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Continuous Plankton Records: Massachusetts to Cape Sable, N.S.,  
and New York to the Gulf Stream, 1983

by

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In 1972, the U.S. National Marine Fisheries Service (NMFS) began a program of cooperation with the Oceanographic Laboratory, Edinburgh, Scotland (now part of the Institute for Marine Environmental Research (IMER)) for the extension of their long-term Continuous Plankton Recorder (CPR) survey (Glover, 1967) into additional areas of the western North Atlantic. This cooperation has led to a modest expansion by NMFS of two monthly sampling routes. The first (Route MC) crosses the Gulf of Maine from the vicinity of Boston, Massachusetts to near Cape Sable, Nova Scotia, and the second (Route MB) extends from near New York City towards Bermuda, into the northern portion of the Gulf Stream. A summary of the sampling of these two routes is given by Jossi et al. (Annls, biol., Copenh., 38: in press).

A continuous record of plankton along these routes is obtained from a depth of approximately 10 m. This record is divided into samples representing 18.5 km of towing. Examination is made of no less than alternate samples resulting in a sample spacing of  $\leq 37$  km. The mesh size (225 X 235  $\mu$ ) is such that medium-to-small phytoplankton are not captured quantitatively. For complete descriptions of the collection and processing methods for CPR samples, consult Colebrook (1960).

This report presents two aspects of the plankton variations along these routes-- "total phytoplankton" and total copepods. The latter are subset into day and night data, while phytoplankton values are presented without regard for time of day. The units used for "total

phytoplankton" are relative units of green (Colebrook and Robinson, 1961) and are obtained by visual comparison of the green or green-brown color of each sample with a set of color standards. These results, although limited in their applications, are indicative of seasonal and annual variations and timing in phytoplankton abundance. The units used for total copepods are numbers per 100 cubic meters. These units are a departure from those most commonly used for CPR data, but they allow for the sometimes appropriate comparison of these data with those from other sources.

Tables 1 and 2 list the monthly mean values of "total phytoplankton" and total copepods, respectively, for samples over the MC Route during 1983. Spatial variations along the route have not been considered. These values are accompanied by statistics which include anomalies of the 1983 data, as compared to the 1961-1983 means.

Tables 3 and 4 list the monthly mean values of "total phytoplankton" and total copepods, respectively, for samples over the MB Route during 1983. Spatial variations along the route have not been considered. The accompanying statistics do not include anomalies, since the entire time series (1976-1983) has not yet been analyzed.

Tables 5 and 6 list the taxa of phytoplankton and zooplankton, respectively, which were captured along these two routes in 1983.

#### References

- Colebrook, J.M. 1960. Continuous plankton records: Methods of analysis 1950-1959. *Bull. Mar. Ecol.*, 5:51-64.
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- Glover, R.S. 1967. The Continuous Plankton Recorder survey of the North Atlantic. *Symp. Zool. Soc. Lond.*, 19: 189-210.
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Table 1. Monthly conditions of "total phytoplankton" in all CPR samples taken at approximately 10 meters depth between the vicinity of Boston, Massachusetts and Cape Sable, Nova Scotia, 1961-1983.

		"TOTAL PHYTOPLANKTON" (relative green)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1983	Mean	0.0	0.0	0.9	2.4	2.9	0.1	0.3	0.1	0.0	0.0	0.1	0.0
	N	12	11	12	10	11	12	12	10	11	10	10	12
	Min	0.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max	0.0	0.0	6.5	3.0	6.5	1.0	1.0	1.0	0.0	0.0	1.0	0.0
	Std	0.0	0.0	1.9	0.5	2.4	0.3	0.5	0.3	0.0	0.0	0.3	0.0
1961-1983	Mean	0.0	0.0	0.5	1.4	0.8	0.4	0.4	0.3	0.2	0.3	0.7	0.2
	N	57	50	110	78	128	135	148	130	113	130	109	67
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max	1.0	1.0	6.5	6.5	6.5	6.5	6.5	6.5	2.0	2.0	6.5	2.0
	Std	0.1	0.1	1.0	2.0	1.5	0.9	0.8	0.8	0.4	0.5	1.6	0.4
1983 Anom	-0.02	-0.02	+0.41	+1.04	+2.03	-0.29	-0.09	-0.23	-0.22	-0.25	-0.63	-0.16	

Table 2. Monthly conditions of total copepods in day and night CPR samples taken at approximately 10 meters depth between the vicinity of Boston, Massachusetts and Cape Sable, Nova Scotia, 1961-1983.

		TOTAL COPEPODS (No./100m <sup>3</sup> )											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
- DAY DATA -													
1983	Mean	1770	696	0	2989	21011	6294	22852	29148	18294	28140	6347	3577
	N	7	5	4	7	7	6	6	4	5	7	5	6
	Min	33	469	0	201	3181	3381	5992	20587	6060	15400	100	569
	Max	3549	1171	0	6629	40880	11918	54932	39768	40009	63808	25142	11717
	Std	1352	266	-	2266	15189	2973	17879	8772	13050	16716	10695	4094
1961-1983	Mean	2009	3716	4417	18968	37618	24050	26563	21445	30609	24808	18838	8234
	N	42	33	73	38	91	79	85	82	70	86	64	30
	Min	0	99	0	0	201	100	33	100	33	0	100	0
	Max	10746	17644	47405	203596	199110	169031	131278	75393	122036	238682	62799	39909
	Std	2129	3892	9375	44390	42643	29250	24624	16088	27208	33523	16637	9092
83 Anom	-239	-3020	-4417	-15979	-16607	-17756	-3712	+7703	-12315	+3332	-12491	-4657	
- NIGHT DATA -													
1983	Mean	1707	1785	388	13281	30074	15573	21670	19907	25372	6863	5986	1479
	N	5	6	5	3	4	6	6	6	6	3	5	6
	Min	770	234	0	201	23168	5859	12788	10846	11718	4519	870	268
	Max	3046	6762	670	31840	37163	27686	39802	33610	44629	10713	13592	3046
	Std	856	2505	284	16516	7171	7654	9356	9151	14792	3360	4969	1104
1961-1983	Mean	1788	3313	3195	13185	63641	51617	22435	30050	28572	27680	14337	7085
	N	26	27	55	39	58	56	62	58	54	44	67	37
	Min	33	234	0	33	133	2544	66	635	2109	502	33	66
	Max	7666	11752	18444	244844	296178	258168	73188	106361	119694	79081	91151	26407
	Std	2072	3102	3971	40560	57533	58636	17129	26128	24290	23456	16545	6393
83 Anom	-80	-1528	-2807	+95	-33567	-36044	-765	-10143	-3199	-20817	-8351	-5607	

Table 3. Monthly conditions of "total phytoplankton" in all CPR samples taken at approximately 10 meters depth along the first 500 kilometers between New York and Bermuda.

		"TOTAL PHYTOPLANKTON" (relative green)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
983	Mean	0.0	0.0	0.3	0.9	0.4	0.8	0.0	0.0	0.7	1.1	0.3	0.3
	N	6	16	12	13	14	14	14	13	13	12	13	13
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max	0.0	0.0	1.0	2.0	2.0	6.5	0.0	0.0	6.5	6.5	1.0	2.0
	Std	0.0	0.0	0.5	0.9	0.6	1.8	0.0	0.0	1.8	1.9	0.5	0.6

Table 4. Monthly conditions of total copepods in day and night CPR samples taken at approximately 10 meters depth along the first 500 kilometers between New York and Bermuda.

		TOTAL COPEPODS (NO./100 m <sup>3</sup> )											
		-DAY DATA-											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1983	Mean	9452	7382	2102	25520	30292	469	13392	7943	7611	24115	11330	15742
	N	3	8	5	7	6	3	5	8	6	4	9	9
	Min	6060	0	1373	5524	2879	0	0	1540	3013	4553	0	1373
	Max	15333	25275	3013	74689	52192	1373	66861	19653	19687	39172	35754	107062
	Std	5113	9735	761	23179	15815	783	29890	6122	6542	16445	14192	34303
		-NIGHT DATA-											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1983	Mean	13258	442	8624	30582	23957	7343	2435	14490	25137	12597	20087	96198
	N	3	5	5	6	8	6	7	5	5	8	4	4
	Min	6027	0	6930	8336	5959	67	201	1507	14095	4821	1540	7030
	Max	24140	875	11048	72781	41178	21961	6027	25613	39273	31673	64545	126479
	Std	9592	803	2184	25682	12309	8387	1874	10086	9970	9792	29961	59450

Table 5. List of phytoplankton taxa sampled by the Hardy Plankton Recorder along Routes MB and MC during 1983.

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<i>Asterionella japonica</i>	<i>Gonyaulax</i> spp.
<i>Bacteriastrium</i>	<i>Hyalochaete</i> spp.
<i>Biddulphia aurita</i>	<i>Nitzschia seriata</i>
<i>Biddulphia sinensis</i>	<i>Ornithocercus</i> spp.
<i>Ceratium carriense</i>	<i>Oscillatoria</i> spp.
<i>Ceratium extensum</i>	<i>Oxytoxum scolopax</i>
<i>Ceratium fusus</i>	<i>Peridinium</i> spp.
<i>Ceratium hexacanthum</i>	<i>Phaeoceros</i> spp.
<i>Ceratium lineatum</i>	<i>Pleurosigma</i> spp.
<i>Ceratium longinum</i>	<i>Prorocentrum</i> spp.
<i>Ceratium longipes</i>	<i>Rhizosolenia alata</i>
<i>Ceratium macroceros</i>	<i>Rhizosolenia alata alata</i>
<i>Ceratium massiliense</i>	<i>Rhizosolenia calcar-avis</i>
<i>Ceratium minutum</i>	<i>Rhizosolenia hebetata</i>
<i>Ceratium pentagonum</i>	<i>Rhizosolenia imbricata</i>
<i>Ceratium setaceum</i>	<i>Rhizosolenia setigera</i>
<i>Ceratium teres</i>	<i>Rhizosolenia</i> spp.
<i>Ceratium trichoceros</i>	<i>Rhizosolenia styliiformis</i>
<i>Ceratium tripos</i>	<i>Schroderella delicatula</i>
<i>Chaetoceros curvisetus</i>	<i>Silicoflagellatae</i>
<i>Corethron criophilum</i>	<i>Skeletonema costatum</i>
<i>Coscinodiscus</i> spp.	<i>Stephanopyxis turris</i>
Cyanophyta	<i>Thalassionema nitzschioides</i>
<i>Dinophysis</i> spp.	<i>Thalassiosira</i> spp.
<i>Dinophysis tripos</i>	<i>Thalassiothrix frauenfeldii</i>
<i>Diplopsalis</i> spp.	<i>Thalassiothrix longissima</i>
<i>Ditylum brightwellii</i>	

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Table 6. List of zooplankton taxa sampled by the Hardy Plankton Recorder along Routes MB and MC during 1983.

Acartia danae	Harpacticoid spp.
Acartia spp.	Hyperiidea
Alciopidae	Labidocera aestiva
Appendicularia	Lucicutia flavicornis
Brachyura	Lucifer typus
Bryozoa	Mecynocera clausi
Calanus finmarchicus	Metridia lucens
Calanus glacialis	Metridia spp.
Calanus helgolandicus	Mysidacea
Calanus minor	Oithona spp.
Calanus spp.	Oncaea spp.
Calanus tenuicornis	Ostracoda
Calocalanus pavo	Oxycephalus clausi
Calocalanus spp.	Paracalanus or Pseudocalanus
Candacia armata	Paracalanus spp.
Candacia pacydactyla	Penilia avirostris
Candacia spp.	Pleuromamma abdominalis
Centropages bradyi	Pleuromma borealis
Centropages furcatus	Pleuromma gracilis
Centropages typicus	Pleuromma xiphias
Chaetognatha	Podon spp.
Cirripedia	Pseudocalanus spp.
Cladocera	Radiolaria
Clausocalanus spp.	Rhincalanus cornutus
Clytemnestra spp.	Rhincalanus nasutus
Coelenterata	Scolecithrix danae
Copepoda	Scyllaridea
Corycaeus spp.	Siphonophora
Ctenophora	Stellate bodies
Cumacea	Stomatopoda
Decapoda-Arthropoda	Temora longicornis
Eucalanus monachus	Temora spp.
Eucalanus spp.	Temora stylifera
Euchaeta marina	Temora turbinata
Euchaeta norvegica	Thalia democratica
Euphausiacea	Thaliacea (Salpa)
Eurytemora herdmani	Thecosomata (Pteropoda, shelled)
Evadne spp.	Tintinnidae
Farranula gracilis	Undeuchaeta minor
Fish	Undinula vulgaris
Gammaridea	