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Molluscs from Puck Bay (Baltic Sea) collected in 1973

[Pp. 507—532, pls. XXIV—XXVII, 7 text-figs.]

Mięczaki zebrane w Zatoce Puckiej (Bałtyk Południowy) w 1973 r.

Abstract. In the samples collected in Puck Bay of the Baltic Sea five species of bivalves and nine species of gastropods have been found, including a four new ones for Poland's fauna: *Hydrobia neglecta* MUUS, *Turboella benzi* (AR. et MAGG.), *Turboella sarsi* (LOV.), *Rissostomia brunosericea* SMAGOWICZ; moreover the so far unrecorded — for Poland — forms *Peringia* and *Hydrobia*, are cited. A mass occurrence of *Mytilus edulis* L. and of the young *Cerastoderma lamarcki* (REEVE) has been noted, while the other species of bivalves have been but scantily represented. The results have been compared with the data obtained for 1962 and 1967: there was a marked change in numbers, perhaps connected with the extend of pollution in the sea.

INTRODUCTION

At the research camp of the Jagiellonian University Students of Natural Sciences Association, in July 1973, benthos samples were collected from the lagoon region of Puck Bay, mainly at its western coast, ca. 35 kms. to NE of Gdańsk. In the recent years, as a result of the growing industrialization and the ensuing water contamination, a marked change is to be noted in the biosphere of that region. The process is not only of local interest, a number of investigations carried out in the whole Baltic area point out to considerable alterations during the last few years, as stated by SEGERSTRÅLE (1969, 1973).

Another vital factor, though of local portent, for the benthonic species was the intensive, not to say wasteful, exploitation of the red algae *Furcellaria fastigiata* (HUDS.), for industrial uses, now no more in operation. A striking instance of the occurring changes the development on mass scale of three species of brown algae of the *Ectocarpaceae* family (PLIŃSKI and GIEBUŁTOWSKA-MINDAK, 1975).

These algae, up till recently rather scarce on this area (RINGER 1972), are now overgrowing a large part of the bottom, the original bottom vegatation and the less mobile animals (PUCHALSKI, manuscript); the fact has been corroborated also by our observations.

HISTORICAL OUTLINE OF RESEARCH IN THIS AREA

The first to carry out investigations upon the zoobenthos distribution and ecology in this area was DEMEL (1925, 1935). Research on a major scale was conducted by BURSA et al. (1939, 1947), WOJTUSIAK et al. (1939, 1950, 1951), and KAŁKOWSKI et al. (1951). It was approximately at that time, too, that a preliminary study of the benthonic plant communities in the Bay had been prepared (KORNAŚ, MEDWECKA-KORNAŚ 1948). The zoobenthos of this area was also the object of research by JAŻDŻEWSKI (1962); a few years later, ŻMUDZIŃSKI (1967) studied it in great detail. However, no separate work on molluscs having been done as yet, they were treated always as just one of the elements of the benthos, thence sometimes in a rather cursory way. This refers particularly to small gastropods of the *Rissoacea* suborder, recorded usually as „*Hydrobia* sp.". We omit the long list of publications on the other groups of benthos.

AREA OF INVESTIGATIONS

The samples were collected between 24 and 30 July 1973, the exact place having been recorded on the map (Fig. 1). All the samples come from the Puck Bay proper (DEMEL, 1935), also known as the Inner Bay. This water region, separated to the SE from the deeper waters of Gdańsk Bay by a sandbank rendering water exchange more difficult and known as Ryf Mew, was labelled by ŻMUDZIŃSKI (1967) as being of lagoon type. The Ryf Mew extends just under the surface, projecting even from the water along a considerable sector, its length varying within certain bounds, depending on the force and direction of wind.

The Inner Puck Bay is a shallow reservoir, ca. 3 m mean depth; it has two vaster regions of somewhat deeper water: the Central Depth with 6 m maximum depth, and the markedly smaller Kuźnica Hollow with the greatest depth in the whole Inner Bay: 8,4 m. A result of the Bay's shallowness is the quick warming of water, which in Summer time is usually several Centigrades higher than in open sea, and well mixed up, showing no major differences of temperature and salinity between the surface and demersal strata. The elongated shape of the Ryf Mew, at whose ends near Rewa and Kuźnica greater depths are recorded (4.5 and 2.5 m, respectively) (JAŻDŻEWSKI, 1962) facilitates the water exchange, which causes a comparatively high salinity ranging from 6.5 to 7.5 per mille. Somewhat more freshened waters occur at the estuaries of rivers, the Reda and Płutnica.

The bottom is sandy or sandy-muddy, mostly rich in detritus, particularly in the Central Depth. In its prevailing part is it overgrown with abundant vegetation, with a predomination of *Zostera marina* L., which forms dense meadows where the zoobenthos finds excellent conditions for growth.

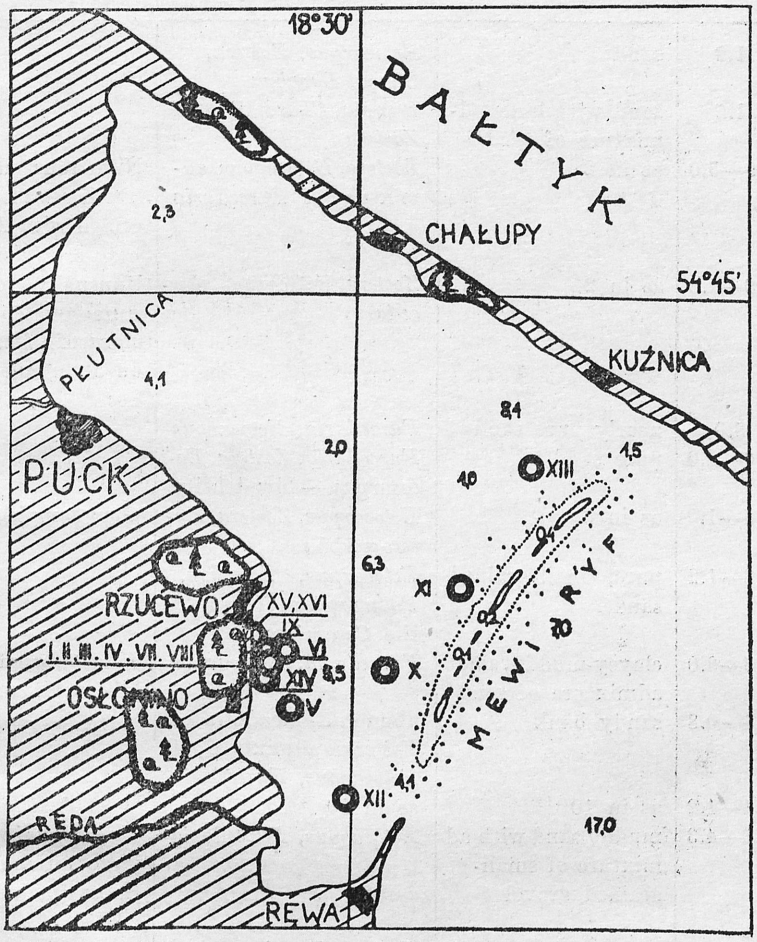

Fig. 1. The map of the Bay of Puck. I—XVI — the stations, depths in metres

Most of the samples have been collected from the coastal belt of waters c. 1 km wide, between Osłonino and Rzucewo. For comparison, two samples from the Ryf Mew have been collected as well as one for each major depth in its vicinity and for the Kuźnica Hollow. The description and characteristics of every station are comprised in Table I.

Samples 1—8 were collected by means of a small, light dredge 0.45 m wide, trimmed with a net with 1—mm. meshes, each time dragged for about 200 m by a rowing boat. In view of the stormy conditions the trawling was usually done before the wind and wave. Samples 9 to 13 were collected with the same

Table I

Descriptions of the stations

Sample No.	Depth m	Description of the bottom		Remarks
		Ground	Plants of the bottom	
1	1.2	sand	*Ectocarpus, Zostera, Chara, Lyngbya*	
2	1.5	sand with large admixture of mud	*Ruppia, Chara,* little of *Zostera*	
3	1.5—3.0	as in 2	*Zostera, Ectocarpus,* admixture of *Furcellaria*	Numerous dead and live *Zostera* leaves overgrown with *Membranipora crustulenta*
4	0.8—1.3	as in 2	*Zostera, Ectocarpus, Furcellaria*	Unusually many and numerous conglomerations of *Mytilus edulis* on abundant plant relics
5	3.0	nearly pure sand	*Furcellaria, Ectocarpus*	
6	3.0—4.0	pure sand	*Furcellaria, Zostera, Ectocarpus* — low density	
7	0.5—1.0	as in 6	*Ectocarpus, Zostera, Enteromorpha*	poor sample
8	0.8—1.2	pure, small grained sand	*Ectocarpus, Lyngbya, Potamogeton,* often with the *Ceramium*	
9	1.5—3.0	clayey-muddy, small admixture of sand	*Furcellaria, Ectocarpus*	collected near the brick-klin at Rzucewo
10	0.4—0.8	sandy bank	abundant meadows of *Zostera,* admixture of *Ectocarpus, Furcellaria*	
11	0.4—1.2	as in 10	as in 10	
12	3.8—4.3	muddy sand with admixture of small-grained gravel	*Ectocarpus, Furcellaria*	*Ectocarpus* inhabited by large numbers of mollusc (mainly *Mytilus edulis*)
13	6.5	mud	*Zostera, Lyngbya,* admixture of *Furcellaria*	
14	3.0—4.0	sand	*Zostera, Furcellaria, Ectocarpus*	the sample consists of a single *Furcellaria* bush, described in the text
15	0.0—0.25	littoral rock	*Enteromorpha*	sample from the sea-facing vertical wall
16	0.0—0.2	the same littoral rock	as in 15	sample from the shore-facing vertical wall

Notes: only the generic names of the plants are given, for the specific names of some species, cf. the text; the sequence of the names of plants is depended on theirs dominations on the stations.

dredge, while trawling was done along a sector of about 500 m with the aid of the cutter „Crangon" adapted for research work.

The whole content of the dredge was revised. The idea was to take all adult bivalves and larger gastropods (*Lymnaea* and *Theodoxus*). *Mytilus*, the most frequently encountered bivalve, was taken in full numbers from several samples only. As to the remaining samples from which only some specimens from each were extracted, are given in brackets in Table VI. In each sample, detailed examination was extended to about 1, from which young bivalves and the remaining gastropods of the *Rissoacea* suborder were extracted. The trawling was often preceded by diving in vestigations of the bottom.

In order to get better insight into the dispersion of the respective species, some extra samples were taken: one by the diving method (No. 14), and two at different walls of a coastal (littoral) stone (Nos. 15 & 16), from which all vegetation and all animals there living were extracted. All samples were fixed by means of 4 per cent formalin, and then kept in a 4 p.c. formalin solution in RINGER'S liquid, thanks to which there was no major change in the colour of examined gastropods. In the laboratory the samples were separated into species and counted, gastropods and bivalves taken into two different groups. The number of specimens and the percentual share of the different species of gastropods are given in Table II. The bivalves have been treated separately in view of their different way of life, and present somewhat differently in view of the way in which the samples were sorted out (Table VI, Fig. 8).

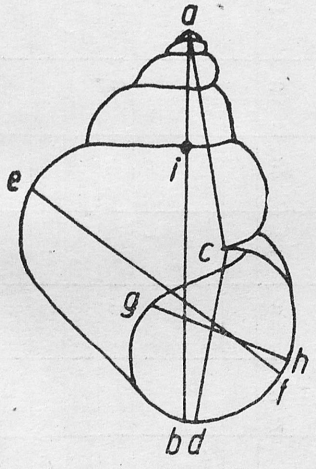

Fig. 2. The schema of the measuring the shell of the gastropod after ŽADIN and NORDSIECK. a—b = height of the shell, c—d = height of the aperture, e—f = width of the shell, g—h = width of the aperture, a—c = height of the spire, b—i = height of the body whorl

The gastropod shells, apart from genus *Theodoxus*, were measured according to the inserted diagram (Fig. 2), recommended by ŽADIN (1952) and modified following NORDSIECK'S instructions (1972). The tables cite only the first dimension — the height — in mm, the remaining ones having been converted into per

Table II

Numbers of individuals and the proportional participation of the several species of gastropods in the samples

Station No:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Number of individuals:	24	32	599	26	34	13	11	4097	276	13	126	255	159	29	19	7
% *Theodoxus fluviatilis* (L.) f. *littoralis* (L.)			2						1	27		6	5	2	5	29
Peringia ulvae (PENN.) f. *ulvae* (PENN.)	62	9	63	46	3	31	55	1	24	8	50	60	17	28		
— — f. *barleei* JEFFR.									1			3				
Hydrobia stagnorum (GMELIN) f. *stagnorum* (GMELIN)			1				9	1	1		2	4	1	10	42	29
— — f. *baltica* CLESSIN		3			3	8			1				1		5	
— — f. *ovata* JEFFR.								1			6				48	29
— — f. *pellucida* JEFFR.		3						1	5	8	9	4	2			
— *neglecta* MUUS		3					9		5		3	4				
Peringia et *Hydrobia* (iuv.)		48			79	38	9	89	37	23	10		18			13
Rissostomia brunosericea SMAGOWICZ	29	25	25	54	9	23	18	5	9	8	12	18	9	41		
Turboella benzi (AR. et MAGGIORE)	8	9	9					1		8	3	1	47			
— *sarsi* (LOVÉN)								1	16		1					
Lymnaea (*Radix*) *peregra* (O. F. MÜLLER) f. *balthica* (L.)					6					8	4					

cent in relation to height (Tables III, IV, V). The above-mentioned *Theodoxus* because of its shape, was measured in three dimensions perpendicular to one another, where the width and height were given as a per cent of the length. The measurements were made on principle for each form, for ten adult specimens.

SYSTEMATIC PART

Work was done according to GÖTTING's systematic order (1974) and, additionally, according to NORDSIECK (1972) within the *Rissoacea* suborder.

Classis: *Gastropoda*
Familia: *Neritidae*
Theodoxus fluviatilis (LINNÉ, 1758)

Of this species, only the Baltic form has been found: *T. fluviatilis* f. *littoralis* (L.), not only as in JAECKEL (1967a) smaller and darker than the fluvial form, but also with a shell with different, more squat proportions. The comparison of these shells with specimens taken from other stations (after URBAŃSKI, 1938) were presented in Table III.

Table III

Comparison of lenghts and proportions of the shells of *Theodoxus fluviatilis* (L.) from Poland

Shell dimensions	Length mm	Width %	Height %
Station:			
Puck Bay, mean value	5.0	70.8	50.4
Puck Bay, max. value	7.5	75.0	60.0
Warta River *	11.0	68.0	45.5
Foluszańskie Lake *	12.5	70.0	48.0

* after URBAŃSKI 1938.

Familia: *Hydrobiidae*
Peringia ulvae (PENNANT, 1777)
(Fig. 5a, Pl. XXIV, 9—12)

This species is cited in the older publications as *Hydrobia ulvae* (PENNANT). It was the most numerous one, its occurrence varying from several to several thousand specimens per sample. It was missing only from samples 15 and 16. The largest specimen had the dimensions 4.3×2.3 mm, the mean dimensions being presented in Table IV. The shells had a markedly varying appearance near the aperture. The young specimens had, as a rule, their aperture with umbilicus, while in some adults there was no umbilicus, which is consistent with the

description of this species given by ŽADIN (1952). According to DOLFUSS (after ANKEL, 1936), however, who had *P. ulvae* holotypes from the British Museum at his disposal, the aperture is always without umbilicus. Apart from this trait, the proportions, colour and appearance of frustules were the same, the dimensions varying only to a minimum extent (Table IV). In this species we observed the dependence of shell dimensions upon the depth of the station, presented in Fig. 3, which suggests the migration of adult specimens to the deeper spots.

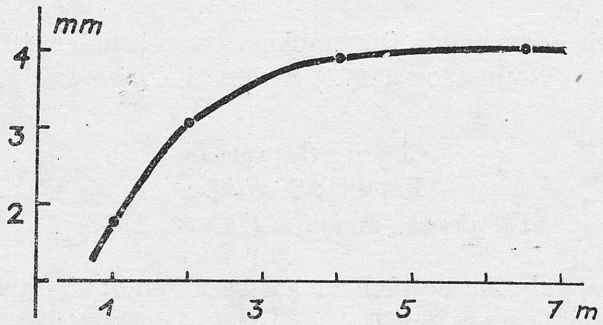

Fig. 3. The dependence of the height of the shell of *Peringia ulvae* (PENNANT) on the depth of it's station

It should be added, however, that all specimens of this species from Puck Bay somewhat differed from the typical ones as cited by DOLFUSS (after ANKEL, 1936, Fig. 78) and NORDSIECK (1972): their whorls were more protuberant and their sutures deeper, which made them akin to the description of *P. ulvae* f. *tumida* (MARSCHALL, 1889); still, the taxonomical position of the Baltic population of this species can be resolved upon only upon comparing them to the typus of species or form. Besides the typical form, 11 specimens correspoding to the description of *P. ulvae* f. *barleei* (JEFFREYS 1884) were found, a form unrecorded so far for the Baltic (Pl. XXIV, 11—12). The largest was 3.2 × 2.0 mm; the remaining specimens are described in Table IV.

Hydrobia stagnorum (GMELIN, 1790)
(Fig. 5b, Pl. XXIV, 1—6)

The oldest denomination of this species is *Hydrobia stagnalis* (BASTER, 1765). The name was, however, subsequently applied by different authors both to this species (ANKEL 1935, NORDSIECK 1972, and among synonyms ŽADIN 1952, GROSSU 1956, EHRMANN 1956, ŠIVICKIS 1960, JAECKEL 1967a, b, ŻMUDZIŃSKI 1967), and to the species *Peringia ulvae* (PENN., 1777) — (GEYER 1909, and among synonyms EHRMANN 1956, URBAŃSKI 1957, ŠIVICKIS 1960). These discrepancies have been accounted for by EHRMANN and ŠIVICKIS (op. cit. supra) by the fact that BASTER's original description is rather vague and treated differently, on the one hand, in English and German publications, and, on the other, in Dutch and French ones. In this situation JAECKEL (1967a, b) and

BRODNIEWICZ (1969a) use the former synonym — *H. stagnorum* (GMELIN, 1790). So far, however, it was the latter, younger synonym — *H. ventrosa* (MONTAGU, 1803) that has been most frequently used.

This species, although in our samples it occurred in much lesser numbers than that previously examined, was found under several forms. The nominal form — *H. stagnorum stagnorum* (GMEL., 1790) occurred in the greatest numbers on littoral rocks, while in other environments it was infrequent: often only empty shell were found (Pl. XXIV, 1—2). Also on littoral rocks the largest numbers of *H. stagnorum* f. *ovata* (JEFFREYS, 1884), as yet unrecorded for Polish water regions, have been found, a form encountered but spottily else here (Pl. XXIV, 4—5). The second form unrecorded for Polish water areas — *H. stagnorum* f. *pellucida* (JEFFREYS, 1884) occurred in a scarce number of specimens at several somewhat deeper stations, while it was very infrequent near the shore (Photo 6). It is not wholly certain whether the specimens classified by us as belonging to the latter form were not recognized by previous investigators as representatives of Baltic form — *H. stagnorum* f. *baltica* (CLESSIN, 1885). The present paper includes into this form only 7 specimens, differing from the nominal form by their smaller dimensions, and from form *H. st. pellucida* — by the presence of a yellowish periostracum (Pl. XXIV, 3). It should be recorded, moreover, that in the Northern Sea the form *H. stagnorum* f. *minor* (JEFFREYS, 1884) has been attested, its only difference from the nominal form lying in smaller dimensions: 2.5 × 1.5 mm; it is possible that it should be identified with the Baltic form.

Hydrobia neglecta MUUS, 1962
(Fig. 5c, Pl. XXIV, 7—8)

This species was recorded in Danish waters. In a more recent work MUUS (1967) stated that it was probably identical with the species *H. stagnalis minuta* (TOTTEN, 1834, cited after JOHANNSEN, 1918). NORDSIECK (1972) admitted MUUS'S description as corresponding to species *H. minuta* (TOTTEN, 1834), treating *H. neglecta* MUUS 1962 as a form, since MUUS did not mention the spiral striae on the shell. The apellation used here is consistent with MUUS'S oral opinion expressed 1975, that TOTTEN'S original description is obscure and can be referred to several different species occurring in Denmark's coastal waters.

The specimens from Puck Bay, which correspond by their size, colour and proportions to one of the forms of the previously discussed species — *Hydrobia stagnorum* (GMEL.) f. *pellucida* (JEFFR.) had, however, distinct spiral striae, superposed upon the line of growth and forming a characteristic pattern (Pl. XXIV, 7). A certain difference was also found to occur in the appearance of radulae (Fig. 6b, c). This species, which in the Danish waters lives at the level of salinity 10—24 per mille, was not recorded for our coasts as yet. It should be added that the station in Puck Bay, where salinity is varying c. 7 per mille, is the most freshened hitherto attested place of occurrence of this species (MUUS 1967,

TATIAŠVILI et al. 1968). The depth at which this species was represented did not surpass, barring a single case, 1.5 m; these stations had a sandy or sandy-muddy bottom, always overgrown with vegetation.

Potamopyrgus jenkinsi (SMITH, 1884)
(Pl. XXIV, 13)

Only two empty shells of this gastropod have been found, both without keel or bristles. They had a yellowish periostracum, with a lighter top, and cream-coloured insides.

Familia: *Rissoidae*

Turboella benzi (ARADAS et MAGGIORE, 1843) = *T. albella* (LOVÉN, 1846)
(Figs. 4, 5f, Pl. XXV, 21—25)

This species has not been so far recorded for Polish coast of the Baltic Sea, but is occurs near the Swedish coast at Kattegat, as well as in the Mediterranean, in Messina Strait (NORDSIECK, 1972). Both the above — mentioned author and JAECKEL (1967a) have found the species of this genus to be very variable; this refers especially to *T. inconspicua* (ALDER 1844), occurring in the Western Baltic, where it reaches up to Rugia. It is possible, therefore, that the specimens of genus *Turboella* from the Puck Bay belong to this species; however, they are more akin to the species *T. benzi*, the only difference consisting in their dimensions. The shells of this gastropod from the area investigated were small, the largest being 2.6 × 1.8 mm in size, but samples for another year have revealed somewhat larger specimens, 3.4 × 1.9 mm. NORDSIECK (1972) cites for the Swedish coast 3.6 × 2.3 mm, and from the Strait of Messina 4.5 × 2.5 mm. These differences can be accounted for by the uneven salinity at the stations mentioned here, c. 7, 20—25, and 38 promille, respectively.

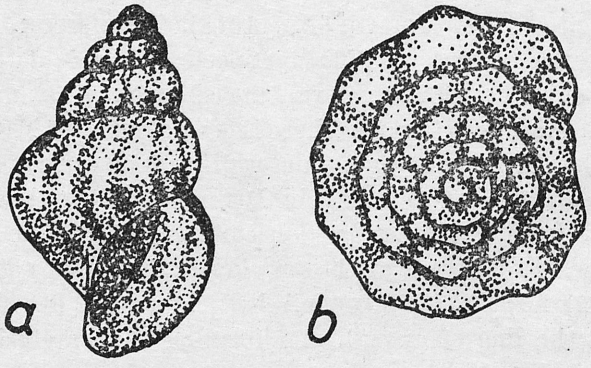

Fig. 4. *Turboella benzi* (ADRAS et MAGGIORE) — well-coloured specimen, aperture and top view

The most obvious traits, distinguishing this species from the young specimens of the genus *Hydrobia*, HARTMANN 1821 of similar size, are: the habitus of the shell, its aperture distinctly wider, — and its colour: upon an untransparent,

cream-yellow background, light brown spots occur in regular intervals, transversally to the whorls (Fig. 4a). This colouring has evolved to a varying degree, from hardly visible to strongly coloured: in the latter case the spots were located between slightly marked, broad ribs: as a result the separate whorls, the older ones particularly assumed the shape of a polygon with rounded corners (Fig. 4b). The variability of this species manifested itself by a higher or lower spire (Pl. XXV, 24—25), and by more or less dense ribs (Pl. XXV, 21—22).

Within the investigated area *T. benzi* was found at eight stations, but only at three of them in larger numbers, somewhere round 60 specimens per sample. These were stations with muddy or muddysandy bottom, overgrown with vegetation, 2 to 6 m. deep.

Turboella sarsi (LOVÉN, 1846)
Turboella benzi sarsi (LOVÉN, 1846)?
(Fig. 5e, Pl. XXV, 20)

This species, equally not recorded before for Polish waters, is known from Norway and the Mediterranean (NORDSIECK 1972). The shells of this species were highly similar to those of *T. benzi*, both in shape and size, the largest being

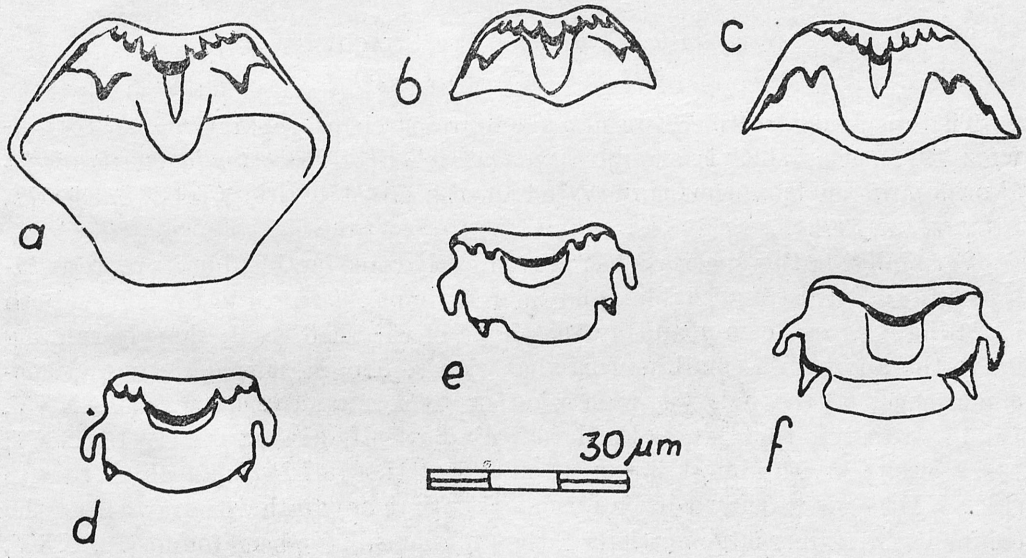

Fig. 5. Dens centralis of the radula of the gastropods from the suborder *Rissoacea* from Puck Bay: a — *Peringia ulvae* (PENN.), b — *Hydrobia stagnorum* (GMEL.), c — *Hydrobia neglecta* MUUS, d — *Turboella benzi* (AR. et MAGG.), e — *Turboella sarsi* (LOV.), f — *Rissostomia brunosericea* SMAG.

2.7×1.8 mm. The chief difference consisted in colouring, the frustules being horny-yellow and translucent, the small spots somewhat darker. As the mantle of this species, like in most of the *Rissoacea*, is strongly pigmented, the shells containing the gastropod's body were distinctly darker than with the species

T. benzi. The second distinctive trait was the smooth, glossy surface, markedly different from the matt surface of shells in *T. benzi*. The structure of the radulae was very similar in both species, the differences seeming not to go beyond individual differentation between one specimen and another (Fig. 5 d, e). It seems probable, therefore, that *Turboella sarsi* (LOVÉN, 1846) is but a subspecies of *Turborboella benzi* (ARADAS et MAGGIORE, 1843), but this question can be resolved only on investigating the specimens collected at typical stations (the southern coast of Norway and the western coast of Sweden). Such an approach is suggested by the description of this species in NORDSIECK (1972) where the author refers to the polymorphism of shells of this genus upon the example of the species *Turboella marginata* (MICHAUD, 1832).

Turboella sarsi has been found at three stations only, of which only one yielded somewhat greater numbers of specimens: 45 in a sample. It was found in a biotop very much the same as that of *Turboella benzi*, at 1.5—3.0 m. depth, upon a muddy a muddy-sandy, overgrown bottom.

It appears that the species, fossil for Poland, originally designated as „*Rissoa inconspicua* ALDER" by BRODNIEWICZ 1960, and later acknowledged to be a new species (BRODNIEWICZ, 1969 a) is very related to one of the above-listed species of the genus *Turboella*, which, incidentally, includes now also the former *Rissoa inconspicua* (ALDER).

Rissostomia brunosericea SMAGOWICZ

(Fig. 5d, Pl. XXV, 14—19)

This species is described as a new one for research in a separate paper (SMAGOWICZ 1977). This shell is enough similar to shell of *Rissostomia membranacea* (ADAMS), which has been observated in the West Baltic (JAECKEL 1967a, NORDSIECK 1972).

Variability in this species it has proved fairly considerable, but its representatives are easily distinguishable from the remaining *Rissoacea* in Puck Bay, both by its light brown colour and by the shape of the shell itself, sharply running up to the apex, with small, uncorroded whorls. The most frequently met specimens, such as the holotyp, with whorls convex in a mediocre way (Pl. XXV, 15, 18—19); but there were also those with markedly convex whorls (Pl. XXV, 14), as well as with almost flat ones, similar to those of *Peringia ulvae* (PENN.) (Pl. XXV, 17). More than a dozen specimens with their mouth withdrawn from the columella, revealing large portion of the umbilicus, have been found (Pl. XXV, 15). One specimen had a pattern composed of dark spots situated at the suture (Pl. XXV, 17), and another, also dark, undistinks streaks on the last two whorls (Pl. XXV, 16). There was also variation of colour, steel-grey prevailing with some few specimens; they had, maybe, a thicker periostracum; in a great many specimens, the whole visible inside of the shell was evenly orange-coloured, except a narrow strip at the lip, which ever has be light.

Rissostomia brunosericea SMAGOWICZ was found in Puck Bay in most of the stations, as to its numbers it was next (second) to *Peringia ulvae* (PENNANT).

It was found both in the littoral waters and at greater depths, it occurred on every kind of substratum except muddy bottoms. In all, 493 specimens were found, the quite young ones missing from the number. The medium and largest dimensions of the collected specimens are presented in Table IV.

Table IV

Heights and proportions of the shells of gastropods of the suborder *Rissoacea*

Shell dimension:	a—b mm	e—f %	a—c %	c—d %	g—h %	b—i %	max. mm
Species:							
Peringia ulvae (closed)	3.69	54	63	42	27	62	4.3 × 2.3
Peringia ulvae (opened)	3.58	54	63	42	27	62	3.9 × 2.2
Peringia ulvae barleei	2.96	62	63	44	30	80	3.2 × 2.0
Hydrobia stagnorum							
— — *stagnorum*	3.98	55	64	38	28	59	4.8 × 2.5
— — *baltica*	2.64	64	61	40	32	66	3.0 × 2.0
— — *ovata*	2.81	66	63	45	32	75	3.2 × 2.0
— — *pellucida*	3.06	60	66	40	28	64	3.4 × 2.0
Hydrobia neglecta	3.04	57	66	40	28	67	3.5 × 2.0
Rissostomia brunosericea	3.65	55	64	41	30	61	4.0 × 2.4
Turboella benzi	2.41	65	60	47	33	73	2.6 × 1.8
Turboella sarsi	2.65	61	57	44	33	72	2.7 × 1.8

Notes: a—b — height of shell, e—f — width of shell, a—c — height of spire, c—d — height of aperture, g—h — width of aperture, b—i — height of the body whorl; the meaning of the letters as on fig. 2; max. — the dimensions of the largest specimens.

Familia: *Lymnaeidae*

Lymnaea (*Radix*) *peregra* (O. F. MÜLLER, 1774)

f. *balthica* (LINNÉ, 1758)

(Pl. XXVI, 26)

The history of the synonymes of this species has been discussed by ROSZKOWSKI (mainly 1914), HUDBENDICK (1945, 1951), JACKIEWICZÓWNA (1954) and PIECHOCKI (1969), the latter author citing Opinion 336 of the International Commission on Zoological Nomenclature on the use of the apellation „*peregra* O. F. MÜLLER" for the species here discussed, instead of the previous names „*limosa* L.", „*ovata* DRAP.", „*balthica* L." and the remaining ones, which had turned into synonyms. It is worth noting, too, that in his publications prior to expressing this opinion, JAECKEL (1967 a, b) has used just the latter of the apellations here listed. Those authors who have made references to the Baltic population of this species, state that this is a separate form, with an unidentified taxonomical position, thence our treating this population as a form should be regarded as a provisional measure.

We found only 8 live specimens and over a dozen empty shells, therefore it is hard to draw any conclusions about that species biology. We observed only a great variability in the shell proportions, therefore a Table with the measurements results for the whole series has been inserted (Table V).

Table V

The heights and proportions of the shells of the several snails *Lymnaea* (*Radix*) *peregra* (O. F. Müll.) *balthica* (L.) from Puck Bay

No. of the individual	a—b mm	e—f %	a—c %	c—d %	g—h %
1	10.5	79.0	28.5	68.5	45.7
2	10.1	89.0	24.8	81.0	56.5
3	10.0	88.0	25.0	74.0	50.0
4	9.9	88.0	35.0	78.0	52.5
5	9.5	95.0	21.0	87.5	57.0
6	8.5	91.7	27.0	76.5	47.0
7	8.0	81.2	20.0	78.8	50.0
8	7.0	76.0	28.6	78.5	50.0
9	6.8	82.6	29.4	78.0	50.0
10	5.3	90.7	24.6	85.0	53.0

Notes: a—b — height of shell, e—f — width of shell, a—c — height of spire, c—d — height of aperture, g—h — width of aperture; the meaning of the letters as on fig. 2.

* * *

Summarily, the above discussed species of gastropods have been found to occur, within the material collected, in the following numbers:

Peringia+*Hydrobia* (iuvenes)	±4000
Peringia ulvae (+forms)	778
Rissostomia brunosericea	493
Turboella benzi	200
Hydrobia stagnorum (+forms)	169
Turboella sarsi	55
Theodoxus fluviatilis littoralis	51
Hydrobia neglecta	22
Lymnaea (*Radix*) *peregra balthica*	8
Potamopyrgus jenkinsi	2

* * *

Classis: *Bivalvia*
Familia: *Mytilidae*
Mytilus edulis Linné, 1758
(Pl. XXVII, 30)

This species of bivalve was represented in the largest numbers; it was missing from one station only, station 8. Some figures referring to it in Table VI have been lowered, as mentioned in the Introduction. A more frequent occurrence

Table VI

Numbers of individuals of the several species of bivalves with the proportional participation of the distinguished groups

Station No.:	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16
Species *Mytilus edulis* L.	(16)	4	50	(42)	(19)	(15)	1	—	18	100	570	20	32	9	4
In it with: *Membranipora crustulenta* (PALLAS) %			10	36	21	33			17	23	28		22		
Balanus improvisus DARWIN %					5						2	15	6		
M. crustulenta+*B. improvisus* %											1		9		
Cerastoderma lamarcki (REEVE)+ *Parvicardium exiguum* (GMELIN)	25	30	2250	63	10	18	18	1300	11	1343	173	1000	26	37	2
In it iuvenes %	52	93	96	86	20	56	78	98	27	98	87	81	69	89	100
Mya arenaria L. In it — iuvenes %	4 75	1 100	1	1	2 50	—	—	—	—	2	2 50	3 66	—	2 100	—
Macoma baltica (L.)	—	—	—	—	—	2	1	—	—	17	8	—	—	—	—

Notice: for the explanation of the meaning of the numbers in the brackets — see in the text.

of this bivalve was observed when the bottom was overgrown with red algae *Furcellaria fastigiata*, to which it is inclined to attach itself. In some samples it has been found that from 10—36 per cent of shells are overgrown with the bryozoan *Membranipora crustulenta* (PALLAS), while somewhat lesser and less frequently — with the barnacle *Balanus improvisus* DARWIN (only at four stations, from 2 to 14 per cent). Occasionally there occurred specimens overgrown simultaneously with barnacle and bryozoan, while only one specimen was overgrown with another genus of bryozoan *M. pilosa* (LINNÉ).

The colouring of *M. edulis* was more variable at stations poor in *Furcellaria*, whereas when this alga had a distinct share in the bottom covering it was the dark mussels that prevailed, while definitely light ones were missing. A separate report is being prepared about the variability of *M. edulis* colouring. Moreover, terathical specimens have been found to occur, two of them being presented in Pl. XXVII, 30.

The smallest mussels were 2.3, 2.7 and 3.2 mm long, respectively, but they were scantily represented: specimens with a shell less than 10 mm long added up hardly to 10.7 per cent of the overall number of specimens collected for this species. Most of them were 20—30 mm long, the largest recorded being 38.3 and 39.7 mm. Presumably, the small specimens should be referred to the current year, while those larger — to the preceding ones. Empty frustules of this species were encountered only occasionally.

Familia: *Cardiidae*

Cerastoderma lamarcki (REEVE, 1844)

(Pl. XXVII, 29)

This species attained the largest numbers. In the older publications on Baltic malacofauna it was recorded as *C. edule* L., 1758. The investigations of PETERSEN (1958) have proved that *C. lamarcki*, previously considered to be a form of *C. edule*, has its own specific diversity.

In the collected samples, notwithstanding its high numbers, the share of this bivalve in the biomass was lower than that of the mussel, since the prevailing part consisted of juvenile specimens below 3 mm, which, incidentally, were not sorted out in most of the samples. As to the boundary line between juvenile and adult specimens, it has been established upon the following morphological criteria: the juvenile specimens have their shell more flattened and thinner, with low translucency, an evenly yellowish colouring, and ribs slightly marked. These specimens occur in great numbers in the bottom's sand and in the patches of brown algae of the *Ectocarpaceae* family; they were but infrequently observed on other plants. The older cockles are encountered both on an overgrown and not overgrown bottom, whereas the juvenile ones, as results from diving observations, form their largest communities on a densely overgrown bottom, overgrown particularly by *Zostera* and *Furcellaria*. This is probably the result of the still light specimens being drifted by the waves into regions overgrown with

stiff plants. Striking was the outstanding number of juvenile specimens when compared to the scanty numbers of adult ones: this seems to prove that in Puck Bay this species is reproduced before *Mytilus edulis* — in all probability in June and July. The largest specimens reached up to 20.1×15.6×13.5 and 22.3×19.2×15.2 mm, which does not exceed the dimensions recorded for the Baltic (URBAŃSKI 1957, ŻMUDZIŃSKI 1961). The shells had a contrasting colouring, with yellow, brown, green and bluish strips running along the ribs, against a cream-coloured background.

C. lamarcki was found in every sample, varying from 2 to 2250 specimens, of which the juvenile ones took up from 20 to 100 per cent, averaging 71 p. c. A characteristic trait was the occurrence of large numbers of big-sized, empty shells, at times surpassing the number of live specimens of similar dimensions.

Parvicardium exiguum (GMELIN, 1791)
(Pl. XXVII, 28)

This species has been found to occur already when the material had been counted, thence the quanitative data in the Tables refer to both representatives of the *Cardiidae* family together. The share of *P. exiguum* in the samples reached up to several per cent. These were, mostly, live specimens, contrary to the results cited by BRODNIEWICZ (1969 b). According to ŻMUDZIŃSKI (1974) and WOŁOWICZ, WIKTOR (1975) the bivalves so far referred to this species, and coming from the Baltic, are representatives of a separate species *Cardium hauniense* PETERSON et RUSSEL (1971).

Familia: *Tellinidae*
Macoma baltica (LINNÉ, 1758)
(Pl. XXVI, 27)

In the case of this bivalve, again the number of collected empty shells surpassed that of live specimens. The representatives of the genus *Macoma* LEACH, 1819 having been designated according to the course of sinus lines (FILATOVA 1948), all specimens have been included into the genus *Macoma baltica*.

It was found to occur in some few samples, in small numbers varying from 1 to 17 specimens. Highly characteristic was the low differentiation of the shell sizes — nearly all were about 14.7 mm. the largest being 15.3 mm in length. Thence, the phenomenon consisting in the occurrence, so characteristic of sandy shallows, of several successive generations of this bivalve (ŻMUDZIŃSKI 1967), was totally absent. The above facts are probably the symptoms of periodical oscillations in the numbers of the zoobenthos population within the examined water region. A similar phenomenon in this species was observed in the years 1929—1959 by SEGERSTRÅLE (1969, 1971) near the Finnish coast.

Familia: *Myidae*
Mya arenaria LINNÉ, 1758

It occurred in 9 samples in small numbers, varying from 1 to 3 specimens per sample. The juvenile specimens amounted to 0 up to 100 per cent of the overall number of this bivalve per sample averaging 49 per cent. This bivalve, having a syphon considerably longer than the shell itself, digs itself deep in the substratum. The smallest specimens were ca. 2 mm. long. Summing up, all the collected *Mya* were young specimens, reaching at the most 32 and 45 mm in length, while the collections of first of the present authors comprise a specimen collected at Brzeźno near Gdańsk in July 1966, just at the shore, in the hull of a derelict landing barge, the specimen being 83 mm long.

As above-mentioned, the type of the floating unit imposed a low rate of trawling and the use of a light dredge shallowly burrowing in the bottom, therefore the data on some of the bivalves, especially on *Mya* those deeply digging into the bottom, are certainly lowered.

ECOLOGICAL REMARKS

The results presented above and in Tables II and VI, are to some extent different from those available to us in previous publications. These differences refer both to qualitative and quantitative relations. To illustrate these differences, our results have been compared to those presented by JAŻDŻEWSKI (1962), the results of his research carried on in 1959, and ŻMUDZIŃSKI (1967), for the years 1955—1963.

JAŻDŻEWSKI has found 19 specimens of „*Hydrobia* sp." in 1/64 of the dredged sample, which amounted to 76 per cent of the overall number of collected gastropods, whereas in the 1973 samples the percentual share of all *Rissoacea* was much higher (99 per cent). Some differences were noted also between our results and ŻMUDZIŃSKI'S findings about this group. A species fairly consistently defined as a common one was *Peringia ulvae*, while the *Hydrobia stagnorum* found by us was markedly lower in numbers. ŻMUDZIŃSKI'S observation (1967) about the prevailing occurrence of the Baltic form of this species, has not found corroboration in our investigations. *Potamopyrgus jenkinsi* in our samples occurred only occasionally (2 specimens), whereas according to ŻMUDZIŃSKI it was only slightly less frequently found than the other ones. One can assume that some of the previous data about the species *P. jenkinsi* should be referred to the species *Rissostomia brunosericea*, common in this water region, and resembling the former species outwardly.

The species *Theodoxus fluviatilis* and *Lymnaea peregra balthica*, very common in 1955—1963, in our samples proved to occur but seldom. Differences were particularly noted in the occurrence of *Lymnaea peregra balthica* in the littoral region between Osłonino and Rzucewo where ŻMUDZIŃSKI has found it to occur

in numbers varying from 1000 to 5300 specimens per one sq. m., in 1973 not a single specimen has been collected, while at stations situated further off from the shore, this species was found as a few per cent admixture among the gastropods.

There were also differences in the occurrence of *Theodoxus fluviatilis*, particularly in comparison to the representatives of the suborder *Rissoacea*. ŻMUDZIŃSKI had found it to occur in 100 to 500 specimens per sq. m., while the 1973 samples yielded a maximum of 8 specimens in one sample and somewhat less in the remaining ones. Neither have we found anywhere a concentration of this species like the one cited by JAŻDŻEWSKI for the Chałupska Hollow, where these gastropods amounted to 97 per cent, whereas at Kuźnicka Hollow the results seem to be similar: JAŻDŻEWSKI found 20 per cent, while the authors 6.2 per cent (which practically amounts to 5 and 6 specimens respectively, in the dredged sample). The percentual composition of the species of gastropods in two chosen samples has been presented in Fig. 6.

Bivalves were the predominant benthonic group, as far as biomass was concerned. These results are consistent with ŻMUDZIŃSKI'S observations, that author having reckoned their numbers to constitute ca. 80 per cent of biomass of all benthonic animals. But, while we found *M. edulis* in fact to occur in large numbers, *M. baltica*, which ŻMUDZIŃSKI cited along with it as the principal component of the *M. baltica* benthos, has been found only infrequently. The tendency shown by *M. edulis* to avoid a muddy bottom, as emphasized by ŻMUDZIŃSKI, has found corroboration in our research. JAŻDŻEWSKI had found in the muddy Kuźnicka Hollow less than 1 per cent of this species, while in the samples collected by us at the same stations we found about 2 per cent.

Differences have been also found to occur in the respective years as to *Cerastoderma lamarcki*. JAŻDŻEWSKI had found it to constitute ca. 5 per cent of the over-all number of bivalves, while ŻMUDZIŃSKI cited it as a frequent species. In our samples, too, it was sometimes the most frequently occurring bivalve, once even the only one in the sample. It should be recorded, though, that in most cases these were juvenile specimens. As far as adult specimens were concerned, their per cent would be akin to that cited by JAŻDŻEWSKI.

Wholly consistent are the estimates of the numbers of *Mya arenaria* found by ŻMUDZIŃSKI and by us: the numbers found in the samples fail to reflect the actual data, the mode of its life causing that the prevailing part of the specimens is outside the range of either dradges or bottom scoopers. This observation has been confirmed by diving estimates based on reckoning the syphons projecting from the bottom — at some places they occurred at small intervals, of a dozen or so cm. each. The proportional specific composition of bivalves in three chosen samples has been presented in Fig. 7; one can see there marked oscillations in the share of respective forms.

Samples 14, 15 and 16 call for a separate discussion. Sample 14 consisted of a medium-size bush *Furcellaria fastigiata*, ca. 15 cm high, collected at 3—4 m. depth, by diving method. About 3/4 of its thallus was overgrown with the sponge *Halichondria panicea* PALLAS, unrecorded previously for Puck Bay (ŻMUDZIŃSKI,

1967), though attested to occur in the South Baltic (BIERNACKA, 1972). The remaining part of the thallus was overgrown (about 1/3 of its surface) by the above-mentioned bryozoan *Membranipora pilosa* (L.), equally unrecorded so far, even in the most complete list drawn by ŻMUDZIŃSKI for this water region. On the other hand, JAŻDŻEWSKI mentioned *M. pilosa* to occur in the Bay, while making no reference to *M. crustulenta*. In our research *M. pilosa* was found to occur only at this station. Also *Ectocarpaceae* and *Ceramium arachnoideum* J. AGARDH have been found to inhabit this bush, as well as numerous molluscs and amphipods. In all, 32 specimens of *M. edulis* have been found, of which 19 not overgrown, 7 overgrown with the bryozoan *Membranipora crustulenta*, and one only with *M. pilosa*, 2 with *Balanus improvisus* as well as 3 overgrown simultaneously

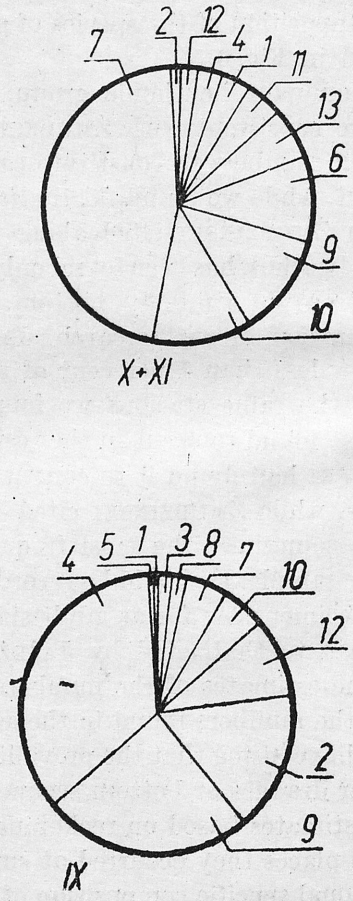

Fig. 6. The proportional composition of the selected samples (9, 10+11) of the *Gastropoda*: 1 — *Theodoxus fluviatilis* (L.), 2 — *Peringia ulvae* (PENN.), 3 — *Peringia ulvae barleei* (JEFFR.), 4 — *Hydrobia stagnorum stagnorum* (GMEL.), 5 — *Hydrobia stagnorum baltica* (CLESS.), 6 — *Hydrobia stagnorum ovata* (JEFFR.), 7 — *Hydrobia stagnorum pellucida* (JEFFR.), 8 — *Hydrobia neglecta* MUUS, 9 — *Peringia et Hydrobia* iuvenes, 10 — *Rissostomia brunosericea* SMAG., 11 — *Turboella benzi* AR. et MAGG., 12 — *Turboella sarsi* (LOV.), 13 — *Lymnaea* (*Radix*) *peregra* (O. F. MÜLL.) *balthica* (L.)

with *M. pilosa* and *B. improvisus*. All the older specimens were equally overgrown with *Ectocarpus*. Attention should be drawn to the unsually high share of the young specimens of mussel (38 per cent), which in the other samples occurred but spottily. Numerous, too, were the cockles *C. lamarcki* — 76 specimens, of which hardly 8 surpassed, and slightly only, 3 mm. of the shell length.

29 gastropods have been found in the same bush. Of these, the most numerous was *Rissostomia brunosericea* (12 specimens) and next, in order of succession: *Peringia ulvae* (8 specimens), *Theodoxus fluviatilis* (6 large gastropods), and, least of all, *Hydrobia stagnorum stagnorum* (3 specimens). On comparing these results with the number of gastropods found in the dredged samples one can assume that in the latter the numbers of *Theodoxus fluviatilis* are lowered. It is possible that the specimens of this species are more clinging to the ground than the remaining species of gastropods.

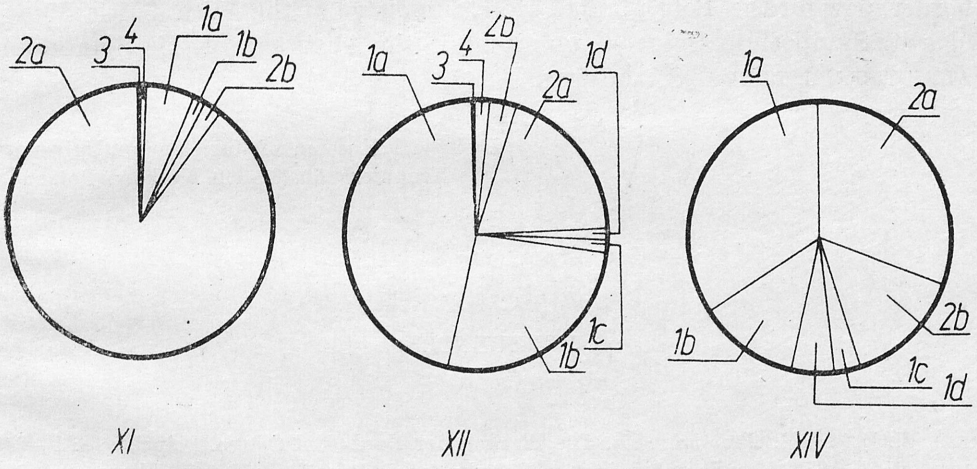

Fig. 7. The proportional composition of the selected samples (11, 12, 14) of the *Bivalvia*: 1a — *Mytilus edulis* L. without any epiphyte, 1b — *Mytilus edulis* with *Membranipora crustulenta* (Pall.), 1c — *Mytilus edulis* with *Balanus improvisus* Darw., 1d — *Mytilus edulis* with *Membranipora crustulenta* and *Balanus improvisus*, 2a — *Cerastoderma*+*Parvicardium* iuvenes, 2b — *Cerastoderma lamarcki* (Reeve)+*Parvicardium exiguum* (Gmel.) adults, 3 *Mya arenaria* L., 4 — *Macoma baltica* (L.)

Samples 15 and 16 have been derived from two walls of a semiimmersed littoral rock, the depth near it varying 20—25—30 cm. It was overgrown with abundant grass-green algae (*Enteromorpha* sp.). The animals, inhabiting in great numbers this vegetation, were represented by molluscs and crustaceans: *Palemonetes*, *Leander*, *Gammarus* sp. sp. and *Idothea* sp. sp. as well as *Jaera*.

Sample 15 was collected from an area of ca. 17 sq. dcm, from the sea side. We found 9 specimens of *M. edulis*, all below 7 mm in length, 4 small and 33 juvenile specimens of *C. lamarcki* and 2 small specimens of *Mya arenaria*, with shell length not exceeding 3 mm. This seems to point to the eurybioticity of the young specimens of the last mentioned bivalve, which, incidentally, find better growth

conditions on the littoral rocks, above all because of the lesser exposure to benthosvorous fishes and waterfowl. The larger specimens probably migrate to reach deeper waters.

In sample 16, collected from the shore side on an area of c. 12 sq. dcm., we found only 4 small specimens of *M. edulis* and 2 juvenile *C. lamarcki*. In both samples we found in all three cases of *M. edulis* having attached itself to the thallus *Enteromorpha*. The numerous occurrence of young bivalves in samples 14, 15 and 16 testifies to the connection between these animals in their youth with bottom vegetation. Noteworthy is the much more numerous occurrence of bivalves on the sea-facing wall. Two species of gastropods have been only found to occur on the rocks: *H. stagnorum stagnorum* and *H. stagnorum ovata*, also much more abundant on the sea-facing wall, — and *Theodoxus fluviatilis* littoralis, three unusually large specimens of which have been found.

Some of the above results relating to gastropod species of the *Rissoacea* suborder, new for the Polish fauna, were submitted at the IVth Baltic Marine Biologists Symposium and were published in the Abstracts of this Symposium (Falniowski, Dyduch, Smagowicz, 1975).

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STRESZCZENIE

Opracowano mięczaki (*Mollusca*) z 16 prób bentosu, zebranych w Zatoce Puckiej, na zachód od Ryfu Mew, w dniach 24—30 lipca 1973 r. Próby te były pobierane głównie dragą, o oczkach średnicy 1 mm, przeważnie w pobliżu brzegów (p. mapa stanowisk, rys. 1).

Znaleziono tam 9 gatunków i 4 formy ślimaków, w tym jeden nowy dla nauki — *Rissostomia brunosericea* Smagowicz (opisany w odrębnej publikacji), trzy gatunki nowe dla fauny Polski: *Turboella benzi* (Ar. et Magg.), *Turboella sarsi* (Lov.) i *Hydrobia neglecta* Muus. Stwierdzono też występowanie nie wyróżnianych dotychczas w naszym morzu form: *Peringia ulvae* (Penn.) *barleei* (Jeffr.), *Hydrobia stagnorum* (Gmel.) *ovata* (Jeffr.) i *Hydrobia stagnorum* (Gmel.) *pellucida* (Jeffr.).

Najczęstszym i najliczniej występującym ślimakiem była *Peringia ulvae* (Penn.), po niej szła *Rissostomia brunosericea* Smag., a na niektórych stanowiskach było dosyć dużo *Turboella benzi* (Ar. et Magg.) i *Hydrobia stagnorum* (Gmel.), głównie forma *ovata* (Jeffr.), pozostałe formy, a wśród nich nominatywna — były rzadkie. Na jednym stanowisku dominowała *Turboella sarsi* (Lov.), pozostałe gatunki — *Theodoxus fluviatilis* (L.) *littoralis* (L.), *Hydrobia neglecta* Muus i *Lymnaea* (*Radix*) *peregra* (O. F. Mull.) *balthica* (L.) wystąpiły w drobnych ilościach, najrzadziej obserwowano *Potamopyrgus jenkinsi* (Sm.) (tab. II).

Średnie i maksymalne wymiary muszli złowionych ślimaków podano w tabeli IV, a w tabeli V — wyniki pomiarów serii muszli bardzo zmiennego gatunku *Lymnaea* (*Radix*) *peregra* (O. F. Müll.) *balthica* (L.). Zjawisko karlenia w wodzie

słonawej zauważono dla obu gatunków z rodzaju *Turboella*, LEACH. Zauważono też wędrówkę dorastających osobników *Peringia ulvae* (PENN.) na głębsze stanowiska (ryc. 3).

Stwierdzono wystąpienie pięciu gatunków przybrzeżnych małży bałtyckich. Najliczniejszy był *Mytilus edulis* L. (fot. 30) i *Cerastoderma lamarcki* (REEVE) (fot. 29), ten ostatni gatunek reprezentowany prawie wyłącznie przez osobniki młodociane, poniżej 3 mm, liczone oddzielnie. Stwierdzono kilkuprocentową domieszkę gatunku *Parvicardium exiguum* (GMEL.) (fot. 28). Spotkano nieliczne okazy dorosłe *Macoma baltica* (L.) (fot. 27), więcej było pustych muszli i brakowało zupełnie młodych. Ostatni z małży — *Mya arenaria* L. był znajdowany najrzadziej, i to głównie jako młode osobniki, co było wynikiem sposobu pobierania prób (tab. 6).

Zbadano zasiedlenie przez mięczaki specyficznych środowisk — dwu przeciwległych ścian głazu przybrzeżnego (próby 15 i 16), oraz pojedynczego krzaczka krasnorostu widlika — *Furcellaria fastigiata* (HUDS.) (próba 14).

Porównano znalezione stosunki procentowe pomiędzy gatunkami mięczaków w niniejszych próbach, z danymi z prac JAŻDŻEWSKIEGO (1962) i ŻMUDZIŃSKIEGO (1967) w aspekcie zmian, spowodowanych postępującym zanieczyszczeniem wód Zatoki Puckiej.

Plate XXIV

Rissoacea I

1—2 — *Hydrobia stagnorum stagnorum* (Gmel.), 3 — *Hydrobia stagnorum baltica* (Cless.), 4—5 *Hydrobia stagnorum ovata* (Jeffr.), 6 — *Hydrobia stagnorum pellucida* (Jeffr.), 7—8 — *Hydrobia neglecta* Muus, 9—10 — *Peringia ulvae ulvae* (Penn.), 11—12 — *Peringia ulvae barleei* (Jeffr.), 13 — *Potamopyrgus jenkinsi* (Sm.); Enlargement about 12 ×, only No. 7 about 18 ×, for a better showing of its sculpture

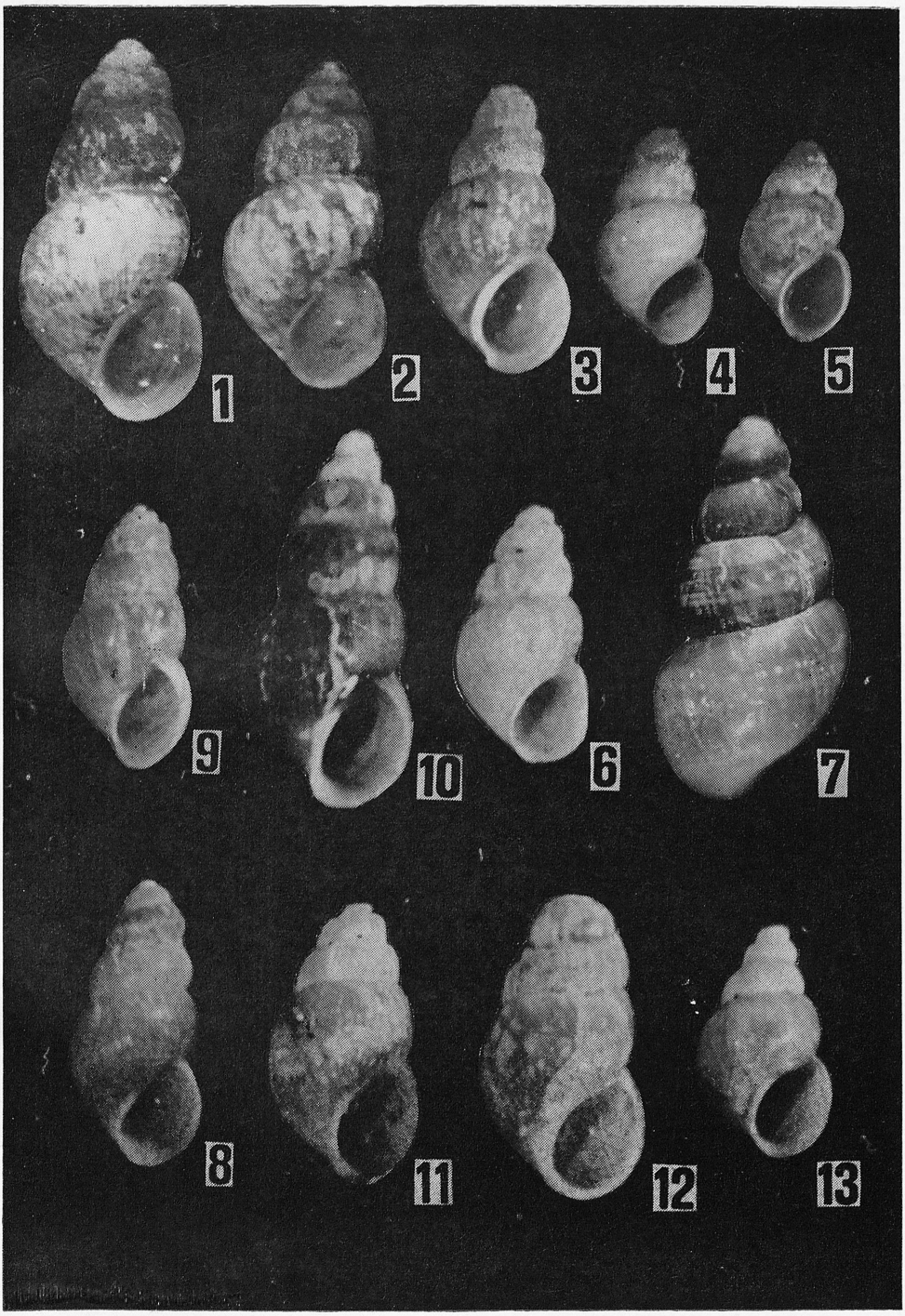

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Plate XXV

Rissoacea II

14—19 — *Rissostomia brunosericea* SMAGOWICZ, the mutability of the shells, 20 — *Turboella sarsi* (LOV.), 21—25 — *Turboella benzi* (AR. et MAGG.), the mutability of the shells; Enlargement 14—17 about 16×, 18—25 — about 12×, attention — No. 16 this two-plates photomounting

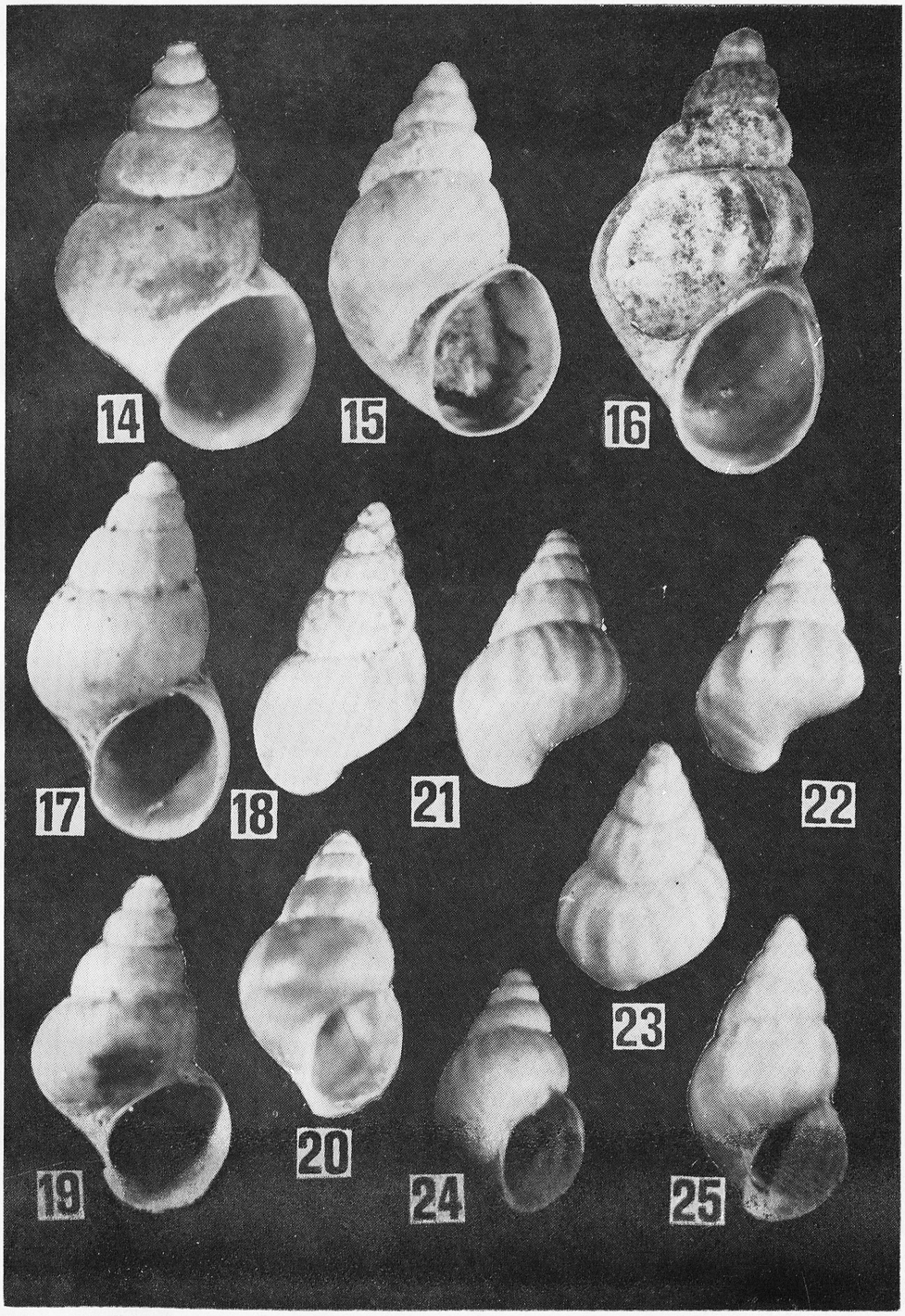

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Plate XXVI

Mutability of the shells
26 — *Lymnaea* (*Radix*) *peregra* (O. F. Müll.) *balthica* (L.), 27 — *Macoma baltica* L.; Enlargement 26 about 4×, 27 about 2×

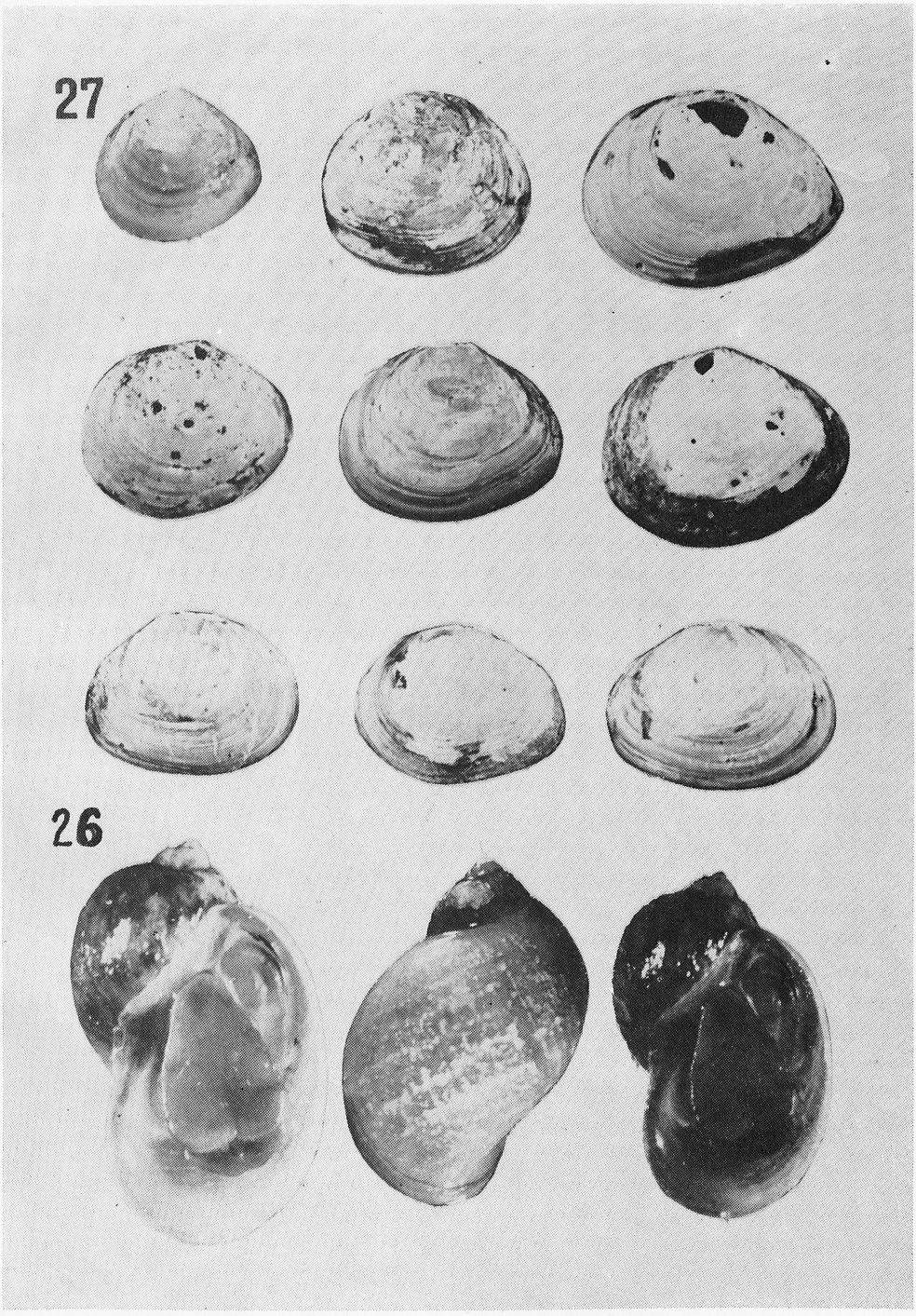

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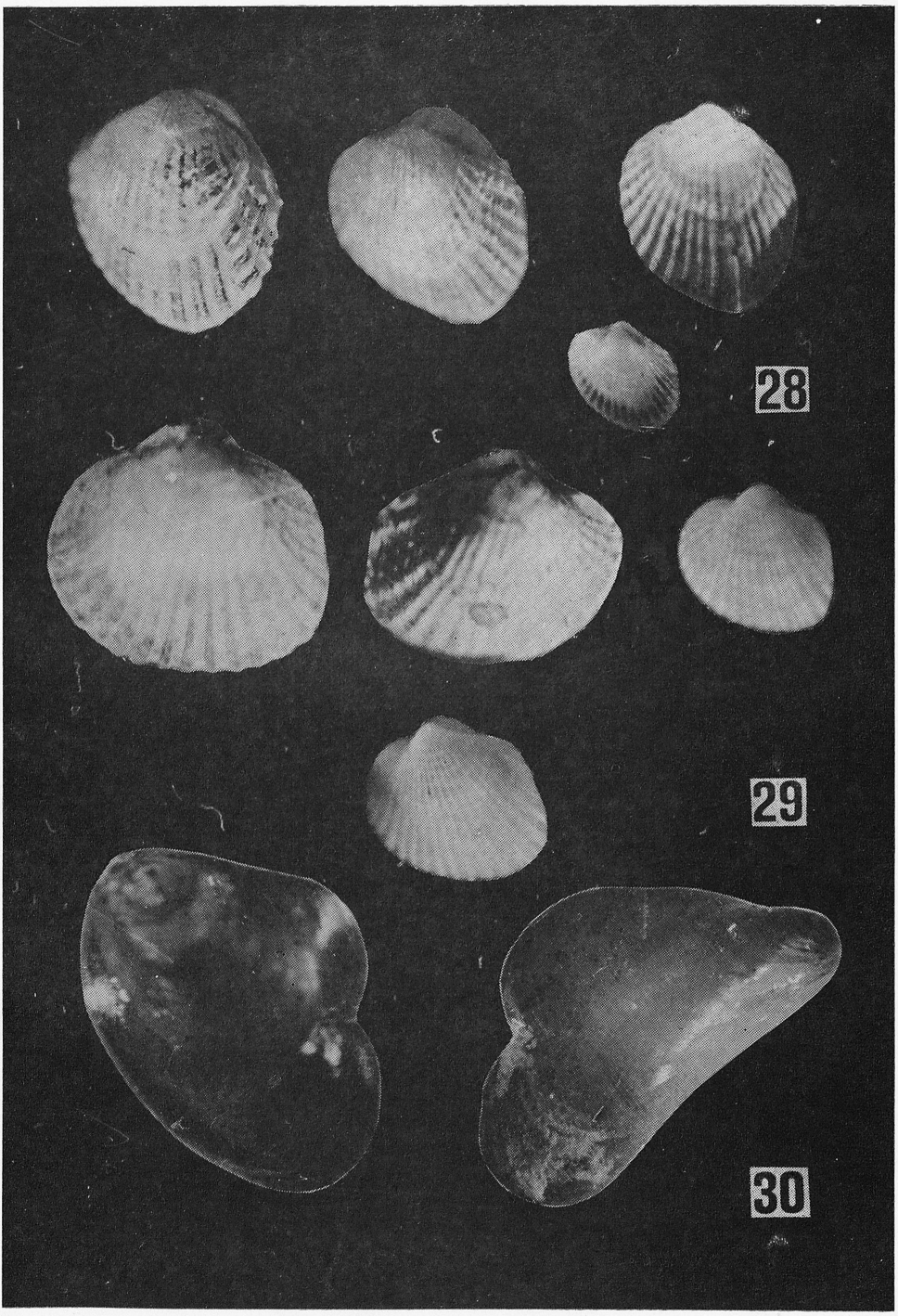
Plate XXVII

Bivalvia, continuation

28 — *Parvicardium exiguum* (GMELL.), 29 — *Cerastoderma lamarcki* (REEVE), 30 — *Mytilus edulis* L., two examples of the teratic shells; Enlargement 28—29 about 5×, 30 about 2×



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