



Jarmila KRZYMIŃSKA, Maciej WOŁOWICZ

***Parvicardium hauniense* (Petersen et Russell, 1971) in Holocene deposits of the Puck Bay (Baltic Sea)**

The bivalve *Parvicardium hauniense* (Petersen et Russell) is the first recorded from Holocene deposits of the Puck Bay. It has been found among numerous species of molluscs represented by both gastropods and bivalves. Richly represented are the gastropods: *Hydrobia ulvae* (Pennant), *H. ventrosa* (Montagu), *Theodoxus fluviatilis* (Linnaeus) as well as the bivalves: *Cardium glaucum* Bruguiere and *Mytilus edulis* (Linnaeus). *P. hauniense* (Petersen et Russell) is particularly abundant in the eastern part of the Puck Bay. The marine deposits in which *P. hauniense* (Petersen et Russell) has been found are dated at 6660–5570 years BP at the Rybitwia Shoal and 3170 years BP off the Hel Spit (R. Kramarska *et al.*, 1993), using the ^{14}C dating method. This may indicate the timing of both the transgression of the Littorina Sea and the first appearance of the species in that region.

INTRODUCTION

In the relatively rich palaeontological literature regarding the whole area of the Polish Baltic Sea coast there is little information on *Parvicardium hauniense* (Petersen et Russell) contrary to that on other species such as *Cardium edule* (Linnaeus) and *C. glaucum* Bruguiere. *P. hauniense* (Petersen et Russell) has been described as a small bivalve, its shell is poor in calcium carbonate, very thin, delicate and easily destructible. Shells of *P. hauniense* (Petersen et Russell) have often been falsely identified with young specimens of the species above mentioned (especially *C. glaucum* Bruguiere) or described in literature as *C. exiguum* (Gmelin) (e.g. H. G. Petersen, 1958; I. Brodniewicz, 1960, 1969).

An invalid name of the species as *C. exiguum* (Gmelin) had continued to be used in the malacological literature until 1971. Thanks to H. G. Petersen and P. J. C. Russell's (1971) studies its taxonomic status was ascertained and a type-species separateness confirmed by genetic investigations (J. E. Jelnes *et al.*, 1971). Originally the bivalve was named *C.*

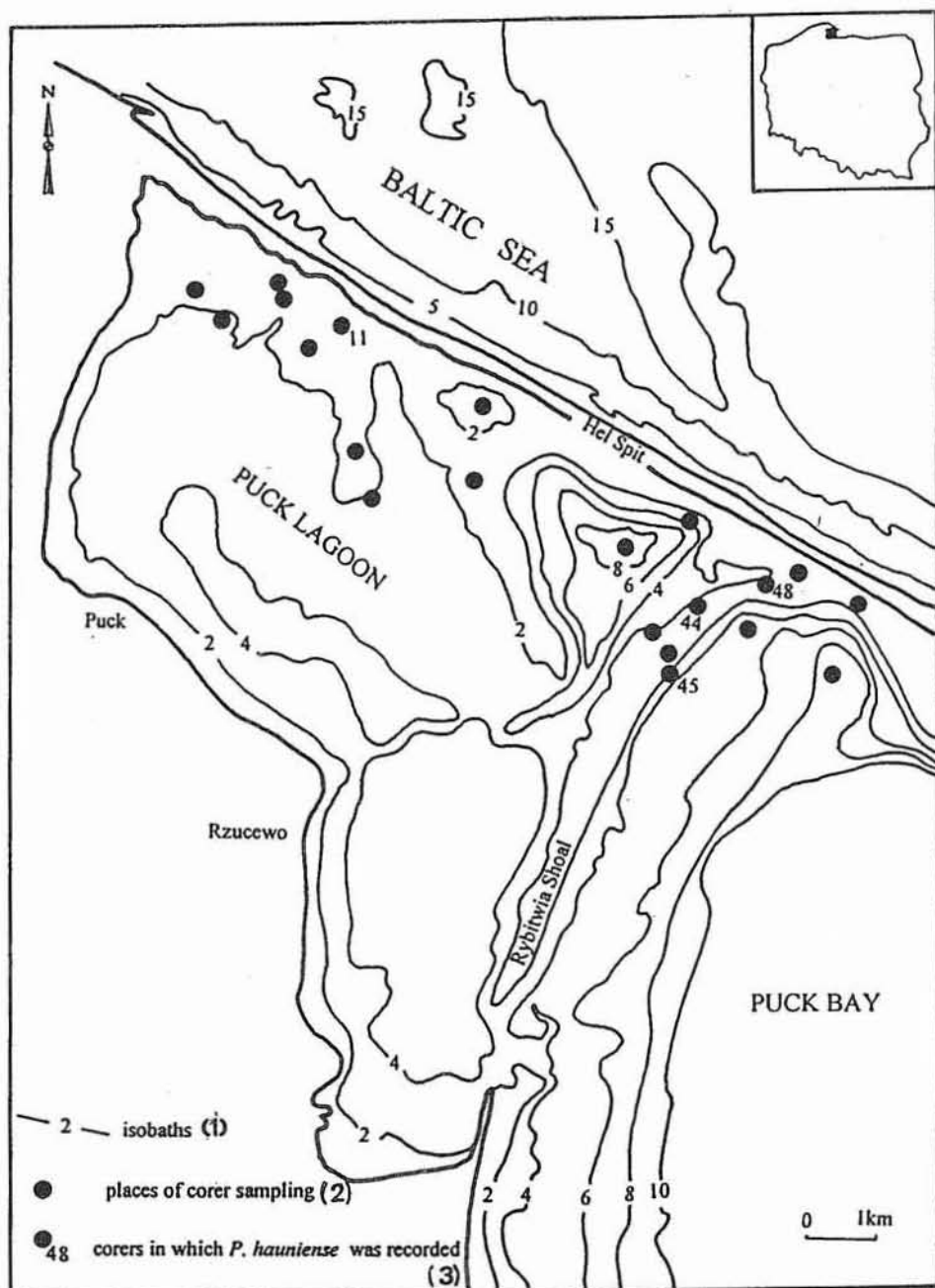


Fig. 1. Location of sampling points

Lokalizacja miejsc pobrania próbek

1 — izobaty, 2 — miejsce pobrania próbki rdzeniowej, 3 — próbki rdzeniowe, w których oznaczono *P. hauniense*

hauniense (*Haunium* is the Latin name for Copenhagen). In the Polish literature it has been termed tiny cockle due to its small size.

There is no reliable evidence now for a present-day or sub-fossil (apart from a piece of a shell showed in fig. 8, pl. III, I. Brodniewicz, 1960) occurrence of *C. exiguum* (Gmelin) in the southern Baltic and all data on the species should rather be referred to *P. hauniense* (Petersen et Russell).

Extent of *C. exiguum* (Gmelin) ranges from the Atlantic coasts of Europe (west Norway) to the Mediterranean Sea and the Black Sea (J. E. Jelnes *et al.*, 1971). It is absent in the southern Baltic chiefly due to low salinity (below 28 PSU).

MATERIAL AND RESEARCH METHOD

Investigations were carried out at the Marine Geology Branch of Polish Geological Institute. 21 samples were collected from the floor of the Puck Bay off the southern coast of the Hel Spit (Fig. 1). The sediment was sieved using a 0.1 mm-meshed sieve. Eight species of marine molluscs such as: *Hydrobia ulvae* (Pennant), *H. ventrosa* (Montagu), *Rissoa membranacea* (Adams), *Cardium glaucum* Bruguiere, *Macoma baltica* (Linnaeus), *Mya truncata* Linnaeus, *Mytilus edulis* (Linnaeus) and *Parvicardium hauniense* (Petersen et Russell) have been separated and labelled. *P. hauniense* shells were encountered in only four out of all the samples collected (Fig. 1). Both entire shells and their halves have been preserved. A great number of fragments, relatively easy for recognition owing to their characteristic ribs and sculpture, have also been found.

The greatest number of shells — 654, occurred at depth of 1.63–1.95 m in the eastern part of the Puck Bay (borehole 11). Lesser amounts were found as follows: at depth of 0.98–1.25 m — 41 (borehole 45), at depth of 2.98–3.10 m — 71 (borehole 48) and at depth of 3.10–3.15 m — only 5 (borehole 44).

SYSTEMATIC DESCRIPTION

Family **Cardiidae**

Genus *Parvicardium*

Parvicardium hauniense (Petersen et Russell, 1971)

(Pl. I, Figs. 1–4)

1971 *Cardium hauniense* (Petersen et Russell); H. G. Petersen, P. J. C. Russell: p. 13, figs. 1–2.

1973 *Cerastobysum hauniense* (Petersen et Russell); H. G. Petersen, P. J. C. Russell: p. 223–224, tabs. 1–2.

Description. — Compared with other *Cardium* species, morphology of *P. hauniense* (Petersen et Russell) is extremely invariable. It may be due to uniform conditions in which the species occurs. Its shell is small, reaching up to 10 mm in length (up to 8 mm

in the Puck Bay), slightly rounded and a little oval and egg-shaped. These characteristics bring it about somewhat oblique in appearance (Pl. I, Figs. 1, 2). At the summit as well as in the mid-posterior the shell is slightly inflated. Its margins remain serrated lifelong. The ribs are radial and separated by similar-sized interspaces. The amount of ribs ranges from 23 to 30 (H. G. Petersen, P. J. C. Russell, 1973). The specimens from the Puck Bay have 24–27 ribs. They are usually smooth but anterior and posterior ones may show several outgrowths or spines particularly when young (K. Wiktor, M. Wołowicz, 1987). The ribs display much differentiation in their development. Interspaces may be smooth or gently lined. These are growth layers. The periostracum is extremely thin, covering the whole shell except on the outgrowths (Figs. 3, 4). The entire shell is very thin, almost transparent and ribbed inside. Both the external and internal sides vary from white to black in colour mostly with brown-purple shade.

The ligament is flat and elongated (Pl. I, Fig. 1) extending half way towards the posterior margin. The hinge consists of two principal teeth. The large, peaked posterior tooth is twice as long as the anterior one which may be bent inwards and peaked, too. There are also two marginal teeth. The anterior-marginal tooth does not exist. The hinge of *P. hauniense* (Petersen et Russell) tends to lengthen out.

Ecological requirements. — *Parvicardium hauniense* (Petersen et Russell) is a stenohaline species which tolerates a salinity range from 6 to 12 PSU (H. G. Petersen, P. J. C. Russell, 1973), in the Puck Bay from 5 PSU, and apparently avoids sites of high freshwater influence. It can also withstand considerable temperature changes related to a low stand of sea level (lagoons, fiords, shallow gulfs) (B. J. Muus, 1967). During winters the species endures four-months (the Puck Bay) and even six-months (the Bothnia Bay) freezing, while in summers, a water temperature of 30°C. *P. hauniense* (Petersen et Russell) occurs in non-tidal basins of a maximum tidal range of 0.1m, largely on a sea floor overgrown by vascular plants (*Zostera* sp., *Ruppia* sp.) or macroalgae (*Fucus* sp., *Furcellaria* sp.). It is attached to them by byssus. In natural environments *P. hauniense* (Petersen et Russell) has been observed crawling by means of the byssus. The species occurs at depths of 0.5 to 40.0 m (H. G. Petersen, P. J. C. Russell, 1971).

Occurrence. — In the Baltic Sea, the *Parvicardium hauniense* (Petersen et Russell) occurrence area extends from the Aland Islands (R. Vainola, 1993) to the Jutland Peninsula and Kattegat (H. G. Petersen, P. J. C. Russell, 1971). It is considered an endemic species to the Baltic Sea. It also occurs in the Mediterranean Sea (M. Wołowicz, 1992). The species can be easily mistaken for young specimens of *Cardium glaucum* Bruguiere since they often occupy the same biotope.

CONCLUSION

It is well-known that *Parvicardium hauniense* (Petersen et Russell) is an endemic species to the Baltic Sea and so the following question should be put: when did the bivalve settle the area of the Puck Bay? That probably happened along with the transgression of the Littorina Sea. The ¹⁴C dating method of the marine deposits determining their age at 6660–5570 years BP at the Rybitwia Shoal and 3170 years BP off the Hel Spit may indicate the timing of the transgression of the Littorina Sea in that region (R. Kramarska *et al.*, 1993).

This can be confirmed by a typical marine fauna contained in the sediment studied. The influence of marine environment was especially well pronounced in the northeastern and southern margins of the Puck Bay where large spits, separating the bay from an open sea, were formed. A quiet bay overgrown with vegetation developed at that time. *P. hauniense* (Petersen et Russell) had probably found itself convenient living conditions and survived until the 1970s. In the 1970s *P. hauniense* (Petersen et Russell) occurred in great numbers, mainly with the vegetation of *Furcellaria lumbricaris* (Hudson) Lamour. and *Fucus vesiculosus* Linnaeus, reaching over 1600 specimens per square metre (average 160/m²) and the biomass up to 7.8 g/m² (average 0.5 g/m²) (M. Wołowicz, 1977). Since the end of the 1970s, along with a retreating of underwater meadows, the population had been diminishing in its quantity as far as almost complete disappearance in the early 1990s. Undoubtedly, it was due to the rapidly progressing degradation of the Puck Bay.

Translated by Krzysztof Leszczyński

Oddział Geologii Morza
Państwowego Instytutu Geologicznego
Sopot, ul. Polna 62
Instytut Oceanografii
Uniwersytetu Gdańskiego
Gdynia, Al. Marszałka J. Piłsudskiego 46
Received: 5.08.1996

REFERENCES

- BRODNIWICZ I. (1960) — Eemian marine molluscs from a boring in Brachlewo (Poland) (in Polish with English summary). Acta Paleont. Pol., 5, p. 35–253, no. 2.
- BRODNIWICZ I. (1969) — The distribution of the Bivalve species *Astarte elliptica* (Brown), *Astarte borealis* (Chemnitz) and *Cardium exiguum* (Gmelin) in the southern Baltic Sea (in Polish with English summary). Bad. Fizjograf. nad Polską Zach., 23, ser. B, p. 223–229.
- JELNES J. E., PETERSEN H. G., RUSSELL P. J. C. (1971) — Isoenzyme taxonomy applied on four species of *Cardium* from Danish and British waters with a short description of the distribution of the species (*Bivalvia*). *Ophelia*, 9, p. 15–20.
- KRAMARSKA R., MASŁOWSKA M., MICHAŁOWSKA M., TOMCZAK A., UŚCINOWICZ S., ZACHOWICZ J. (1993) — Zagadnienia geologiczne dna Zatoki Puckiej oraz brzegu Półwyspu Helskiego. Arch. Państw. Inst. Geol. Sopot.
- MUUS B. J. (1967) — The fauna of Danish estuaries and lagoons; distribution and ecology of dominating species in the shallow reaches of the mesohaline zone. Meddr. Danm. Fisk. Og-Havunders., 5, p. 157–165.
- PETERSEN H. G. (1958) — Notes on the growth and biology of the different *Cardium* species in the Danish brackish water areas. Meddr. Danm. Fisk. og-Havunders., 2, p. 1–31.
- PETERSEN H. G., RUSSELL P. J. C. (1971) — *Cardium hauniense* nov. sp. a new brackish water bivalve from the Baltic. *Ophelia*, 9, p. 11–13.
- PETERSEN H. G., RUSSELL P. J. C. (1973) — The nomenclature and classification of some European shallow-water *Cardium* species. *Malacologia*, 14, p. 233–234.
- RUSSELL P. J. C., PETERSEN H. G. (1973) — The use of ecological data in the elucidation of some shallow water European *Cardium* species. *Malacologia*, 14, p. 223–232.
- WIKTOR K., WOŁOWICZ M. (1987) — Characteristics of the *Cardium hauniense* (Petersen, Russell, 1971), population in the Puck Bay Proper. In: Proc. 4th BMB Symposium, Gdańsk, 1975, p. 266–272.

- WOŁOWICZ M. (1977) — The distribution and biomass of *Cardium glaucum* (Poiret, 1789) and *Cardium hauniense* (Petersen, Russell, 1971) in the waters of Puck Inner Bay (in Polish with English summary). *Zesz. Nauk. Wydz. Biol. Nauk o Ziemi UG, Oceanografia*, 5, p. 103–115.
- WOŁOWICZ M. (1992) — *Parvicardium hauniense*, an endemic species to Baltic brackish water, new to the Mediterranean Region. *J. Conch. Lond.*, 34, p. 139–141.
- VAINOLA R. (1993) — Pikkusydansimpukka Lounais-Suomessa. *Luonnon Tutkija*, 1, p. 33–34.

Jarmila KRZYWIŃSKA, Maciej WOŁOWICZ

**PARVICARDIUM HAUNIENSE (PETERSEN ET RUSSELL, 1971)
W OSADACH HOLOCENSKICH ZATOKI PUCKIEJ**

Streszczenie

Z dana Zatoki Puckiej, wzdłuż południowego brzegu Mierzei Helskiej, pobrano 21 próbek. Wyodrębniono i oznaczono 8 gatunków mięczaków morskich, takich jak: *Hydrobia ulvae* (Pennant), *H. ventrosa* (Montagu), *Rissoa membranacea* (Adams), *Cardium glaucum* Bruguiere, *Macoma baltica* (Linnaeus), *Mya truncata* Linnaeus, *Mytilus edulis* (Linnaeus), oraz w czterech próbkach opisywany *Parvicardium hauniense* (Petersen et Russell).

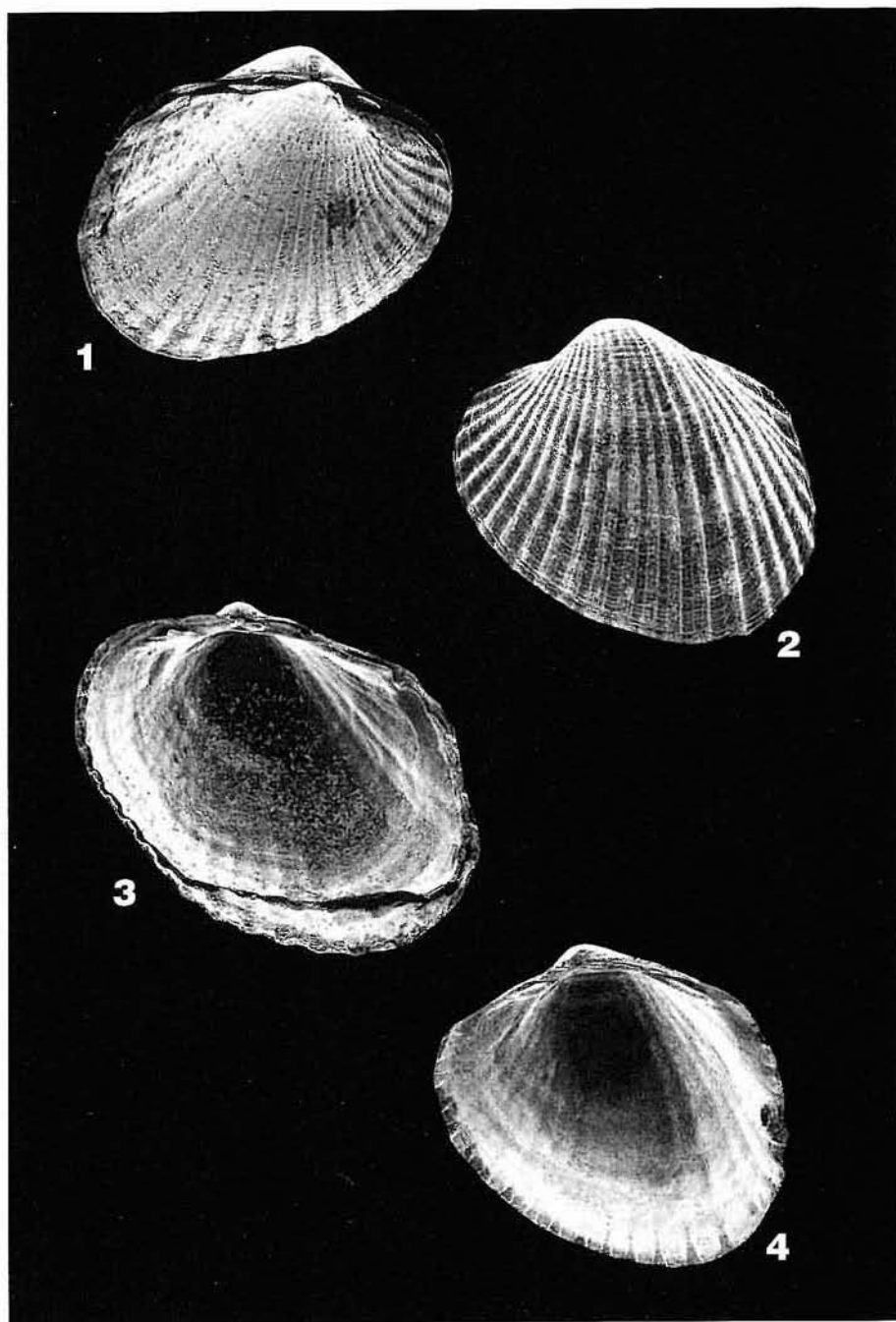
We wschodniej części zatoki szczególnie licznie reprezentowany był małż *P. hauniense* (Petersen et Russell), po raz pierwszy spotkany w osadach holocenijskich. Obecność jego stwierdzono dotychczas jedynie w wodach Zatoki Puckiej (M. Wołowicz, 1977). Wśród znalezionych okazów zachowane były całe muszle, ich połówki oraz liczne fragmenty stosunkowo łatwe do rozpoznania, dzięki charakterystycznym żebram i ich urzeźbieniu.

Datowania metodą ^{14}C osadów morskich, w których znajdował się *P. hauniense* (Petersen et Russell), określają wiek na 6660–5570 lat BP na przedpolu Rybitwiej Mielizny oraz 3170 lat BP na płycznach u brzegów Mierzei Helskiej (R. Kramarska i in., 1993). Może to wskazywać na czas transgresji morza lityrynowego i czas pojawienia się tego gatunku w tym rejonie.

PLATE I

Fig. 1–4. *Parvicardium hauniense* (Petersen et Russell)

Fig. 1 — x 23; Fig. 2 — x 25; Fig. 3 — x 34; Fig. 4 — x 22



Jarmila KRZYMIŃSKA, Maciej WOŁOWICZ — *Parvicardium hauniense* (Petersen et Russell, 1971) in Holocene deposits of the Puck Bay (Baltic Sea)