

RISSOA (PUSILLINA) INCONSPICUA ALDER, 1844 SUBSP. *ALBELLA* LOVEN, 1846 COMB. NOVA (GASTROPODA: PROSOBRANCHIA) FROM POLISH BALTIC

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ABSTRACT: In the paper the author describes Polish representatives of the subgenus *Pusillina* (Rissoa: Rissoidae). The characteristics of the shell features and their variability (especially of the ribs) is given. Next the protoconch, ctenidium, osphradium and male reproductive organs are concisely described. A more detailed description of the head pigmentation (within which three types: A, B, and A + B are distinguished), penis variability and female reproductive organs (showing some very characteristic features) is given. Finally, the author lists the differences between the Polish *Pusillina* and the data in the literature on *Rissoa albella*, *R. benzi* and *R. inconspicua*. Basing on this, the author considers *R. albella* a probable subspecies of *R. inconspicua*, and the Polish *Pusillina* being identical with *R. inconspicua albella*.

KEY WORDS: shell variability, protoconch, ctenidium, osphradium, head pigmentation, reproductive organs, penis

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Abstract: In the paper the author describes Polish representatives of the subgenus Pusillina (Rissoa: Rissoidae). The characteristics of the shell features and their variability (especially of the ribs) is given. Next the protoconch, ctenidium, osphradium and male reproductive organs are concisely described. A more detailed description of the head pigmentation (within which three types: A, B, and A + B are distinguished), penis variability and female reproductive organs (showing some very characteristic features) is given. Finally, the author lists the differences between the Polish Pusillina and the data in the literature on Rissoa albella, R. benzi and R. inconspicua. Basing on this, the author considers R. albella a probable subspecies of R. inconspicua, and the Polish Pusillina being identical with R. inconspicua albella.

INTRODUCTION

Falniowski, Dyduch and Smagowicz (1977) first time recorded in Puck Bay (Polish Baltic Sea coast) the occurrence of the representatives of the genus Rissoa (Fréminville) Desmarest, 1814: one species from the subgenus Rissostomia Sars, 1878, and two species from the subgenus Pusillina Monterosato, 1884 (= Turboella (Leach) Gray, 1847: the nomenclature of subgenus level is acknowledged after Coan 1964). This paper is an attempt at more exact and detailed description, as well as determination of the systematical status of the representatives of subgenus Pusillina inhabiting Puck Bay.

Rissoidae are known one of the least known groups of the European gastropods, and their systematics is full of doubts and controversies.

Unfortunately, one can suppose that the situation would not change in the nearest future, because the revision of this rich in taxons group, basing on the present level of the knowledge, seems to be simply impossible. Nevertheless, every attempt at marshalling of the data, even a contributory and provisional one, seems needed if not necessary.

SHELL DESCRIPTION

The shells of Pusillina occurring in Puck Bay are presented in Figs 1,1 - 1,18 and 2,1 - 2,16. They are conical or conically-oval less often slightly turreted. The spire moderately elongate and rather variable. The value of proportion between the shell breadth and height very variable, and then the shells may be, in extremal cases, rather stocky or evidently slender. The apex rather blunt, the corrosion of the oldest whorls very rare. Whorls number: $5 \frac{1}{4}$ - $5 \frac{3}{4}$ - 6 - $6 \frac{1}{2}$. The whorls moderately convex and the suture well marked but moderately deep. The whorls convexity and suture depth hardly variable.

Whorls breadth grows regularly and moderately rapidly. The body whorl equals in height more than a half of the shell. A wide variability of the convexity of the body whorl, which can be from completely uninflated to rather markedly inflated, can be observed. On the body whorl a more or less visible keel, parallel to the suture, is observable. At the keel ribs terminate, if present.

The outline of the aperture is variable, from broadly- to elongately oval. Down close to the columella the mouth rather strongly or strongly elongated, the corner at its upper left side weak or absent, nearly always rounded. The peristome never continuous. The parietal lip narrow and short, showing the outline of a spherical triangle or a half of ellipse. No outer lip, the margins of the mouth thin. The umbilicus covered by the parietal lip, then absent; in only 2.1% of the snails studied I found the umbilicus, in the form of a narrow slit.

Shell dimensions: males: height 2.2 - 2.9 - 3.3 mm, exceptionally up to 3.7 mm; breadth up to 2.3 mm; females: height 2.1 - 2.8 - 3.0 mm, exceptionally up to 3.7 mm; breadth up to 2.3 mm. As one can see, the ranges for the males (Figs 2,1 - 2,16) and females (Figs 1,1 - 1,18) are the same, but commonly the females are somewhat bigger. The other features, like the whorl convexity or suture depth seem identical in both sexes.

The walls of the shells from Puck Bay are thin to moderately thick. The shell surface smooth, slightly glossy or matt. A delicate spiral dotting often visible, though I have never observed any conspicuous

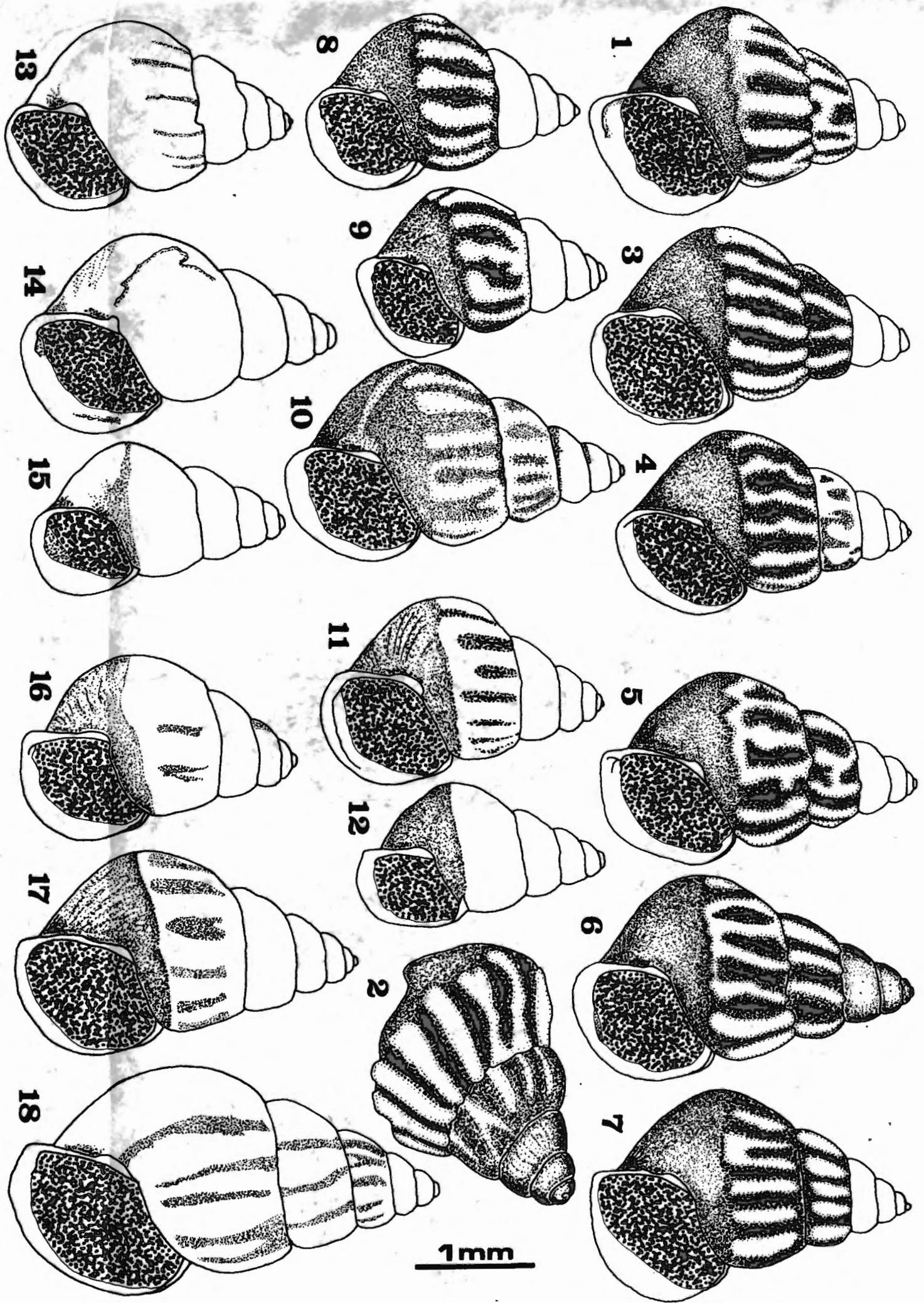


Fig. 1. 1 - 18: *Rissoa inconspicua albella* from Puck Bay, shells of females

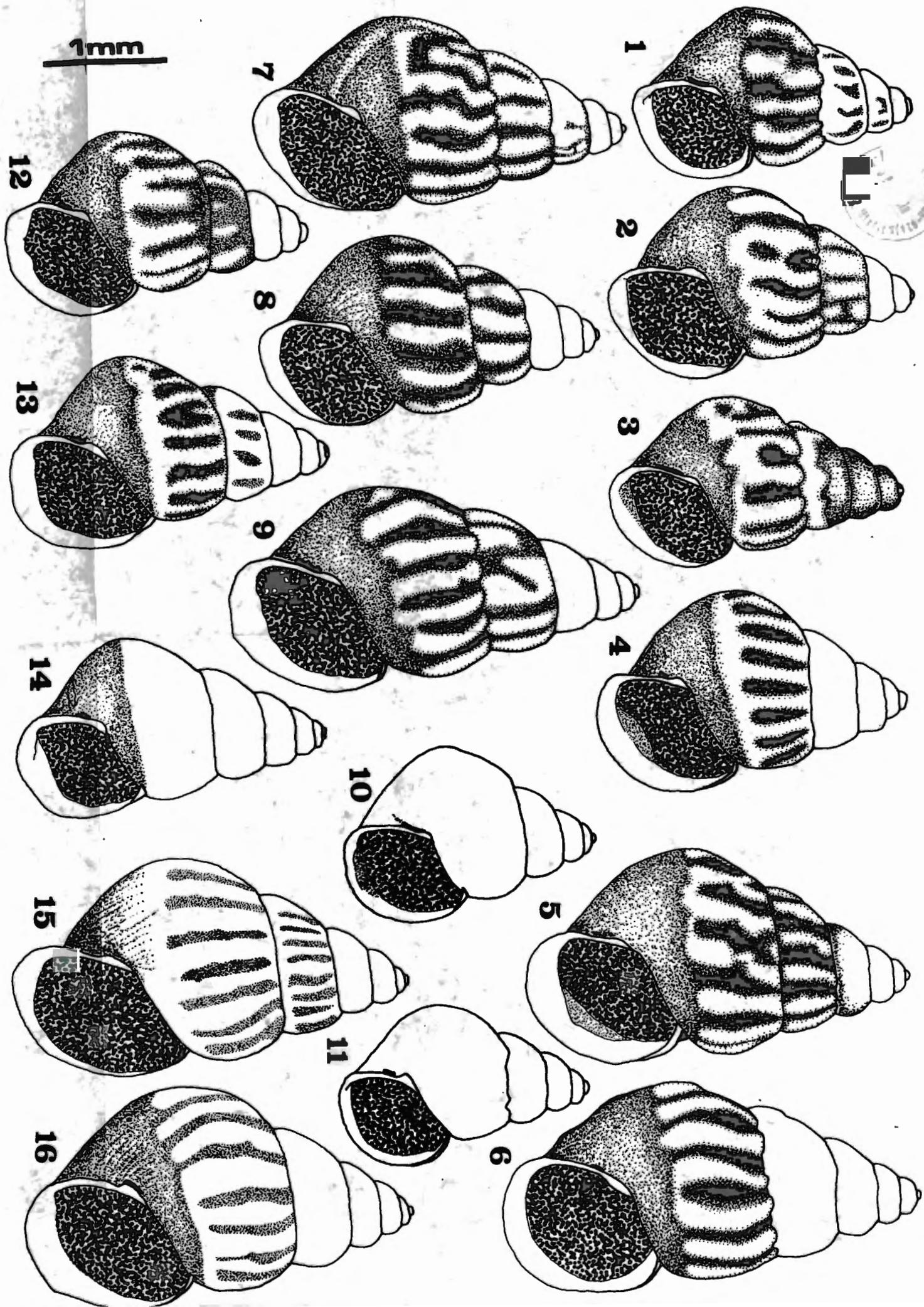


Fig. 2. 1 - 16: *Rissoa inconspicua albella* from Puck Bay, shells of males

spiral sculpture. The shell creamy yellowish, creamy brownish, yellowish, or brownish. In 78.5% of the studied specimens I have found the occurrence of longitudinal spots. The spots are usually associated with the ribs lying between the latter, however, in 25.2% of the specimens the spots were present on the shells with no ribs. The spots yellowish, light brown or brown. The outline of the spots often with a bend or undulate. The spots sometimes may be very poorly, but usually strongly or very strongly marked.

RIBS OCCURRENCE AND DIFFERENTIATION

In the studied material from Puck Bay 46.7% of the snails had smooth shells, which means the shells without as well as with spots, but always with no ribs. The remaining 53.3% of the shells were with ribs; among them 36% with very poorly developed ribs, 13.6% with moderately marked ones, and only 3.7% with very strong ribs. The whole range of variability is presented in the pictures (Figs 1,1 - 1,18 and 2,1 - 2,16).

The ribs never occur at the oldest whorls, however, they appear rather early - the correlation between the lack of ribs and the small dimensions of the shell is evidently weak. The first ribs are smaller, distributed less numerous and less regularly than the following ones. At the surface of the older whorls there are often wide gaps between a couple of first ribs or groups of ribs. The ribs arrangement on the younger whorls is also not very regular.

The ribs relatively flat and broad, arched or bent (slightly zigzagged). At the surface of the body whorl the ribs terminate about the keel, at the older whorls they run from suture to suture. The ribs often connected with each other by irregular junctions at their upper as well as at bottom side. In the majority of ribbed specimens, especially in those bigger, the ribs on the penultimate whorl are marked more strongly than the ones on the body whorl. Usually the higher rib number per whorl the less conspicuous ribs.

The maximum number of ribs per whorl is different in the males and in the females. In the females: 12 - 20, but in 50% of the studied females there were 14 ribs per whorl, and in 20% - 16. In the males the range of variability was wider: 9 - 22 ribs per whorl, and the distribution of the noticed numbers was less contagious. 30.8% of males had the shells with 11 ribs per whorl, 23% - with 12, and 15.5% apiece - 15 and 16 ribs per whorl. It is well to add that inside the given ranges the variability was not continuous: not all of the values inside them were actually noticed.

The total number of the ribbed whorls per the male shell was $1 \frac{1}{4}$ - $2 \frac{1}{3}$. About 40% of the ribbed males had the shells with two ribbed whorls, and about 20% - with $1 \frac{3}{4}$. The total number of the ribbed whorls per the female shell was $1 \frac{1}{2}$ - $2 \frac{1}{2}$; about 40% of the ribbed females had $2 \frac{1}{2}$ whorls with ribs, and about 20% apiece - $1 \frac{1}{2}$ or two. In all the ribbed females studied ribs were present to the very end of the body whorl, reaching the margins of the mouth. In the males the same pattern was observed in 22% of ribbed specimens only, while in the remaining ones the last rib was situated $\frac{1}{4}$ - $\frac{2}{3}$ of the whorl from the margins of the aperture: in 45% the distance from the mouth was $\frac{1}{4}$ of the whorl, and only in 11% as much as $\frac{2}{3}$.

SHELL VARIABILITY

The shell variability shows the typical of Rissoidae character. It is marked in the habitus, slenderness (an especially wide variability), the inflatedness and height of the body whorl, and in the form of the keel on the body whorl (a wide variability of all these features). It can be observed as well in the outline of the aperture (including the form of the angle and the elongation), the shell dimensions and wall thickness (rather a slight variability). Another part of the variability is associated with the shell colouration, its spotted pigmentation and ribs. Nothing exact is known about the background of the shell variability. It seems very probable that we observe an example of the genotypical polymorphism. Due to a low salinity - about 7‰ in Puck Bay - the gastropods are smaller than the ones occurring in higher salinities. The sexual dimorphism, as it could be seen in the drawings, is slightly expressed, with an exception of the ribs pattern.

There is a number of papers devoted to the variability of ribs in rissoids, among them in the subgenus Pusillina. Rissoa parva (Da Costa, 1779) is a commonly known example of the age variability of ribs (Gostan 1958, Fretter and Graham 1962). In this species the smooth shell is characteristic of the young snail having the rudimentary reproductive organs. The following stages of the development of the reproductive organs appear along with the formation of the first rib and an angulated outer lip, then numerous ribs and a rounded outer lip. The maturity is manifested in the presence of the labial rib.

Rissoa interrupta (Adams, 1798) in northern seas forms often the populations consisting entirely of unribbed specimens (Verduin 1976). Wigham (1975) observed in R. parva seasonal changes - not very regular, however - in the ratio of the ribbed to smooth specimens numbers. In spring and summer the ribbed gastropods dominated, while in late winter

and early spring the smooth ones prevailed. In summer there occurred the intermediate specimens: between smooth and ribbed, whereas in winter the intermediates between ribbed and smooth. The Wigham's data seem to show that an environmental stress, like a low temperature, intensive waves action, food shortage, and probably also pollution, after reaching some level that alters with an individual, stops the rib formation. Wigham (1975) regards the ribs formation as not genotypically determined, but Verduin (1976) doubts in this opinion.

PROTOCONCH

The protoconchs of Pusillina from Puck Bay are smooth, with no distinct sculpture. The diameter of the nucleus: 60 - 70 - 80 μm , the diameter of the first half of the whorl: 100 - 120 μm . The dimensions are thus even smaller than those given by Verduin (1976) for Pusillina species with the small protoconch, which means characterized by the pelagic larve stage in the life history.

SOFT PARTS MORPHOLOGY AND PIGMENTATIONS

The metapodial tentacle styliform, moderately big. The head and foot translucent, either whitish or whitishyellow or light brownish. The visceral hump often very intensively darkly pigmented. Besides the hump only the snout and the area behind the latter are pigmented: the tentacles always unpigmented and colourless (Figs 3,1 - 3,6). The observed pattern of pigmentation varies from very delicate, sometimes even hardly visible brownish colourations through intensively black, dispersed dots to dark brown or completely black continuous spots of undifferentiated intensity. Three types of the pigmentation pattern: A, B, and A + B were observed.

The pigmentation pattern type A (Figs 3,1 - 3,2) consists of spots located posteriorly to the snout, while the entire snout is unpigmented. At the pigmented area there are two triangular spots of pigment lying on both sides, the basis of each triangle arranged parallelly to the lateral margin of the head at its side. The size as well as the intensity of these spots are variable. The spots are always approximately triangular in shape although they may be a little irregular; they are always arranged symmetrically or nearly symmetrically to each other. I found the pigmentation of type A in all the studied males; it was also the most common type of pigmentation in the females, characterizing 44% of the examined females. In the other females I noticed the

pigmentation patterns of type B, or A + B, or complete lack of pigment on the head.

The pigmentation pattern type B (Figs 3,3 - 3,5) is characterized by the lack of pigment posteriorly to the snout, and by the occurrence of pigment at both the lateral sides of the snout. The intensity of pigmentation, although often very high, is variable. The pigmentation pattern in the form of broader or narrower belts, running along nearly the entire snout except its very short distal section (Figs 3,3 - 3,4), or in the form of rather broad spots limited to the short proximal section (Fig. 3,5) of the snout. The pattern B I found in only 12% of females.

In about 22% of females the spots of the type A occurred along with the snout pigmentation of type B. This pattern being the combination of both the patterns described above (including the whole ranges of their variability) can be designated as A + B (Fig. 3,6).

Within all the types of pigmentation pattern more than a half of snails of both sexes were characterized by poor or very poor pigmentation. Moreover, in 22% of the studied females there was no pigment on the head.

CTENIDIUM AND OSPHRADIUM

The number of ctenidium lamellae in the males oscillated within the range: 14 - 19, mean value: 16, standard deviation: 1.66. The range for the females was: 16 - 22, mean value: 19, standard deviation: 2.39. Osphradium in the form of a rather uncompact and broad zigzag.

RADULA

The radula is typical of Rissoa, without any characteristic features. It was described by Falniowski, Dyduch and Smągóicz (1977).

MALE REPRODUCTIVE ORGANS

The male reproductive organs of Polish Pusillina are very similar to those described by Johansson (1939) for Rissoa inconspicua Alder, 1844, and typical of Rissoidae. Along the pallial section of the vas deferens there is a long and broad prostate (Figs 3,7 - 3,8), partly parallel to the rectum. The occurrence of the prostate is accompanied with the lack of glandular epithelium inside the canal of the small penis; this does not confirm the data of Fretter and Graham (1962).

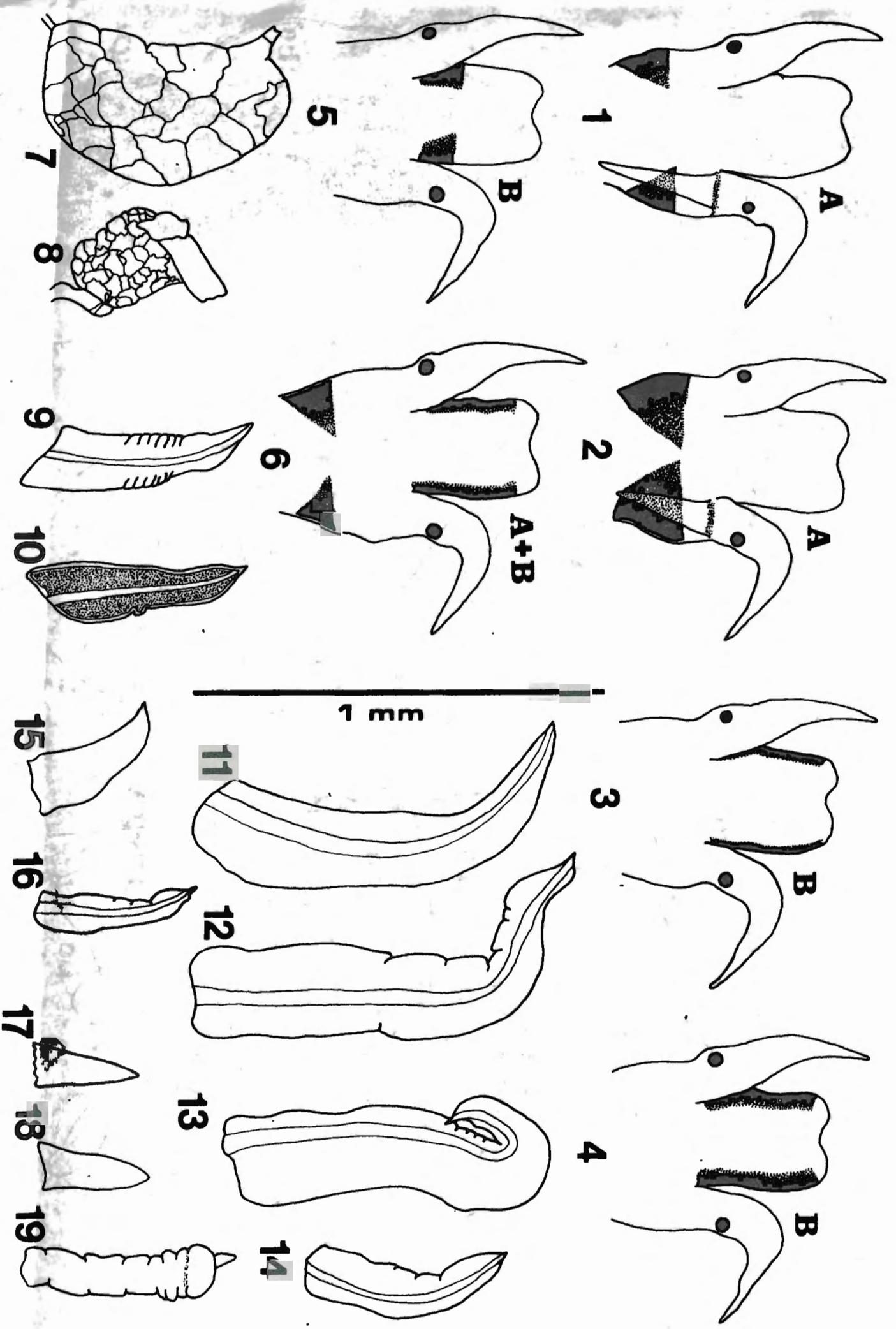


Fig. 3. *Rissoa inconspicua albella* from Puck Bay: 1-6 - types of head pigmentation pattern; 7-8 - prostate; 7 - dorsally, 8 - ventrally; 9-19 - penes

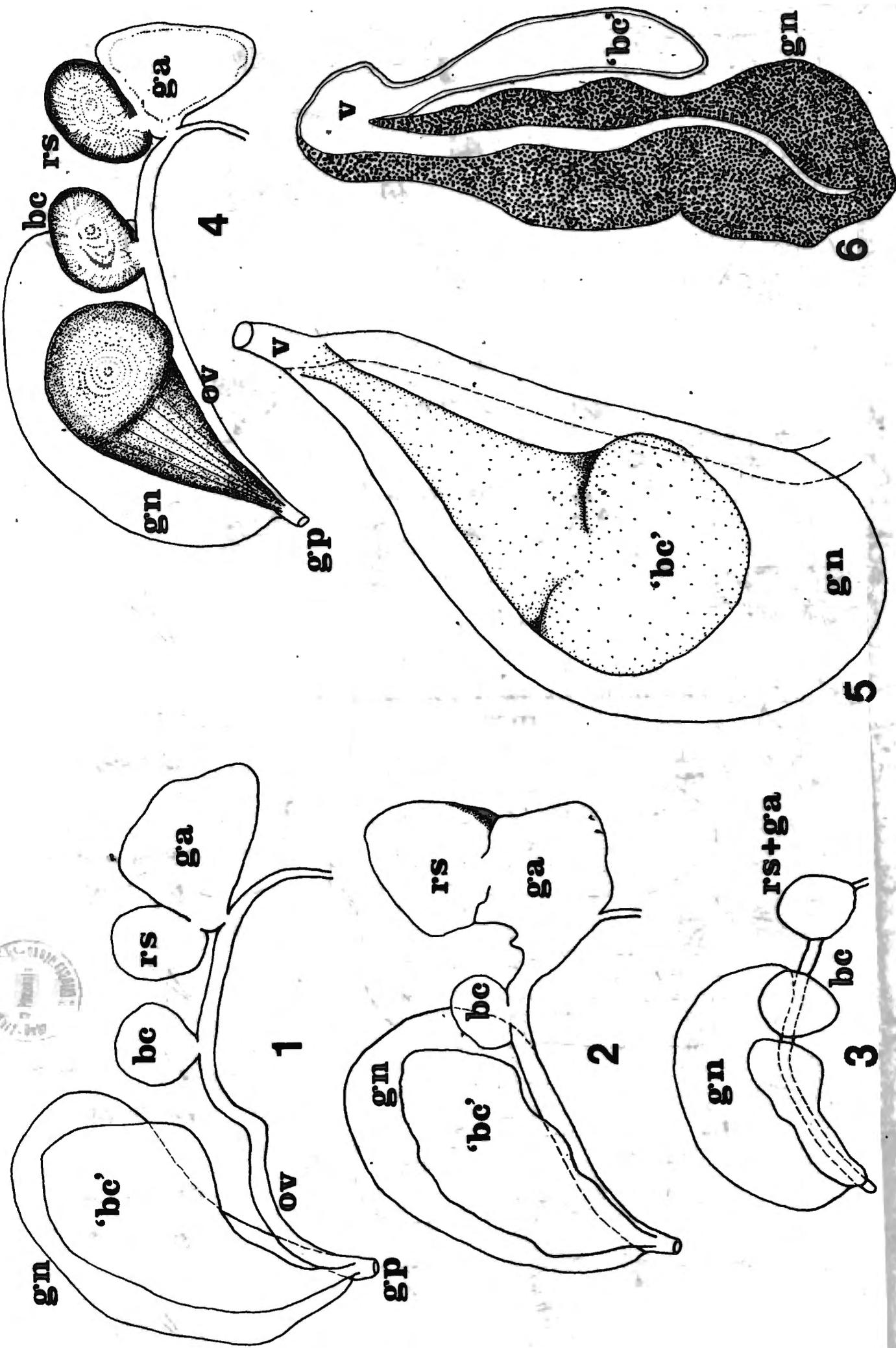


Fig. 4. *Rissoa inconspicua albella* from Puck Bay, medial and distal section of female reproductive organs: 1-4 - habitus of this section; 5 - habitus of nidamental gland and "lower" bursa copulatrix; 6 - longitudinal section of nidamental gland, "lower" bursa copulatrix and vagina (typically of *Rissoidae* not separated from lumen of nidamental gland): bc - bursa copulatrix, 'bc' - "lower" bursa copulatrix, ga - albuminoid gland, gn - nidamental gland, gp - gonoporus, ov - oviduct, rs - receptaculum seminis, v - vagina

PENIS

The uni-armed and simple penis is situated at the right side of the head, exactly along the continuation of the axis of symmetry of the right tentacle, and is directed backwards. The penis is rather small; some exemplary dimensions of it are as follows:

shell height (mm)	2.50	2.70	2.75	2.80	3.25	3.30	3.35	3.60	3.65
penis length (mm)	0.50	0.50	0.55	0.30	0.45	0.75	1.05	0.90	1.25

The length of the penis virtually equalled not less than 0.50 mm; the smaller penes were characteristic of the specimens intensively infected with larval trematodes. The relatively small dimensions are connected with the lack of a glandular epithelium inside the penis. This epithelium is unnecessary if there is a prostate. The penis bears no outgrowths; it is slender and rather not massive. Usually arched, it often terminates dagger-like. A rather thick and usually visible vas deferens runs along the middle of the penis. Besides the dimensions the variability of penis is very restricted.

FEMALE REPRODUCTIVE ORGANS

The structure of the female reproductive organs resembles that described by Johansson (1939) for R. inconspicua. The typical of rissoids upper accessory gland of the oviduct (albuminoid gland) is moderately big. The upper blind sac of the oviduct, being functionally the receptaculum seminis, passes into the lumen of the upper gland, not directly to the oviduct. This mode of organization is very characteristic (Figs 4,1 - 4,4). The lower blind sac of the oviduct, being functionally the bursa copulatrix, passes into the oviduct typically of all the Rissoi-
dae. It is moderately big and spheroid-like. Also the large bean-shaped lower accessory gland of the oviduct (nidamental gland), lying along the distal part of the oviduct, is typical of all the rissoids. The oviduct between the glands is narrow, unbroadened, what differs this Pusillina from some other Rissoa.

The oviduct terminates forming a thin-walled vagina. Into the vagina there passes a giant, also thin-walled, "lower bursa copulatrix" (Figs 4,5 - 4,6) lying along the lower accessory gland of the oviduct. This structure does not occur in any other Rissoa whose anatomy has been studied so far (Johansson 1939, author's own observations). It is in the shape of an elongated sac narrowing towards the outlet into the vagina, but without a markedly distinguishable duct. The variability of the female reproductive organs is very restricted.

DISCUSSION ON THE SYSTEMATIC POSITION OF POLISH PUSILLINA

* Falniowski, Dyduch and Smagowicz (1977) recorded from Puck Bay two species from the subgenus Pusillina: Turboella benzi (Aradas et Maggiore, 1843) and T. sarsi (Lovén, 1846). The description of the variability presented above, this of the shell as well as that of the other structures shows that the subgenus Pusillina is represented in Puck Bay rather by a single, very variable species. Moreover, this variability shows the continuous and typical of Rissoidae character and, virtually, it is observable only in the form of the shell.

Nordsieck (1972) and numerous other authors regard Mediterranean Rissoa benzi, which inhabits Straight of Messina, as identical with R. albella Lovén, 1846 which occurs in Kattegat Straight. Verduin (1976) points out the differences between these two taxa. He emphasizes also a long distance between the ranges of their distribution as well as the absence of R. benzi anywhere outside Straight of Messina. R. benzi seems to be a narrowly specialized species, separate from R. albella. Additionally, the Polish specimens are markedly different from those of R. benzi from Straight of Messina.

Numerous authors (Schwartz 1863, Meyer and Möbius 1872, Nordsieck 1972 and Jaekel 1976) give the descriptions and drawings of R. inconspicua Alder, 1844 which suggest that the Polish Pusillina belong to this species. Especially the specimens described and drawn by Meyer and Möbius (1872) are virtually identical with the Polish ones. On the other hand, in comparison with the descriptions of R. inconspicua of Ziegelmeier (1966), McMillan (1968), Graham (1971) and Verduin (1976) there are three constant differences:

1. Polish specimens are bigger than those of R. inconspicua (the shell height up to 3.7 mm, while in R. inconspicua up to 2.0, exceptionally 2.9 mm).
2. The spiral sculpture in Polish Pusillina is poor or extremely poor, while in R. inconspicua - often very strongly marked.
3. In Polish specimens the number of ribs (9 - 22) is lower than in R. inconspicua (16 - 50).

The existence of such remarkable differences of opinions in the literature explains Verduin (1976). He points out that Schwartz (1863) erroneously described the shells of R. albella as the typical of R. inconspicua.

Pusillina from Puck Bay corresponds with the descriptions and drawings of R. albella (among others McMillan 1968, Palazzi 1978), however, the sutures of the Polish Pusillina are less deep, and the habitus of their shells is rather more similar to R. inconspicua than to R. albella.

la. Moreover, the number of ribs in the Polish specimens may be higher than the one recorded for R. albella. Verduin (1976) considers R. albella a northern species; McMillan (1968) gives the distribution of the species: from English Channel to Thurso.

CONCLUSIONS

The data presented above, especially:

- a. the described wide variability of R. inconspicua,
- b. the restriction of the differences observed between R. inconspicua and R. albella, these constant and rather univocally given, practically merely to the different maximum dimensions,
- c. the distribution of the two taxa,
- d. the ranges and character of the variability of various representatives of Rissoidae,

lead to considering of R. albella a subspecies or, possibly, only a form of R. inconspicua as well as to considering of the Pusillina inhabiting Puck Bay belonging to R. inconspicua albella. Anyway, this seems just the only solution of the problem of the systematic position of Polish Pusillina as long as there is no revision of all the European Rissoa, or at least of subgenus Pusillina alone, based on solid grounds.

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RISSOA (PUSILLINA) INCONSPICUA ALDER, 1844 SUBSP. ALBELLA LOVÉN, 1846
COMB. NOVA (GASTROPODA: PROSOBRANCHIA) Z POLSKIEGO BAŁTYKU

Streszczenie: W pracy podjęto próbę dokładniejszego opisu morfologicznego, a także ustalenia pozycji systematycznej wykazanych wcześniej z Zatoki Puckiej przedstawicieli podrodzaju Pusillina (Rissoa: Rissoidae). Opisano muszlę i jej zmienność, zwracając uwagę na cechy najbardziej charakterystyczne. Omówiono zmienność ubarwienia muszli oraz występowanie i zróżnicowanie żeber. Krótko zestawiono dane o podłożu zmienności muszli, zwłaszcza żeber. Omówiono krótko protokonch. Opisano zmienność ubarwienia części miękkich, a zwłaszcza pigmentacji głowy, wyróżniając trzy jej typy: A, B i A + B.

Krótko omówiono ktenidium i osphradium, podobnie męskie narządy rozrodcze, odznaczające się dobrze rozwiniętą prostatą. Następnie opisano zmienność prącia. Opis morfologiczny kończy omówienie ogólnej organizacji i cech charakterystycznych żeńskich narządów rozrodczych.

Na podstawie przedstawionej wcześniej zmienności poszczególnych cech uznano, że w Zatoce Puckiej występuje jeden gatunek Pusillina. Omówiono prawdopodobne stosunki systematyczne pomiędzy Rissoa (Pusillina) benzi, R. albella i R. inconspicua, uznając R. benzi za gatunek śródziemnomorski, różny od R. albella, a ten ostatni takson za prawdopodobny podgatunek R. inconspicua: za należące do tego ostatniego uznano Pusillina z Zatoki Puckiej.