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Benthic studies of the southern Bight of the North Sea.XI. The meiofauna in the Belgian coastal waters in the period 1980-1981.

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Abstract

Density, biomass and diversity of the meiobenthic community have been studied in six stations off the Belgian coast in 1980 - 1981.

Three of them located east of Ostend, show a poor meiofauna composition. In the more sandy sediments West of Ostend a richer fauna occurs.

The mean total density of 1.2 10^6.m-2 and an average nematode biomass of 0.17 g C.m-2 are of the same order of magnitude as in previous studies in that area (HERMAN et al. 1984,1985).

Of the 13 meiofaunal taxa found the majority occurs in the western zone. Detailed analysis of the harpacticoid community demonstrates a net differentiation of the western area from the eastern part of the coastal zone, and again illustrates that this Belgian coastal area is impoverished compared to off shore sediments.

Introduction

Meiobenthos of the Belgian coastal zone was sampled seasonally from june 1977 onwards. In a first study, 18 stations were investigated over the period 1977-79 (HERMAN et al., 1985). These stations were classified into three groups, according to sediment type.

A second study in six selected coastal stations over the period 1982-83 (HERMAN et al., 1984) demonstrated that density and diversity of meiobenthic communities were much than in 1977-79.

Whether this was simple coincidence or due to long term fluctuations of certain parameters could partly be explained by investigating the 1980-81 samples. Analysis of this material provided for a continuous series of data over more than seven years.

In this study a quantitative and qualitative analysis of the meiofauna is done for two sand , two muddy sand and two mud stations. A detailed analysis of the harpacticoid fauna of the Belgian coastal zone is given.

Materials and methods.

Six coastal stations were sampled in March, May and September 1980 an in March, July and October 1981. Their localisation is show in fig. 1.

Due to logistic reasons and bad weather conditions samples were collected by subsampling a 0,1 m2 Van Veen grab, except in May 1980 and in October 1981 when samples were obtained by subsampling a 170 cm2 Reineck box corer.

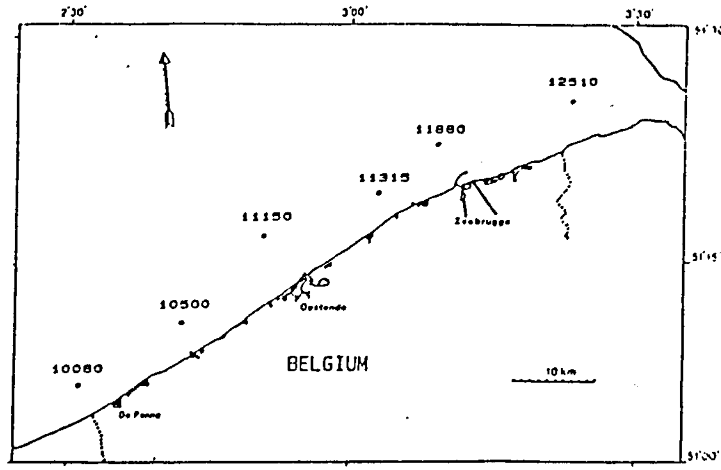

Fig. 1. Localisation of the six coastal stations.

All meiofauna sampling was done using 10.2 cm^2 plastic cores. Samples were fixed with warm formalin (70 °C) to a final concentration of 4%. A supplementary core was used for sediment analysis. The methods for elutriation of the fauna, biomass and sediment analysis are described in HEIP et al., (1979). For the harpacticoid copepod community species diversity was estimated using Brillouin's formula and evennnes was calculated using the Heip-, the Pielou- and the Alatalo-index. Furthermore two multidimensional statistic analyses were applied to the Harpacticoid community : Correspondence analysis was executed following Lefebvre (1976) and cluster analysis methods as described in Legendre and Legendre (1977).

Results and discussion.

Sediment analysis

Sediment composition of the six stations is listed in table 1. The mean median grain size of the sand fraction for the coastal zone is 0.198 mm. The sediment composition is rather stable for all stations in the 1980-81 period. The mud content is the most variable component. The only very exceptional value was noted for the pure sand station 10080 where in September 1980 an aberrant value of 22.4 % mud was found, probably due to a navigation error.

Table 1. Coordinates of the six coastal stations and sediment characteristics over the 1982-83 period, (Mean grain size of the sand fraction, mean % mud and sand).

Station	Lat. N	Long. E	Grain size Md mm	% Mud <63 µm	% Sand
10080	51°17'00"	02°31'00"	0.205	3.2	93.4
11150	51°16'32"	02°51'08"	0.332	1.4	96.2
10500	51°11'06"	02°42'04"	0.189	5.7	93.6
12510	51°26'58"	03°21'45"	0.185	7.1	92.8
11315	51°19'30"	03°03'00"	0.179	44.7	55.3
11880	51°22'00"	03°09'15"	0.103	81.0	18.7

Taxonomic group diversity

The meiofauna of the six coastal stations belongs to thirteen taxonomic groups (tab. 2). The most important taxa are Nematoda, Harpacticoida, Turbellaria and Gastrotricha. Less important taxa are Archiannelida, Halacarida, Tardigrada, interstitial Polychaeta, Ostracoda, Hydrozoa, Oligochaeta, Rotifera and Nemertini.

The mean number of taxa is higher than in previous studies (HERMAN et al., 1984,1985). This is demonstrated in fig. 2 where the trend values of the mean number of taxa per sample is plotted for the six coastal stations for the 1977-1983 period. The mean values for the three study periods are :

	Coastal zone	West of Ostend	East of Ostend
1977-79	3.8	4.7	2.6
1980-81	6.7	8.9	4.5
1982-83	4.4	5.8	3.0

Table 2. Composition of the meiofauna : density (N.10cm^{-2}), mean and dominance per taxon for all sampling data for the three sediment groups.

SAND STATIONS

	10080	10080	10080	10080	10080	10080	11150	11150	11150	11150	11150	11150		
Taxon	3.80	5.80	9.80	3.81	7.81	10.81	3.80	5.80	9.80	3.81	7.81	10.81	Gem	%D
Nematoda	188.5	513.0	8745.0	345.5	1010.0	3251.5	35.5	434.5	826.5	364.5	1383.5	244.0	1445.2	88.37
Harpacticoida	9.5	4.5	19.0	2.0	33.0	46.5	5.5	174.5	254.5	96.0	441.5	74.0	96.7	5.91
Turbellaria	10.5	13.5	13.0	20.0	10.0	27.0	10.5	23.5	33.0	18.5	55.5	19.0	21.2	1.29
Archiannelida	0.5	1.0	-	1.5	11.0	1.5	5.5	2.0	15.0	6.5	11.0	12.0	5.8	0.35
Gastrotricha	2.5	7.5	1.0	0.5	18.0	3.0	21.5	40.5	63.5	32.0	128.5	32.0	29.2	1.79
Ostracoda	0.5	1.0	-	-	1.0	-	-	5.5	42.0	-	89.0	3.5	11.9	0.73
Tardigrada	-	1.0	-	2.5	10.0	-	-	7.0	11.0	1.5	10.0	0.5	3.6	0.22
Hydrozoa	-	-	-	-	-	0.5	1.5	13.0	38.0	3.0	15.0	9.0	6.7	0.41
Halacarida	0.5	1.5	2.0	0.5	-	1.0	4.0	16.5	23.0	6.5	17.0	18.5	7.6	0.46
Oligochaeta	-	1.0	-	-	-	2.0	-	1.5	0.5	-	1.0	0.5	0.5	0.03
Nemertini	-	-	-	-	-	-	-	-	0.5	-	-	0.5	0.1	0.01
Polychaeta-meio	-	-	-	-	10.0	16.0	2.0	1.0	18.5	1.5	4.0	17.0	5.8	0.36
Rotatoria	1.5	1.5	-	1.0	-	-	-	8.0	-	-	0.5	-	1.0	0.06
Aantal individuen :	214	546	8780	374	1103	3349	86	728	1326	530	2159	431	1635	
Aantal taxa :	8	10	5	8	8	9	8	12	12	9	12	12	13	

MUDDY SAND STATIONS

	10500	10500	10500	10500	10500	12510	12510	12510	12510	12510		
Taxon	3.80	5.80	3.81	7.81	10.81	5.80	9.80	3.81	7.81	10.81	Gem	%D
Nematoda	832.5	2170.0	489.5	697.0	952.0	422.5	5719.0	447.5	696.0	1737.0	1416.3	90.56
Harpacticoida	15.5	12.5	13.0	19.0	4.5	1.0	3.0	3.0	9.5	2.0	8.3	0.53
Turbellaria	34.0	37.0	59.0	31.5	9.0	14.5	50.0	8.0	23.5	11.0	27.8	1.77
Archiannelida	0.5	-	0.5	-	-	-	4.0	-	-	-	0.5	0.03
Gastrotricha	29.0	15.0	51.0	60.5	21.0	1.5	21.0	4.0	8.5	8.0	22.0	1.40
Ostracoda	1.0	-	-	-	-	-	-	-	-	-	0.1	0.01
Tardigrada	2.5	2.5	87.0	8.5	0.5	7.0	-	-	19.5	-	12.8	0.82
Hydrozoa	1.0	-	-	-	-	-	-	-	-	-	0.1	0.01
Halacarida	0.5	0.5	-	0.5	1.0	-	3.0	0.5	1.0	2.0	0.9	0.06
Oligochaeta	-	0.5	-	3.0	-	-	2.0	-	-	1.0	0.7	0.04
Nemertini	-	-	-	-	-	1.0	-	-	-	-	0.1	0.01
Polychaeta-meio	4.5	1.5	3.5	0.5	-	0.5	28.0	-	2.0	0.5	4.1	0.26
Rotatoria	0.5	-	-	-	-	-	-	-	-	0.5	0.1	0.01
Aantal individuen :	922	2940	704	821	988	448	5830	473	760	1762	1564	
Aantal taxa :	11	8	7	8	6	7	8	5	7	8	13	

MUD STATIONS

	11315	11315	11315	11315	11315	11880	11880	11880	11880	11880	11880		
Taxon	5.80	9.80	3.81	7.81	10.81	3.80	5.80	9.80	3.81	7.81	10.81	Gem	%D
Nematoda	225.0	626.0	1272.0	434.5	310.5	19.5	473.5	18.5	247.5	603.0	62.5	390.2	88.88
Harpacticoida	-	1.0	0.5	468.0	0.5	7.0	2.5	0.5	-	5.0	-	44.1	10.04
Turbellaria	-	15.0	10.5	6.5	2.5	1.5	3.5	0.5	1.0	3.0	0.5	4.0	0.92
Gastrotricha	-	-	0.5	-	-	-	-	-	-	-	-	0.0	0.01
Halacarida	-	-	-	3.5	-	-	0.5	0.5	-	1.5	-	0.5	0.12
Polychaeta-meio	-	-	-	0.5	-	-	-	-	-	-	-	0.0	0.01
Rotatoria	-	-	-	-	0.5	-	-	-	-	-	-	0.0	0.01
Aantal individuen :	225	642	1284	913	314	28	480	20	249	613	63	439	
Aantal taxa :	1	3	4	5	4	3	4	4	2	4	2	7	

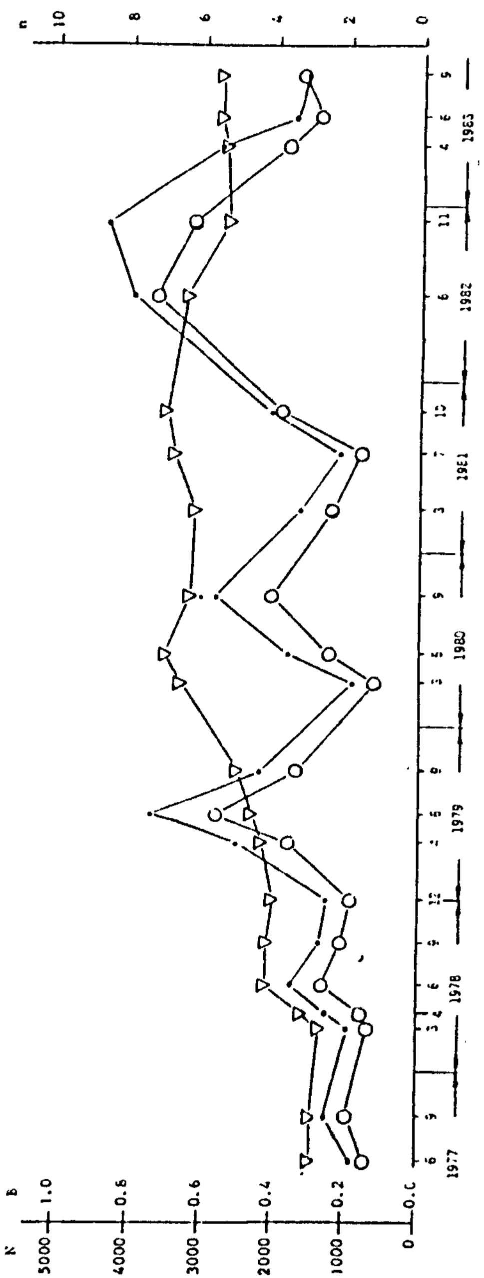

Fig. 2. Long term fluctuation of the number of taxa n (▽—▽), total meiofauna density (N.10 cm^{-2}) (o——o) and biomass B of the Nematoda (in mg dwt.10 cm^{-2}) (.——.) in the Belgian coastal zone for the period 1977 - 1983.

Again this study demonstrates that the zone east of Ostend is markedly poorer than the Western part of the coastal zone: the number of taxa is half that found in the more sandy area west of Ostend.

Density.

The overall mean meiofauna density for the 80-81 period is 1.2 10^6 ind.m-2. The mean number per taxon for the three station groups for each sampling date is listed in table 2. The mean density both for the sand and muddy sand stations is 1.6 10^6 ind. m-2. In the mud stations a rather low mean density of 0.44 10^6 ind. m-2 was found. Maximum values are 8.8 10^6 ind. m-2 (10080, Sept. '80) and 5.8 10^6 ind. m-2 (12510, Sept. '80). Minimum densities are noted in the pure mud station 11880 : 0.02 10^6 ind. m-2 ..(Sept.'80) and 0.03 10^6 ind. m-2 (March '80).

The most dominant taxon are the Nematoda, with resp. 88.4 % dominance in the sand stations, 95.1 % in the muddy sand and 98.5 % in the mud stations.

From the other meiofaunal taxa, only harpacticoid copepods, turbellarians and gastrotrichs may be of some importance. An exceptionally high harpacticoid density was recorded at the mud station 11315 in July '81 (0.47 10^6 ind. m-2 or 52 %). In the muddy sand and mud stations the second dominant taxon are the Turbellaria. Although extraction of preserved samples yields the best results for the majority of turbellarians (MARTENS, 1984), densities are to be considered as minimal estimates.

Except for Gastrotricha the importance of other meiofaunal taxa is generally negligible (less than 0.5 %).

Biomass.

Because nematodes generally are superdominant within the meiofauna, biomass fluctuations are very well correlated with density changes in this taxon (fig. 2). The average individual biomass, estimated for the May '80 and the October '81 samples, is 0.38 µg dwt. ind-1. The mean individual biomass for the sand, sandy mud and mud stations is resp. 0.54 µg dwt, 0.51 µg dwt and 0.19 µg dwt per nematode.

Due to the rather low nematode density found, especially in the mud stations, the total mean biomass is slightly lower than in other years (see fig. 2). This figure clearly shows the yearly periodicity both for density and biomass over the 1977 - 1983 period, with an absolute minimum for the March 1980 samples.

Harpacticoida of the coastal area.

The mean density of the harpacticoid copepods for all sampling data per sediment type is given in tables 3,4 and 5. The mean density in sandy sediments is 97 ind. 10 cm2, which is comparable to other studies in similar sediments, such as SCHEIBEL (1973,1976), ANKAR & ELMGREN (1978), ELMGREN et al. (1984) and COULL (1985), in which density ranges between 84 and 118 ind. per 10 cm2.

In the muddy sand and mainly in the mud samples density drops to very low numbers. The mean density is resp. 8 and 2 individuals per cm2. In most studies, such as BODIN (1984), AFLT (1975,1977), ANKAR & ELMGREN (1978) and MOORE (1979), the mean values are generally much higher (range : 11 - 175 ind. 10 cm2).

In this study 55 species belonging to 14 families were found. They are listed in table 6; twenty species occur only once. The most frequent species are *Paraleptastacus espinulatus* (f= 16), *Microarthridion littorale* (f= 11), *Halectinosoma sarsi and Leptastacus laticaudatus* which are found at 10 of the 33 sampling dates.

The families Cylindropsyllidae, Paramesochridae, Ectinosomatidae, Ameiridae and Diosaccidae are qualitatively best represented by resp. 9,9,3,7 and 6 species. Quantitatively, the most important families are Tachidiidae (29 %), Ectinosomatidae (20,9 %), Cylindropsyllidae (20,6 %), Ameiridae (8,7 %) and Paramesochridae (8,3 %).

In sandy sediments, 43 species belonging to 11 families are found, while in muddy sand only 25 species occur. In mud stations the 11 species found belong to 7 families, of which 7 typically phytal forms occur only once.

Other community parameters, such as diversity and evenness, reflect the impoverishment of the harpacticoid fauna found in most of the mud and muddy sand stations. A mean number of 4 species per sample is found for the total coastal area (7 spp. West, 1 sp. East of Ostend). this results in a low diversity both for the Shannon-Wiener index H' and for the Brillouin index H :

	West	East
H'	1.97 bits/ind	0.36 bits/ind
H	1.56 bits/ind	0.34 bits/ind

Maximal diversity values are found in the sand station 11150 with H = 2.52. The minimum is H = 0 in both mud stations 11080 and 11315 where often only one or no harpacticoid copepod occurs. The mean H = 0.88 which is slightly lower than the mean 82-83 value of H = 0.96. The rather low mean Simpson's index SI = 0.27 means that in most samples often more than one species is dominant.

Table 3. Species composition and dominance of the Harpacticoida in the sand stations 10080 and 11150 per sampling date.

KUSTSTATIONS Harpacticoida 1980-1981

	10080	10080	10080	10080	10080	10080	11150	11150	11150	11150	11150	11150		
Species	3.80	5.80	9.80	3.81	7.81	10.81	3.80	5.80	9.80	3.81	7.81	10.81	n	%
Metacyclopina brevisetosa	-	-	-	-	-	-	-	-	0.5	-	-	-	0.0	0.04
Ichnopedia minor	-	-	-	-	1.0	0.5	-	-	-	-	-	-	0.1	0.13
Canuella perplexa	0.5	0.5	-	-	-	5.5	-	-	0.5	0.5	-	-	0.6	0.65
Pteronetella germ. germanica	-	-	-	-	-	-	-	4.0	1.5	-	11.5	7.5	2.0	2.11
Halectinosoma gothiceps	-	-	-	-	-	0.5	-	-	-	-	-	-	0.0	0.04
Halectinosoma herdmani	-	0.5	4.0	0.5	8.0	-	-	-	0.5	-	-	-	1.1	1.16
Halectinosoma propinquum	-	0.5	-	-	6.0	-	-	-	-	-	-	-	0.5	0.56
Halectinosoma sarsi	0.5	-	2.0	-	1.0	2.0	-	-	1.0	-	2.0	-	0.7	0.73
Hastigerella leptoderma	-	-	-	-	-	-	-	-	1.0	1.0	-	-	0.2	0.17
Pseudobradya beduina	-	0.5	10.0	-	-	1.5	-	-	2.0	-	0.5	-	1.2	1.25
Microarthridion littorale	-	-	-	-	11.0	-	0.5	-	-	-	0.5	-	1.0	1.03
Tisbe furcata	-	-	-	-	-	0.5	-	-	-	-	-	-	0.0	0.04
Dactylopodia vulgaris	-	-	-	-	1.0	-	-	-	-	-	-	-	0.1	0.09
Ammoniascoides debilis	-	-	-	-	1.0	-	0.5	-	-	-	-	-	0.1	0.13
Ameiascus varians	-	-	-	-	-	-	-	-	-	-	-	0.5	0.0	0.04
Pararchiesocopsis longirostris	-	-	-	-	-	-	-	-	0.5	-	-	-	0.0	0.04
Psammotopa phyllosetosa	-	-	-	-	-	-	-	3.0	20.5	-	9.5	6.5	3.3	3.40
Ameira brevipes	-	-	-	-	-	-	-	-	-	-	5.0	6.5	1.0	0.99
Ameira hyalina	-	-	-	-	-	-	-	-	33.0	0.5	-	5.0	3.2	3.31
Ameira parvula	-	-	2.0	-	1.0	29.5	-	-	-	-	-	-	2.7	2.80
Interleptomesochra eulitoralis	-	-	-	-	-	-	-	0.5	2.0	0.5	0.5	-	0.3	0.30
Sicameira leptoderma	-	-	-	-	-	-	-	1.5	-	-	-	-	0.1	0.13
Ameiridae sp.	-	0.5	-	-	-	-	-	-	-	-	-	-	0.0	0.04
Apodopsyllus sp.A	0.5	-	-	-	-	0.5	-	1.5	-	-	-	-	0.2	0.22
Diarthrodella secunda s.s.	-	-	-	-	-	-	0.5	-	-	-	-	-	0.0	0.04
Kliopsyllus constrictus s.s.	-	-	-	-	-	-	-	-	-	5.5	-	-	0.5	0.47
Kliopsyllus holsaticus s.s.	-	-	-	-	-	-	2.5	82.0	53.5	8.5	128.5	16.5	24.3	25.09
Kliopsyllus paraholsaticus	0.5	-	-	-	-	-	-	-	5.5	0.5	4.0	0.5	0.9	0.95
Leptopsyllus sp.A	-	-	-	-	-	2.0	-	-	-	-	-	-	0.2	0.17
Paramesochra sp.(Mielke)	-	-	-	-	-	-	-	7.0	1.5	2.5	1.0	-	1.0	1.03
Scottopsyllus Scottops. minor	-	-	-	-	-	-	-	0.5	-	1.5	-	-	0.2	0.17
Scottopsyllus Scottops. sp.C	-	-	-	-	-	-	-	2.5	-	-	-	-	0.2	0.22
Arenocaris bifida	-	-	-	-	-	0.5	-	-	-	-	-	-	0.0	0.04
Arenopontia sp.A	1.5	-	-	-	-	1.0	-	-	-	-	-	0.5	0.3	0.26
Cylindropsyllus remanei	-	-	-	-	-	-	-	0.5	-	-	-	-	0.0	0.04
Evansula pygmaea	-	-	-	0.5	-	-	-	17.0	4.5	2.5	51.0	6.5	6.4	7.06
Leptastacus laticaudatus intermedius	1.5	-	-	-	1.0	-	0.5	19.5	123.0	59.0	152.5	19.5	31.4	32.40
Leptopontia curvicauda	-	-	-	-	-	-	-	1.5	1.0	-	1.0	1.5	0.4	0.43
Paraleptastacus espinulatus	4.5	2.0	-	1.0	2.0	2.5	1.0	28.5	2.5	13.0	73.5	3.0	11.1	11.49
Paraleptastacus holsaticus	-	-	-	-	-	-	-	4.5	-	-	0.5	-	0.4	0.41
Paraleptastacus spinicauda	-	-	-	-	-	-	-	0.5	-	1.5	-	-	0.2	0.17
Enhydrosoma propinquum	-	-	1.0	-	-	-	-	-	-	-	-	-	0.1	0.09
Cletodidae sp.A	-	-	-	-	-	-	-	0.5	-	-	-	-	0.0	0.04
Aantal individuen :	10	5	19	2	33	47	6	175	255	97	442	74	97	
Aantal species :	7	6	5	3	10	12	6	17	18	13	15	12	43	

Table 4. Species composition and dominance of the Harpacticoida in the muddy sand stations 10500 and 12510 per sampling date.

ZAND-SLIB STATIONS Harpacticoida 1980-81

Species	10500 3.80	10500 5.80	10500 3.81	10500 7.81	10500 10.81	12510 5.80	12510 9.80	12510 3.81	12510 7.81	12510 10.81	n	%D
Canuella perplexa	3.0	-	0.5	1.0	0.5	-	-	-	-	-	0.5	6.02
Arenosetella germ. germanica	-	-	-	-	-	-	-	-	0.5	-	0.1	0.60
Halectinosoma gothiceps	1.0	-	-	-	-	-	-	-	-	-	0.1	1.20
Halectinosoma herdmani	1.5	-	0.5	2.5	-	-	-	0.5	-	-	0.5	6.02
Halectinosoma propinquum	-	-	-	-	-	-	3.0	-	2.0	-	0.5	6.02
Halectinosoma sarsi	3.0	-	1.5	1.5	-	0.5	-	-	-	-	0.7	7.83
Pseudobradya beduina	-	-	-	1.0	1.0	-	-	-	3.5	1.0	0.7	7.83
Pseudobradya minor	-	-	-	-	-	-	-	-	-	0.5	0.1	0.60
Euterpina acutifrons	-	-	-	-	-	-	-	-	-	0.5	0.1	0.60
Microarthridion littorale	-	2.5	-	12.5	-	-	-	-	3.5	-	1.9	22.29
Harpacticus littoralis	-	-	-	-	-	-	-	0.5	-	-	0.1	0.60
Dactylopodia tisboides	-	0.5	-	-	0.5	-	-	-	-	-	0.1	1.20
Dactylopodia vulgaris	-	-	1.0	-	-	-	-	-	-	-	0.1	1.20
Amphiascoides debilis	-	-	1.0	-	0.5	-	-	-	-	-	0.2	1.81
Amphiascus varians	1.0	-	1.0	-	-	-	-	1.5	-	-	0.4	4.22
Bulbamphiascus imus	-	-	3.5	-	0.5	-	-	-	-	-	0.4	4.82
Ameira hyalina	-	3.5	-	-	-	-	-	-	-	-	0.4	4.22
Ameira parvula	3.5	1.0	0.5	-	0.5	-	-	0.5	-	-	0.6	7.23
Proameira sp.A	0.5	3.0	-	-	0.5	-	-	-	-	-	0.4	4.82
Apodopsyllus sp.A	0.5	0.5	0.5	0.5	0.5	-	-	-	-	-	0.3	3.01
Scottopsyllus Scottops. minor	-	0.5	-	-	-	-	-	-	-	-	0.1	0.60
Mesochra pygmaea	-	-	0.5	-	-	-	-	-	-	-	0.1	0.60
Leptastacus laticaudatus intermedius	1.0	1.0	-	-	-	-	-	-	-	-	0.2	2.41
Paraleptastacus espinulatus	0.5	0.5	1.0	-	-	0.5	-	-	-	-	0.3	3.01
Esola bulligera	-	-	1.0	-	-	-	-	-	-	-	0.1	1.20
Aantal individuen :	16	13	13	19	5	1	3	3	10	2	8	
Aantal species :	10	9	12	6	8	2	1	4	4	3	25	

Table 5. Species composition and dominance of the Harpacticoida in the mud stations 11315 and 11880 per sampling date.

SLIBSTATIONS Harpacticoida 1980-1981

Species	11315 9.80	11315 3.81	11315 7.81	11315 10.81	11880 3.80	11880 5.80	11880 9.80	11880 7.81	n	%D
Euterpina acutifrons	1.0	-	-	0.5	-	-	-	-	0.2	0.31
Microarthridion littorale	-	0.5	468.0	-	-	2.0	0.5	5.0	59.5	98.14
Dactylopodia tisboides	-	-	-	-	2.0	-	-	-	0.3	0.41
Diarthrodes pygmaeus	-	-	-	-	1.0	-	-	-	0.1	0.21
Amphiascoides debilis	-	-	-	-	0.5	-	-	-	0.1	0.10
Stenhelia (D.) norm. normani	-	-	-	-	0.5	-	-	-	0.1	0.10
Ameira parvula	-	-	-	-	1.0	-	-	-	0.1	0.21
Mesochra pygmaea	-	-	-	-	0.5	-	-	-	0.1	0.10
Paraleptastacus espinulatus	-	-	-	-	-	0.5	-	-	0.1	0.10
Laophonte cornuta	-	-	-	-	1.0	-	-	-	0.1	0.21
Paralaophonte congenera congenera	-	-	-	-	0.5	-	-	-	0.1	0.10
Aantal individuen :	1	1	468	1	7	3	1	5	61	
Aantal species :	1	1	1	1	8	2	1	1	11	

Table 6. Dominance and frequency (sampling data) of the Harpacticoida per species in the Belgian coastal waters for the 1980-81 period (with abbreviations used in fig. 5 for the more frequent species).

Species	Abr.	f	% D	Species	f	% D
Canuella perplexa	Cpe	9	2.29	[illegible] brevisetosa	1	0.01
Arenosetella germ. germanica	Age	5	0.70	[illegible] minor	2	0.14
Halectinosoma herdmani	Hhe	9	4.17	Halectinosoma gothiceps	2	0.25
H. propinquum	Hpr	4	5.01	Hastigerella leptoderma	2	0.05
H. sarsi	Hsa	10	3.77	Pseudobradya minor	1	0.33
Pseudobradya beduina	Pbe	9	6.07	Harpacticus littoralis	1	0.55
Euterpina acutifrons	Eac	3	7.50	Tisbe furcata	1	0.04
Microarthridion littorale	Mli	11	21.48	Dactylopodia vulgaris	2	0.37
Dactylopodia tisboides	Dti	3	1.45	Diarthrodes pygmaeus	1	0.48
Amphiascoides debilis	Ade	5	1.28	Bulbamphiascus imus	2	1.30
Amphiascus varians	Ava	4	2.17	Paramphiascopsis longirostris	1	0.01
Psammotopa phyllosetosa	Pph	4	0.69	Stenhelia (D.) norm. normani	1	0.24
Ameira hyalina	Ahy	4	1.57	Ameira brevipes	2	0.33
A. parvula	Apa	9	5.11	Sicameira leptoderma	1	0.03
Interleptomesochra eulitoralis	Ieu	4	0.06	Ameiridae sp.	1	0.37
Proameira sp. A	Pro	3	1.25	Diarthrodella secunda s.s.	1	0.30
Apodopsyllus sp. A	Apo	8	1.07	Kliopsyllus constrictus s.s.	1	0.19
Kliopsyllus holsaticus s.s.	Kho	6	5.78	Leptopsyllus sp. A	1	0.14
K. paraholsaticus	Kpa	5	0.32	Scottopsyllus Scottopsyllus sp. C	1	0.19
Paramesochra mielki	PaM	4	0.25	Mesochra pygmaea	2	0.87
Scottopsyllus Scottop. minor	SSm	3	0.19	Arenocaris bifida	1	0.04
Arenopontia sp. A	Are	3	0.62	Cylindropsyllus remanei	1	0.01
Evansula pygmaea	Epy	6	1.98	Paraleptastacus holsaticus	2	0.09
Leptastacus laticaudatus	Lli	10	7.44	P. spinicauda	2	0.06
Leptopontia curvicauda	Lcu	4	0.12	Enhydrosoma propinquum	1	0.18
Paraleptastacus espinulatus	Pes	16	10.26	Cletodidae sp. A	1	0.01
				Esola bulligera	1	0.27
				Laophonte cornuta	1	0.48
				Paralaophonte congenera congenera	1	0.24

The fluctuations of the Pielou-, Heip- and Alatalo evenness indices follow an identical pattern, with the Pielou-index J always higher (fig. 3).

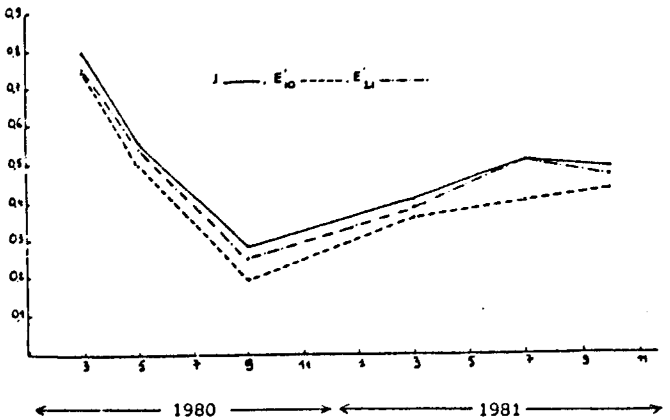

Fig. 3. Evolution of three evennes indexes for all stations over the 1980-81 period : Pielou index J, Heip index E'_{10} and Alatalo index E'_{21}.

The highest values are noted in spring 1980, then evenness drops due to the appearance of mesopsammic species to reach minimum values in Sept.'80, when *Leptastacus laticaudatus and Kliopsyllus holsaticus* become very dominant. In 1981 the equitability of the individuals among the species becomes better.

That the composition of the harpacticoid communities is well correlatred with the sediment type is demonstrated in the cluster diagrams (fig. 4). Cluster analysis is done with two similarity indices : the Sorensen-index - a binary index - on presence or absence of species between the stations and the Bray-Curtis-index which takes the relative densities into account. This was done once for all the 55 species and once for 26 species after elimination of all species with a frequency lower than 3.

The clustering of the stations over the 55 species is identical to that over 26 species for both indices, with an evidently higher degree of similarity for the 26 species.

With the Sorensen similarity index one can see a net separation of the sand stations from the other ones, although this is better illustrated by the Bray-Curtis plots. These graphs shows a net separation of the sand station 11150 both for the 26 and for the 55 species cluster. Also one can see that most samples of the other two stations west of Ostend (10500 and 10080) are grouped.

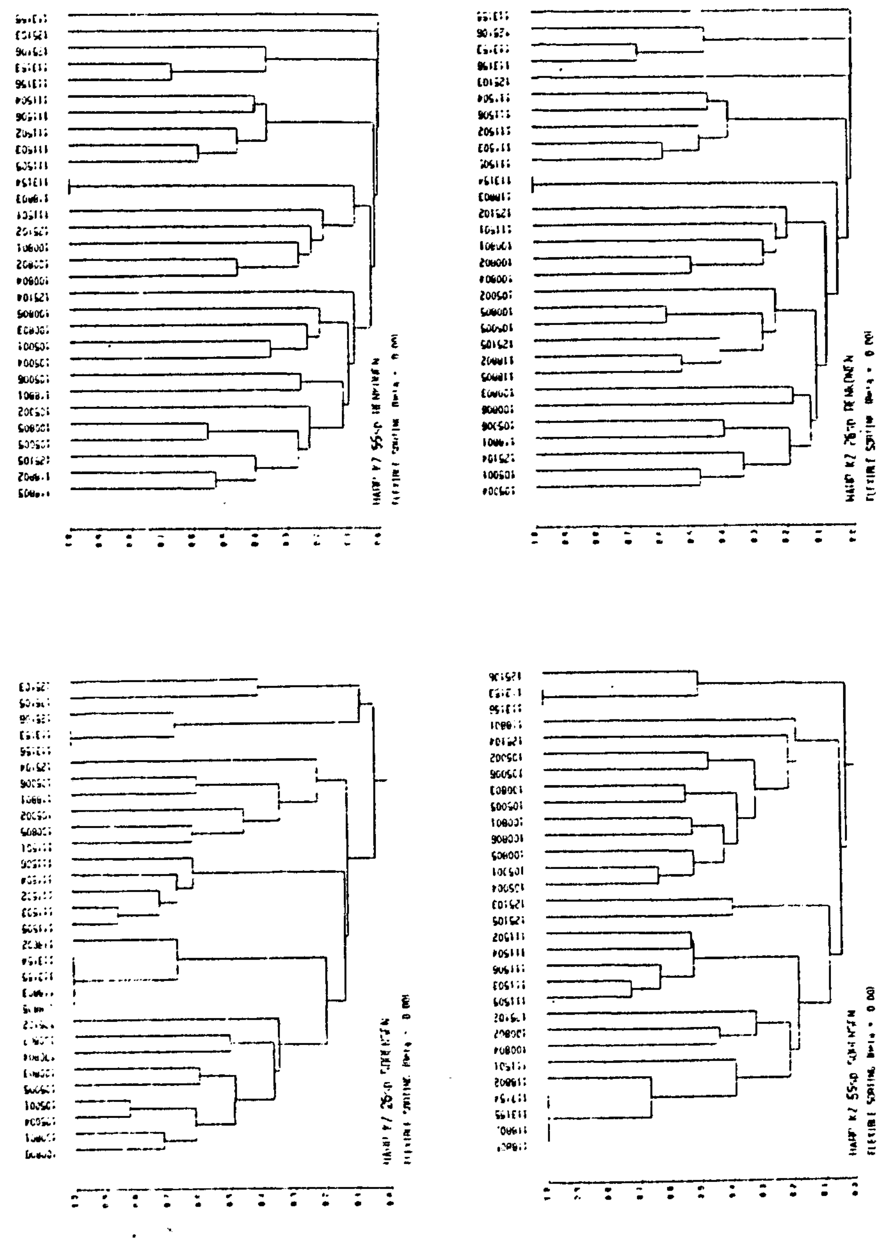

Fig. 4. Cluster diagrams over 55 and 26 harpacticoid species (see text).

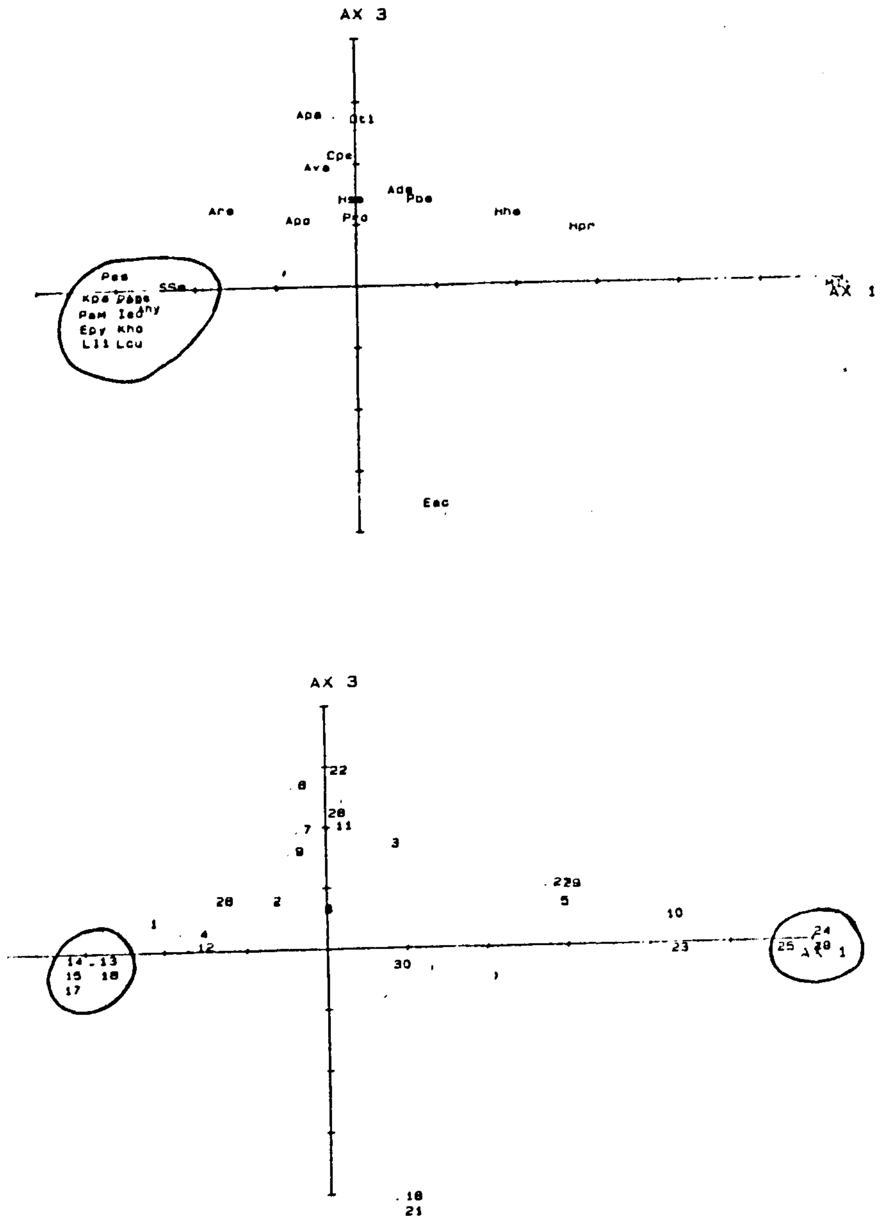

Fig. 5. Correspondence analysis over 26 harpacticoid species (top) and stations (bottom) in six stations off the Belgian coast for the '80-81 data.(For station numbers see table 2).

Because there was no marked difference between cluster analyses over the 55 and 26 species, correspondence analysis or reciprocal averaging was done for the smallest species group on the 80-81 data (fig. 5).

The abbreviations for the species used in this graph are listed in table 6. Two principal axes are plotted both for species and for stations. It is rather difficult to explain what all axes mean in ecological terms and allocate them to one of the numerous parameters acting within an ecosystem. In this study one can give a reasonable explanation for the two axes in the analysis of this harpacticoid communities.

Ax 1 is strongly correlated with sediment. In the top graph (fig. 5) one can distinguish on the left a group of representatives of the pure sand fauna. On the right of the graph the mud-dweller *Microarthridion littorale* (Mli) is netly separated from an intermediate group scattered around the Ax 3 which corresponds with the diverse muddy sand community. The same remarks can be made for the stations (bottom graph). Most samples of the sand station 11150 are concentrated in the left of this graph, while on the extreme right we find the mud samples with only *M. littorale* ; the bulk of the stations form a very heterogeneous intermediate group.

The parameter 'time' seems not to be of direct importance because the stations remain in the same group for sediment type and species composition.

CONCLUDING REMARKS

Considering the evolution of the total meiofauna from 1977 till 1983 one sees that peak values for all parameters studied are noted in summer '82. In the first study period (1977-79) there was an increasing trend both for meiobenthic diversity and for density and biomass. Density and biomass decrease slightly in the 80-81 period and reach their maxima in '82.

The diversity of the harpacticoid fauna from 1980 onwards is considerably higher than in the previous years. However, compared to other similar environments (e.g. MOORE, 1979; WILLEMS et al.,1982; BODIN, 1984) density and diversity are always low.

This study demonstrates again that the meiofauna in the Belgian coastal zone is 'poorer' compared to other localities of the North Sea.

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