = 363) in Kongsfjorden, Svalbard 2022; *n* = number of individuals, NF_i = relative numerical frequency, FO_i = frequency of occurrence, W = total biomass and B_i = relative proportion of biomass.

	Polar Night					Summer				
Taxon	*n*	NF_i (%)	FO_i (%)	W (g)	B_i (%)	*n*	NF_i (%)	FO_i (%)	W (g)	B_i (%)
Fish										
Polar cod	13	0.98	2.11	24.93	38.41	-	-	-	-	-
Cottidae	1	0.08	0.21	1.66	2.56	-	-	-	-	-
Stichaeidae	7	0.53	0.84	4.31	6.64	-	-	-	-	-
Fish[a]	115	8.63	23.79	16.25	25.04	6	0.06	2.48	0.9	2.32
Amphipoda										
Hyperia galba	1	0.08	0.21	< 0.01	< 0.01	-	-	-	-	-
Hyperoche medusarum	5	0.38	1.05	0.16	0.25	-	-	-	-	-
Themisto abyssorum	40	3	7.58	1.4	2.16	188	1.74	21.76	5.28	13.59
Themisto libellula	2	0.15	0.42	< 0.01	< 0.01	4	0.04	1.10	0.16	0.41
Themisto spp.	73	5.48	14.32	2.92	4.50	167	1.55	26.17	6.68	17.20
Hyperiidae	1	0.08	0.21	< 0.01	< 0.01	-	-	-	-	-
Lysianassidae	1	0.08	0.21	0.02	0.03	2	0.02	0.55	0.04	0.10
Oedicerotidae	8	0.60	1.47	0.16	0.25	17	0.16	3.31	0.34	0.88
Pardaliscidae	-	-	-	-	-	1	0.01	0.28	0.02	0.05
Amphipoda	1	0.08	0.21	0.04	0.06	22	0.20	6.34	0.76	1.96
Copepoda										
Calanus hyperboreus	14	1.05	0.42	0.03	0.04	3	0.03	0.28	0.01	0.02
Calanus spp.[b]	792	59.41	48.42	1.58	2.44	10174	94.35	84.85	20.35	52.39
Metridia longa	10	0.75	0.63	0.02	0.03	2	0.02	0.55	< 0.01	0.01

Metridia spp.	19	1.43	3.37	0.04	0.06	-	-	-	-	-
Harpacticoida	1	0.08	0.21	< 0.01	< 0.01	-	-	-	-	-
Cumacea										
Diastylis spp.	-	-	-	-	-	5	0.05	1.10	0.05	0.13
Eudorella emarginata	-	-	-	-	-	32	0.30	7.16	0.32	0.82
Leucon sp.	-	-	-	-	-	1	0.01	0.28	0.01	0.03
Decapoda										
Sabinea septencarinata	-	-	-	-	-	1	0.01	0.28	< 0.01	< 0.01
Pandalus borealis	9	0.68	1.47	0.71	1.09	13	0.12	1.93	0.10	0.27
Pagarus pubescens	-	-	-	-	-	1	0.01	0.28	< 0.01	< 0.01
Decapoda	15	1.13	2.74	0.01	0.02	9	0.08	1.93	0.01	0.02
Euphausiidae										
Thysanoessa longicaudata	2	0.15	0.42	0.16	0.25	-	-	-	-	-
Thysanoessa inermis	-	-	-	-	-	2	0.02	0.55	0.08	0.21
Thysanoessa spp.	92	6.90	16.63	9.14	14.08	11	0.10	2.48	1.10	2.83
Meganyctiphanes norvegica	23	1.73	0.63	0.41	0.64	2	0.02	0.53	0.03	0.07
Euphausiidae	2	0.15	0.42	0.10	0.15	-	-	-	-	-
Other Crustacea										
Bopyridae	-	-	0.17	-	-	-	-	-	-	-
Munnopsidae	2	0.15	0.42	< 0.01	< 0.01	1	0.01	0.28	< 0.01	< 0.01
Isopoda	-	-	-	-	-	1	0.01	0.28	< 0.01	< 0.01
Mysida	1	0.08	0.42	0.32	0.49	12	0.11	2.20	< 0.01	< 0.01
Ostracoda	2	0.15	0.42	< 0.01	< 0.01	2	0.02	0.55	< 0.01	< 0.01
Crustacea	70	5.25	21.05	0.03	0.05	72	0.67	8.26	-	-
Polychaeta										
Errantia	1	0.08	0.21	0.10	0.15	-	-	-	-	-

Polychaeta	4	0.30	0.84	0.40	0.62	26	0.24	6.61	2.60	6.69
Other										
Bivalvia	2	0.15	0.21	< 0.01	< 0.01	-	-	-	-	-
Foraminifera	-	-	-	-	-	1	0.01	0.28	< 0.01	< 0.01
Nematoda	1	0.08	0.21	< 0.01	< 0.01	2	0.02	0.83	< 0.01	< 0.01
Fish eggs	1	0.08	0.21	< 0.01	< 0.01	-	-	-	-	-
Gelatinous zooplankton	2	0.15	0.42	< 0.01	< 0.01	3	0.03	0.28	< 0.01	< 0.01

[a]Roughly estimated to consist of 50/50 polar cod and the prickleback *Anisarchus medius*.

[b]*Calanus finmarchicus* or *C.* glacialis

Table S3. Dietary indices and number of individuals of different prey taxa found in the stomachs of Atlantic cod collected during Polar Night (*n* = 207) and summer (*n* = 39) in Kongsfjorden, Svalbard 2022; *n* = number of individuals, NF_i = relative numerical frequency, FO_i = frequency of occurrence, W = total biomass and B_i = relative proportion of biomass.

	Polar Night					Summer				
Taxon	*n*	NF_i (%)	FO_i (%)	W (g)	B_i (%)	*n*	NF_i (%)	FO_i (%)	W (g)	B_i (%)
Fish										
Atlantic cod	5	0.42	2.42	472.12	17.05	-	-	-	-	-
Polar cod	97	6.36	24.04	1034.22	37.36	84	22.83	69.23	1267.70	93.55
Gadidae	3	0.20	0.96	-	-	-	-	-	-	-
Ammodytidae	1	0.07	0.48	4.10	0.15	-	-	-	-	-
Capelin	5	0.42	0.96	31.77	1.15	1	0.27	2.56	7.78	0.57
Cottidae	1	0.07	0.48	3.56	0.13	-	-	-	-	-
Atlantic herring	63	4.13	7.21	71.59	2.59	5	1.36	10.28	2.57	0.19
Leptoclinus maculatus	2	0.13	0.96	9.20	0.42	-	-	-	-	-
Stichaeidae	30	1.97	8.65	27.13	0.98	22	5.98	23.08	19.68	1.45
Liparis bathyarcticus	6	0.39	1.92	40.04	1.45	1	0.27	2.56	4.91	0.36
Liparidae	11	0.72	4.81	22.20	0.80	-	-	-	-	-
Sebastes mentella	2	0.13	0.96	134.96	4.88	-	-	-	-	-
S. viviparus	1	0.07	0.48	10.68	0.39	-	-	-	-	-
Fish	25	1.64	37.02	10.91	0.39	8	2.17	15.38	-	-
Amphipoda										
Hyperia galba	3	0.20	0.96	< 0.01	< 0.01	-	-	-	-	-
Hyperoche medusarum	3	0.20	0.48	0.01	< 0.01	1	0.27	2.56	0.03	< 0.01
Themisto abyssorum	4	0.28	1.44	0.11	< 0.01	172	46.74	64.1	1.20	0.09
Themisto libellula	-	-	-	-	-	3	0.82	7.69	0.21	0.02

Hyperiidae	3	0.20	1.44	0.04	< 0.01	2	0.54	5.13	0.02	< 0.01
Apherusa	1	0.07	0.48	0.02	< 0.01	-	-	-	-	-
Arrhis phyllonyx	178	11.67	31.73	10.26	0.37	-	-	-	-	-
Calliopiidae	2	0.13	0.48	0.05	< 0.01	-	-	-	-	-
Gammarus oceanicus	2	0.13	0.96	0.78	0.03	-	-	-	-	-
Halirages fulvocinctus	10	0.66	2.88	0.28	0.01	-	-	-	-	-
Lysianassidae	1	0.07	0.48	0.02	< 0.01	-	-	-	-	-
Onisimus litoralis	1	0.07	0.48	0.01	< 0.01	-	-	-	-	-
Rhachotropis aculeata	1	0.07	0.48	0.08	< 0.01	-	-	-	-	-
Wimvadocus torelli	1	0.07	0.48	2.07	0.07	-	-	-	-	-
Amphipoda	79	5.18	27.88	1.58	0.06	3	0.82	2.56	0.05	< 0.01
Copepoda										
Calanus hyperboreus	2	0.13	0.96	< 0.01	< 0.01	-	-	-	-	-
Calanus spp.[a]	2	0.13	0.96	< 0.01	< 0.01	6	1.63	2.56	0.01	< 0.01
Copepoda	4	0.28	1.92	< 0.01	< 0.01	-	-	-	-	-
Metridia longa	1	0.07	0.48	< 0.01	< 0.01	-	-	-	-	-
Paraeuchaeta norvegica	1	0.07	0.48	0.01	< 0.01	-	-	-	-	-
Paraeuchaeta	1	0.07	0.48	< 0.01	< 0.01	-	-	-	-	-
Cumacea										
Diastylis goodsiri	3	0.20	1.44	0.76	0.03	-	-	-	-	-
Diastylis rathkei	1	0.07	0.48	0.17	0.01	-	-	-	-	-
Cumacea	1	0.07	0.48	0.01	< 0.01	1	0.27	2.56	0.01	< 0.01
Decapoda										
Crangonidae	1	0.07	0.48	0.44	0.02	2	0.54	5.13	1.03	0.08
Sabinea sarsi	10	0.66	2.88	3.13	0.11	-	-	-	-	-
Sabinea sp.	1	0.07	0.48	0.16	0.01	-	-	-	-	-

Eualus gaimardii	3	0.20	1.44	0.43	0.02	-	-	-	-	-
Lebbeus polaris	9	0.59	2.88	1.27	0.05	-	-	-	-	-
Spirontocaris spinus	12	0.79	4.81	31.91	1.15	1	0.27	2.56	0.29	0.02
Hippolytidae	7	0.46	3.37	0.74	0.03	-	-	-	-	-
Hyas araneus	3	0.20	0.95	10.54	0.38	-	-	-	-	-
Brachyura	-	-	-	-	-	1	0.27	2.56	< 0.01	< 0.01
Pandalus borealis	373	24.46	41.35	229.82	8.30	22	5.98	35.9	42.81	3.16
Decapoda	81	5.31	18.27	13.98	0.51	2	0.54	7.69	0.67	0.05
Euphausiidae										
Thysanoessa inermis	1	0.07	0.48	0.07	< 0.01	7	1.90	7.69	0.35	0.03
Thysanoessa spp.	6	0.39	1.92	0.27	0.01	7	1.90	10.28	0.14	0.01
Thysanoessa furcilia	56	3.67	12.02	0.76	0.03	2	0.54	5.13	0.01	0.01
Meganyctiphanes norvegica	1	0.07	0.48	0.07	< 0.01	-	-	-	-	-
Other Crustacea										
Munnopsis typica	1	0.07	0.48	< 0.01	< 0.01	-	-	-	-	-
Munnopsidae	1	0.07	0.48	< 0.01	< 0.01	-	-	-	-	-
Isopoda	10	0.66	2.88	0.03	< 0.01	-	-	-	-	-
Mysida	119	7.80	17.79	19.06	0.69	-	-	-	-	-
Crustacea	38	2.49	36.06	-	-	8	2.17	12.82	-	-
Polychaeta										
Amphicteis gunneri	1	0.07	0.48	4.43	0.16	2	0.54	5.13	< 0.01	< 0.01
Lumbrineris spp.	6	0.39	2.40	< 0.01	< 0.01	2	0.54	5.13	0.91	0.07
Phyllodoce spp.	27	1.77	6.73	0.96	0.03	1	0.27	2.56	0.06	< 0.01
Polychaeta	32	2.10	20.19	32.34	1.17	-	-	10.28	-	-
Sipunculidea										
Golfingiidae	25	1.64	3.85	522.94	18.89	-	-	-	-	-

Other										
Chlamys islandica	2	0.13	0.96	3.70	0.13	-	-	-		-
Bivalvia	28	1.84	5.77	0.18	0.01	-	-	-		-
Gastropoda	-	-	-	-	-	1	0.27	2.56	< 0.01	< 0.01
Echinoidea	1	0.07	0.48	0.47	0.02	-	-	-	-	-
Holothuroidea	-	-	-	-	-	1	0.27	2.56	4.57	0.34
Ophiuroidea	2	0.13	0.96	0.18	< 0.01	-	-	-	-	-
Enthemonae	1	0.07	0.48	1.56	0.06	-	-	-	-	-
Fish eggs	110	7.21	0.96	0.20	0.01	-	-	-	-	-
Algae fragments	2	-	0.96	-	-	-	-	-	-	-
Non-food items										
Nematode (parasite)	-	-	34.62	-	-	-	-	66.67	-	-
Plastic fragment	-	-	1.92	-	-	-	-	-	-	-
Stone	-	-	4.81	-	-	-	-	10.28	-	-

[a]*Calanus finmarchicus* or *C.* glacialis

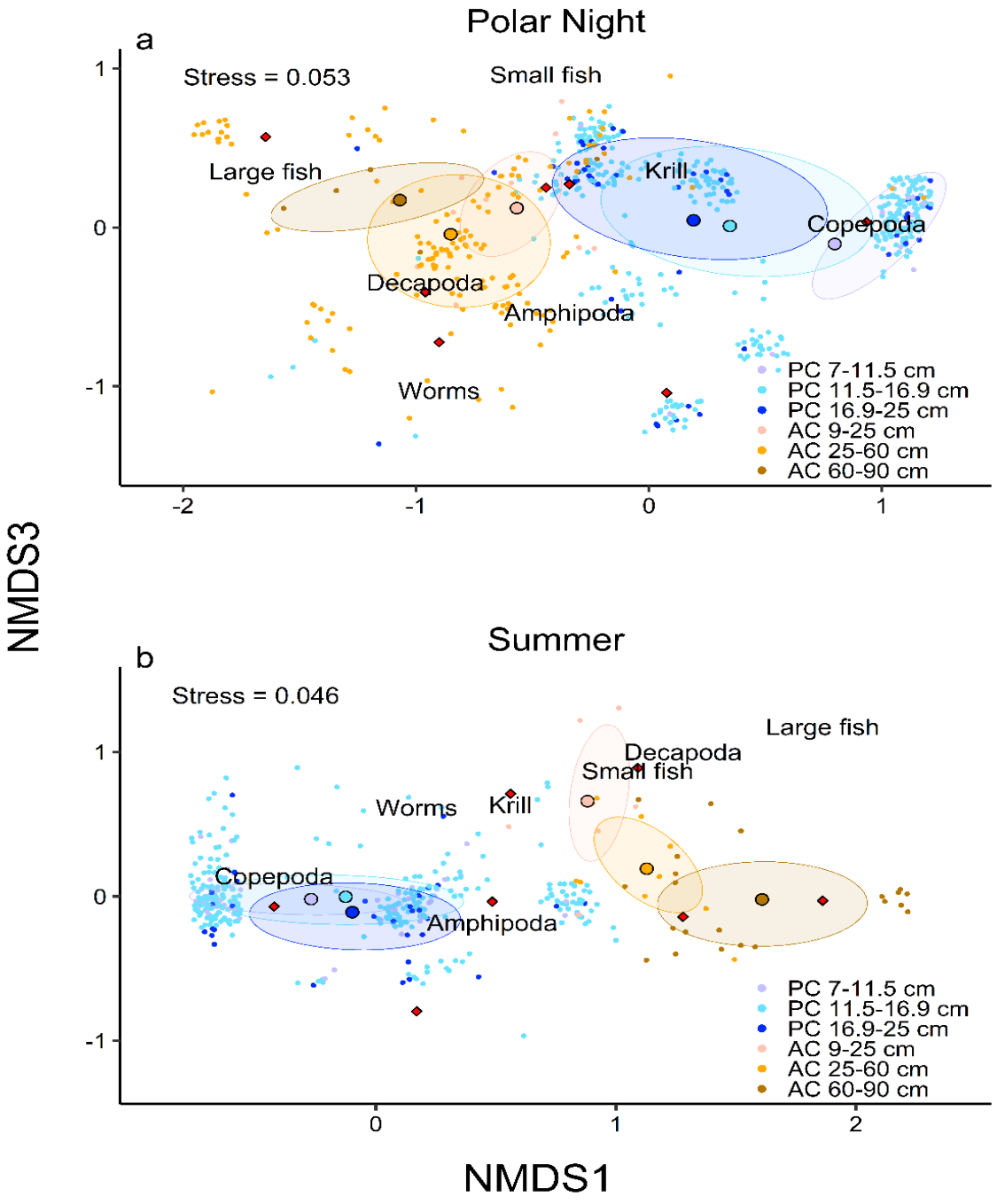

Fig. S1. Axes 1 and 3 of non-metric multidimensional scaling (NMDS) of diet composition (biomass of seven prey classes) of different length classes of polar cod (PC) and Atlantic cod (AC) collected during (a) Polar Night and (b) summer in Kongsfjorden, Svalbard 2022. Individual fish are represented by small points. Large points are group centroids and ellipses cover 40% confidence areas for the mean position of each group. Red rhombi denote prey groups.

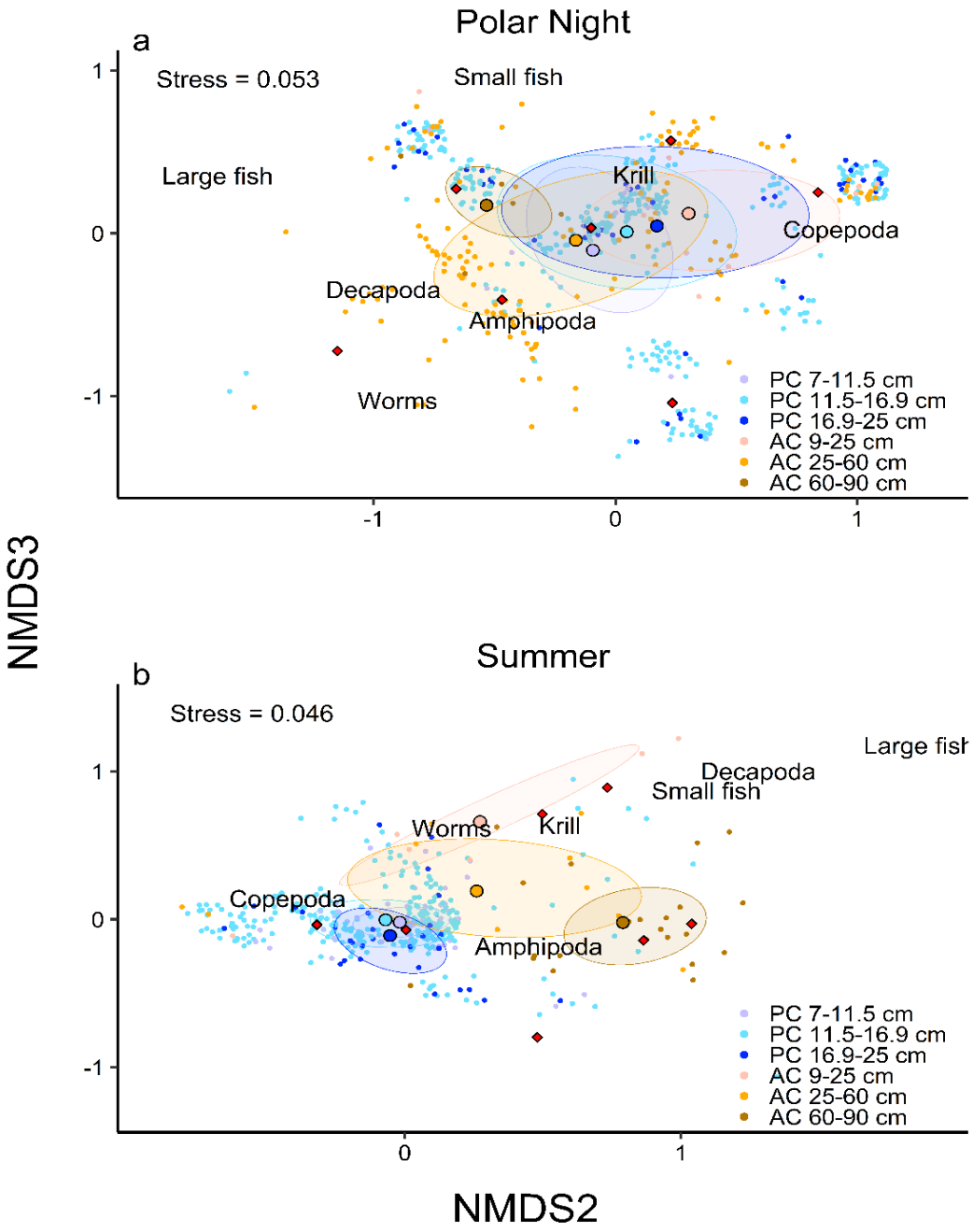

Fig. S2. Axes 2 and 3 of non-metric multidimensional scaling (NMDS) of diet composition (biomass of seven prey classes) of different length classes of polar cod (PC) and Atlantic cod (AC) collected during (a) Polar Night and (b) summer in Kongsfjorden, Svalbard 2022. Individual fish are represented by small points. Large points are group centroids and ellipses cover 40% confidence areas for the mean position of each group. Red rhombi denote prey groups.

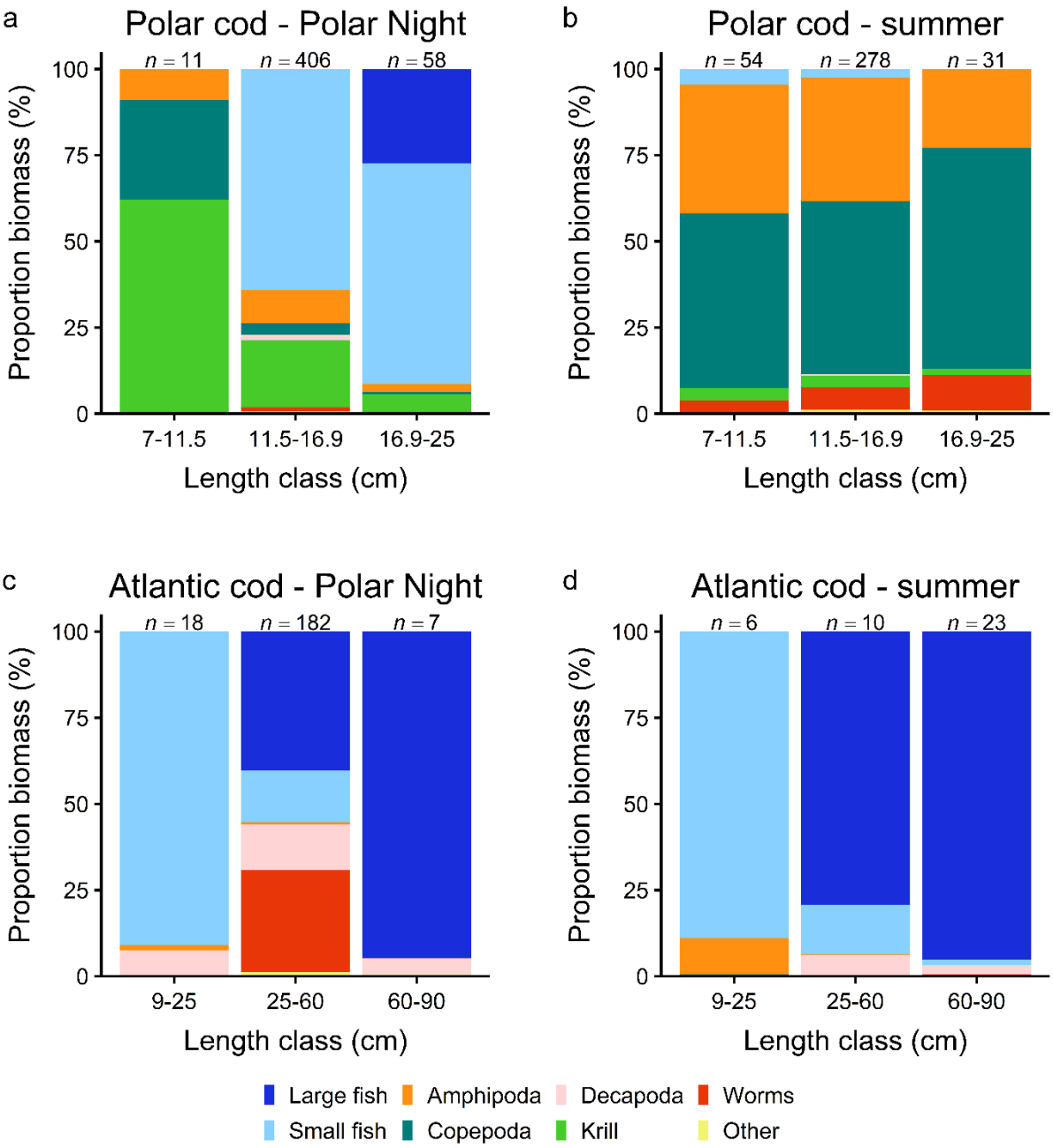

Fig. S3 Proportion of biomass (%) of different prey groups in the diet of different length classes of polar cod and Atlantic cod collected during Polar Night and summer in Kongsfjorden, Svalbard 2022; (a) polar cod during Polar Night, (b) polar cod during summer, (c) Atlantic cod during Polar Night and (d) Atlantic cod during summer.