The Proximate Composition and Caloric Content of Arctic Marine Invertebrates from Frobisher Bay

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THE PROXIMATE COMPOSITION AND CALORIC CONTENT OF ARCTIC MARINE INVERTEBRATES FROM FROBISHER BAY

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ABSTRACT

Percy, J. A., and F. J. Fife. 1980. The proximate composition and caloric content of arctic marine invertebrates from Frobisher Bay. Can. Data Rep. Fish. Aquat. Sci. 214: iv + 35 p.

This report serves as a repository for tabular data relating to the proximate composition (water, protein, lipid, carbohydrate and ash) and energy content (calories per unit dry weight and per unit ash free weight) of 20 species of marine invertebrates collected during the open water season in Frobisher Bay, N.W.T. Fifteen of the species are planktonic and represent 8 major invertebrate groups, while the remainder are benthic crustaceans.

Key words: Arctic, zooplankton, biochemical composition, crustaceans, caloric content.

RÉSUMÉ

Percy, J. A., and F. J. Fife. 1980. The proximate composition and caloric content of arctic marine invertebrates from Frobisher Bay. Can. Data Rep. Fish. Aquat. Sci. 214: iv + 35 p.

Ce rapport sert de répertoire pour les données tabulaires reliées à la composition biochimique (eau, protéine, graisse, hydrate de carbone et cendre) et au contenu d'energie calorifique de 20 espéces d'invertébrés marins qui ont été ramassés durant l'été dans la Baie du Frobisher, T.N.O. Quinze de ces espéces sont planctoniques, et consistent de 8 groupes majeurs d'invertébrés, tandis que les autres sont des crustacés benthiques.

INTRODUCTION

There have been many studies of the trophic interrelationships within marine zooplankton communities in different regions of the world. Early qualitative studies primarily attempted to describe the basic form of the feeding network by arranging the diverse elements in discrete trophic levels. More recent quantitative studies have emphasized the dynamic nature of the complex interchange of both matter and energy between the different levels. Information about the occurrence, relative amount, biological transformation and transfer, and physiological role of each of the important classes of biochemical compounds is clearly useful in understanding the pattern of energy utilization within a particular community.

Many of the earliest studies measured only the concentrations of different chemical compounds in unsorted mass zooplankton samples and are of limited utility in working out the details of community energetics. More recent investigations have focussed on the proximate biochemical composition of individual species. The most useful of these studies also provide information about seasonal fluctuations in concentrations of major classes of compounds. The majority of such studies have dealt with either tropical or temperate species; only a limited number have been carried out on antarctic (Littlepage, 1964; Ferguson and Raymont, 1974; Clarke, 1980) and arctic species (Ikeda, 1974; Lee, 1974, 1975). Such studies carried out on high latitude species are of particular interest because of the pronounced shortening of the period of primary production in ice-covered polar seas and the consequent possibility of compensatory adjustments in the energetics of polar zooplankton.

A complementary approach to better understanding the energetics of zooplankton communities involves estimating the relative amounts of caloric energy in the different components of the community. This is a prerequisite for determining the rates of energy transfer between different trophic levels. Once again, the available data pertains almost exclusively to tropical and temperate species. Little if any information is available about the caloric content of polar marine zooplankton.

In conjunction with an ongoing study of the energetics of several macrozooplanktonic carnivores important in Southern Baffin Island waters we have gathered some data on the proximate chemical composition and caloric energy content of many of the common macrozooplankton species found in the area. Comparable values for several species of benthic crustaceans were also obtained. This report serves as a repository for the bulk of the preliminary biochemical and caloric data.

METHODS

Zooplankton samples were collected with a 1-metre stramin net at irregular intervals during two summers at a station in upper Frobisher Bay (Station 5 of Grainger, 1971; 63°40.2'N, 68°26.3'W). Euphausiids were only rarely encountered at this station, but were readily obtained at a deeper station on the opposite side of Frobisher Bay (Station 51; 63°38.8'N, 68°35.6'W). A total of 15 different zooplankton species were analyzed in the present study. These are listed in Table 1. The polychaetes and calanoid copepods were not identified to species; those indicated in Table 1 have been reported to occur at Station 5 (Grainger, 1971).

The benthic species consisted of four gammaridean amphipods and an isopod. Anonyx nugax and Orchomonella minuta were collected in baited traps in about 10 metres of water adjacent to Mair Island. Mesidotea sabini, Onisimus litoralis and Gammarus setosus were collected intertidally either in the vicinity of the causeway at Frobisher Bay or on the beach northwest of Apex Hill.

For certain species it was necessary to pool collections made on several different days in order to obtain sufficient material for analysis; thus, the collection periods usually represent a range of dates as follows:

BCU1 - July 22, 1978
BCU2 - July 27-August 9, 1978
BCU3 - August 11-29, 1978
BCU4 - September 19-20, 1978
BCU6 - July 29-August 4, 1979
BCU7 - August 6-28, 1979
BCU8 - September 7-23, 1979

The animals were transported rapidly to the laboratory in chilled seawater and sorted immediately to species. As this was intended to be a wide ranging preliminary survey no attempt was made to restrict the size range of animals used in most of the samples. The samples were rinsed with isotonic ammonium formate, drained for 2 minutes on plankton netting over vacuum and weighed (live weight). The samples were then quick frozen and lyophilized. In those instances where it proved necessary to pool material from a number of collections the samples were accumulated in a freezer for several days prior to lyophilization. The lyophilized samples were stored in a freezer at -20°C, except during transport to the home laboratory. The final analyses were generally carried out within nine months of collection. Prior to analysis the samples were redried for several hours at 70°C, cooled in a dessicator and reweighed (dry weight). The samples were then ground finely, mixed thoroughly and subsamples taken for analysis.

Protein was measured spectrophotometrically by the Biuret method following the procedure of Bamstedt (1974). Samples of 5-10 mg were used and bovine albumin was used as a standard.

Lipid was measured gravimetrically following extraction of 50-100 mg tissue samples with chloroform-methanol (2:1) in a microsoxhlet extractor. The resulting crude lipid extract was washed with a 0.9% NaCl solution to remove non-lipid contaminants according to the method of Folch et al. (1957). The solvent was evaporated at 70°C and the residue held overnight in a dessicator prior to weighing.

Carbohydrate was measured spectrophotometrically by the anthrone method, as described by Dowgiallo (1975), following digestion of 10-20 mg

samples in hot 10% trichloro acetic acid.

Ash content was estimated by incinerating 30-60 mg samples at 500°C for four hours and measuring the weight loss.

The caloric content of pelletized 10-20 mg samples was determined with a Phillipson microbomb calorimeter (Phillipson, 1964) using standard procedures. In the case of tissues having a high inorganic content (such as ctenophores and coelenterates) it was necessary to add 10-30% benzoic acid to ensure proper ignition of the samples.

In order to assess the precision of the various biochemical procedures a large sample of dried tissue of the marine amphipod Boeckosimus (Onisimus) affinis collected in an earlier study was finely ground and thoroughly mixed. Samples, equivalent in weight and number to those generally employed in the different assays were tested at irregular intervals. Representative results are included in Tables 2-5.

LIST OF TABLES

Table 1. List of species examined in the present study. Benthic species indicated by "B" after the name.

Coelenterata:
- Bougainvillia superciliaris (L. Agassiz).
- Halitholus cirratus Hartlaub
- Sarsia princeps (Haeckel)
- Hybocodon prolifer L. Agassiz
- Aglantha digitale (O. F. Müller)

Ctenophora:
- Mertensia ovum (Fabricius)
- Beroe cucumis Fabricius

Polychaeta:
- Autolytus spp. [A. alexandri Malmgren, A. cornutus Agassiz, A. prismaticus (Müller)]

Gastropoda:
- Spiratella helicina (Phipps)
- Clione limacina (Phipps)

Copepoda:
- Calanus spp. (C. glacialis Yaschnov, C. hyperboreus Krøyer)

Isopoda:
- Mesidotea sabini (Krøyer) (B)

Amphipoda:

Hyperiidea:
- Parathemisto libellula (Lichtenstein)
- Hyperoche medusarum (Krøyer)

Gammaridea:
- Gammarus setosus Dementieva (B)
- Onisimus litoralis (Krøyer) (B)
- Orchomonella minuta (Kroyer) (B)
- Anonyx nugax Phipps (B)

Euphausiacea:
- Thysanoessa inermis (Krøyer)

Chaetognatha:
- Sagitta elegans Verrill

Table 2. Estimate of precision for protein analysis.

	Replicate analyses				
No.	A	B	C	D	E
1	27.65	28.81	29.56	27.3	29.7
2	28.42	31.60	29.07	26.5	31.1
3	28.07	26.96	24.03	30.9	30.0
4	28.83	28.27	26.37	27.0	29.2
5	29.21	29.61	24.03	26.0	28.0
6	27.85	29.20	25.59	25.9	28.9
7	28.89	28.28	28.64		28.3
8			27.82		29.7
9			25.03		31.7
10			27.46		31.0
11			26.83		30.3
12			28.09		
13			24.11		
14			27.71		
15			26.13		
N	7	7	15	6	11
$\bar{X}$	28.42	28.96	26.70	27.3	29.8
S.D.	0.58	1.44	1.85	1.9	1.2
S.E.	0.22	0.54	0.48	0.8	0.4
C.V.	2.06	4.97	6.92	7.1	3.9
95% C.I.*	±1.42	±3.53	±4.00	±5.0	±2.6

*95% confidence interval

Table 3. Estimate of precision for lipid analysis.

	Replicate analyses					
No.	A	B	C	D	E	F
1	7.04	7.48	6.72	7.56	7.69	7.85
2	6.94	7.03	6.68	7.96	6.70	7.33
3	7.22	7.19	7.03	7.87	7.80	7.50
4	7.12	7.19	6.81	8.06	6.84	6.43
5	7.06	7.37	6.61	7.73	5.91	6.96
6		7.31	6.73	7.84	6.95	6.62
7		6.78	6.98	8.30	7.69	7.35
8		7.17	6.83			7.15
N	5	8	8	7	7	8
$\overline{X}$	7.08	7.19	6.80	7.90	7.08	7.15
S.D.	0.10	0.22	0.15	0.24	0.69	0.47
S.E.	0.05	0.08	0.05	0.09	0.26	0.16
C.V.	1.46	3.00	2.14	2.97	9.75	6.52
95% C.I.	±0.28	±0.52	±0.35	±0.59	±1.69	±1.11

Table 4. Estimate of precision for carbohydrate analysis.

	Replicate analyses			
No.	A	B	C	D
1	2.61	2.61	2.35	2.52
2	2.99	2.64	2.39	2.50
3	2.88	2.46	2.49	2.37
4	3.06	2.47	2.51	2.72
5	2.90	2.51	2.47	2.63
6	2.94	2.55	2.24	2.54
7		2.47	2.34	2.71
8				2.43
N	6	7	7	8
$\overline{X}$	2.90	2.51	2.40	2.55
S.D.	0.15	0.10	0.09	0.13
S.E.	0.06	0.04	0.04	0.04
C.V.	5.34	4.03	4.06	4.94
95% C.I.	±0.39	±0.25	±0.22	±0.31

Table 5. Estimate of precision for ash analysis.

	Replicate analyses		
No.	A	B	C
1	43.70	43.61	42.87
2	43.24	43.71	43.03
3	43.53	43.52	43.28
4	43.67	42.90	43.18
5	43.11	43.07	43.71
6	43.51	43.59	43.52
7	43.83	43.43	43.06
8	43.62	42.92	43.11
9	42.94	42.80	43.46
10	43.58	43.48	43.43
N	10	10	10
$\overline{X}$	43.47	43.30	43.27
S.D.	0.28	0.34	0.26
S.E.	0.09	0.13	0.08
C.V.	0.65	0.78	0.60
95% C.I.	±0.63	±0.83	±0.59

Table 6. Water content (% of live weight) of principal macrozooplankton species, and of several benthic crustaceans from Frobisher Bay.

Species	Coll. no.[1]	N[2]	$\bar{X}$	S.D.[3]	±95%[4] C.I.	C.V.[5]
A. Zooplanktonic:						
Mertensia ovum	BCU2	2	95.71	0.33	4.19	0.35
Beroe cucumis	BCU2	2	97.05	1.46	18.54	1.51
Clione limacina	BCU2	3	94.30	1.39	5.98	1.48
Sagitta elegans	BCU2	5	90.39	1.05	2.92	1.17
Calanus spp.	BCU2	1	70.54	--	--	--
Parathemisto libellula	BCU2	4	79.34	0.68	2.16	0.86
Thysanoessa inermis	BCU2	1	79.59	--	--	--
Hyperoche medusarum	BCU2	1	75.86	--	--	--
Clione limacina	BCU3	3	92.13	0.71	3.05	0.88
Sagitta elegans	BCU3	8	90.53	0.37	0.87	0.41
Calanus spp.	BCU3	6	64.24	3.85	9.89	5.99
Mertensia ovum	BCU3	5	96.04	1.98	5.50	2.06
Autolytus spp.	BCU3	1	85.94	--	--	--
Parathemisto libellula	BCU3	3	78.35	2.52	10.84	3.21
Calanus spp.	BCU4	7	61.84	0.90	2.21	1.46
Halitholus cirratus	BCU4	5	95.70	0.18	0.50	0.19
Sagitta elegans	BCU4	7	90.11	0.30	0.74	0.33
Parathemisto libellula	BCU4	5	75.78	0.76	2.11	1.00
Clione limacina	BCU4	3	92.69	0.88	3.78	0.94
Aglantha digitale	BCU4	5	95.64	0.18	0.50	0.18
Hyperoche medusarum	BCU4	1	75.86	--	--	--
Autolytus spp.	BCU4	1	88.89	--	--	--
Thysanoessa inermis	BCU4	3	68.18	5.95	25.59	8.73
Mertensia ovum	BCU4	8	94.93	0.39	0.92	0.41
Bougainvillia superciliaris	BCU4	7	95.79	0.18	0.44	0.18
Sarsia princeps	BCU4	3	95.56	0.20	0.86	0.21
Spiratella helicina	BCU6	2	78.58	1.24	15.75	1.58
Sagitta elegans	BCU6	1	90.21	--	--	--
Spiratella helicina	BCU7	1	73.87	--	--	--
Hyperoche medusarum	BCU7	2	83.82	1.80	22.86	2.15
Beroe cucumis	BCU7	1	96.17	--	--	--
Halitholus cirratus	BCU7	1	96.02	--	--	--
Hybocodon prolifer	BCU7	1	94.94	--	--	--
B. Benthic:						
Mesidotea sabini	BCU1	4	83.95	1.79	5.69	2.14
Gammarus setosus	BCU1	6	79.51	0.93	2.39	1.17
Onisimus litoralis	BCU3	3	72.80	0.84	3.61	1.15
Gammarus setosus	BCU3	6	79.04	0.85	2.18	1.07
Anonyx nugax	BCU3	4	73.03	1.45	4.61	1.99
Gammarus setosus (male)	BCU4	6	78.56	0.36	0.93	0.46
Gammarus setosus (fem.)	BCU4	6	73.18	0.77	1.98	1.06
Gammarus setosus	BCU4	4	77.67	0.74	2.35	0.96
Onisimus litoralis	BCU4	1	75.09	--	--	--

[1]Collection number
[2]Number of samples analyzed
[3]Standard deviation
[4]±95% confidence interval
[5]Coefficient of variation

Table 7. Protein content (% of dry weight) of principal macrozooplankton species and of several benthic crustaceans from Frobisher Bay.

Species	Coll. no.	N	$\bar{X}$	S.D.	±95% C.I.	C.V.
A. Zooplanktonic:						
Mertensia ovum	BCU2	7	22.18	0.80	1.96	3.60
Parathemisto libellula	BCU2	6	52.36	2.71	6.96	5.17
Clione limacina	BCU2	7	39.16	1.55	3.80	3.96
Calanus spp.	BCU2	7	36.09	2.37	5.81	6.57
Sagitta elegans	BCU2	7	56.77	2.70	6.62	4.75
Clione limacina	BCU3	6	40.07	2.38	6.12	5.94
Sagitta elegans	BCU3	6	69.84	2.68	6.89	3.84
Mertensia ovum	BCU3	7	23.76	0.92	2.25	3.85
Parathemisto libellula	BCU3	6	58.57	2.86	7.35	4.88
Calanus spp.	BCU3	7	37.05	2.66	6.52	7.17
Bougainvillia superciliaris	BCU3	5	7.73	0.62	1.72	7.95
Autolytus spp.	BCU3	7	70.73	1.37	3.36	1.95
Hybocodon prolifer	BCU3	1	31.04	--	--	--
Halitholus cirratus	BCU4	7	18.15	0.81	1.98	4.44
Sagitta elegans	BCU4	7	63.28	2.69	6.59	4.26
Calanus spp.	BCU4	7	36.97	1.42	3.48	3.85
Aglantha digitale	BCU4	12	21.63	2.01	4.42	9.29
Thysanoessa inermis	BCU4	7	43.91	0.83	2.03	1.90
Bougainvillia superciliaris	BCU4	6	14.28	0.88	2.26	6.14
Mertensia ovum	BCU4	7	19.87	1.14	2.79	5.73
Sarsia princeps	BCU4	7	14.51	1.76	4.31	12.16
Clione limacina	BCU4	7	39.77	2.35	5.76	5.90
Parathemisto libellula	BCU4	14	36.43	1.04	2.25	2.86
Bougainvillia superciliaris	BCU6	1	14.85	--	--	--
Spiratella helicina	BCU6	4	70.14	4.80	15.26	6.85
Hyperoche medusarum	BCU7	2	35.94	1.05	13.34	2.93
Beroe cucumis	BCU7	4	8.76	0.34	1.08	3.90
Halitholus cirratus	BCU7	3	10.42	0.65	2.80	6.24
Hybocodon prolifer	BCU7	2	22.95	1.22	15.49	5.33
Spiratella helicina	BCU7	1	77.01	--	--	--
Beroe cucumis	BCU8	6	8.74	0.23	0.59	2.57
Halitholus cirratus	BCU8	8	10.91	0.72	1.70	6.58
Autolytus spp.	BCU8	2	78.83	6.05	76.83	7.67
Aglantha digitale	BCU8	8	22.10	0.57	1.35	2.58
Sarsia princeps	BCU8	3	14.69	0.44	1.89	3.00
B. Benthic:						
Mesidotea sabini	BCU1	6	27.27	1.06	2.72	3.90
Gammarus setosus	BCU1	7	41.18	1.66	4.07	4.04
Gammarus setosus	BCU3	7	53.67	2.07	5.07	3.86
Onisimus litoralis	BCU3	6	44.30	2.12	5.45	4.78
Anonyx nugax (adult)	BCU3	7	35.94	1.97	4.83	5.49
Anonyx nugax (juv.)	BCU3	6	41.11	1.19	3.06	2.90
Orchomonella minuta	BCU3	7	32.10	1.99	4.88	6.20
Gammarus setosus (male)	BCU4	7	44.11	2.12	5.19	4.80
Gammarus setosus (fem.)	BCU4	7	45.39	1.30	3.19	2.88

Table 8. Lipid content (% of dry weight) of principal macrozooplankton species and of several benthic crustaceans from Frobisher Bay.

Species	Coll. no.	N	$\bar{X}$	S.D.	±95% C.I.	C.V.
A. Zooplanktonic:						
Mertensia ovum	BCU2	8	5.28	0.24	0.57	4.54
Sagitta elegans	BCU2	6	17.64	2.58	6.63	14.59
Parathemisto libellula	BCU2	8	18.19	0.57	1.35	3.13
Clione limacina	BCU2	5	16.99	0.63	1.75	3.70
Bougainvillia superciliaris	BCU2	3	6.75	1.17	5.03	17.40
Calanus spp.	BCU2	3	57.00	3.30	14.19	5.79
Mertensia ovum	BCU3	8	10.20	0.34	0.80	3.32
Calanus spp.	BCU3	8	57.38	2.36	5.57	4.11
Halitholus cirratus	BCU3	3	7.61	0.75	3.23	9.91
Bougainvillia superciliaris	BCU3	7	6.82	1.35	3.31	19.79
Sagitta elegans	BCU3	5	23.85	0.23	0.64	0.96
Parathemisto libellula	BCU3	5	25.09	0.76	2.11	3.05
Autolytus spp.	BCU3	3	22.17	0.31	1.33	1.38
Clione limacina	BCU3	6	19.93	2.83	7.27	14.20
Hybocodon prolifer	BCU3	1	22.08	--	--	--
Sarsia princeps	BCU3	1	9.07	--	--	--
Parathemisto libellula	BCU4	8	34.60	0.27	0.64	0.77
Mertensia ovum	BCU4	8	14.35	0.41	0.97	2.84
Calanus spp.	BCU4	8	57.37	1.43	3.37	2.50
Sagitta elegans	BCU4	4	23.80	0.38	1.21	1.61
Aglantha digitale	BCU4	7	6.00	1.58	3.87	26.33
Clione limacina	BCU4	4	24.42	0.11	0.35	0.44
Thysanoessa inermis	BCU4	5	52.43	1.80	5.00	3.43
Halitholus cirratus	BCU4	4	5.49	0.55	1.75	10.05
Bougainvillia superciliaris	BCU4	5	7.32	0.46	1.28	6.28
Sarsia princeps	BCU4	3	7.78	0.44	1.89	5.66
Aglantha digitale	BCU4	3	7.66	0.45	1.94	5.87
Bougainvillia superciliaris	BCU6	2	9.99	1.69	21.46	16.92
Spiratella helicina	BCU6	2	18.26	1.61	20.45	8.82
Beroe cucumis	BCU7	4	6.02	0.48	1.53	7.97
Spiratella helicina	BCU7	2	19.06	1.07	13.59	5.61
Hyperoche medusarum	BCU7	2	27.24	0.95	12.07	3.49
Halitholus cirratus	BCU7	4	4.57	0.27	0.86	5.91
Hybocodon prolifer	BCU7	1	13.11	--	--	--
Beroe cucumis	BCU8	5	4.35	0.81	2.25	18.62
Halitholus cirratus	BCU8	4	5.88	0.37	1.18	6.29
Autolytus spp.	BCU8	4	16.68	0.69	2.19	4.14
Aglantha digitale	BCU8	7	6.89	0.91	2.23	13.21
Sarsia princeps	BCU8	8	8.05	0.45	1.06	5.59

Table 8. (Continued)

Species	Coll. no.	N	$\bar{X}$	S.D.	±95% C.I.	C.V.
B. Benthic:						
Gammarus setosus	BCU1	8	7.52	0.39	0.92	5.15
Mesidotea sabini	BCU1	8	2.66	0.26	0.61	9.86
Anonyx nugax (adult)	BCU3	8	25.61	0.44	1.04	1.73
Onisimus litoralis	BCU3	5	21.45	0.44	1.22	2.05
Anonyx nugax (juv.)	BCU3	8	18.41	0.24	0.57	1.31
Orchomonella minuta	BCU3	5	14.97	1.78	4.95	11.91
Gammarus setosus	BCU3	7	9.18	0.39	0.96	4.30
Gammarus setosus (male)	BCU4	7	7.30	0.49	1.20	6.69
Gammarus setosus (fem.)	BCU4	5	14.29	0.36	1.00	2.55

Table 9. Carbohydrate content (% of dry weight) of principal macrozooplankton species and of several benthic crustaceans from Frobisher Bay.

Species	Coll. no.	N	$\bar{X}$	S.D.	±95% C.I.	C.V.
A. Zooplanktonic:						
Mertensia ovum	BCU2	7	0.53	0.02	0.05	3.24
Clione limacina	BCU2	7	0.77	0.05	0.12	6.05
Calanus spp.	BCU2	6	0.23	0.05	0.13	20.31
Parathemisto libellula	BCU2	7	1.09	0.14	0.34	12.94
Clione limacina	BCU3	7	0.96	0.12	0.29	12.98
Sagitta elegans	BCU3	7	0.25	0.08	0.20	32.79
Calanus spp.	BCU3	6	0.24	0.06	0.15	24.69
Mertensia ovum	BCU3	7	0.69	0.04	0.10	6.19
Bougainvillia superciliaris	BCU3	7	0.96	0.04	0.10	4.47
Parathemisto libellula	BCU3	6	0.95	0.12	0.31	12.39
Autolytus spp.	BCU3	3	5.14	0.31	1.34	6.10
Sarsia princeps	BCU3	1	0.76	--	--	--
Calanus spp.	BCU4	7	0.24	0.07	0.17	29.67
Sagitta elegans	BCU4	6	0.10	0.02	0.05	21.52
Parathemisto libellula	BCU4	7	1.46	0.12	0.29	8.21
Clione limacina	BCU4	7	0.63	0.03	0.07	4.92
Aglantha digitale	BCU4	5	0.38	0.05	0.14	13.36
Thysanoessa inermis	BCU4	7	0.26	0.03	0.07	9.78
Mertensia ovum	BCU4	7	0.53	0.02	0.05	2.97
Bougainvillia superciliaris	BCU4	7	0.65	0.05	0.12	7.50
Halitholus cirratus	BCU4	2	0.67	0.20	2.54	29.55
Sarsia princeps	BCU4	2	0.68	0.06	0.76	8.82
Spiratella helicina	BCU6	2	2.49	0.05	0.64	1.99
Hyperoche medusarum	BCU7	1	2.88	--	--	--
Halitholus cirratus	BCU7	2	0.78	0.03	0.38	3.63
Hybocodon prolifer	BCU7	2	0.80	0.09	1.14	11.56
Beroe cucumis	BCU7	2	0.73	0.15	1.91	20.48
Beroe cucumis	BCU8	6	0.55	0.02	0.05	3.55
Halitholus cirratus	BCU8	2	0.68	0.05	0.64	7.33
Autolytus spp.	BCU8	1	4.21	--	--	--
Aglantha digitale	BCU8	4	0.85	0.07	0.22	8.12
Sarsia princeps	BCU8	8	0.43	0.02	0.05	4.00
B. Benthic:						
Mesidotea sabini	BCU1	7	0.73	0.07	0.17	9.45
Gammarus setosus	BCU1	7	2.97	0.06	0.15	2.10
Onisimus litoralis	BCU3	7	2.89	0.27	0.66	9.18
Anonyx nugax (adult)	BCU3	7	1.75	0.08	0.20	4.84
Anonyx nugax (juv.)	BCU3	6	1.51	0.08	0.21	5.41
Orchomonella minuta	BCU3	7	4.50	0.10	0.25	2.17
Gammarus setosus (male)	BCU4	7	2.82	0.08	0.20	2.77
Gammarus setosus (fem.)	BCU4	7	2.08	0.08	0.20	4.01

Table 10. Ash content (% of dry weight) of principal macrozooplankton species and of several benthic crustaceans from Frobisher Bay.

Species	Coll. no.	N	$\bar{X}$	S.D.	±95% C.I.	C.V.
A. Zooplanktonic:						
Parathemisto libellula	BCU2	3	18.91	1.42	6.11	7.49
Beroe cucumis	BCU2	2	63.33	0.33	4.19	5.25
Clione limacina	BCU2	3	40.86	0.22	0.95	0.54
Sagitta elegans	BCU2	2	16.73	0.15	1.91	0.89
Calanus spp.	BCU2	2	5.29	0.18	2.29	3.48
Bougainvillia superciliaris	BCU2	1	56.13	--	--	--
Mertensia ovum	BCU2	8	59.33	1.21	2.86	2.03
Sagitta elegans	BCU3	5	15.62	0.31	0.86	1.99
Calanus spp.	BCU3	5	3.59	0.11	0.31	3.18
Mertensia ovum	BCU3	4	57.90	1.54	4.90	2.66
Hyperoche medusarum	BCU3	1	16.98	--	--	--
Clione limacina	BCU3	2	35.45	0.08	1.02	0.24
Autolytus spp.	BCU3	2	14.42	0.18	2.29	1.27
Thysanoessa inermis	BCU3	2	7.41	0.15	1.91	2.01
Aglantha digitale	BCU3	1	59.83	--	--	--
Bougainvillia superciliaris	BCU3	3	60.29	2.64	11.35	4.38
Spiratella helicina	BCU3	1	23.58	--	--	--
Beroe cucumis	BCU3	1	66.72	--	--	--
Parathemisto libellula	BCU3	2	20.68	0.08	1.02	0.38
Halitholus cirratus	BCU3	1	53.39	--	--	--
Sarsia princeps	BCU3	1	61.84	--	--	--
Hybocodon prolifer	BCU3	1	44.77	--	--	--
Calanus spp.	BCU4	5	2.85	0.06	0.17	2.02
Parathemisto libellula	BCU4	5	15.23	0.43	1.20	2.83
Sagitta elegans	BCU4	5	20.71	3.46	8.89	16.70
Mertensia ovum	BCU4	7	53.65	0.95	2.33	1.76
Bougainvillia superciliaris	BCU4	3	65.98	3.25	13.98	4.93
Sarsia princeps	BCU4	1	64.71	--	--	--
Halitholus cirratus	BCU4	1	69.43	--	--	--
Clione limacina	BCU4	1	37.31	--	--	--
Aglantha digitale	BCU4	4	59.90	0.33	1.05	0.55
Thysanoessa inermis	BCU4	3	5.89	0.05	0.22	0.77
Hyperoche medusarum	BCU4	1	12.46	--	--	--
Spiratella helicina	BCU6	1	23.47	--	--	--
Hybocodon prolifer	BCU7	1	45.95	--	--	--
Halitholus cirratus	BCU7	1	66.62	--	--	--
Hyperoche medusarum	BCU7	1	16.32	--	--	--
Beroe cucumis	BCU7	1	69.25	--	--	--
Autolytus spp.	BCU8	1	18.04	--	--	--
Aglantha digitale	BCU8	1	57.14	--	--	--
Sarsia princeps	BCU8	1	62.99	--	--	--
Beroe cucumis	BCU8	1	69.89	--	--	--

Table 10. (Continued)

Species	Coll. no.	N	$\bar{X}$	S.D.	±95% C.I.	C.V.
B. Benthic:						
Gammarus setosus	BCU1	9	26.55	0.22	0.51	0.84
Mesidotea sabini	BCU1	9	50.95	1.51	3.49	2.97
Onisimus litoralis	BCU3	5	26.89	0.23	0.64	0.87
Gammarus setosus	BCU3	5	25.84	0.21	0.58	0.81
Anonyx nugax (adult)	BCU3	5	24.87	0.51	1.42	2.04
Anonyx nugax (juv.)	BCU3	4	31.27	0.14	0.45	0.46
Gammarus setosus (male)	BCU4	4	30.36	0.48	1.53	1.59
Gammarus setosus (fem.)	BCU4	5	22.87	0.15	0.42	0.65
Orchomonella minuta	BCU3	3	36.40	0.10	0.43	0.28
Onisimus litoralis	BCU4	1	30.48	--	--	--

Table 11. Caloric content (calories per mg dry weight) of principal macrozooplankton species and of several benthic crustaceans from Frobisher Bay.

Species	Coll. no.	N	$\bar{X}$	S.D.	±95% C.I.	C.V.
A. Zooplanktonic:						
Parathemisto libellula	BCU2	10	4.22	1.33	3.01	31.46
Mertensia ovum	BCU2	6	1.91	0.07	0.18	3.79
Sagitta elegans	BCU2	5	4.84	0.16	0.44	3.21
Clione limacina	BCU2	5	3.31	0.17	0.47	4.98
Beroe cucumis	BCU2	2	1.68	0.10	1.27	5.89
Calanus spp.	BCU2	5	6.84	0.55	1.53	8.05
Sagitta elegans	BCU3	6	5.20	0.23	0.59	4.34
Parathemisto libellula	BCU3	6	5.12	0.18	0.46	3.54
Hyperoche medusarum	BCU3	2	5.16	0.10	1.27	1.92
Autolytus spp.	BCU3	3	5.04	0.35	1.51	6.87
Aglantha digitale	BCU3	1	1.95	--	--	--
Hybocodon prolifer	BCU3	3	3.99	0.18	0.77	4.52
Spiratella helicina	BCU3	1	3.69	--	--	--
Beroe cucumis	BCU3	5	1.04	0.28	0.78	26.97
Thysanoessa inermis	BCU3	3	7.08	0.39	1.68	5.51
Halitholus cirratus	BCU3	3	2.43	0.23	0.99	9.46
Bougainvillia superciliaris	BCU3	3	2.12	0.08	0.34	3.96
Calanus spp.	BCU3	5	7.34	0.42	1.17	5.77
Calanus spp.	BCU4	4	7.69	0.31	0.99	3.97
Sagitta elegans	BCU4	6	5.23	0.45	1.16	8.64
Parathemisto libellula	BCU4	6	5.62	0.15	0.39	2.66
Bougainvillia superciliaris	BCU4	5	1.91	0.15	0.42	7.77
Aglantha digitale	BCU4	3	2.02	0.26	1.12	12.74
Sarsia princeps	BCU4	5	1.17	0.11	0.31	9.59
Autolytus spp.	BCU4	2	4.86	0.33	4.19	6.85
Hyperoche medusarum	BCU4	2	5.68	0.50	6.35	8.85
Thysanoessa inermis	BCU4	5	6.21	0.46	1.28	7.48
Clione limacina	BCU4	5	4.05	0.08	0.22	1.87
Mertensia ovum	BCU4	5	1.93	0.33	0.92	17.14
Spiratella helicina	BCU6	5	4.20	0.22	0.61	5.22
Bougainvillia superciliaris	BCU6	1	1.61	--	--	--
Spiratella helicina	BCU7	3	4.34	0.13	0.56	3.00
Hybocodon prolifer	BCU7	5	2.81	0.21	0.58	7.38
Hyperoche medusarum	BCU7	2	5.19	0.28	3.56	5.45
Beroe cucumis	BCU7	2	1.29	0.19	2.41	14.86
Halitholus cirratus	BCU7	1	2.00	--	--	--
Autolytus spp.	BCU8	4	4.46	0.30	0.95	6.62
Aglantha digitale	BCU8	5	2.03	0.17	0.47	8.18
Sarsia princeps	BCU8	5	1.60	0.24	0.67	14.66
Halitholus cirratus	BCU8	5	1.28	0.16	0.44	12.91

Table 11. (Continued)

Species	Coll. no.	N	$\bar{X}$	S.D.	±95% C.I.	C.V.
B. Benthic:						
Mesidotea sabini	BCU1	6	2.28	0.87	2.24	3.81
Gammarus setosus	BCU1	6	4.06	0.31	0.80	7.53
Onisimus litoralis	BCU3	6	4.39	0.05	0.13	1.21
Anonyx nugax (juv.)	BCU3	12	3.98	0.18	0.40	4.51
Anonyx nugax (adult)	BCU3	6	4.81	0.29	0.75	5.97
Gammarus setosus (male)	BCU4	3	3.93	0.05	0.22	1.30
Gammarus setosus (fem.)	BCU4	6	4.38	0.27	0.69	6.10
Orchomonella minuta	BCU3	6	3.54	0.16	0.41	4.48
Gammarus setosus	BCU3	6	4.09	0.14	0.36	3.53

Table 12. Summary of proximate biochemical composition of the principal macrozooplankton species and of several benthic crustaceans from Frobisher Bay. Water content expressed as percent of live weight; all other components expressed as percent of dry weight.

Species	Coll. no.	Water	Protein	Lipid	Carbo-hydrate	Ash
A. Zooplanktonic:						
Mertensia ovum	BCU2	95.71	22.18	5.28	0.53	59.33
	BCU3	96.04	23.76	10.20	0.69	57.90
	BCU4	94.93	19.87	14.35	0.53	53.05
Sagitta elegans	BCU2	90.39	56.77	17.64	0.10	16.73
	BCU3	90.53	69.84	23.85	0.04	15.62
	BCU4	90.11	63.28	23.80	0.03	20.71
	BCU6	90.21	--	--	--	--
Parathemisto libellula	BCU2	79.34	52.36	18.19	1.10	18.91
	BCU3	78.35	58.57	25.09	0.95	20.68
	BCU4	75.78	36.43	34.60	1.50	15.23
Beroe cucumis	BCU2	97.05	--	--	--	63.33
	BCU3	--	--	--	--	66.72
	BCU7	96.17	8.76	6.02	0.73	69.25
	BCU8	--	8.74	4.35	0.55	69.89
Clione limacina	BCU2	94.30	39.16	16.99	0.77	40.86
	BCU3	92.13	40.07	19.93	0.96	35.45
	BCU4	92.69	39.77	24.42	0.63	37.31
Bougainvillia superciliaris	BCU2	--	--	6.75	--	56.13
	BCU3	--	7.73	8.23	0.96	60.29
	BCU4	95.79	14.28	7.32	0.65	65.98
	BCU6	--	14.85	9.99	--	--
Spiratella helicina	BCU3	--	--	--	--	23.58
	BCU6	78.58	70.14	18.26	2.49	23.47
	BCU7	73.87	--	19.06	--	--
Hyperoche medusarum	BCU2	75.86	--	--	--	--
	BCU3	--	--	--	--	16.98
	BCU4	75.86	--	--	--	12.46
	BCU7	83.82	35.94	27.24	2.88	16.32
Halitholus cirratus	BCU3	--	--	7.61	--	53.39
	BCU4	95.70	18.15	5.49	0.67	69.43
	BCU7	96.02	10.42	4.57	0.78	66.62
	BCU8	--	10.91	5.88	0.68	--
Hybocodon prolifer	BCU3	--	31.04	22.08	--	44.77
	BCU7	94.94	22.95	13.11	0.80	45.95
Autolytus spp.	BCU3	85.94	70.37	22.17	5.14	14.42
	BCU4	88.89	--	--	--	--
	BCU8	--	--	16.68	4.21	18.04

Table 12. (Continued)

Species	Coll. no.	Water	Protein	Lipid	Carbo-hydrate	Ash
Aglantha digitale	BCU3	--	--	--	--	59.83
	BCU4	95.64	21.63	6.00	0.38	59.90
	BCU8	--	22.10	6.89	0.85	57.14
Sarsia princeps	BCU3	--	--	9.07	0.76	61.84
	BCU4	95.56	14.51	7.78	0.68	64.71
	BCU8	--	14.69	8.05	0.43	62.99
Calanus spp.	BCU2	70.54	36.09	57.00	0.23	--
	BCU3	64.24	37.05	57.38	0.24	3.59
	BCU4	61.84	36.97	57.37	0.24	2.85
Thysanoessa inermis	BCU2	79.59	--	--	--	--
	BCU3	--	--	--	--	7.41
	BCU4	68.18	43.91	52.43	0.26	5.89
B. Benthic:						
Onisimus litoralis	BCU3	72.80	44.30	21.45	2.89	26.89
	BCU4	75.09	--	--	--	30.48
Gammarus setosus	BCU1	79.51	41.18	7.52	2.97	26.55
	BCU3	79.04	53.67	9.18	--	25.84
(male)	BCU4	78.56	44.11	7.30	2.08	30.36
(fem.)	BCU4	73.18	45.39	14.29	2.82	22.87
Orchomonella minuta	BCU3	--	32.10	14.97	4.50	36.40
Anonyx nugax (adult)	BCU3	73.03	35.94	25.61	1.75	24.87
(juv.)	BCU3	--	41.11	18.41	1.51	31.27
Mesidotea sabini	BCU1	83.95	27.27	2.66	0.73	50.95

Table 13. Summary of organic content and caloric content per unit dry weight and per unit ash free dry weight for the principal macrozooplankton species and for several benthic crustaceans from Frobisher Bay.

Species	Coll. no.	% organic content	Calories/ mg d.w.	Calories/ mg a.f.d.w.
A. Zooplanktonic:				
Mertensia ovum	BCU2	40.67	1.91	4.70
	BCU3	42.10	--	--
	BCU4	46.95	1.93	4.16
Sagitta elegans	BCU2	83.27	4.84	5.82
	BCU3	84.38	5.20	6.16
	BCU4	79.29	5.23	6.60
Parathemisto libellula	BCU2	81.09	4.22	5.20
	BCU3	79.68	5.12	6.43
	BCU4	84.77	5.62	6.63
Beroe cucumis	BCU2	36.67	1.68	4.58
	BCU3	33.28	1.04	3.13
	BCU7	30.75	1.29	4.20
	BCU8	30.11	--	--
Clione limacina	BCU2	59.14	3.31	5.60
	BCU3	64.55	--	--
	BCU4	62.69	4.05	6.46
Bougainvillia superciliaris	BCU3	36.69	2.12	5.78
	BCU4	32.32	1.96	6.06
	BCU6	--	1.61	--
Spiratella helicina	BCU3	76.42	3.69	4.83
	BCU6	76.53	4.20	5.49
	BCU7	--	4.34	--
Hyperoche medusarum	BCU3	83.02	5.16	6.22
	BCU4	87.54	5.68	6.49
	BCU7	83.68	5.19	6.20
Halitholus cirratus	BCU3	43.39	2.43	5.60
	BCU4	30.57	--	--
	BCU7	33.38	2.00	5.99
	BCU8	--	1.28	--
Hybocodon prolifer	BCU3	55.23	3.99	7.22
	BCU7	54.05	2.81	5.20
Autolytus spp.	BCU3	85.58	5.04	5.89
	BCU4	--	4.86	--
	BCU8	81.96	4.46	5.44
Aglantha digitale	BCU3	40.17	1.95	4.85
	BCU4	40.10	2.02	5.04
	BCU8	42.86	2.03	4.74

Table 13. (Continued)

Species	Coll. no.	% organic content	Calories/ mg d.w.	Calories/ mg a.f.d.w.
Sarsia princeps	BCU3	38.16	--	--
	BCU4	35.29	1.17	3.32
	BCU8	37.01	1.60	4.32
Calanus spp.	BCU2	94.71	6.84	7.22
	BCU3	96.41	7.34	7.61
	BCU4	97.15	7.69	7.92
Thysanoessa inermis	BCU3	92.59	5.80	6.26
	BCU4	94.11	6.21	6.60
B. Benthic:				
Mesidotea sabini	BCU1	49.05	2.28	4.65
Gammarus setosus	BCU1	73.45	4.06	5.52
Gammarus setosus	BCU3	74.16	4.09	5.52
Gammarus setosus (male)	BCU4	69.64	3.93	5.64
Gammarus setosus (fem.)	BCU4	77.13	4.38	5.68
Orchomonella minuta	BCU3	63.60	3.54	5.57
Anonyx nugax (juv.)	BCU3	75.13	4.81	6.40
Anonyx nugax (adult)	BCU3	68.73	3.98	5.80
Onisimus litoralis	BCU3	73.11	4.39	6.01
	BCU4	69.52	--	--

Table 14. Ranking of macrozooplankton and benthic crustaceans (B) on basis of total water content (expressed as percent of wet weight).

Rank	Species	Range of values
1	Beroe cucumis	96.17-97.05
2	Halitholus cirratus	95.70-96.02
3	Mertensia ovum	94.93-96.04
4	Bougainvillia superciliaris	95.79
5	Aglantha digitale	95.64
6	Sarsia princeps	95.56
7	Hybocodon prolifer	94.94
8	Clione limacina	92.13-94.30
9	Sagitta elegans	90.11-90.53
10	Autolytus spp.	85.94-88.89
11	Mesidotea sabini (B)	83.95
12	Hyperoche medusarum	75.86-83.82
13	Thysanoessa inermis	68.18-79.59
14	Gammarus setosus (B)	73.18-79.51
15	Parathemisto libellula	75.78-79.34
16	Spiratella helicina	73.87-78.58
17	Onisimus litoralis (B)	72.80-75.09
18	Anonyx nugax (B)	73.03
19	Calanus spp.	61.84-70.54

Table 15. Ranking of macrozooplankton and benthic crustaceans (B) on basis of total protein content (expressed as percent of dry weight).

Rank	Species	Range of values
1	Autolytus spp.	70.39
2	Spiratella helicina	70.14
3	Sagitta elegans	56.77-69.84
4	Parathemisto libellula	36.43-58.57
5	Gammarus setosus (B)	41.18-53.67
6	Onisimus litoralis (B)	44.30
7	Thysanoessa inermis	43.91
8	Anonyx nugax (B)	35.94-41.11
9	Clione limacina	39.16-40.07
10	Calanus spp.	36.09-37.05
11	Hyperoche medusarum	35.94
12	Orchomonella minuta (B)	32.10
13	Hybocodon prolifer	22.95-31.04
14	Mesidotea sabini (B)	27.27
15	Mertensia ovum	19.87-23.76
16	Aglantha digitale	21.63-22.10
17	Halitholus cirratus	10.42-18.15
18	Bougainvillia superciliaris	7.73-14.85
19	Sarsia princeps	14.51-14.69
20	Beroe cucumis	8.74- 8.76

Table 16. Ranking of macrozooplankton and benthic crustaceans (B) on basis of total lipid content (expressed as percent of dry weight).

Rank	Species	Range of values
1	*Calanus* spp.	57.00-57.38
2	*Thysanoessa inermis*	52.43
3	*Parathemisto libellula*	18.19-34.60
4	*Hyperoche medusarum*	27.24
5	*Anonyx nugax* (B)	18.41-25.61
6	*Clione limacina*	16.99-24.42
7	*Sagitta elegans*	17.64-23.85
8	*Autolytus* spp.	16.68-22.17
9	*Hybocodon prolifer*	13.11-22.08
10	*Onisimus litoralis* (B)	21.45
11	*Spiratella helicina*	18.26-19.06
12	*Orchomonella minuta* (B)	14.97
13	*Gammarus setosus* (B)	7.30-14.29
14	*Mertensia ovum*	5.28-14.35
15	*Bougainvillia superciliaris*	6.75- 9.99
16	*Sarsia princeps*	7.78- 9.07
17	*Halitholus cirratus*	4.57- 7.61
18	*Aglantha digitale*	6.00- 6.89
19	*Beroe cucumis*	4.35- 6.02
20	*Mesidotea sabini* (B)	2.66

Table 17. Ranking of macrozooplankton and benthic crustaceans (B) on basis of total carbohydrate content.

Rank	Species	Range of values
1	Autolytus spp.	4.21-5.14
2	Orchomonella minuta (B)	4.50
3	Gammarus setosus (B)	2.08-2.97
4	Onisimus litoralis (B)	2.89
5	Hyperoche medusarum	2.88
6	Spiratella helicina	2.49
7	Anonyx nugax (B)	1.51-1.75
8	Parathemisto libellula	0.95-1.50
9	Bougainvillia superciliaris	0.65-0.96
10	Clione limacina	0.63-0.96
11	Aglantha digitale	0.38-0.85
12	Hybocodon prolifer	0.80
13	Halitholus cirratus	0.67-0.78
14	Sarsia princeps	0.43-0.76
15	Mesidotea sabini (B)	0.73
16	Beroe cucumis	0.55-0.73
17	Mertensia ovum	0.53-0.69
18	Thysanoessa inermis	0.26
19	Calanus spp.	0.23-0.24
20	Sagitta elegans	0.03-0.10

Table 18. Ranking of macrozooplankton and benthic crustaceans (B) on basis of total organic content (percent ash free dry tissue).

Rank	Species	Range of values
1	Calanus spp.	94.71-97.15
2	Thysanoessa inermis	92.59-94.11
3	Hyperoche medusarum	83.02-87.54
4	Autolytus spp.	81.96-85.58
5	Parathemisto libellula	79.68-84.77
6	Sagitta elegans	79.29-84.38
7	Gammarus setosus (B)	69.64-77.13
8	Spiratella helicina	76.42-76.53
9	Anonyx nugax (B)	68.73-75.13
10	Onisimus litoralis (B)	69.52-73.11
11	Clione limacina	59.14-64.55
12	Orchomonella minuta (B)	63.60
13	Hybocodon prolifer	54.05-55.23
14	Mesidotea sabini (B)	49.04
15	Mertensia ovum	40.67-46.95
16	Halitholus cirratus	30.57-43.39
17	Aglantha digitale	40.10-42.86
18	Sarsia princeps	35.29-38.16
19	Bougainvillia superciliaris	32.32-36.69
20	Beroe cucumis	30.11-36.67

Table 19. Ranking of macrozooplankton and benthic crustaceans (B) on basis of total caloric content (expressed as calories per mg of dry weight).

Rank		Range of values
1	Calanus spp.	6.84-7.69
2	Thysanoessa inermis	5.09-6.21
3	Hyperoche medusarum	5.16-5.68
4	Parathemisto libellula	4.22-5.62
5	Sagitta elegans	4.84-5.23
6	Autolytus spp.	4.46-5.04
7	Anonyx nugax (B)	3.98-4.81
8	Onisimus litoralis (B)	4.39
9	Gammarus setosus (B)	3.93-4.38
10	Spiratella helicina	3.69-4.34
11	Clione limacina	3.31-4.05
12	Hybocodon prolifer	2.81-3.99
13	Orchomonella minuta (B)	3.54
14	Halitholus cirratus	1.28-2.43
15	Mesidotea sabini (B)	2.28
16	Bougainvillia superciliaris	1.61-2.12
17	Aglantha digitale	1.95-2.03
18	Mertensia ovum	1.91-1.93
19	Beroe cucumis	1.04-1.68
20	Sarsia princeps	1.17-1.60

Table 20. Ranking of macrozooplankton and benthic crustaceans (B) on basis of total caloric content (expressed as calories per mg of ash free dry weight).

Rank	Species	Range of values
1	Calanus spp.	7.22-7.92
2	Hybocodon prolifer	5.20-7.22
3	Parathemisto libellula	5.20-6.63
4	Thysanoessa inermis	6.26-6.60
5	Sagitta elegans	5.82-6.60
6	Hyperoche medusarum	6.20-6.49
7	Clione limacina	5.60-6.46
8	Anonyx nugax (B)	5.86-6.40
9	Bougainvillia superciliaris	5.78-6.06
10	Onisimus litoralis (B)	6.01
11	Halitholus cirratus	5.60-5.99
12	Autolytus spp.	5.44-5.89
13	Gammarus setosus (B)	5.52-5.68
14	Orchomonella minuta (B)	5.57
15	Spiratella helicina	4.83-5.49
16	Aglantha digitale	4.74-5.04
17	Mertensia ovum	4.16-4.70
18	Mesidotea sabini (B)	4.65
19	Beroe cucumis	3.13-4.58
20	Sarsia princeps	3.32-4.32

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