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Physical and Biological Monitoring at Prince 5 during 1998: a Preliminary Analysis

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Abstract

This is a preliminary summary of some of the physical and biological monitoring conducted at Prince 5 in 1998. The sampling effort is described along with preliminary results. As the data become more fully analyzed and quality controlled some of the results from this analyses may change.

Résumé

Ce document présente un sommaire préliminaire d'une partie des études d'observation des éléments physiques et biologiques faites à Prince 5 en 1998, dans lequel sont décrits les travaux d'échantillonnage ainsi que les résultats préliminaires. Certains résultats peuvent changer avec une analyse plus approfondie et le contrôle de la qualité des données.

Introduction

The Prince 5 station is located on the northern side of the mouth of the Bay of Fundy. It is east of Campobello Island and north of Grand Manan Island in approximately 100m of water (Fig. 1). The station has been sampled since at least 1913. Vertical profiles of temperature and salinity have been taken almost continuously, at a frequency of once a month, since 1921. Biological sampling has been sporadic.

As a result of the dramatic decline in the northern cod fish stock and the consequent closure of the fishery in the early 1990s, the Department of Fisheries and Oceans decided to put a new emphasis on monitoring the marine physical and biological environment of Atlantic Canada. Consequently, a modest monitoring program was designed and began to be implemented in 1997-98. As part of this program the regular physical sampling at Prince 5 was to be enhanced with regular sampling of the plankton and water chemistry.

To help initiate this enhanced monitoring program, a three year Department of Fisheries and Oceans Strategic Research Fund Project was approved for the period April 1, 1997 to March 31, 2000. The general objective of the project was to gain a better understanding of the temporal and spatial scales of variability represented by the physical and biological data collected at Prince 5 and Station 27. The latter is the historically monitored station located off St. John's Newfoundland. The objectives for the Prince 5 component of the project included: (1) initiation of regular zooplankton sampling at Prince 5, (2) collation of existing data and literature pertaining to the zooplankton in the vicinity of Prince 5 and adjacent areas , (3) analyses of the data for temporal and spatial patterns, (4) estimation of the temporal and spatial scales over which the data from Prince 5 is representative and (5) suggestions for refinements to the monitoring strategy for Prince 5.

This report focuses on the first objective. The main goal is to provide a very preliminary analysis of the sampling effort and data collected at Prince 5 during 1998, the first full year of zooplankton sampling. As the data become more fully analyzed and quality controlled some of the results from this analyses may change.

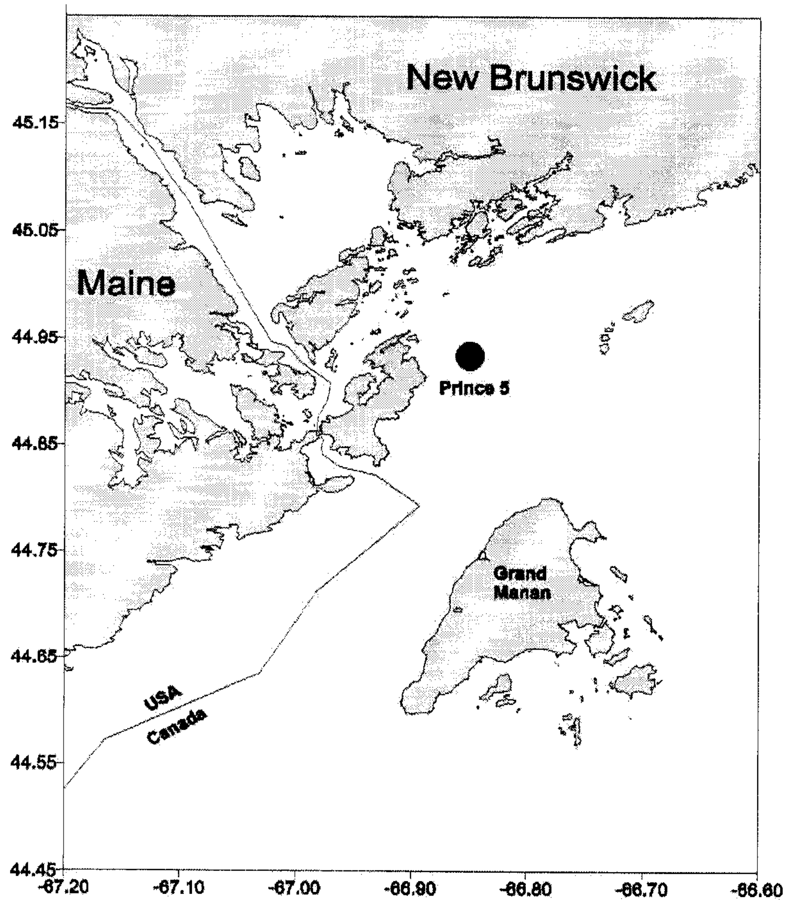

Figure 1: *Map showing the location of the Prince 5 long-term monitoring station.*

Materials and Methods

The monitoring program for Prince 5 in 1998 aimed to sample the station every two weeks, near the middle and end of each month, resulting in a total of 24 samples. In practice, the station was only sampled 21 times (Table 1, Fig. 2). Sampling was not conducted at the end of February or the middle of March due to the sampling vessel, the CCGC *Pandalus III*, being in annual refit. Plankton sampling was not conducted on the last sampling date due to rough weather.

During each visit to Prince 5 a vertical depth profile of water conductivity (salinity), temperature and flourescence was taken along with a vertical plankton haul for zooplankton. The CTD (conductivity, temperature, depth) profiles were taken with a SeaBird Electronics Model 25 Sealogger CTD. Plankton tows were made with a 333μm NITEX mesh net attached to a 75cm diameter ring. The net was hauled vertically from a maximum depth of about 100m to the surface. At the end of each tow, the net was washed down and the cod end rinsed into a 1 liter Mason jar. Each jar was preserved by adding a solution of 10% buffered formalin.

Table 1: Sampling effort conducted at Prince 5 in 1998 as part of the regional monitoring program. SBE stands for a SeaBird Electronics Model 25 Sealogger CTD. WetStar refers to the manufacturer's name of the fluorescence probe used. ns refers to not sampled.

Sampling Date	Consecutive Day	Sample Type			
		SBE Temp.	SBE Sal.	WetStar Flourescence	Vertical Zooplankton Haul (333μm mesh)
Jan-19-1998	19	•	•	•	•
Feb-09-1998	40	•	•	•	•
Mar-31-1998	90	•	•	•	•
Apr-15-1998	105	•	•	•	•
Apr-28-1998	118	•	•	•	•
May-12-1998	132	•	•	•	•
May-29-1998	149	•	•	•	•
Jun-17-1998	168	•	•	•	•
Jun-29-1998	180	•	•	•	•
Jul-13-1998	194	•	•	•	•
Jul-30-1998	211	•	•	•	•
Aug-12-1998	224	•	•	•	•
Sep-01-1998	244	•	•	•	•
Sep-15-1998	258	•	•	•	•
Sep-29-1998	272	•	•	•	•
Oct-13-1998	286	•	•	•	•
Nov-02-1998	306	•	•	•	•
Nov-13-1998	317	•	•	•	•
Nov-30-1998	334	•	•	•	•
Dec-10-1998	344	•	•	•	•
Dec-30-1998	364	•	•	•	**ns**

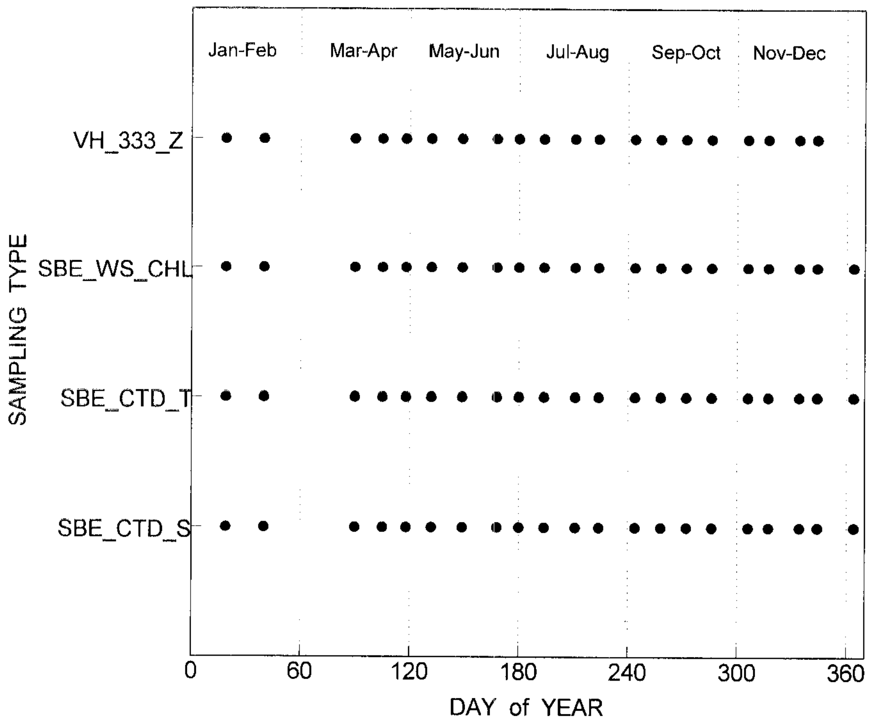

Figure 2: *Sampling effort at Prince 5 during 1998. SBE_CTD-S and SBE_CTD_T indicate depth profiles of salinity and temperature taken with a SeaBird Electronics Model 25 Sealogger CTD. SBE_WS_CHL indicates depth profiles of chlorophyll as measured by a Wetstar fluorometer mounted on a SBE Model 25 Sealogger. VH_333_Z indicates a vertical zooplankton haul taken with a 60cm diameter ring net fitted with a 333μm mesh net. The labels near the top of the plot indicate the approximate bimonthly periods represented by each gridded column.*

All zooplankton samples were sorted by the Atlantic Reference Center (ARC). The samples were sub-sampled and each sub-sample was processed by identifying and counting individual organisms. The identifications were made to the lowest convenient taxonomic category.

The recorded number of individuals was scaled up to the number per tow by accounting for the sub-sample size. The number per tow could then be converted to the number per square meter by dividing the number per tow by the area of the net mouth. For the 75•cm diameter net the dividend is $0.443 \bullet m^{-2}$ resulting in a multiplier for the number per tow of $2.264 \bullet m^{-2}$.

Data Analyses

The data were analyzed for groupings of species and sampling dates using the SPLUS 2000 implementation of the cluster analyses methods described in Kaufman and Rousseeuw (1990). In order to explore the similarity between the sampling dates as indicated by the zooplankton, a data matrix was organized such that the objects (rows) were the sampling dates and the variables (columns) were unique taxonomic classifications.

The abundance data was transformed into a binary variable of presence (1) or absence (0). The transformed variables could then be considered as either symmetric or asymmetric (Kaufman and Rousseeuw 1990). Treating the variables as symmetrical often implies giving equal meaning or weight to a presence and absence whereas treating the data as asymmetrical implies giving unequal weight to a presence or absence. We considered these data to be asymmetric since absence had the distinct meaning of not being detected in a sample and presence could mean an organism type was detected once or any number of times. By convention we code the most important outcome, a presence, as a 1 and the absence as a 0. Unlike convention, the most important is not necessarily the rarest event.

Dissimilarities (D) between each pair of data objects were calculated as Jaccard Coefficients (Eq. 1) which are sometimes called S-coefficients. These are among the most well known measures of dissimilarity (Kaufman and Rousseeuw 1990).

$$D = \frac{b + c}{a + (b + c)} \qquad \text{Eq. 1}$$

In equation 1, a is the number of pairings between two objects in which both variables are present, b is the number of pairings in which the first variable is present and the second is absent and c is the number in which the second variable is present and the first is absent. Thus coefficient, D, is the ratio of the number of mismatches (presence-absence or absence-presence) to the total number of none absence-absence matches. As such it emphasizes the mismatches and does not include the joint absences. It is often argued that ignoring absence-absence matches is a favourable trait of D since it avoids attributing a low degree of dissimilarity (a high degree of similarity) to objects that have many joint absences of variables.

The Jaccard coefficient can be interpreted as the proportion of mismatches because it ranges from '0' (complete similarity) to '1' (complete dissimilarity). A value of 0.2 indicates 20% of the none absence-absence matches are mismatches and 0.5 indicates that 50%.are mismatched.

Clustering of dissimilarity matrices was done using an agglomerative group average method, otherwise referred to as the unweighted pair-group average method. Kaufman and Rousseeuw (1990) provide a good description of this methodology.

All statistical analyses were conducted using S-Plus 2000 Professional Release 1, implemented on an Intel Pentium II based personal computer.

Results

CTD Profiles

There is a distinct seasonal cycle in the water temperature, salinity and density at Prince 5 in 1998. The temperatures vary from more than 2-3°C in the winter to 10-12°C in the late summer (Fig. 3). The range of temperature within each vertical profile varies from almost zero degrees Celcius throughout the winter and late fall to between 2 and 3°C in the summer and early fall (Fig. 3).

The salinities vary from about 30 to 32.5psu with an annual minimum during the spring (Fig. 4). The range of salinity within each profile is almost zero during the winter and fall and is about 1psu during the summer. In the spring the range increases to almost 2psu.

These temperature and salinity characteristics result in a seasonal variation in density and stratification (Fig. 5). The water column is vertically well mixed during the winter and fall. A density difference of about 1 sigma-t unit, appears in the spring with the arrival of the salinity minima. This difference persists through the summer (Fig. 5).

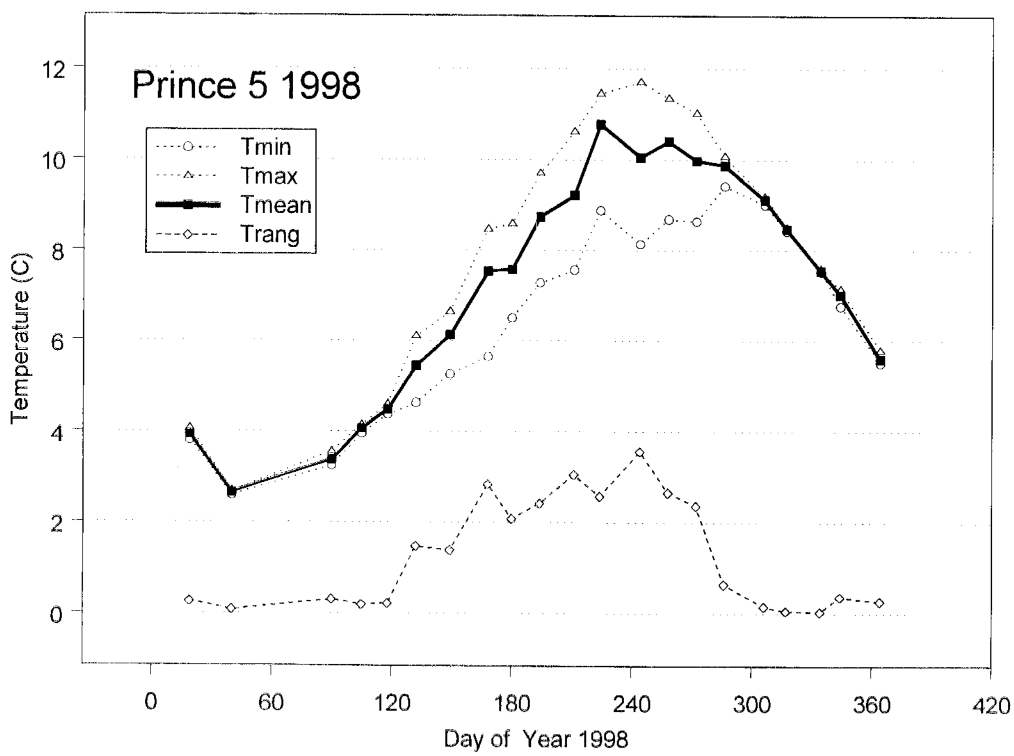

Figure 3: *Annual time series of the profile specific temperature maxima, mean, minima and range at Prince 5 in 1998.*

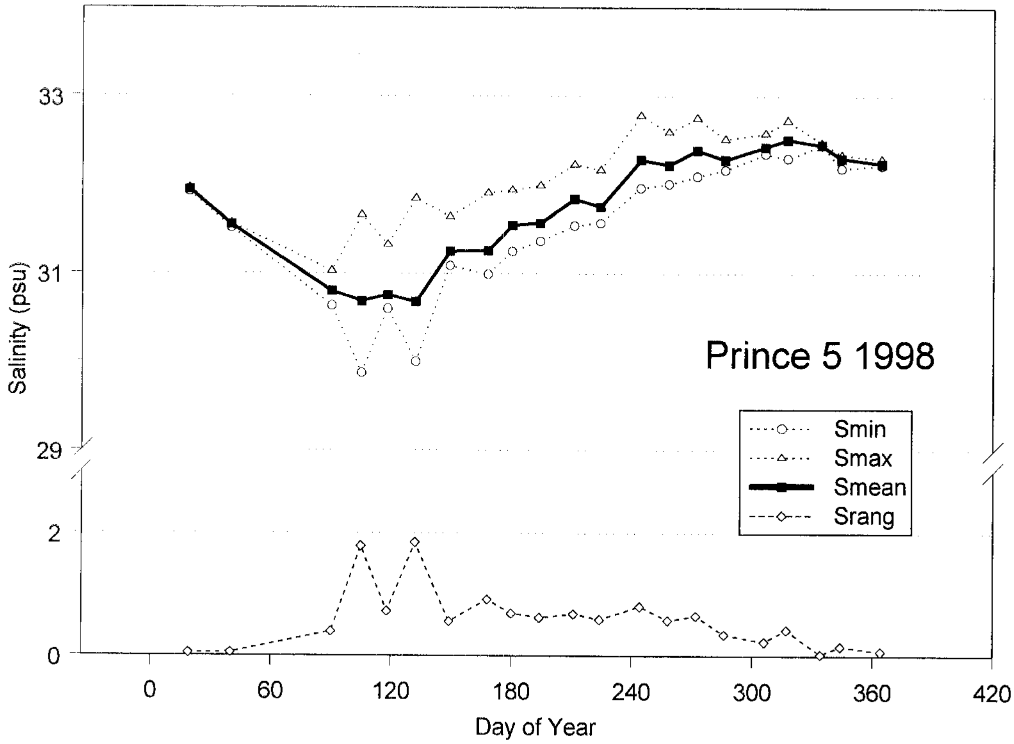

Figure 4: *Annual time series of the profile specific salinity maxima, mean, minima and range at Prince 5 in 1998.*

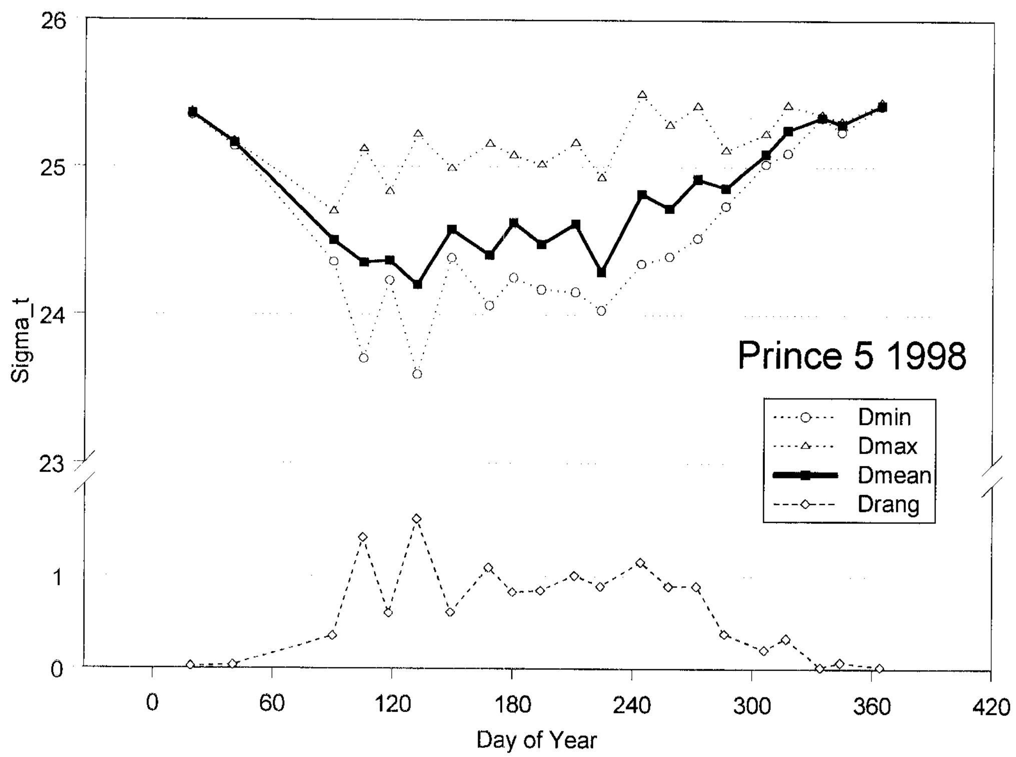

Figure 5: *Annual time series of the profile specific density (sigma-t) maxima, mean, minima and range at Prince 5 in 1998.*

Plankton Sampling: 333μm Mesh Vertical Hauls

The results of the plankton sampling are included in Appendix 1.

Bio-diversity

The total number of individuals per tow ranged from 1928 to 403456, a difference of over 2 orders of magnitude (Table 2). The mean (median) number per tow was 71711 (51715). The number of taxonomically different organisms, hence forth referred to as species, per tow ranged from 8 to 22 with a mean (median) of 14.5 (14). There were 42 species identified from all twenty samples (Table 3). Only, 10 of these were classified to the level of genus and species. Some of the organisms were further identified to developmental stages.

On the basis of an annual total number of individuals caught, *Oithona similis* was the most abundant species. It comprised 24 percent of the individuals caught. An additional two species, *Acartia longiremis* and *Temora longicornis* accounted for an additional 28% of the individuals. Hence, three species accounted for over 50% of the individuals. Eleven species accounted for over 90% of the individuals (Fig. 6).

Table 2: *Summary statistics of zooplankton collected in 1998 from Prince 5 using 333μm mesh net vertical plankton hauls .*

Statistic	Number of Individuals per Sample	Number of Species per Sample
Minimum	1928	8
1st Quartile	19120	12.75
Mean	71711.6	14.5
Median	51712	14
3rd Quartile	88192	16
Maximum	403456	22
Total Number of Samples	20	20
Missing values	0	0
Standard Deviation.	89394.12	2.91

Table 3: Taxonomy and relative annual abundance for each zooplankton organism identified from vertical plankton hauls taken at Prince 5 in 1998 using a 333μm mesh net. Relative abundance is based on the annual sum of the numbers per tow given in Appendix 1.

Annual Rank	Organism Code	Organism Name	Type	Annual Percent	Cumul. Percent
1	OITSIM	*Oithona similis*	holoplankton	24.42	24.42
2	ACALON	*Acartia longiremis*	holoplankton	14.27	38.69
3	TEMLON	*Temora longicornis*	holoplankton	14.25	52.94
4	PSEUSP	*Pseudocalanus sp.*	holoplankton	12.33	65.26
5	CENTSP	*Centropages sp.*	holoplankton	8.55	73.82
6	BIVCLA	Bivalvia	meroplankton	3.78	77.59
7	PODOSP	*Podon sp.*	holoplankton	3.00	80.59
8	CALSBO	*Calanoida* copepodites& nauplii	holoplankton	2.83	83.42
9	FRITIL	*Fritillaria*	holoplankton	2.75	86.17
10	CENTYP	*Centropages typicus*	holoplankton	2.70	88.87
11	BALANU	*Balanus*	meroplankton	1.74	90.61
12	EURYSP	*Eurytemora sp.*	holoplankton	1.54	92.15
13	EVADSP	*Evadne sp.*	holoplankton	1.45	93.60
14	MICRSP	*Microcalanus sp.*	holoplankton	1.28	94.88
15	CALFHG	*Calanus FHG*	holoplankton	1.17	96.05
16	ANOMSP	*Anomia sp.*	meroplankton	0.75	96.80
17	OIKOSP	*Oikopleura sp.*	holoplankton	0.71	97.51
18	EURHER	*Eurytemora herdmani*	holoplankton	0.66	98.17
19	EUPFAM	*Euphausiidae* calyptopis	holoplankton	0.61	98.78
20	CALFIN	*Calanus finmarchicus*	holoplankton	0.43	99.21
21	POLCLA	*Polychaeta*	meroplankton	0.12	99.33
22	GASCLA	*Gastrapoda*	meroplankton	0.10	99.43
23	PARPAR	*Paracalanus parvus*	holoplankton	0.07	99.57
24	SAGISP	*Sagitta sp.*	holoplankton	0.07	99.57
25	INVEGG	Invertebrate egg		0.05	99.73
26	METLON	*Metridia longa*	holoplankton	0.05	99.73
27	TORDIS	*Tortanus discaudatus*	holoplankton	0.05	99.73
28	CALHYP	*Calanus hyperboreus*	holoplankton	0.05	99.77
29	EUPORD	*Euphausiacea*	holoplankton	0.04	99.81
30	BIVORD	Bivalve		0.04	99.88
31	CENHAM	*Centropages hamatus*		0.04	99.88
32	HARSBO	*Harpacticoida*	holoplankton	0.02	99.90
33	OBELSP	*Obelia sp.*	holoplankton	0.02	99.93
34	PARASP	*Paracalanus sp.*	holoplankton	0.02	99.95
35	SIPORD	*Siphonophora*	holoplankton	0.01	99.96
36	METRSP	*Metridia sp.*	holoplankton	0.01	99.97
37	HYPFAM	*Hyperiidae*		0.01	99.98
38	CYCSBO	*Cyclopoida*	holoplankton	0.01	99.99
39	CYTEGG	fish eggs		0.00	100.00
40	SCOMIM	*Scolecithricella minor*		0.00	100.00
41	ONCASP	*Oncacea sp.*		0.00	100.00
42	SCOMIN			0.00	100.00

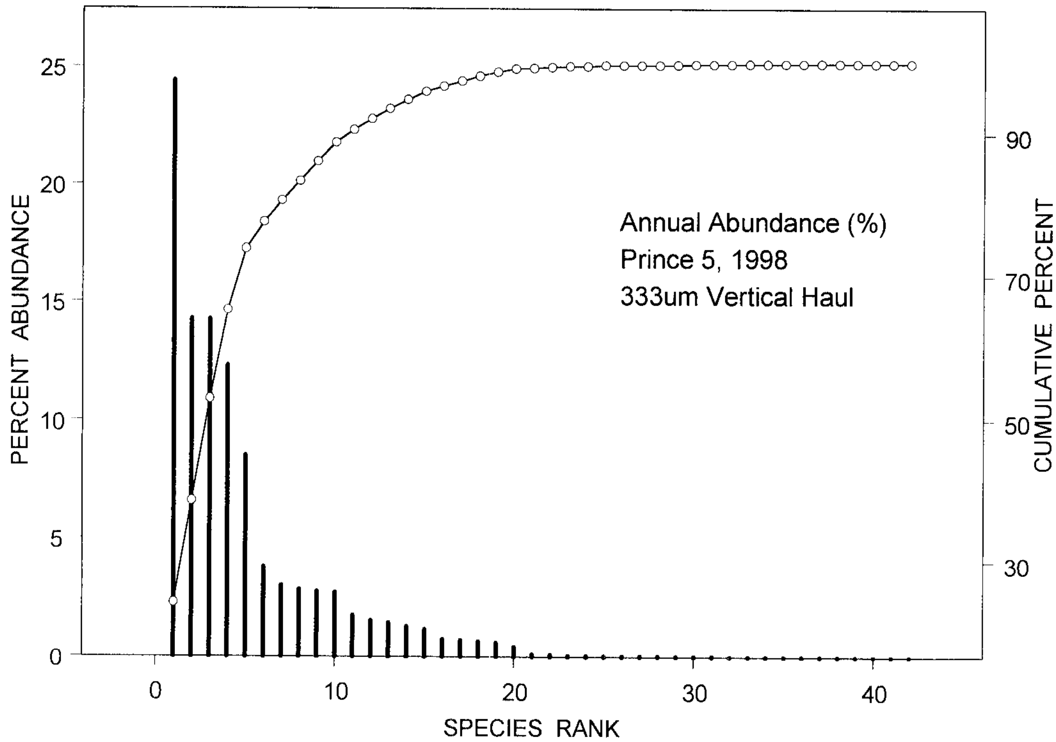

Figure 6: *Annual percent and cumulative percent for each zooplankton species identified from 333μm mesh vertical hauls taken at Prince 5 in 1998. Percentages are based on the organism specific annual totals of the number of individuals per tow. The name of the organism corresponding to each rank is given in Table 3.*

Seasonal Time Trends

The total number of individual organisms per tow varied seasonally, as did the number of different organism types (Fig. 7). The number of organisms per tow varies by about 2 orders of magnitude with the numbers being lowest in the winter and highest in the summer. The species richness or number of organism types per tow ranged from 8 to 22. However, if the two extremes are removed, the richness ranged from 12 to 18. The richness was slightly higher during the spring than in the winter and summer (Fig. 7)

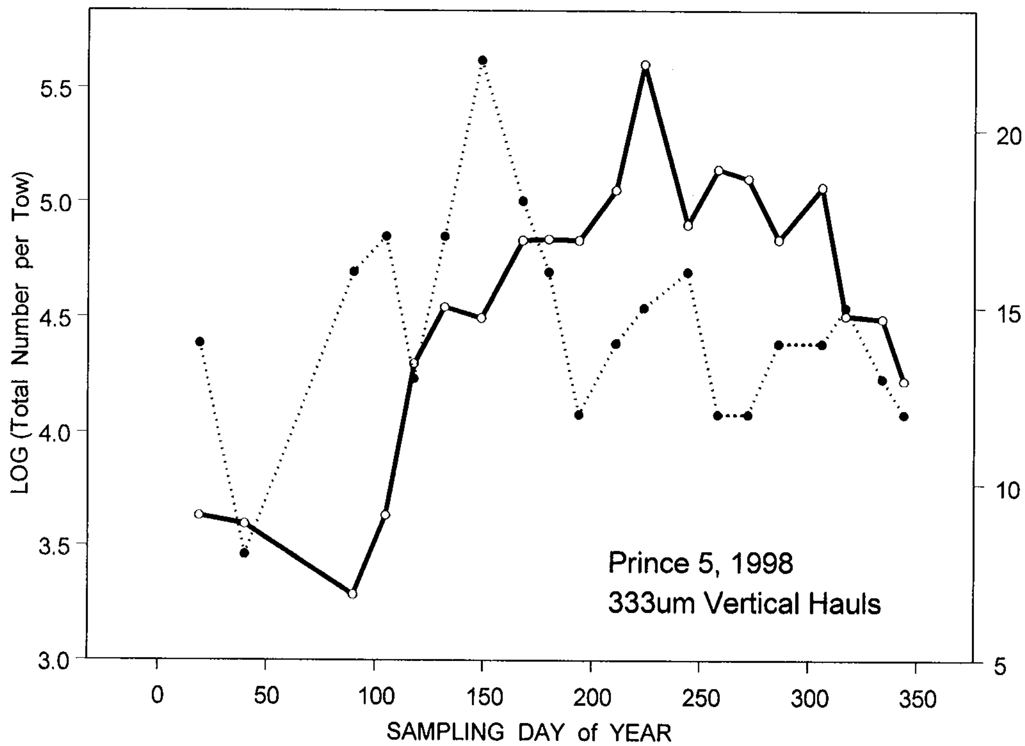

Figure 7: *Time series of the total number of organisms per tow (thick line with open circles) and total number of species or identified organism type (dashed line with closed circles) collected at Prince 5 in vertical hauls taken with a 333μm mesh net in 1998.*

Species Specific Time Trends

The time trend for the presence of organisms varies between species (Fig. 8&9). Some species were present throughout the year whereas others only occurred sporadically and some in only one sample. The time trend in the abundance of each organism type also varies between species (Fig. 10a,b).

These time trends result in the species composition of the samples varying throughout the year (Fig. 11). During the winter, when the total number of individual organisms in a sample is relatively low, one or only a few species dominate the catch (e.g. days 40 and 90). In the summer and fall several organism types are abundant.

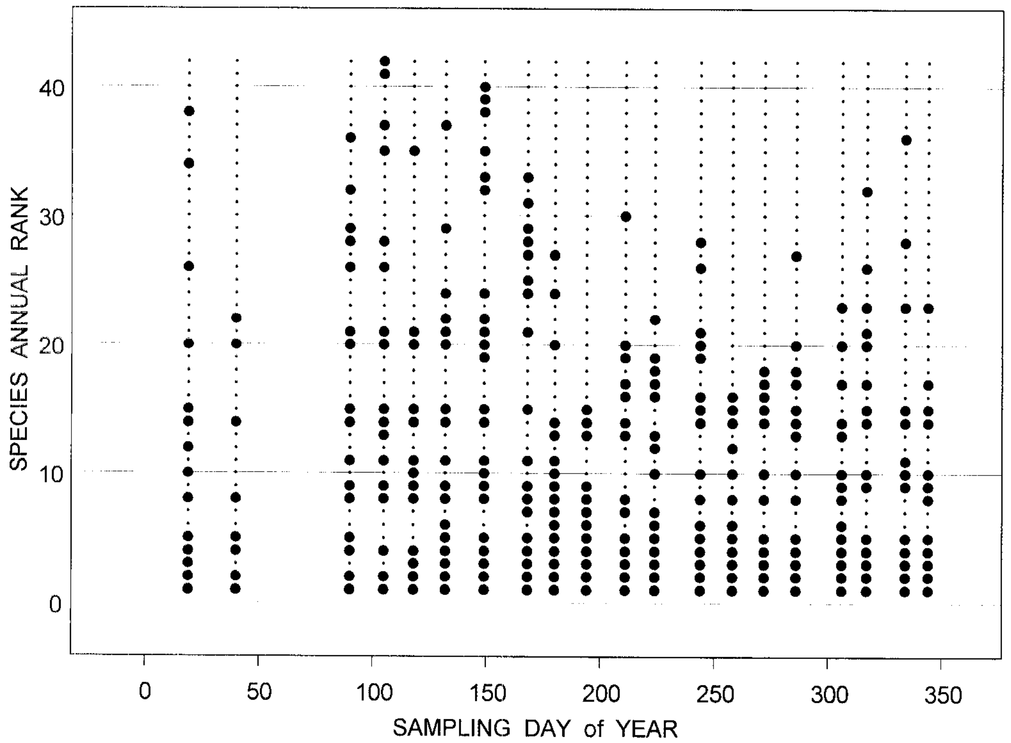

Figure 8: *Time series of the presence and absence of each zooplankton species identified in 333um mesh net vertical hauls taken at Prince 5 in 1998. The correspondence between species rank and the species name is given in Table 3.*

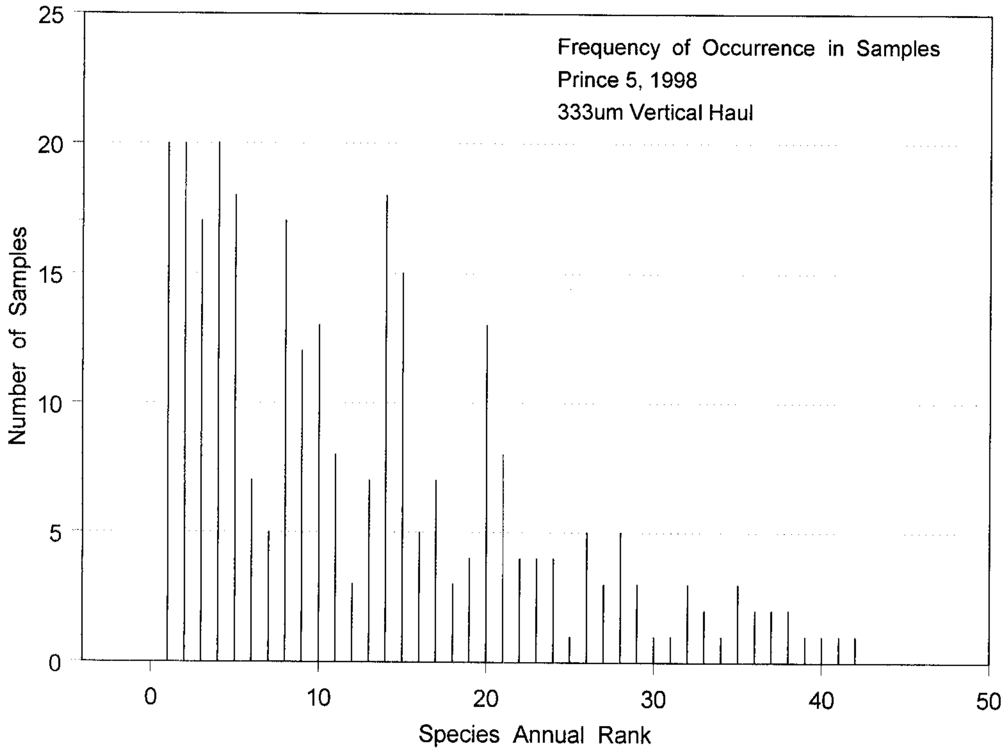

Figure 9: *The number of 333um mesh net, vertical haul samples each zooplankton species occurred in at Prince 5 in 1998. The annual species rank is the ranking based on the annual total number of individuals per species. The rankings correspond with the species names given in Table 3.*

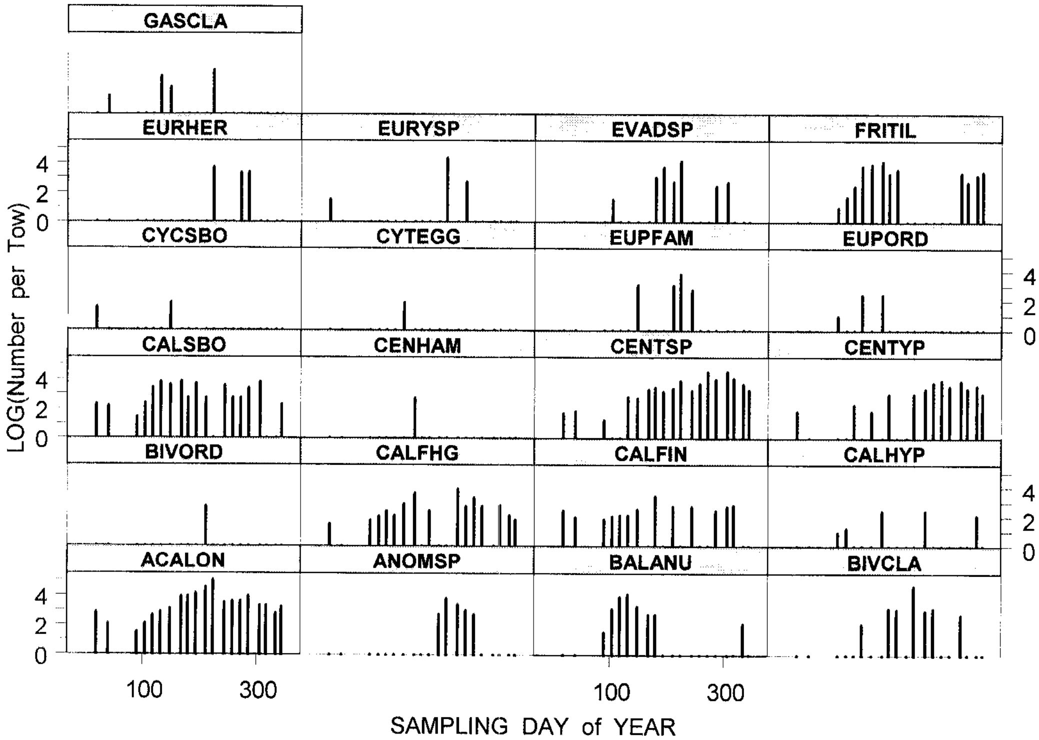

Figure 10a: Time series of the number of individuals per tow

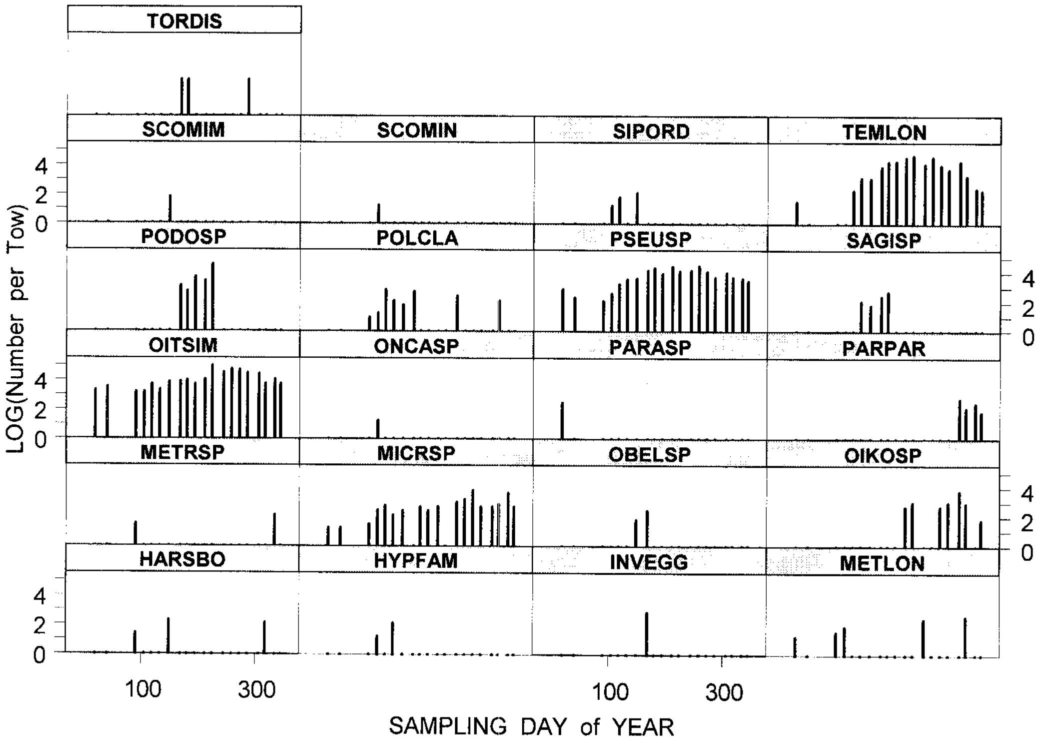

Figure 10b: Time series of the number of individuals per tow continued.

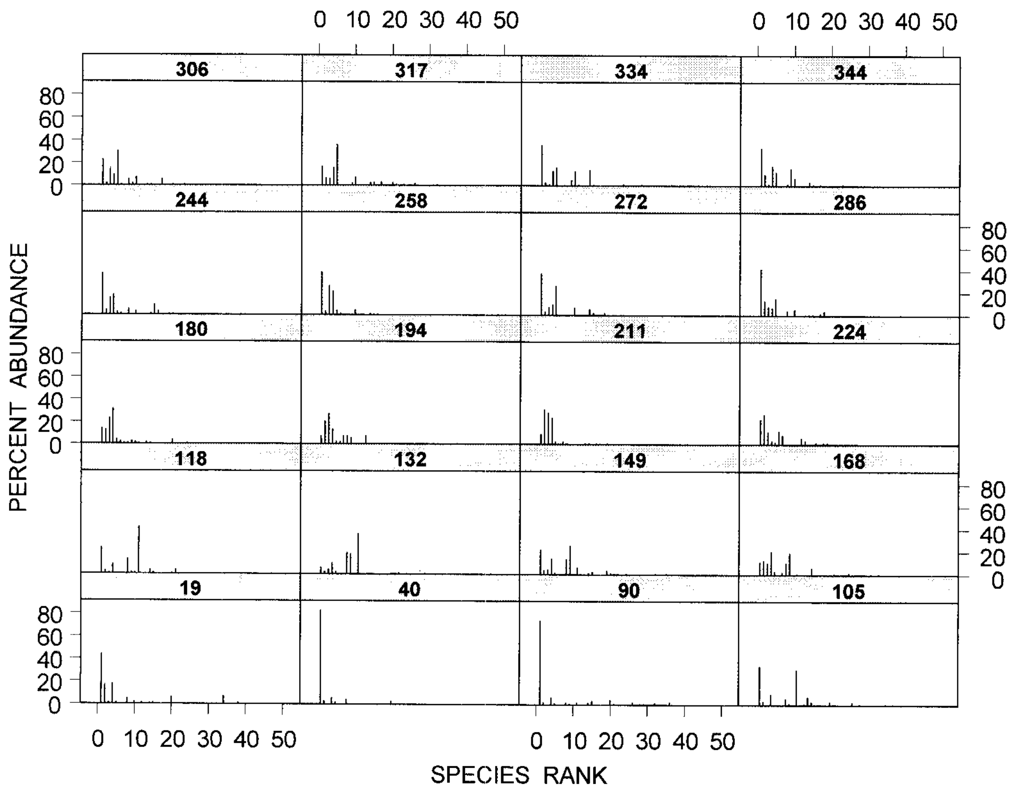

Figure 11: *Percent abundance for each zooplankton species identified from each 333μm mesh vertical haul taken at Prince 5 in 1998. Percentages are based on the organism specific number of individuals per tow. The species rank is the same as in annualised ranks used in the text.*

Species Groupings

Similarities between the time trends in the presence and absence of the 42 species was explored using two indices of dissimilarity and several methods of clustering. All of the methods indicated four distinct groupings. Only the results from the agglomerative hierarchical cluster analyses using group average linkage and the matrix of Jaccard Dissimilarity Coefficients calculated from the presence and absence transformed abundance time series are presented in detail.

The dendogram resulting from the agglomerative hierarchical cluster analyses (Fig. 12) suggested 4 groupings of species at the 0.4 level of dissimilarity. The agglomerative coefficient associated with the analyses was 0.58, which suggests the groupings were only of moderate strength (Kaufman and Rousseeuw 1990). For convenience, we have defined the effective groupings as those with a Jaccard Coefficient of ~0.4 or less. This means the average dissimilarity between groupings is 40% or less.

The largest grouping consisted of ten species of copepod, rank numbers 1,2,4,14,5,8,3,15,10 and 20. The first three, *Oithona similis, Acartia longiremis and Pseudocalanus spp*., rank numbers 1, 2 and 4 respectively, were present in all samples and hence had identical time trends with no mismatches (Fig. 8) and dissimilarity coefficients of "0". The remaining seven species, *Microcalanus sp.*, *Centropages sp.*, *Calanoida*, *Temora longicornis*, *Calanus FHG*, *Centropages typicus* and *Calanus finmarchicus*, were present in all but 2 to 7 samples. The number of absences increased with the Jaccard Coefficient.

Three additional groupings consisted of only two species each. Organisms 41 (oncasp) and 42 (scomin) also had zero mismatches but were present in only the day 105 sample (Fig. 8). Organisms 25 (unidentified invertebrate egg) and 31 (*Centropages hametus*) also had zero mismatches but were present in only the day 168 sample. Organisms 39 (fish eggs) and 40 (*Scolecithricella minor*) were present in only the day 149 sample (Fig. 8).

A fifth grouping consisted of species 9 (*Fritillaria*), 11(*Balanus*) and 21(Polychaeta). This grouping did not emerge from any of the cluster analyses performed on Euclidean Distance matrices.

Similar groupings were produced by other clustering techniques applied to the binary data. These approaches included agglomerative hierarchial clustering using group average linkage and the matrix of Euclidean distances, and divisive hierarchical clustering of the matrices of Jaccard Coefficients and Euclidean Distances using group average linkage.

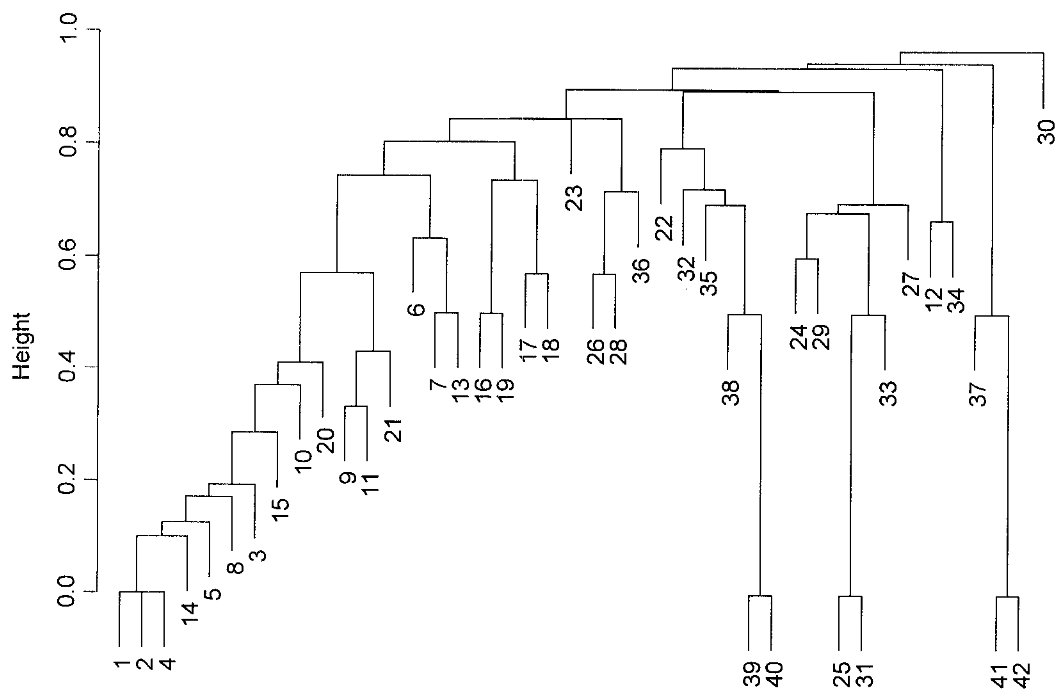

Figure 12: *Dendogram of species clusters resulting from agglomerative hierarchial clustering and group average linkage on a matrix of Jaccard Dissimilarity Coefficients calculated from the presence and absence transformed data. The numbers on the dendogram correspond to the rank of the species with respect total annual abundance (Table 5). The height corresponds to the Jaccard Coefficient where "0" indicates no dissimilarity (=complete similarity) and "1" indicates 100% dissimilarity (=no similarity).*

Similarities in the species composition of each sample was also explored using the binary data. The dissimilarities between sample dates were calculated based on the presence and absence of all the species in each sample. Matrices of Jaccard Dissimilarity Coefficients and Euclidean Distances were calculated and explored using agglomerative hierarchical clustering and group average linkage. Both approaches yielded little evidence for identifiable groupings of species composition. The dendograms for these clustering efforts are not shown.

Acknowledgements

Sampling at Prince 5 was conducted aboard the CCGC *Pandalus III* with Captain Wayne Miner. Funding for the sampling and sample analyses was provided in part by Department of Fisheries and Oceans Strategic Research Funds. All 333μm mesh zooplankton samples were sorted, identified and enumerated by the Atlantic Reference Centre (ARC) located in St. Andrews, New Brunswick.

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Kaufman, L. and P.J. Rousseeuw. 1990. Finding groups in data: An introduction to cluster analysis. John Wiley and Sons, Inc., New York, 342p.

Appendix 1: Abundance, in number of individuals per tow, by species and tow date of the zooplankton identified from the 333μm mesh vertical hauls taken at Prince 5 during 1998.

Annual Rank	Species Code	Sample Day of the Year (Jan.1 = 1, Jan. 2 = 2, etc.)									
		19	40	90	105	118	132	149	168	180	194
1	OITSIM	1856	3280	1424	1456	4672	2048	6912	7680	9472	4864
2	ACALON	704	112	32	128	448	768	1216	8448	8704	14080
3	TEMLON	32	0	0	0	192	1408	1280	7168	15872	18688
4	PSEUSP	720	208	120	400	1728	3584	4224	13824	21504	8960
5	CENTSP	48	64	16	0	0	640	512	2048	2816	1536
6	BIVCLA	0	0	0	0	0	128	0	0	1536	1280
7	PODOSP	0	0	0	0	0	0	0	1280	512	4864
8	CALSBO	192	144	24	224	2432	6528	4160	7168	512	4864
9	FRITIL	0	0	8	48	256	6144	8064	13056	1792	3584
10	CENTYP	64	0	0	0	192	0	64	0	1024	0
11	BALANU	0	0	32	1328	8256	12416	1792	512	512	0
12	EURYSP	32	0	0	0	0	0	0	0	0	0
13	EVADSP	0	0	0	32	0	0	0	0	1024	5120
14	MICRSP	16	16	32	288	640	128	256	0	512	256
15	CALFHG	32	0	56	112	256	128	768	4096	0	256
16	ANOMSP	0	0	0	0	0	0	0	0	0	0
17	OIKOSP	0	0	0	0	0	0	0	0	0	0
18	EURHER	0	0	0	0	0	0	0	0	0	0
19	EUPFAM	0	0	0	0	0	0	1088	0	0	0
20	CALFIN	256	96	72	112	128	128	320	0	2560	0
21	POLCLA	0	0	8	16	640	128	64	512	0	0
22	GASCLA	0	16	0	0	0	384	64	0	0	0
23	PARPAR	0	0	0	0	0	0	0	0	0	0
24	SAGISP	0	0	0	0	0	128	64	256	512	0
25	INVEGG	0	0	0	0	0	0	0	768	0	0
26	METLON	16	0	32	80	0	0	0	0	0	0
27	TORDIS	0	0	0	0	0	0	0	256	256	0
28	CALHYP	0	0	8	16	0	0	0	256	0	0
29	EUPORD	0	0	8	0	0	256	0	256	0	0
30	BIVORD	0	0	0	0	0	0	0	0	0	0
31	CENHAM	0	0	0	0	0	0	0	512	0	0
32	HARSBO	0	0	24	0	0	0	192	0	0	0
33	OBELSP	0	0	0	0	0	0	64	256	0	0
34	PARASP	288	0	0	0	0	0	0	0	0	0
35	SIPORD	0	0	0	16	64	0	128	0	0	0
36	METRSP	0	0	32	0	0	0	0	0	0	0
37	HYPFAM	0	0	0	16	0	128	0	0	0	0
38	CYCSBO	32	0	0	0	0	0	64	0	0	0
39	CYTEGG	0	0	0	0	0	0	64	0	0	0
40	SCOMIM	0	0	0	0	0	0	64	0	0	0
41	ONCASP	0	0	0	16	0	0	0	0	0	0
42	SCOMIN	0	0	0	16	0	0	0	0	0	0

Appendix 1: continued.

Annual Rank	Species Code	Sample Day of the Year (Jan.1 = 1, Jan. 2 = 2, etc.)										Species Total
		211	224	244	258	272	286	306	317	334	344	
1	OITSIM	10240	90112	29440	53248	47104	28416	26112	5248	11136	5568	350288
2	ACALON	34816	108544	3072	4096	4096	8960	2048	2048	640	1664	204624
3	TEMLON	31744	46080	11776	35840	9216	5376	17408	1792	256	192	204320
4	PSEUSP	26624	13312	14080	29184	11776	4608	10240	4864	3968	2880	176808
5	CENTSP	2560	8192	1792	5120	33280	10240	35328	11648	4864	1984	122688
6	BIVCLA	0	48128	1024	1536	0	0	512	0	0	0	54144
7	PODOSP	2560	33792	0	0	0	0	0	0	0	0	43008
8	CALSBO	512	0	3840	512	512	2560	6144	0	0	192	40520
9	FRITIL	0	0	0	0	0	0	2048	512	1408	2496	39416
10	CENTYP	0	1024	2304	6144	8704	3584	8192	2432	3968	1088	38784
11	BALANU	0	0	0	0	0	0	0	0	128	0	24976
12	EURYSP	0	21504	0	512	0	0	0	0	0	0	22048
13	EVADSP	512	13312	0	0	0	256	512	0	0	0	20768
14	MICRSP	512	0	1024	1536	6656	512	512	768	4224	512	18400
15	CALFHG	0	0	7168	512	2048	512	0	640	128	64	16776
16	ANOMSP	512	6144	2560	1024	512	0	0	0	0	0	10752
17	OIKOSP	512	1024	0	0	512	1024	6144	896	0	64	10176
18	EURHER	0	5120	0	0	2048	2304	0	0	0	0	9472
19	EUPFAM	1024	6144	512	0	0	0	0	0	0	0	8768
20	CALFIN	512	0	512	0	0	256	512	640	0	0	6104
21	POLCLA	0	0	256	0	0	0	0	128	0	0	1752
22	GASCLA	0	1024	0	0	0	0	0	0	0	0	1488
23	PARPAR	0	0	0	0	0	0	512	128	256	64	960
24	SAGISP	0	0	0	0	0	0	0	0	0	0	960
25	INVEGG	0	0	0	0	0	0	0	0	0	0	768
26	METLON	0	0	256	0	0	0	0	384	0	0	768
27	TORDIS	0	0	0	0	0	256	0	0	0	0	768
28	CALHYP	0	0	256	0	0	0	0	0	128	0	664
29	EUPORD	0	0	0	0	0	0	0	0	0	0	520
30	BIVORD	512	0	0	0	0	0	0	0	0	0	512
31	CENHAM	0	0	0	0	0	0	0	0	0	0	512
32	HARSBO	0	0	0	0	0	0	0	128	0	0	344
33	OBELSP	0	0	0	0	0	0	0	0	0	0	320
34	PARASP	0	0	0	0	0	0	0	0	0	0	288
35	SIPORD	0	0	0	0	0	0	0	0	0	0	208
36	METRSP	0	0	0	0	0	0	0	0	128	0	160
37	HYPFAM	0	0	0	0	0	0	0	0	0	0	144
38	CYCSBO	0	0	0	0	0	0	0	0	0	0	96
39	CYTEGG	0	0	0	0	0	0	0	0	0	0	64
40	SCOMIM	0	0	0	0	0	0	0	0	0	0	64
41	ONCASP	0	0	0	0	0	0	0	0	0	0	16
42	SCOMIN	0	0	0	0	0	0	0	0	0	0	16