

RISSOA (RISSOSTOMIA) MEMBRANACEA (J. ADAMS, 1797) (GASTROPODA: PROSOBRANCHIA: RISSOIDAE) IN PUCK BAY (SOUTHERN BALTIC SEA)

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ABSTRACT: In the paper the author describes the morphology and anatomy of the *Rissostomia* species inhabiting Puck Bay. A detailed description of the shell and its variability (including the colour spots and ribs occurring very rarely) is given. Then the author describes the head pigmentation, variable and quite uncharacteristic. The concise descriptions of the soft parts morphology, ctenidium, radula and male reproductive organs are given. The variability of the giant penis is described, as well as the structure of the female reproductive organs. Then the author compares the Polish *Rissostomia* with the drawings and descriptions of *R. membranacea* given in the literature, as well as with the specimens of the species from the localities outside the Baltic Sea. He establishes that the Polish *Rissostomia* belong to *Rissoa membranacea* which is an extremely polymorphic species.

KEY WORDS: shell variability, pigmentation, ctenidium, radula, reproductive organs, penis

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Abstract: In the paper the author describes the morphology and anatomy of the Rissostomia species inhabiting Puck Bay. A detailed description of the shell and its variability (including the colour spots and ribs occurring very rarely) is given. Then the author describes the head pigmentation, variable and quite uncharacteristic. The concise descriptions of the soft parts morphology, sphenidium, radula and male reproductive organs are given. The variability of the giant penis is described, as well as the structure of the female reproductive organs. Then the author compares the Polish Rissostomia with the drawings and descriptions of R. membranacea given in the literature, as well as with the specimens of the species from the localities outside the Baltic Sea. He establishes that the Polish Rissostomia belong to Rissoa membranacea which is an extremely polymorphic species.

INTRODUCTION

Falniowski, Dyduch and Smagowicz (1977) in a paper on the molluscs of Puck Bay (a part of the Bay of Gdańsk, the Southern Baltic Sea, Poland) recorded the occurrence of a Rissoa species being new for the Polish fauna. The species belongs to the subgenus Rissostomia Sars, 1878 (the systematics and nomenclature of the genus and subgenus level after Coan 1964). This Rissostomia was described by Smagowicz (1977) as Rissostomia brunosericea. The presented paper is devoted to a detailed description of the Polish Rissostomia and, moreover, it is an attempt at the determination of its systematic position.

SHELL DESCRIPTION

The shells of the Polish Rissostomia (Figs 1.1 - 1.19; 2.1 - 2.18 and 3.1 - 3.5) are sharply conical, elongately ovate or conically-ovate. The spire is high or very high, usually narrow, very variable. The proportion: shell breadth : shell height is variable within a wide range, but in general the shells are nearly always rather slender or slender. I must point out that the drawings present the whole range of the shell variability, and then the majority of the phenotypes figured are not common or even actually rare. The real majority of the snails have the shells characterized by high, slender, conical and sharp spires. The apex rather sharp, the corrosion of the youngest whorls extremely rare: I have noticed it in two specimens only.

The number of whorls: $5 \frac{3}{4} - 6 \frac{1}{2} - 7 - 7 \frac{3}{4}$ in males (Figs 1,1 - 1,19), and $6 \frac{1}{4} - 7 - 7 \frac{1}{3}$ in females (Figs 2,1 - 2,18 and 3,1 - 3,5). The whorls slightly to moderately convex, the suture moderately deep or completely shallow. The whorls growth regular and rather rapid; in numerous specimens more rapid through the last whorls. In a number of shells some part of the body whorl is drawn away from the earlier whorls, sometimes even separated from them along the distance of $\frac{1}{4} - \frac{1}{2}$, but in extremal cases (for example: Figs 2,14 - 2,15) along the whole body whorl (then instead of a suture there is a slit). The height of the body whorl is $\frac{3}{5} - \frac{2}{3}$ of the shell height.

The mouth prominent, oval, usually broad or very broad. Its upper part without an angle or, exceptionally, with a very slightly marked angle. Very often there is a narrow distance between the peristome and the body whorl. It is noteworthy that this arrangement of the mouth in relation to the body whorl, the breadth and outline of the aperture and the always continuous peristome are the best diagnostical features for Rissoa (Rissostomia) membranacea (J. Adams, 1797) given in the literature.

The umbilicus is absent only exceptionally: usually present, often as a groove running along the whole zone of contact of the mouth with the body whorl.

Shell dimensions of the Polish Rissostomia: males: height: 3.3 - 4.0 - 4.3, exceptionally up to 4.9 mm; breadth: up to 3.0 mm; females: height: 3.25 - 4.0 - 4.3 - 4.7 mm; breadth: up to 2.9 mm. As one can see, the males may be a little bigger, but in general the dimensions for both sexes are the same. No other kind of sexual dimorphism of the shell can be observed (Figs 1,1 - 1,19 and 2,1 - 2,18). An exception are the ribbed shells (Figs 2,7 and 3,1 - 3,5), which are entirely the shells of females.

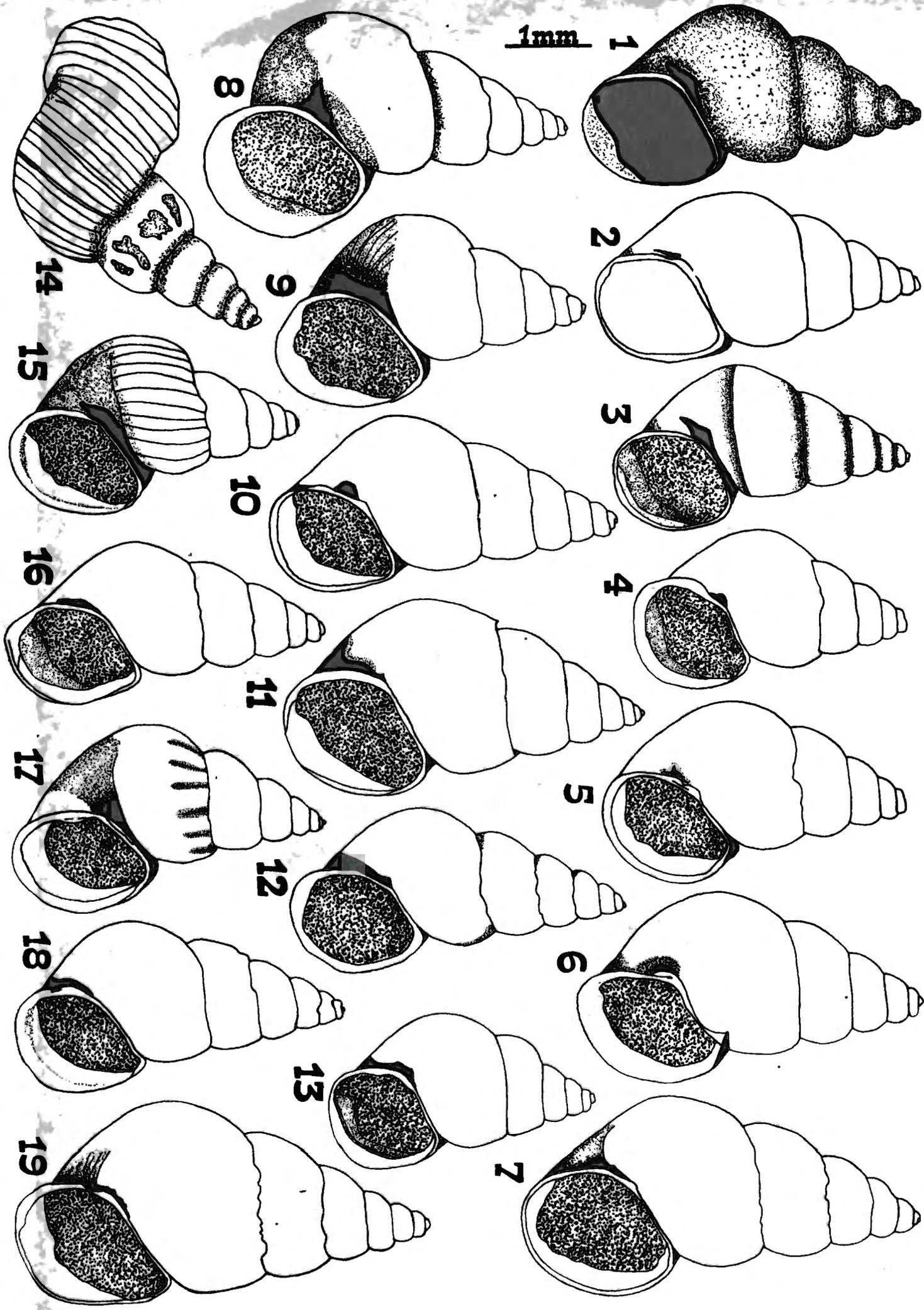


Fig. 1. 1 - 19 - *Rissoea membranacea* from Puck Bay, shells of males

1mm

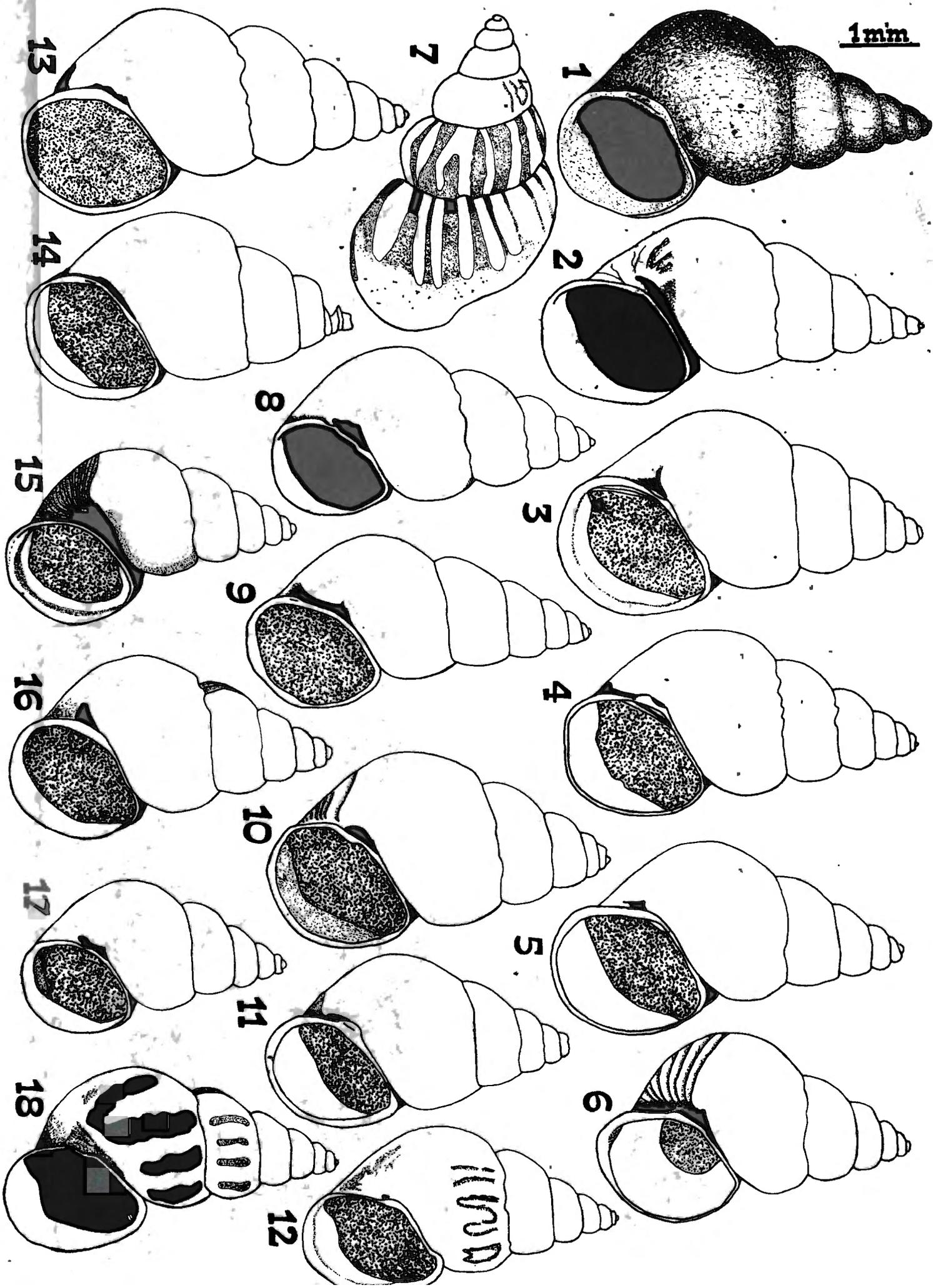


Fig. 2. 1 - 18 - *Rissoa membranacea* from Puck Bay, shells of females

The shell walls rather thick, but sometimes relatively very thick, always thicker than in the other Polish Rissoacea.

SHELL SURFACE VARIABILITY

The surface with no spiral sculpture, matt, rough, opaque. Periostracum thick and porous, silky, light brown or brownish. Sometimes, with the periostracum especially thick the shell light grey. The visible inside the aperture endostracum nearly always light orange; a narrow belt along the lip - light. The colour of the periostracum, as well as of the endostracum, very characteristic of the species.

A majority of the shells of the Polish Rissostomia are unicolour. In few specimens only I have found the occurrence of longitudinal dark brownish spots (Figs 1,17; 2,7; 2,12; 2,18 and 3,1). They are situated on the surface of no more than two last whorls and associated with ribs, but sometimes are present also on the surface of smooth shells. The spots from delicate to well marked; sometimes very distinct close to the suture but down delicate (Fig. 2,7). In one specimen I have observed very well marked and broad spots on the surface of the completely smooth shell (Fig. 2,18). The spots occurred almost entirely on the females' shells.

Among several thousand of specimens of Rissostomia from Puck Bay only several dozens of females have ribbed shells (Figs 2,7; 2,12 and 3,1 - 3,5). The ribs are always weak and low or even vestigial. On the penultimate whorl the ribs are marked more weakly or similarly as on the body whorl. The ribs present on 1 1/2 - three whorls, usually on about two. The maximum number of ribs per whorl: 11 - 16, usually: 15. The last rib situated 0 - 3/4 whorl from the mouth, usually about 1/2.

NOTES ON THE SHELL VARIABILITY

The character of the variability described above and presented in the drawings is typical for Rissoidea. It is marked in the shape of the shell, its proportions (a big range, although a majority of specimens present only a narrow section of this range), the shape of the spire, the convexity of the whorls and the depth of the suture (the same remark), the breadth of the mouth and its shape, the shell dimensions, the thickness of the walls of the shell, the colour of the periostracum and, sometimes, the pigmented spots and ribs.

SOFT PARTS MORPHOLOGY AND COLOURATION

The anterior lobe of foot, broad and flatly rounded, usually bears a band of dark pigment arranged in two joined together sectors of arcs. The body sometimes creamy, but more often from light brownish, by light yellowbrownish, to dark brown. The visceral hump sometimes darkly pigmented, but often completely lacking pigment. The eyes situated on proportionally very big knobs.

HEAD PIGMENTATION

The pigmentation of the head (Figs 4,1 - 4,5) is fairly variable and not very characteristic, and completely different from that pictured for R. membranacea by Rehfeldt (1968), or by Meyer and Möbius (1872) and Graham (1971). The tentacles yellowish or yellow, always without pigment. In many specimens there is no pigmentation of any other soft part as well. In the others pigment may occur at the snout, posteriorly to the snout, and rarely at the bases of the tentacles, in the form of rather narrow transverse belts (Fig. 4,1).

At the area situated posteriorly to the snout pigment never occurs in the form of geminate spots, but only may form a continuous transverse belt being variable in its breadth and intensity. The pigmentation may be in the form of from hardly visible dots to a completely black belt, sometimes lightened along its borders (Fig. 4,5). The belt often connects with the pigmented area of the snout (Figs 4,1 - 4,3).

The pigmentation of the snout (Figs 4,1 - 4,4) is also variable in intensity. Sometimes brightened in the middle and more intensive to the sides (Fig. 4,1). Sometimes the snout pigmentation in the form of geminate spots situated at the lateral sides of the snout (Fig. 4,4). The snout pigmentation need not accompany that of the area posterior to the snout, and vice-versa.

CTENIDIUM

The number of ctenidium lamellae was in males: 16 - 28, mean value: 22.4, standard deviation: 4.72, and in females: 18 - 26, mean value: 22.0, standard deviation: 3.00.

RADULA

The radula is rather uncharacteristic, as in a majority of Rissoi-
dae. Its structure (Falniowski, Dyduch and Smagowicz 1977) agrees with
the R. membranacea radula descriptions of Meyer and Möbius (1872) and
Rehfeldt (1968).

MALE REPRODUCTIVE ORGANS

The Rissostomia from the Polish coast of the Baltic Sea has no pros-
tate. The function of prostate is fulfilled by a strongly developed
glandular epithelium inside the massive penis (Fig. 3,12). This con-
firms the data of Johansson (1939) on the R. membranacea female repro-
ductive organs. This function is just the reason for proportionally the
giant dimensions of the penis:

shell height (mm)	3.4	3.6	3.7	3.7	3.8	3.8	3.9	4.0	4.0	4.3	4.3	4.9
penis length (mm)	1.8	1.6	3.3	2.0	1.8	2.1	2.9	1.9	2.5	2.6	2.3	3.3

The variability of the dimensions is evidently high. However, I have
not found any markedly small penis being typical of the snails more
seriously infected with larval trematodes. A weak correlation between
the length of the penis and the height of the shell ($r = 0.572$) is
striking. For example, I have found a 3.3 mm long penis in a specimen
with the 4.9 mm high shell as well as in another one whose shell was
only 3.7 mm high. Besides the dimensions the penis variability is weakly
marked (Figs 3,6 - 3,11 and 3,13 - 3,19).

The penis is simple, without any outgrowths. In the medial part
usually thicker than at the basis, terminally narrow and sharp, just
dagger-shaped while not contracted. The penis is usually arched. The
vas deferens well visible along nearly the whole penis, only inside its
distal part less easy to distinguish. At the proximal part it runs in
zigzag - forming three loops, while at the medial part it runs straight-
ly. Inside the medial part of the penis the vas deferens very strongly
pigmented from light to medium brown, and very strongly thickened.

In one specimen I noticed an accessory duct running inside along more
than a half of the penis, right to the vas deferens (Fig. 3,19). The
function of the duct is unknown, and nobody has observed it so far. The
penes of the Rissostomia from Puck Bay are identical with those of the
R. membranacea specimens from the Netherlands.

FEMALE REPRODUCTIVE ORGANS

The female reproductive organs (Figs 4,6 - 4,9) correspond with the scheme presented by Johansson (1939) for R. membranacea. The upper accessory gland of the oviduct (albuminoid) is relatively big. The oviduct between the upper and the lower accessory gland of the oviduct (nidamental) is thickened. The upper blind sac of the oviduct, which can be identified as receptaculum seminis, is connected directly with the oviduct. The receptaculum small and tube-shaped.

The lower blind sac of the oviduct, which can be identified as bursa copulatrix, is somewhat bigger than the receptaculum; narrow close to the outlet and broad along its upper part (Figs 4,6 - 4,7). In its normal position, when the organs are not artificially arranged to show their structure, the bursa lies flatly along the oviduct (Figs 4,8 - 4,9). After joining the outlet of the nidamental gland, the oviduct runs into a short, thin-walled vagina whose outlet is situated at a papilla on the wall of the mantle cavity.

The variability of the female reproductive organs of the Polish Rissostomia is slight. The organs of the Dutch specimens of R. membranacea are practically identical with those of the specimens of Rissostomia from Puck Bay.

DISCUSSION OF THE SYSTEMATIC POSITION OF THE POLISH RISSOSTOMIA

Johansson (1939) gives a photograph of R. membranacea shell, being very similar to the Polish Rissostomia. Also some of the specimens drawn by Cuchcin (1975) from the Black Sea are evidently similar to the specimens from Puck Bay. The same can be said about "R. membranacea from B" from Danish waters (Rehfeldt 1968) and, to a lesser degree, about the specimen figured by Jaeckel (1976). The drawings of McMillan (1968), Graham (1971), Nordsieck (1972) and Palazzi (1978) differ from the Polish "R. brunosericea", although the descriptions accompanying them pay attention to the features, which are in majority present in the Polish specimens. An exception could be the monograph of Nordsieck (1972), however, this monograph is plenty of mistakes, inexactitudes and vaguenesses, and is a source of big amount of chaos occurring nowadays in the taxonomy of Rissoidea.

The comparison between the specimens from the Puck Bay and those of R. membranacea from the Black Sea (Varna, Sozopol), the Atlantic coasts (Biarritz, St Nazaire), and the North Sea (Texel Island, leg. L. J. M. Butot) from my collection, as well as the observations on the variability of other Rissoa species, show also that R. brunosericea is nothing

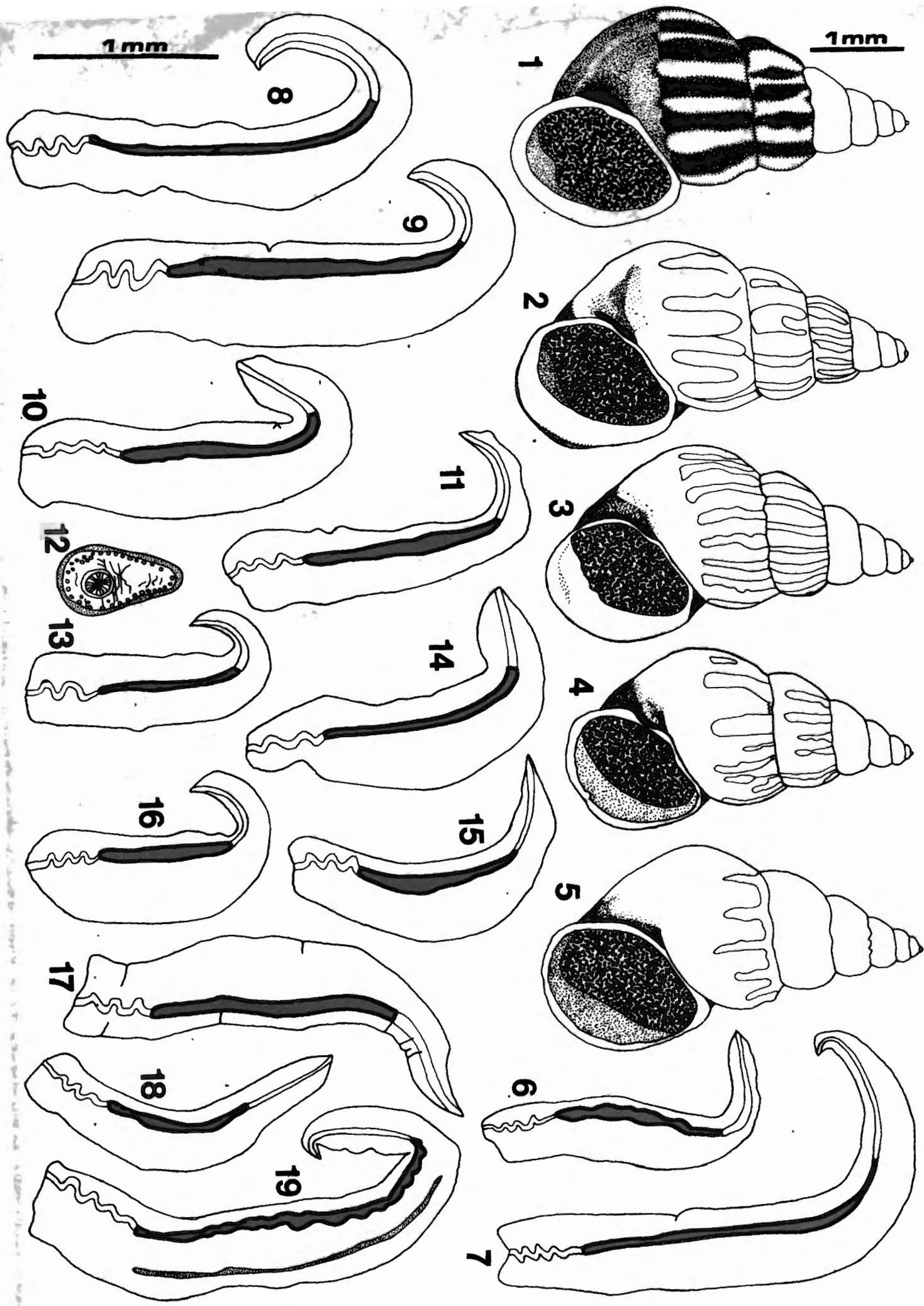


Fig. 3. *Rissoa membranacea* from Puck Bay: 1 - 5 - ribbed shells of females; 6 - 19 - penes: 6 - 11 and 13 - 19 - habitus, 12 - cross-section, after Johansson (1939), modified

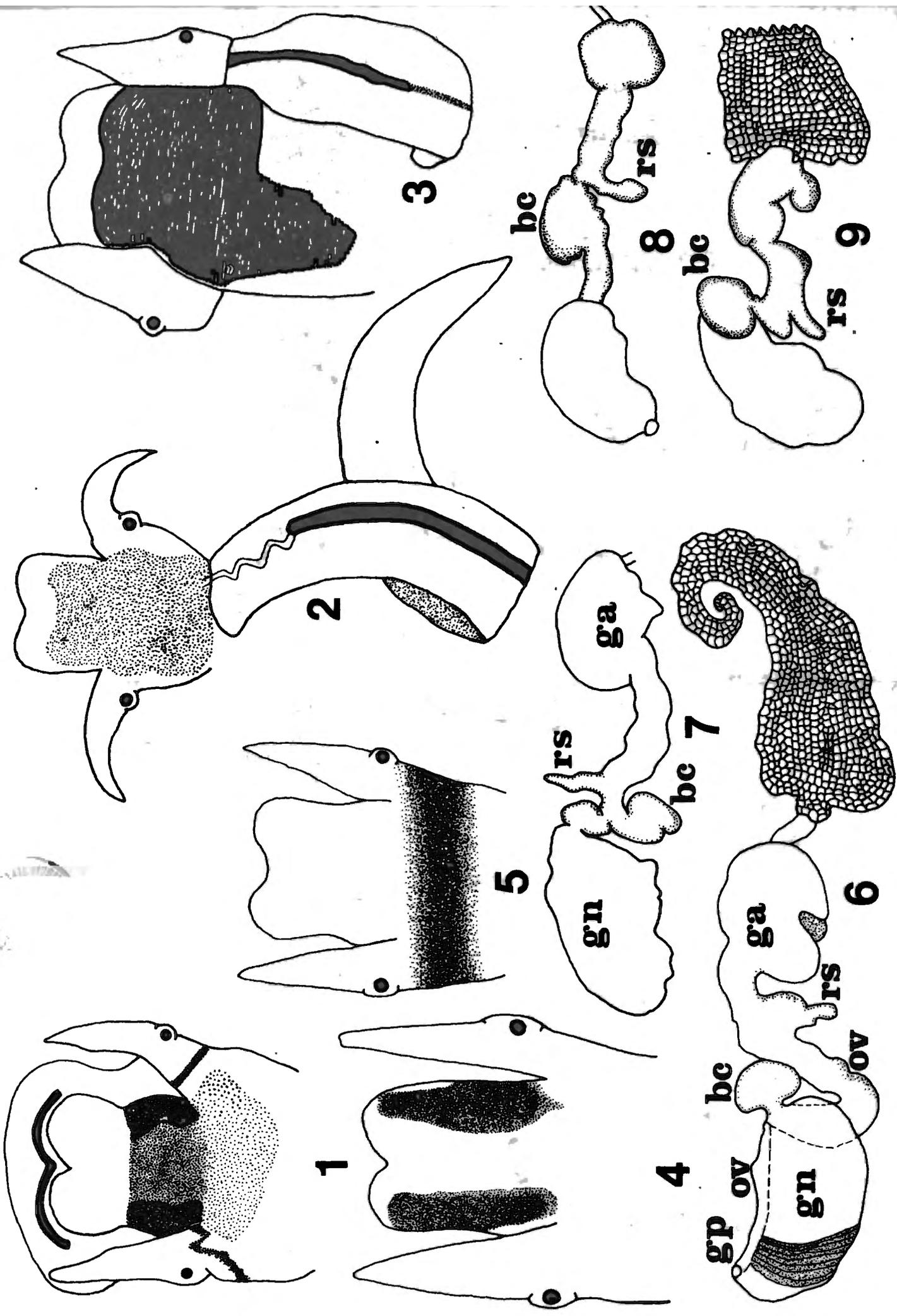


Fig. 4. *Rissoa membranacea* from Puck Bay: 1 - 5 - head pigmentation; 1 and 4 - 5 - females, 2 - 3 - males; 6 - 9 - female reproductive organs: 6 - complete, 7 - 8 - medial and distal section, 9 - without proximal part of ovary; bc - bursa copulatrix, ga - albuminoid gland, gn - gonopod, gp - gonopod, ov - oviduct, rs - receptaculum seminis

more than only one more a form (phenotype) of extremely variable R. membranacea (J. Adams, 1797). This opinion shares Palazzi (correspondence contact).

The variability of R. membranacea is as wide as to force many authors to regard the species as a complex one (among others Schwartz 1864, Mörch 1871, Meyer and Möbius 1872, Muus 1967, Rehfeldt 1968 and Nordsieck 1972). However, all the attempts at the division of R. membranacea into several separate species made so far seem doubtful in respect of their bases.

Accordingly, the numerous data show that this is one species, strongly genotypically polymorphic and showing a great ecophenotypical plasticity. For example, Rehfeldt (1968) found the correlation between the occurrence of morphs with different shell proportions, whorls' number, shape of the spire and dimensions, and some environmental factors like salinity or water movements.

Mars (1956) and Gostan (1966) noticed the occurrence of the morphs with smooth shells parallelly to the morphs with ribbed shells. At the most strongly freshened stations they found the smooth morph only, so the scarceness of the ribbed morph in Puck Bay confirms their observations. The environmental stress of another character than enlowered salinity also stops the production of ribs, similarly as in other Rissoa. Cuchcin (1975) observed that in laboratory conditions the offspring of the ribbed form was always smooth.

Among numerous described forms of R. membranacea, f. baltica Nils-son, which is very similar or even identical with the form from Puck Bay, is worth of attention; f. baltica is known from the Baltic Sea: from Straights to Rugia Island, occurring at a salinity not less than 7‰, so the salinity in Puck Bay is equal to the lower limit of the salinity range known for this form.

Rehfeldt (1968) described the types A and B within Danish R. membranacea. Besides the shell shape the types differ in their pigmentation and life history as well. The types were distinguished on the basis of the value of the diameter of the first half of the whorl of the embrional shell. In the type A - with a pelagic larve - the diameter is 85 μm , while in the type B - without a pelagic larve, the development inside the capsule to the stage of a creeping gastropod - 120 μm . In the specimens from Puck Bay the diameter was 75 - 100 - 110 μm , and the variability within this range was continuous. This neither confirms the occurrence of one of the types described from Danish waters in Puck Bay, nor lets one deduce the mode of development of the Polish R. membranacea.

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RISSDA (RISSOSTOMIA) MEMBRANACEA (J. ADAMS, 1797)

(GASTROPODA: PROSOBRANCHIA: RISSOIDAE)

W ZATOCE PUCKIEJ (POŁUDNIOWY BAŁTYK)

Streszczenie: W pracy podjęto próbę dokładniejszego opisu morfologiczno-anatomicznego zamieszkujących Zatokę Pucką przedstawicieli podrodzaju Rissostomia, a także ustalenia ich pozycji systematycznej. Opisano muszlę i jej zmienność, podkreślając, że przy dużym zakresie zmienności większość ślimaków mieści się w jej zdecydowanie wąskim zakresie. Podkreślono cechy charakterystyczne muszli, omówiono też nieczęste występowanie barwnych plam i żeber. Opisano krótko morfologię części miękkich i, szerzej, pigmentację głowy, podkreślając znaczną zmienność tej pigmentacji i brak cech charakterystycznych. Podano zakresy zmienności liczby lamelli skrzela u samic oraz u samców, podkreślono brak cech charakterystycznych tarki. Wskazano na brak prostaty w męskich narządach rozrodczych i występowanie proporcjonalnie ogromnego prącia, którego zmienność omówiono. Podobnie opisano żeńskie narządy rozrodcze, charakteryzujące się małą zmiennością. Krótko omówiono protokonch.

Wskazano, że polskie okazy Rissostomia odpowiadają, przynajmniej w odniesieniu do cech istotnych, opisom i rysunkom w literaturze dla R. membranacea. Potwierdza to porównanie ich z okazami spoza Bałtyku. Zwrócono uwagę na ogromny zakres zmienności R. membranacea, który był powodem uważania jej przez licznych badaczy za gatunek zbiorowy. Autor uważa, że - przynajmniej na obecnym poziomie wiedzy o Rissoidea - R. membranacea trzeba uznać za gatunek wybitnie polimorficzny i plastyczny ekofenotypowo, a nie podejmować prób jego podziału, zwiększających jedynie i tak znaczny chaos w systematyce tej rodziny.