An attempt to determine trophic structure of the bottom fauna in coastal waters of the Gulf of Gdańsk *

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Trophic structure
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Abstract

The paper is an attempt to characterize trophic structure of the bottom fauna coastal waters of the Gulf of Gdańsk, based on the results of studies on the composition and distribution of the zoobenthos, carried out in 1977–1981. Five trophic groups were distinguished: herbivores, which are of no importance in the Gulf of Gdańsk, suspension-feeders, deposit-feeders, predators and facultative suspension-deposit-feeders. The latter group was distinguished in view of considerable disagreement as the character of *Macoma baltica* feeding behaviour.
The trophic structure appeared to be considerably differentiated depending on the region and the depth. Suspension-feeders predominated in the west part of the gulf, in shallow zone (to 20 m depth). The east, and deep areas of the whole gulf, were predominated by facultative suspension-deposit-feeders, mostly due to noticeable dominance of *Macoma baltica* in total biomass of the bottom fauna.

1. Introduction

Studies on the bottom fauna in the Gulf of Gdańsk have a long tradition (Demel, 1935; Żmudziński, 1967; Wenne and Wiktor, 1982; Herra and Wiktor, 1985). Species composition, biomass and distribution of the macrozoobenthos components constituted main subject of these studies.

Studies carried out in recent years (1977–1981) pointed to some changes in distribution of the bottom fauna in the Gulf of Gdańsk during the last 20 years, as also to some changes in percentages of particular components in total biomass of the fauna. These changes can be related both to increasing pollution of the Gulf of Gdańsk and accelerated eutrophication, the latter factor being of considerable importance (Wenne and Wiktor, 1982). Eutrophication process is usually connected with an increase and accumulation of organic matter in a water body (Rhoads, 1974; Pearson and Rosenberg, 1978). Increasing inflow of organic matter results in significant time and spacial changes in trophic structure of the zoobenthos. Hence,

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it seemed purposeful to look at the effects of eutrophication in the Gulf of Gdańsk also from this point of view. Cederwall and Elmgren (1980) undertook an attempt to determine trophic structure of the macrozoobenthos of the Baltic Sea, taking into account the eutrophication process. Their studies, however, dealt only with open water of the Baltic Sea and Swedish coast, so that no consideration was given to southern Baltic and coastal waters of this part.

2. Material and methods

An attempt to determine trophic structure of the bottom fauna was based on the results of studies on composition and distribution of the zoobenthos, carried out by a team of scientists and students from the Institute of Oceanography of the University of Gdańsk in 1977–1981 (Wenne, 1979; Wenne and Wiktor, 1982; Herra, 1982; Herra and Wiktor, 1985).

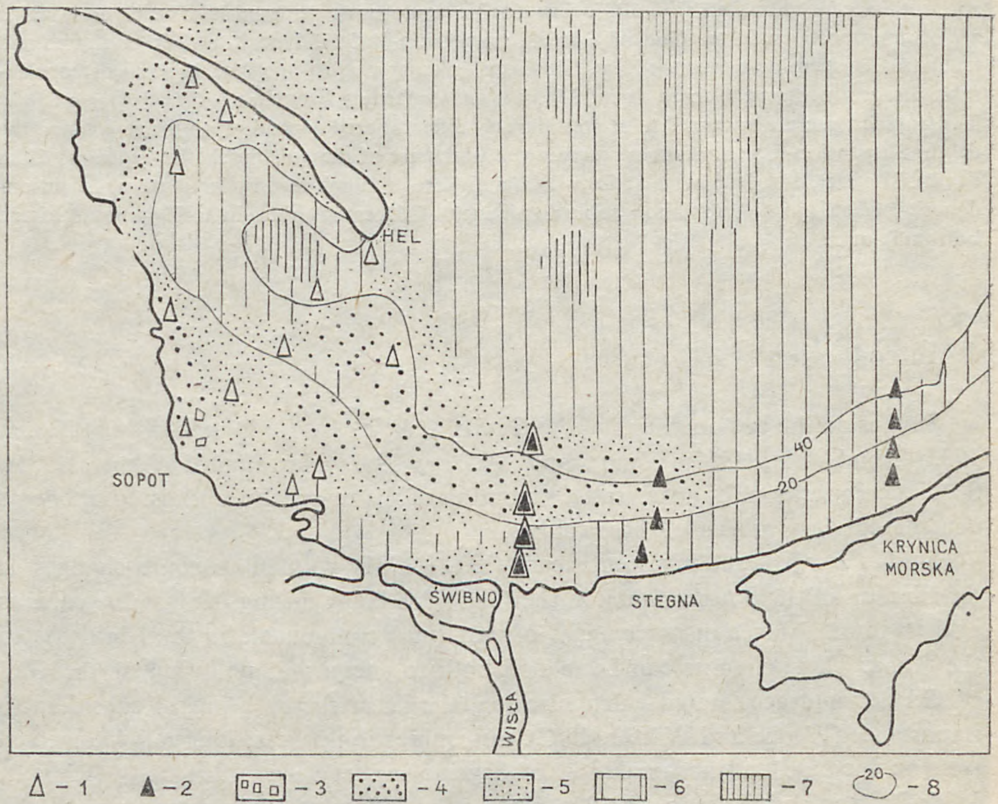

Fig. 1. Location of the bottom fauna sampling station in 1977–1981, on the background of the distribution of surface bottom sediments (according to Pieczka, 1974). 1 – location of sampling stations in 1977/78; 2 – location of sampling stations in 1981; 3 – stones, cobbles; 4 – gravel, sand; 5 – small grain sand; 6 – large grain aleurites (muds), large aleurite loams; 7 – small aleurite loams, pelite loams; 8 – isobaths in meters

Table 1. List of bottom fauna species found in coastal waters of the Gulf of Gdańsk in 1977–1981, and their classification to trophic groups

Trophic group	Species
Deposit feeders	*Nematoda*
	Priapulus caudatus Lamarck
	Nereis diversicolor (Müller)
	Pygospio elegans Claparede
	Manayunkia aestuaria Bourne
	Oligochaeta
	Asellus aquaticus (L.)
	Bathyporeia pilosa (Lindstr.)
	Pontoporeia femorata (Kröyer)
	Pontoporeria affinis (Lindstr.)
	Gammarus zaddachi Sexton
	Gammarus salinus Spooner
	Gammarus oceanicus Segerstrăle
	Corophium volutator (Pallas)
	Corophium multisetosum (Pallas)
	Diastylis rathkei (Kröyer)
	Chironomidae (larvas)
	Hydrobia ulvae Pennant
	Hydrobia ventrosa Montague
	Potamopyrgus jenkinsi Smith
	Zippora membranacea Adams
	Lymnea peregra Müller
	Theodoxus fluviatilis L.
Suspension-feeders	*Balanus improvisus* Darvin
	Cardium glaucum Brugiere
	Mytilus edulis (L.)
Predators	*Halicryptus spinulosus* (v. Sieb).
	Antinoella sarsi Malmgren
	Mesidothea entomon (L.)
	Crangon crangon L.
Herbivores	*Idothea* sp. sp.
Suspension-deposit-feeders	*Macoma baltica* (L.)
	Mya arenaria (L.)

Materials were collected in coastal waters, 3–5 to 35 m deep, with the Petersen sampler of catching area of 0.1 m^2. Location of the sampling stations is presented in Figure 1. In 1981 additional sample was collected once from deeper waters, at the depth of 55 m.

Considerable difficulties arose in classifying particular representatives of the macrozoobenthos into various trophic groups. For comparison, advantage was essentially taken of the system proposed by Cederwall and Elmgren (1980) for open waters of the Baltic Sea, with two main modifications:

(i) the mentioned authors classified *Nereis diversicolor* as a predator, while our observations showed that this species was rather a deposit-feeder or a polyphagous organism.

Table 2. Average biomass (in [g/m²]) of bottom fauna in coastal waters of the Gulf of Gdańsk, depending on region and depth.

Species	Western part (according to materials from 1977/78)					Eastern part (according to materials from 1981)			
	Depth [m]					Depth [m]			
	3–5	8–10	20	30–35	55	3–5	8–10	20	30–35
Fabricia sabella S	–	0.018	–	–	–	–	–	–	–
Balanus improvisus S	0.440	2.138	2.446	0.754	0.81	–	1.00	0.09	0.41
Cardium glaucum S	3.803	20.036	0.442	–	–	–	5.00	5.65	–
Mytilus edulis S	16.954	37.321	115.184	2.968	–	–	9.58	–	2.64
Priapulus caudatus D	–	–	–	–	–	0.13	–	0.26	0.32
Nereis diversicolor D	0.781	0.610	1.420	–	–	0.21	0.15	0.23	–
Pygospio elegans D	0.017	0.088	0.026	0.002	–	–	0.01	–	0.17
Manyunkia aestuarina D	–	0.001	–	–	–	–	–	–	–
Oligochaeta D	0.089	0.113	0.129	0.010	–	0.13	0.03	0.12	0.05
Cyathura carinata D	0.009	0.004	–	–	–	–	–	–	–
Asellus aquaticus D	–	0.004	0.005	–	–	–	–	–	–
Bathyporeia pilosa D	0.009	0.001	0.001	–	–	–	–	–	–
Pontoporeia femorata D	–	–	0.013	4.788	–	–	–	–	0.03
Pontoporeia affinis D	–	–	0.021	0.680	–	–	–	–	0.01
Gammarus zaddachi D	–	0.107	–	–	–	–	–	–	–
Gammarus salinus D	0.078	0.106	–	–	–	–	–	–	0.02
Gammarus oceanicus D	–	0.004	0.065	–	0.08	–	0.04	–	–
Corophium volutator D	0.002	0.018	0.163	–	–	–	0.13	0.12	0.11
Corophium multisetosum D	0.002	–	–	–	–	–	–	–	–
Diastylis rathkei D	–	0.018	0.212	0.005	–	–	–	0.09	0.03
Hydrobia ulvae D	1.745	7.347	1.128	0.010	–	–	0.09	1.30	0.04
Hydrobia ventrosa D	0.279	0.185	0.012	–	–	0.77	0.02	2.24	0.16
Potamopyrgus jenkinsi D	–	–	0.105	–	–	–	–	–	–
Macoma baltica FSD	7.380	8.644	49.691	59.836	227.50	0.09	3.46	88.11	112.80
Mya arenaria FSD	6.405	7.448	2.185	0.006	0.17	4.08	1.02	16.10	0.28

Halicryptus spinulosus P	–	–	0.195	3.172	–	–	–	0.31	0.30
Antinoella sarsi P	–	–	0.115	0.003	–	–	–	–	–
Mesidothea entomon P	–	–	1.166	15.052	12.49	–	–	–	5.28
Crangon crangon P	–	–	0.051	–	–	–	–	–	–
Idothea sp. sp. H	–	–	0.010	–	–	–	–	–	–
Lymnea peregra ?	–	0.026	–	–	–	–	–	–	–
Zippora membranacea ?	0.004	0.001	0.070	–	–	–	–	–	–
Other	–	–	–	0.061	–	–	–	–	–
Total	37.997	84.238	174.855	187.347	241.05	5.41	20.53	114.62	112.65

S – Suspension-feeders, D – Deposit-feeders, FSD – Facultative suspension-deposit-feeders, P – Predators, H – Hebivores.

(ii) *Macoma baltica* and *Mya arenaria* were initially defined as suspension-feeders by Cederwall and Elmgren, but later on the authors decided that *Macoma baltica* should be excluded from the group of suspension-feeders.

There is still no agreement as to the feeding behaviour of *Macoma baltica*. Many authors are of the opinion that *M. baltica* utilizes food deposited at the surface of bottom sediments, so that the species should be treated as a deposit-feeder (Bubnova 1972; Younge, 1949). Other authors (Reid R. G. B. and Reid A., 1969) classified it as a suspension-feeder. It seems probable that *M. baltica* can utilize both: food deposited at the bottom and suspended in water, depending on the environmental conditions (and possibly on abundance of the given food resource). Consequently, I have classified both *M. baltica* and *Mya arenaria* into a separate group of 'facultative suspension-deposit-feeders' (Table 1). Other traditional groups were used: herbivores, suspension-feeders, deposit-feeders and predators (carnivores).

Unequivocal characterization of trophic structure of the zoobenthos in coastal Baltic waters is very difficult. Special difficulties arise in the region of the Gulf of Gdańsk, which is characterized by considerable time and spatial variability of hydrologic conditions and high inflow of allochthonic organic matter from the Vistula River.

Species inhabiting such environments are characterized by considerable plasticity, *ie* they are able to consume food of various origin (for instance *Nereis* and probably *Macoma baltica*), as also to utilize substitutive food. Coastal waters of the Gulf of Gdańsk accumulate various forms of the detritus. This results in the fact that a large group of organisms uses permanently or periodically particular forms of dead organic matter as a food resource (for instance species from the genus *Gammarus*).

3. Results and discussion

Most bottom species inhabiting coastal waters of the Gulf of Gdańsk can be classified as the deposit-feeders (Table 1). Only 3 species were classified as the suspension-feeders, *viz Mytilus edulis* in the first place, and *Cardium glaucum* and *Balanus improvisus*. Predators were also represented by only a few species: *Halicryptus spinulosus*, *Antinöella sarsi*, *Mesidothea entomon* and *Crangon crangon*. It is, however, questionable, whether predation consitutes the main feeding behaviour of *Mesidothea entomon*.

Herbivores in the Gulf of Gdańsk were represented by two *Idothea* species, but apart from the Puck Lagoon (which was excluded from the analysis) these species were of no significance (Table 2).

Two species: *Macoma baltica* and *Mya arenaria* were classified as members of the group distinguished by myself: *viz* as the facultative suspension-deposit-feeders.

The group of deposit-feeders was most diversified and numerous as regards the species composition although its percentage in total biomass of the bottom fauna was small, varying in different regions from 1.9% in the deepest point (55 m) to

Table 3. Average biomass (in [g/m²]) of bottom fauna in coastal waters of the Gulf of Gdańsk – Vistula River estuary (depending on depth)

Species	According to data from 1977/78			According to data from 1981			
	Depth [m]			Depth [m]			
	3–5	8–10	20	3–5	8–10	20	30–35
Cardium glaucum S	–	–	0.325	–	–	–	–
Mytilus edulis S	–	–	–	–	–	–	0.09
Priapulus caudatus D	–	–	–	–	–	–	0.07
Nereis diversicolor D	0.013	2.270	6.706	–	0.26	20.11	0.16
Pygospio elegans D	0.001	0.016	0.074	–	–	–	0.86
Oligochaeta D	–	0.274	0.513	–	0.02	0.17	0.19
Bathyporeia pilosa D	0.003	–	–	–	0.03	–	–
Pontoporeia femorata D	–	–	–	–	–	–	0.13
Pontoporeia affinis D	–	–	0.011	–	–	–	0.15
Gammarus salinus D	–	–	0.021	–	–	–	–
Corophium volutator D	–	–	0.090	–	–	0.22	0.02
Diastylis rathkei D	–	–	0.013	–	–	–	–
Hydrobia ulvae D	0.006	0.052	2.821	0.30	0.13	1.06	–
Hydrobia ventrosa D	–	–	–	–	–	2.69	0.15
Macoma baltica FSD	0.830	17.275	215.653	3.03	4.74	128.30	127.12
Mya arenaria FSD	0.010	0.798	17.100	–	–	113.91	7.11
Halicryptus spinulosus P	–	–	–	–	–	–	0.63
Mesidothea entomon P	–	–	–	–	3.11	7.79	7.03
Crangon crangon P	–	–	–	–	0.08	–	–
Lymnea peregra ?	–	–	–	–	0.28	0.08	–
Other	–	0.003	–	–	–	–	–
Total:	0.863	20.688	243.327	3.33	8.65	274.33	143.71

S, D, FSD, and P – see Table 2.

22.9% in the shallowest waters of the east part of the Gulf (east of the Vistula River mouth) (Tables 2, 4). In most cases this group represented less than 10% of total biomass of the bottom fauna. This was essentially due to small size of the deposit-feeders, so that their biomass was low even though numbers of the organisms might have been fairly high (Table 2).

Percentage of predators was also small, usually not exceeding 10% of total biomass of the macrozoobenthos. These organisms represented 37% of total biomass of the bottom fauna in the region of Vistula River estuary only, in samples collected from the depths of 8–10 m. This was connected with numerous occurrence of *Mesidothea entomon* (Tables 2 and 3). Analysis of the bottom fauna based on samples collected with the Petersen's sampler (catching area of 0.1 m²) pointed to total lack of predators in shallow waters, 3–10 m deep. However, earlier studies carried out with another sampling device (a small trawl) showed that *Crangon crangon*, *ie* a typical predator, was most numerous exactly in these waters, especially during summer (Wiktor *et al*, 1980). This suggests that persentage of predators in the bottom fauna of the Gulf of Gdańsk was higher than it would result from the analysed materials. The trophic group of predators is usually represented by bigger and rap-

Table 4. Trophic structure of bottom fauna in the Gulf of Gdańsk, depending on region and depth

Trophic group	Depth [m] 3–5		8–10		20		30–35		55	
	Average biomass									
	[g/m²]	[%]	[g/m²]	[%]	[g/m²]	[%]	[g/m²]	[%]	[g/m²]	[%]
Western part (according to data from 1977/78)										
Suspension-feeders	21.20	55.7	59.5	70.8	117.1	66.8	3.7	2.0	0.8	0.3
Deposit-feeders	3.0	7.9	8.6	10.3	4.4	2.7	5.5	3.0	0.1	0.1
Facultative suspension--deposit-feeders	13.8	36.5	16.1	18.9	51.9	29.7	159.9	85.3	227.7	94.4
Predators	–	–	–	–	1.5	0.8	18.2	9.7	12.5	5.2
Herbivores		–	–	–	–	–	–	–	–	–
Total	38.0		84.2		174.9		187.3		241.1	
Eastern part (according to data from 1981)										
Suspension-feeders	–	–	15.6	77.3	1.5	1.3	3.1	2.5	–	–
Deposit-feeders	1.2	22.9	0.5	2.3	8.8	7.6	1.0	0.8	–	–
Facultative suspension--deposit-feeders	4.2	77.1	4.5	20.4	105.0	90.8	113.0	92.2	–	–
Predators	–	–	–	–	0.3	0.3	5.6	4.5	–	–
Total	5.4		20.6		115.6		122.7			
Vistula River estuary (according to data from 1977/78)										
Suspension-feeders	–	–	–	–	0.3	0.1				
Deposit-feeders	0.02	2.3	2.6	12.7	10.3	4.0	no data			
Facultative suspension--deposit-feeders	0.84	97.7	18.1	87.3	232.8	95.9				
Predators	–	–	–	–	–					
Total	8.86		20.7		243.4					
Vistula River estuary (according to data from 1981)										
Suspension-feeders	–	–	–	–	–	–	0.1	0.1		
Deposit-feeders	0.3	9.0	0.7	8.0	24.3	8.9	1.7	1.2	no data	
Facultative suspension--deposit-feeders	3.0	91.0	4.7	55.0	242.8	88.3	134.2	93.4		
Predators	–	–	3.2	37.0	7.8	2.8	7.7	5.3		
total	3.3		8.6		274.9		143.7			

idly moving organisms, characterized by an ability to escape from such catching devices as the bottom samplers.

Consequently, two trophic groups were of importance in the bottom fauna of the Gulf of Gdańsk: suspension-feeders and facultative suspension-deposit-feeders, although each group was represented by 2–3 species only. Both groups were represented mainly by molluscs, *ie* by organisms constituting the essential part of the bottom fauna biomass (up to 90%–Wenne and Wiktor, 1982). Among the mol-

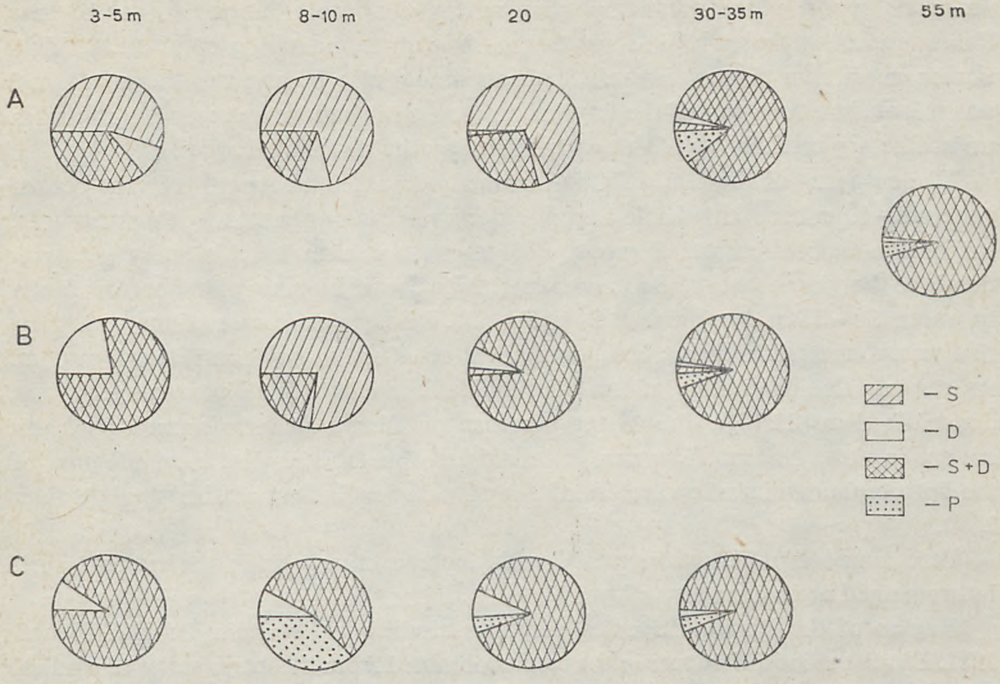

Fig. 2. Trophic structure of bottom fauna in the Gulf of Gdańsk, depending on the region and depth. Section A – Western part of the Gulf; Section B – Eastern part of the Gulf; Section C – Vistula River estuary; S – suspension-feeders; D – deposit-feeders; S+D – facultative suspension-deposit-feeders; P – predators

luscs, *Mytilus edulis* was the most important species in the first trophic group, and *Macoma baltica* in the second. Percentage of suspension-feeders reached 71–77%, and of facultative-suspension-deposit-feeders even 85–94% of total biomass of the bottom fauna, depending on the water zone (Tables 2, 3, 4, Fig. 2).

Structure of the bottom fauna was visibly differentiated spatially, similarly as environmental conditions, *viz* character of the bottom sediments (Pieczka, 1974), hydrologic conditions (Cyberska, 1979). This differentiation allowed for conventional division of the Gulf of Gdańsk into the west part (embracing the Puck Bay and waters west of the Vistula River mouth) and the east part (waters east of the Vistula mouth, to Krynica Morska). The Vistula River estuary was analysed separately.

Basing on the data presented in Tables 2 and 4 it can be stated that the suspension-feeders predominate in shallow waters (down to the depth of 20 m) in the west part of the Gulf of Gdańsk, and especially in the Puck Bay. This predominance was due most of all to mass occurrence of *Mytilus edulis* together with the attached barnacles. At deeper stations their percentage in total biomass of the bottom fauna decreased noticeably, while the share of facultative suspension-deposit-feeders increased with depth, the latter group being represented most of all by *Macoma baltica*.

The highest percentages of the deposit-feeders were found in shallow waters (3–10 m deep), a decrease being noted along with increasing depth. In case of predators an opposite trend was noted: their percentage in total biomass of the bottom fauna increase with depth. This was due most of all to increasing numbers of *Mesidothea entomon* in deeper waters. Attention should also be given to the mentioned possible underestimation of the level of predators in shallow waters, resulting from unsatisfactory catchability of those organisms by the sampling devices.

The east part of the Gulf of Gdańsk was quite different. Apart from the belt of waters 8–10 m deep, the whole area was decisively predominated by the facultative suspension-deposit-feeders. Percentage of these organisms visibly increased with depth, so that they constituted as much as 92.2% of total biomass of the bottom fauna in waters 30–35 m deep (Tables 2, 4, Fig. 2). Similarly as in case of the west part, this was connected with increasing numbers of *Macoma baltica* in deeper waters. As regards shallow waters, attention should be given to high percentage of the deposit-feeders (22.9%), due to the presence of *Nereis diversicolor* and *Hydrobia* sp. sp. in these waters. However, it should be remembered that total biomass of the bottom fauna in shallow waters of this part of the Gulf was rather small (Tables 2, 4).

Percentage of predators increased with depth, similarly as in the western part, but remained at an even lower level.

Region of the Vistula River estuary was studied in two periods: 1977/78 and 1981. Despite some differences in the results obtained from these two series of studies, it can be stated that trophic structure in this region was even simpler. Taking into account the results obtained in 1977/78 it can be concluded that only two trophic groups were represented in the bottom fauna: the deposit-feeders and the facultative suspension-deposit-feeders. The latter group constituted up to 98% of total biomass of the bottom fauna. Suspension-feeders appeared in this region as deep as 20 m. They were represented exclusively by *Cardium glaucum* and constituted only 0.1% of total biomass of the macrozoobenthos (Tables 3, 4).

A slightly different pattern was obtained from materials collected in 1981. Generally, the trophic structure was similar, *ie* there were no suspension-feeders in the area down to the depth of 30–35 m, while the deposit-feeders and the facultative suspension-deposit-feeders were dominating, but the percentage of the latter group was lower than previously. Moreover, the trophic structure contained also some predators, which were represented mainly by *Mesidothea entomon* (Table 3). It reached the highest percentage (37%) in waters 10 m deep. In deeper waters, 20 m and 30 m deep, percentage of predators in total biomass of the bottom fauna decreased to 2.8% and 5.3%, respectively, notwithstanding almost twofold increase in the biomass of *Mesidothea entomon.*

The pattern observed in the Vistula River estuary was very similar to the distribution of trophic groups described by Pearson and Rosenberg (1978) for waters affected by an inflow of organic matter (organic pollution). According to these authors characteristic changes took place in the bottom fauna along with increasing distance from the discharge of organic wastes. These changes refer both to bottom fauna biomass and its structure. And thus, in the region close to the inflow of wastes an azoic zone was formed, totally devoid of the macrozoobenthos, or else an extremely poor zone existed both with respect to species composition, biomass and trophic structure. Only the deposit-feeders were present in this zone, and rarely some predators. As the gradient of organic pollution decreased, biomass of the macrozoobenthos first increased, and then decreased to a level characteristic of the given water body. Number of species also increased, and the trophic structure was enriched with representatives of the suspension-feeders, while percentage of predators decreased to about 5% of total biomass and remained at a more or less constant level.

The situation observed in the Vistula River estuary was in many ways similar to the above described. The main difference consisted of the fact that in the Vistula estuary biomass of the bottom fauna in shallow waters, close to the river mouth, was represented mainly by the facultative suspension-deposit-feeders, and not by the deposit-feeders as in the case described by Pearson and Rosenberg. The facultative suspension-deposit-feeders were represented mainly by *Macoma baltica*, while percentage of decisive deposit-feeders was low (Tables 3, 4).

What were the possible reasons for these similarities and differences? Although the Vistula River brings in considerable amounts of organic matter in various forms, this was not a decisive factor. Amount of C_{prg} brought by Vistula waters into the Gulf of Gdańsk amounted to about 11.75 $mg \cdot dm^{-3}$, in this 7.1 $mg \cdot dm^{-3}$ in form of dissolved matter (DOC), and 4.65 $mg \cdot dm^{-3}$ in form of suspension (POC) (Pempkowiak and Kupryszewski, 1980). Thus, the concentrations were much lower than in the vicinity of the discharge of organic wastes described by Pearson and Rosenberg.

Constant movement of the rubble, frequent changes of the flow direction (back delta) and, consequently, frequent changes of water salinity in the estuary limited development of the bottom fauna in the region of direct contact between the gulf and the Vistula River waters. This resulted in low numbers and biomass of the zoobenthos (0.86–3.33 g/m^2), as also low number of species inhabiting this zone. Suspension rich in organic matter, which is brought into the gulf by the Vistula River, can be used by the zoobenthos only at the far end of the estuary, at a distance from the river mouth. Consequently, the biomass increased at the depth of 20 m. At this depth biomass of the bottom fauna was every time at the highest level. Suspension-feeders were found also in this zone only.

It is still unclear, whether there were real differences in the trophic structure of the zoobenthos between the Vistula River estuary and the scheme described by Pearson and Rosenberg for waters enriched with organic matter. The problem can be solved only after the feeding behaviour of *Macoma baltica* in the region under study will be precisely defined. If *M. baltica* appears to be a typical deposit-feeder in these waters, as suggested by various authors, the trophic structure of the bottom fauna in Vistula estuary can be taken as similar to the pattern presented by the mentioned authors, and so can the spatial changes.

The above presented trophic structure of the macrozoobenthos in the Gulf of Gdańsk undoubtedly constitutes a simplified picture, somehow erratic. In order to present a more detailed pattern it would be necessary to analyse the feeding behaviour of particular representative of the bottom fauna in different regions of the gulf. It should also be remembered that the organisms classified traditionally as the deposit-feeders are frequently characterized by different feeding behaviour. This results from the fact that the mentioned group comprises a variety of organisms: collecting food from the surface of bottom sediments, uptaking it together with the sediments (as *Oligochaeta*, for instance), collecting alive plant cells, protozoans and bacteria from the surface of bottom sediments, or utilizing detritus of organic origin. In each case role of these organisms in the ecosystem, energy flow and structure of trophic levels is totally different.

Analysing trophic structure of the bottom fauna I have taken into consideration percentages of particular trophic groups in total biomass of the zoobenthos. This approach, however, does not fully illustrate the role played by particular trophic groups in the biocenosis. Role of the deposit-feeders, represented mainly by small organisms with short life cycle and high rate of production, is undoubtedly more important than it would result from their percentage in total biomass of the bottom fauna.

As it was mentioned in the introduction, the main objective of this work was to present an initial characteristic of trophic structure of the macrozoobenthos in the Gulf of Gdańsk, so as to obtain a basis for further observations on possible changes in the environmental conditions.

Studies on the bottom fauna in the Gulf of Gdańsk, carried out in 1977/78 (Wenne and Wiktor, 1982) showed that some changes took place in the biocenosis of this water body. As regards the bottom fauna, these changes consisted essentially of a certain dislocation of bottom zones of the highest productivity to deeper waters, and of a general increase of the fauna biomass. No essential changes took place in the species composition, nor in general percentages of particular species in total biomass of the bottom fauna. Hence, it can be assumed that also trophic structure of the bottom fauna did not undergo major changes. Although the studies carried out in 1977/78 (Wenne and Wiktor, 1982) suggested a decrease in the biomass of the main suspension-feeder *Mytilus edulis*, but further studies, carried out in 1981 (Herra and Wiktor, 1985) did not confirm this trend. This would rather point to some fluctuations in *Mytilus edulis* development, and not to a decrease of its resources. Consequently, it might be rather risky to speak of long-term changes in trophic structure of the bottom fauna in the Gulf of Gdańsk. On the other hand, even this general approach revealed considerable differences in trophic structure between particular areas of the Gulf of Gdańsk. The main difference consisted of a decisive role of the facultative suspension-deposit-feeders at all depths in the east part of the Gulf of Gdańsk, while in the west part these organisms were of importance only in deeper waters (30 – 55 m). In shallow waters predominating role was played by the suspension-feeders, represented mainly by *Mytilus edulis*. Hence, in future more attention should be given to the role of this species in the Puck Bay.

References

1. Bubnova N. P., 1972, *Pitanie detritoiadnykh molluskov Macoma baltica (L) i Portlandia arctica (Gray) i ikh vlianie na donnye osadki*, Okeanologia, *12*, 6. Akad. Nauk SSSR.
2. Cederwall M., Elmgren R., 1980, *Biomass increase of benthis macrofauna demonstrates eutrophication of the Baltic Sea*, Ophelia, Suppl. 1.
3. Cyberska B., 1979, *Zmienność pól fizycznych w Basenie Gdańskim*. [In:] Mater. Sesji Nauk.: 60-lecie Państ. Służ. Hydrol.- Meteor., t. II, Warszawa.
4. Demel K., 1935, *Studia nad fauną denną i jej rozsiedleniem w polskich wodach Bałtyku*, Arch. Hydrobiol. i Rybactwa, *9*, 3-4.
5. Herra T., Wiktor K., 1985, *Fauna denna przybrzeżnych wód Zatoki Gdańskiej właściwej*, Stud. i Mater. Oceanolog. KBM PAN, 46.
6. Pearson T. H., Rosenberg R., 1978, *Macrobenthic succession in relation to organic enrichment and pollution of the marine environment*, Oceanogr. Mar. Biol. Ann. Rev., 16.
7. Pempkowiak J., Kupryszewski G., 1980, *The input of organic matter to the Baltic from the Vistula River*, Oceanologia, 12.
8. Pieczka F., 1974, *Z badań osadów dennych Zatoki i południowej części Głębi Gdańskiej*, Stud. i Mater. Oceanol., KBM PAN, 5;
9. Rhoads D. C., 1974, *Organisms-sediment relations on the muddy sea floor*, Oceanogr. Mar. Biol. Ann. Rev., 12.
10. Reid R. G. B., Reid A., 1969, *Feeding processes of member of the genus Macoma* (Mollusca: Bivalvia), Can. J. Zool. 47.
11. Wenne R., 1979, *Skład, rozmieszczenie i zmiany sezonowe makrozobentosu zachodniej części Zatoki Gdańskiej*, Master's Thesis, Inst. Oceanogr., Univ. Gdańsk.
12. Wenne R., Wiktor K., 1981, *Fauna denna przybrzeżnych wód Zatoki Gdańskiej*, Stud. i Mater. Oceanolog. 39, KBM PAN.
13. Yonge C. M., 1949, *On the structure and adaptation of the Tellinacea, deposit-feeding Eulamellibranchita*, Philos. Trans. Royal Soc. London, Ser. B., Biol. Sc. 234, (609).
14. Żmudziński L., 1967, *Zoobentos Zatoki Gdańskiej*, Pr. MIR Gdynia, 14/A.