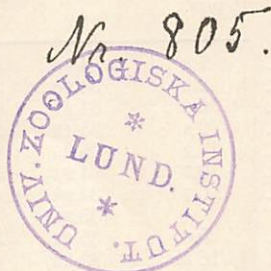


Haldar. 805. 139

Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar 1900. N:o 2.
Stockholm.



Geographical distribution of Atlantic Copepoda and
their physical conditions.

By P. T. CLEVE.

1900

(Communicated February 14, 1900.)

In the following article I have arranged the Atlantic copepoda, which I noted in the years 1898—1899, according to their occurrence in my planktotypes and have calculated for each species the mean temperature and the mean salinity. I have also noted the extreme limits north and south, known by my own and other observations, and the distribution in the eastern, central or western Atlantic, as well as outside the Atlantic.

The letters E., C., W. indicate the distribution in the eastern, central and western Atlantic, but E includes in several cases the distribution across the Atlantic north of 40° N., because many species of essentially eastern distribution go from the north of the Azores across the Atlantic towards the region of New York.

When in the Tables the figures are enclosed in parentheses, this denotes exceptional cases or occurrence in other regions than the Atlantic, for instance in the Baltic.

The letters M., P., I., R., B. indicate the occurrence in the Mediterranean, Pacific, Indian Ocean, Red Sea and Baltic.

The following list comprises species which belong to *trichoplankton*, or arctic forms.

	Mean temperature.	Mean salinity.	Northern and southern limit.	Distribution outside the Atlantic.
<i>Calanus finmarchicus</i> . . .	7.8	34.30	30°—81° N.	M.P.I.
<i>C. hyperboreus</i>	2.0	34.98	58°—82° N.	
<i>Chiridius armatus</i>	0.0	34.81	65°—74° N.	
<i>Euchæta norvegica</i>	2.3	35.12	58°—80° N.	
<i>Metridia hibernica</i>	11.1	35.25	42°—69° N.	
<i>M. longa</i>	0.7	34.94	58°—80° N.	
<i>Oncaea conifera</i>	0.7	34.98	62°—71° N.	
		(35.95)	(38° N.)	M.
<i>O. minuta</i>	5.0	35.02	38°—78° N.	
	(16.3)	(35.82)		M.

It will be seen from the list, that the number of the species is comparatively small, that the mean temperature varies between 0 and 11.1, the mean salinity between 34.30 and 35.25.

Among these species *Calanus hyperboreus*, *Chiridius armatus*,¹⁾ *Euchæta norvegica*, *Metridia longa* and *Oncaea conifera* live as a rule far below the surface or are deep-sea species.

Of the tricho-plankton copepods *Calanus finmarchicus*, *Oncaea conifera* and *O. minuta* have also been observed in the Mediterranean, which seems to point to the conclusion that the Mediterranean may receive water from the arctic regions. *Calanus finmarchicus* has the widest distribution, as it occurs also in the antarctic seas and follows the currents from that region.

The following list comprises boreal forms which are more neritic than oceanic. All with the exception of *Anomalocera Patersonii* enter the plankton of the Baltic. They have not been seen south of 40° N.

	Mean temperature.	Mean salinity.	Northern and southern limit.	Distribution in the Atlantic.	Distribution outside the Atlantic.
<i>Acartia longiremis</i> . . .	7.8	33.99 (6.00)	58°—80° N.		B.
<i>Anomalocera Patersonii</i>	11.5	34.17	50°—73° N.	E.	
<i>Centropages hamatus</i> .	9.7	33.58 (12.00)	50°—70° N.	E.	B.
<i>Pseudocalanus elongatus</i>	8.9	34.53 (6.00)	40°—79° N.	E.W.	B.
<i>Temora longicornis</i> . .	10.8 (—1.5)	34.16 (18.00)	40°—70° N.	E.W.	B.

¹⁾ According to G. O. Sars the same as *Euchæta armata* BOECK.

I consider the species of the following list as belonging to my plankton-type *styliplankton*.

	Mean temperature.	Mean salinity.	Northern and southern limit.	Distribution in the Atlantic.	Distribution outside the Atlantic.
<i>Acartia Clausii</i>	11.4	35.20	38°—73° N.	E.	M.
<i>A. Danae</i>	17.6	35.97	34°—49° N.	E.	P.
<i>Candace pectinata</i>	17.3	36.06	33°—60° N.	E.	M.
<i>Centropages Chierchiaë</i>	15.0	35.84	38°—48° N.	E.	
<i>C. typicus</i>	15.7	34.24	6° S.—63° N.	E.	M.
<i>Clausocalanus arcuicornis</i>	17.5	35.89	33° S.—55° N.	E.	M.P.
<i>Corycæus rostratus</i>	19.6	35.98	33° S.—48° N.	E.	M.
<i>Eucalanus elongatus</i>	17.4	36.54	36°—60° N.	E.	M.P.
<i>Euchæta spinosa</i>	16.4	35.82	42°—46° N.	E(?)	M.
<i>Euchirella rostrata</i>	16.2	35.93	32°—44° N.	E.	M.
<i>Mecynocera Clausii</i>	16.8	35.77	30° S.—50° N.	E.(C.W.)	M.P.
<i>Microsetella atlantica</i>	19.0	35.50	31° S.—79° N.	E.(C.W.)	M.P.
<i>Oithona similis</i>	12.3	35.00	33° S.—81° N.	E.	M.
<i>Oncæa mediterranea</i>	16.8	36.42	33°—42° (80°) N.	E.(C.)	M.P.
<i>O. subtilis</i>	13.0	35.66	32° S.—47° N.	E.	M.
<i>Paracalanus parvus</i>	15.9	34.88	32° S.—61° N.	E.W.	M.P.I.
<i>Pleuromma abdominale</i>	13.7	35.17	16°—50° N.	E.	M.P.I.
<i>P. gracile</i>	15.6	35.69	33°—50° N.	E.	M.P.I.
<i>Rhinocalanus nasutus</i>	15.5	35.61	21°—60° N.	E.	M.P.

It will be seen that the mean temperature varies between 11.4 and 19.6. The salinity varies from 34.24 to 36.54. The species of the group reach in many cases from the latitude of Rio Janeiro or Cape of Good Hope to about 60° N., or to the Färöe Channel, but several go far more to the north, as is the case with *Acartia Clausii*, *Microsetella atlantica* and *Oithona similis*, which reach Spitzbergen. *Oncæa mediterranea* has been noted by TH. SCOTT at Franz Josef Land. Most species have their principal area of distribution on the northern hemisphere in the eastern Atlantic. Almost all inhabit the Mediterranean and some also the Pacific and Indian.

The following species belong to *desmo-plankton*.

	Mean temperature.	Mean salinity.	Northern and southern limit.	Distribution in the Atlantic.	Distribution outside the Atlantic.
<i>Acartia negligens</i> . . .	22.6	36.19	33° S.—36° N.	W.	M.P.
<i>A. macropus</i> <i>N. Sp.</i> . .	21.3	36.26	38° N.	E.	
<i>Calanus brevicornis</i> . .	21.0	—	41° S.—36° N.	E.	I.
<i>C. gracilis</i>	25.2	36.71	35° S.—44° N.	E.	M.P.I.
<i>C. minor</i>	20.5	36.00	32° S.—40° N.	E.C.W.	M.P.I.
<i>C. tenuicornis</i>	20.3	36.94	28°—34° N.	E.C.	M.P.
<i>C. vulgaris</i>	24.4	35.69	25° S.—40° N.	E.C.W.	P.
<i>Calocalanus pavo</i> . . .	22.2	36.09	6° S.—40° (56°) N.	E.C.W.	M.P.
<i>Candace bispinosa</i> . . .	23.7	35.61	20°—38° N.	C.W.	M.P.
<i>C. ethiopica</i>	22.7	36.06	3°—40° N.	E.C.W.	M.P.
<i>C. pachydaetyla</i>	25.8	35.02	18° S.—38° N.	E.C.W.	M.P.
<i>Centropages violaceus</i> .	22.1	35.92	26° S.—44° N.	E.C.W.	M.P.
<i>Clausocalanus furcatus</i>	23.9	35.84	25° S.—40° N.	E.C.W.	M.P.
<i>Clytemnestra rostrata</i> .	24.2	—	43° S.—42° N.	E.W.	M.P.I.
<i>Copilia mirabilis</i> . . .	24.3	35.90	6° S.—36° N.	E.W.	P.I.
<i>Corycæus longicaudis</i> .	25.3	35.98	25° S.—45° N.	E.C.W.	P.
<i>C. obtusus</i>	23.7	35.47	24° S.—38° N.	E.W.	M.P.
<i>C. ovalis</i>	21.6	35.43	6° S.—45° N.	E.C.W.	M.
<i>C. speciosus</i>	24.3	35.95	30° S.—40° (50°) N.	E.C.W.	P.
<i>Euchaeta marina</i>	24.6	35.95	26° S.—30° (50°) N.	E.C.W.	M.P.
<i>Miracia efferata</i>	24.6	35.87	4° S.—42° N.	E.C.W.	P.
<i>Monops perspicax</i>	27.1	36.27	6° S.—25° N.	E.W.	
<i>Oithona plumifera</i> . . .	21.8	36.04	33° S.—40° (66°) N.	E.C.W.	M.P.I.
<i>Oncaea media</i>	22.2	35.78	33° S.—47° N.	E.C.W.	M.P.
<i>O. venusta</i>	21.8	36.88	33° S.—41° N.	E.W.	M.P.
<i>Paracalanus aculeatus</i> .	23.9	35.37	1° S.—41° N.	E.W.	P.R.
<i>Pontellina plumata</i> . . .	25.8	35.22	35° S.—38° N.	E.	M.P.
<i>Rhinocalanus cornutus</i>	20.4	36.24	1°—43° N.	E.W.	P.
<i>Sapphirina gemma</i>	26.2	35.22	36° S.—11° N.	E.	M.P.
<i>S. opalina</i>	27.5	34.72	14° N.	W.	M.P.
<i>S. ovatolanceolata</i> . . .	23.0	36.61	24°—15° S.	E.W.	M.
<i>S. stellata</i>	25.7	36.25	16°—31° N.	W.	P.I.
<i>Scolecithrix Danæ</i>	25.6	35.28	18° S.—34° N.	E.C.	M.P.
<i>Setella gracilis</i>	24.5	35.69	37° S.—47° N.	E.C.W.	M.P.

The mean temperature varies from 20.3 to 27.5 and the mean salinity between 34.72 and 36.94. Most of these species occur in the southern hemisphere and reach as a rule to 40°—50° N. They proceed only rarely beyond that limit, but *Oithona plumifera* makes an exception.

Most of these species occur in the Mediterranean and the Pacific, several also in the Indian Ocean. The principal areas of distribution are between Africa and South America, between the Azores and the Caribbean Sea, the Antilles and Florida currents.

The following list comprises rare species of the tropical or temperate Atlantic, which may belong either to the *styli-* or the *desmo-plankton*.

	Mean temperature.	Mean salinity.	Northern and southern limit.	Distribution in the Atlantic.	Distribution outside the Atlantic.
<i>Copilia denticulata</i>	18.3	35.90	38° N.	E.	M.
<i>C. quadrata</i>	22.4	36.04	31° N.	W.	M.P.
<i>Corycaeus elongatus</i>	18.6	36.68	20° S.—38° N.	E.	M.
<i>C. flaccus</i>	15.0	36.01	40° N.	E.	M.P.
<i>C. venustus</i>	20.6	35.25	30° S.—42° N.	E.W.	M.P.
<i>Labidocera acutifrons</i>	22.3	35.20	23° S.—18° N.	E.	M.P.
<i>L. Nerei</i>	24.9	35.25	2°—44° N.	E.	—
<i>Leuckartia flavicornis</i>	19.4	36.12	28°—45° N.	E.W.	M.P.
<i>Lubbockia squillimana</i>	19.4	36.85	12° S.—29° N.	E.C.	M.P.
<i>Sapphirina sinuicauda</i>	19.6	35.40	28° N.	E.	P.

The following list comprises species, which belong to the coast-regions of the tropical or temperate Atlantic, or may be classified as tropical or southern neritic species.

	Mean temperature.	Mean salinity.	Northern and southern limit.	Distribution in the Atlantic.	Distribution outside the Atlantic.
<i>Acartia bifilosa</i>	1.8—26.2	4—30.34	6° S.—63° N.	E.	B.
<i>A. tonsa</i>	26.6	31.82	7° N.	W.	P.
<i>Eutерpe acutifrons</i>	19.4	20.29—36.52	40° S.—51° N.	E.W.	M.
<i>Monops brevis</i>	22.0	33.81	24° S.	W.	I.
<i>Oithona brevicornis</i>	26.2	20.29	6° S.	E.	P.
<i>Sapphirina nigromaculata</i>	23.9	33.52	6° S.—49° N.	E.W.	M.P.
<i>Temora stylifera</i>	22.6	34.93	37° S.—42° N.	E.W.	M.
<i>T. turbinata</i>	21.0	20.29	6° S.—18° N.	E.	P.

Of these *Acartia biflosa* is remarkable as occurring in the mouth of the Congo as well as in the Baltic. I have very carefully examined the African specimens, but could not find any difference between them and the Baltic ones. Also *Euterpe acutifrons*, which is found from the English Channel along the continental coast into the Skagerak, is remarkable for its wide distribution.
