



## CHANGES TO THE COASTLINE IN THE NEIGHBOURHOOD OF THE MEDIEVAL HARBOUR IN PUCK, IN THE LIGHT OF THE RESEARCH MADE BY THE POLISH MARITIME MUSEUM IN GDAŃSK

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**Abstract.** The site was discovered in 1977 by amateur scuba divers. During preliminary excavation in the Puck Lagoon, a massive system of timber structures, fascine, and stone as well as earthen embankments scattered over an area of over 12 hectares, were found. Looking at the chronological arrangement of the site, slowly reconstructed on the basis of dendrochronological analyses and supplemented with radiological research, it should be assumed that the northern strip of the construction is a continuation of the quay strengthening construction, the root of a harbour pier. It is probably the earliest stage of the Puck harbour development. Taking both the layout of the construction, working as defences of the swampy alluvial estuary of the Płutnica river, parallel to the present coastline, as well as chronological layout of the stand, which gets younger and younger the closer it gets to the present shore line, it may be assumed that the changes in the location of the port construction were influenced by quite quick deepening of the basin and movement to the south of the medieval shore line.

**Key words:** archaeology, medieval period, changes of coastline.

### INTRODUCTION

Archaeological stand in Puck, described as relicts of a medieval harbour, was discovered by amateur divers in 1977. Since then, the research covering the definition of the object type, chronology as well as the role it played in particular phases of its activity, has been carried out with some pauses until the present time. It is the only case of a so well preserved harbour complex discovered in the Polish seawaters, so far.

The remnants of the medieval harbour in Puck are situated at the estuary of the Płutnica river, about 150 m away from the present coastline of the western part of the Puck Lagoon, in the inside part of the Puck Bay. The stand occupies over 12 hectares of the sea bottom. At present, the sea depth ranges there between 1.5 and 2.5 m. During the research, archaeologists discovered a log-boat, wrecks of planking boats, pottery (Fig. 1) as well as hundreds of wooden piles, which together with horizontal wooden structures and embankments of stone and soil, strengthened with fascine, were a part of the proper section of the stand (Stępień, 1984).



Fig. 1. Pottery from Puck site, 10–11 century

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## CHARACTERISTICS OF NATURAL ENVIRONMENT

The Płutnica Boggy (swampy) valley is space-limited to the north by Kępa Pucka, and to the south by Kępa Swarzewska (Fig. 2). The Puck Lagoon is separated from the Puck Bay by a sandbar called Rybitwia Mielizna. At present, it may be crossed at one isthmus only, however, according to some written sources, it may be assumed that in medieval times there existed another isthmus, from the open sea through the Czarna Woda and Płutnica rivers.

At the mouths of the rivers Płutnica and Reda entering the Lagoon, the shore is flat, consisting of alluvial and peaty-lacustrine formations poorly resistant to abrasion. On the other hand, the bottom of the Lagoon is rising there due to the constant supply of terrigenous material, which is thus reducing the rate of the coastal erosion (Jankowska, Łęczyński, 1993). This provides natural protection for cultural layers at the Lagoon bottom.



Fig. 2. Location of the reminds of medieval harbour in Puck

## HISTORICAL SOURCES

Since the beginning of the research works, the most important interpretation difficulties were connected with the large size of the discovered object. The additional difficulty was caused by the lack of written sources that would help to understand the role which the town of Puck played in early medieval times. The first piece of information comes from as late as the 13<sup>th</sup> century. Puck is described there as a medieval castellan city - one of fourteen cities with similar position, out of about 125 cities existing at that time in the area of Gdańsk and Slavonic Pomerania (Śliwiński, 1998).

Puck is situated in the area which belonged in medieval times to the Sobiesławice family who, after the conquest of Gdańsk Pomerania by Bolesław Krzywousty in 1116, were sent as deputies in order to consolidate the Gdańsk Pomerania integration with Poland. The recognition of the oldest proper-

ties location was possible thanks to the foundation privilege document of the Oliwa monastery, only. It is the oldest written document coming from Gdańsk Pomerania, most probably counterfeit from the forties of the 13<sup>th</sup> century, but it is based on an unpreserved original copy dated 1186.

The name Wieś Pucka appears first in 1220, in the privilege document given to the Cistercians by the Gdańsk prince Świętopełk. This document reports that it had been initially given as a present by prince Sambor I to the monastery but it was soon exchanged for the nearby village of Starzyno. The earliest information on the foundation of the castellan town in Puck comes from 1271, contained in the privilege document issued by Mściwoj II for the Cistercian monastery in Oliwa (Śliwiński, 1998).

## RESULTS OF ARCHAEOLOGICAL EXPLORATIONS, IN THE LIGHT OF DENDROCHRONOLOGICAL ANALYSES

During the inventory of the archaeological structures visible on the surface, the archaeologists came to the conclusion that its unusually large size may be connected both with the shifting of the Puck Bay coastline in early medieval times and gradual flooding of the coastal areas. It, in turn, forced building of the new coastal defences as well as moving inland the location of the fishing and boat building.

To prove this thesis, dendrochronological as well as geological and palynological analyses were made for the selected elements of wooden construction and boat (Fig. 3). Dendrochronological analyses concerned over 80 wood samples. Six dates are contained between 927 ±1 (sample 9F/93/D2) and 943 ±8–6 (sample 10G/4D/95) years, whereas

all samples collected from the constructions situated to the south indicated twelfth century (box constructions, samples 4/89 1163 and 6/89 1169) and the turn of thirteenth century (1/88 1295), or even the first half of the fourteenth century (five dates: 5/88 1321 to 10/88 1354) (Ważny, 1997). The only exception was a piece of a pile lying separately near the wreck P-2 which dated 907 ±6 (Ważny, 2001). It may have been, however, a material brought from the constructions located further to the north.

Observing the chronological layout of the site, which slowly emerges on the basis of the results achieved from dendrochronological analyses supplemented with radiological tests, it may be assumed that the northern belt of the stand is

a continuation of the construction strengthening the coast and forming the base of the port pier, and it constitutes the earlier (probably the oldest) phase of the Puck harbour development. It seems, then, not to be a part of a platform, coastal defences or

mooring piles connected to the chest constructions located in the middle part of the Puck stand (Pomian, Latałowa, Łęczyński, Badura 2000).

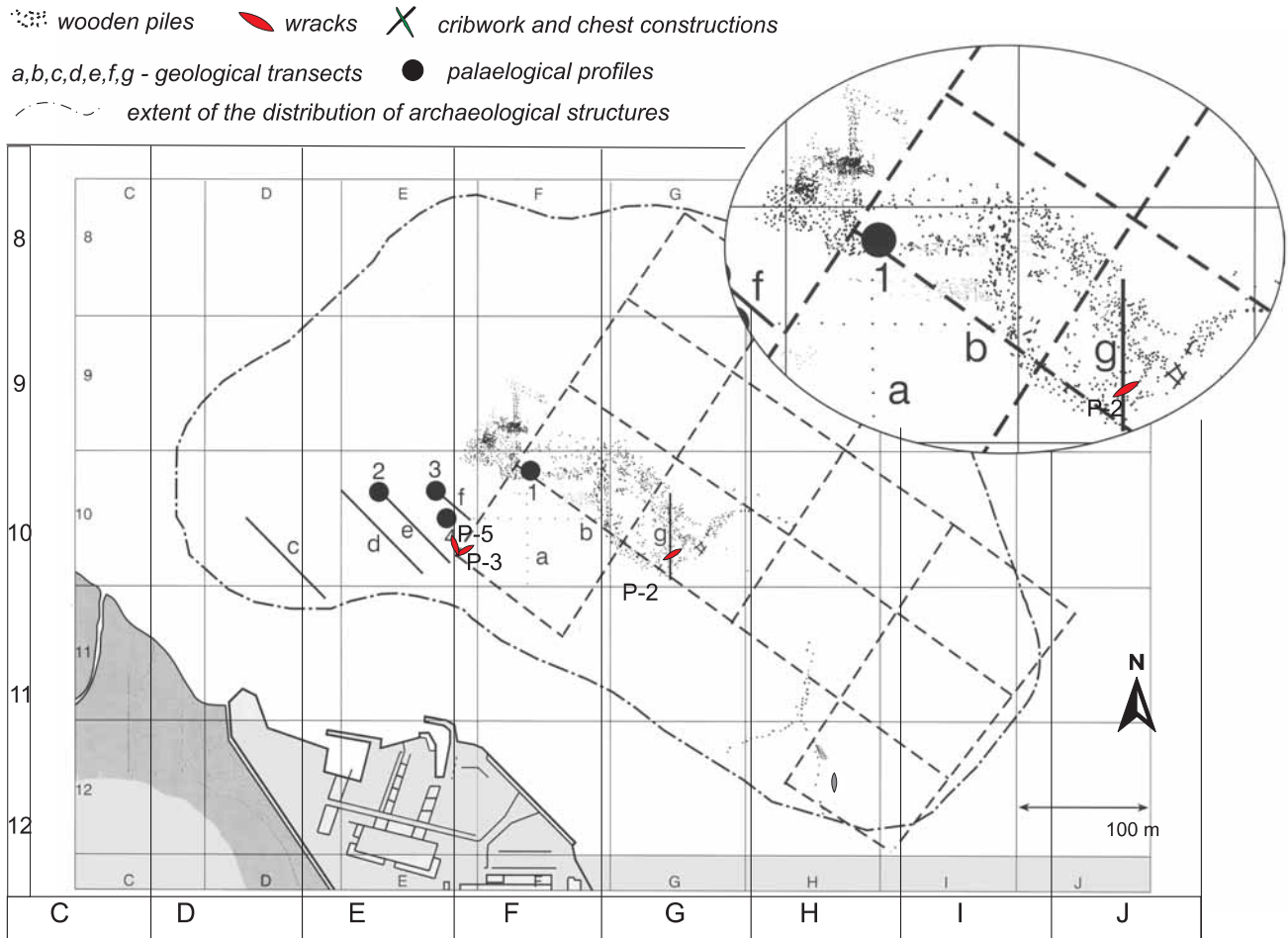


Fig. 3. Plan of the Puck site

### RESULTS OF ARCHAEOLOGICAL EXPLORATIONS IN THE LIGHT OF GEOLOGICAL AND PALAEOECOLOGICAL SURVEY

The sample materials for geological analyses were collected in 1994 by the Research and Consulting Enterprise „GEOMOR”. 21 drilling holes were carried out in hectare 10 F. The samples were collected up to the depth of 3 m, along two transects. The geological material, including macroscopic descriptions, was handed over to the Polish Geological Institute for further scientific examination. In 1996, a co-operation with L. Łęczyński from the University of Gdańsk was established. He examined the samples extracted in hectare 10 F. In order to complete the sampling, further drilling was made in hectares 10 D, 10 F, and 10 G. As a result of the research, it was discovered that in the most of the stand the late Holocene sea bottom sediment, connected with early medieval human activity, was destroyed. It was also confirmed by the radiocarbon dating,

which defined the age of  $8750 \pm 90$  years BP (Gd-10 176) of the top sediment layer (0.0–0.15 cm), in the profile WE/2, at the hectare 10 F (Pomian, Latałowa, Łęczyński, Badura, 2000).

The destruction of the upper sediment layer may have happened due to both some natural reasons and human activity especially in the recent years (deepening of the entry track to the fishing port as well as silting works).

These above works were supplemented by introductory palaeobotanic research carried out, in accordance with a contract of the Polish Maritime Museum, at the Palaeoecology and Archaeobotany Laboratory of the Chair of Plants Ecology and Wildlife Protection, of the University of Gdańsk. Four profiles located in hectares 10 E and 10 F were selected for the study (Fig. 3). Complete analyses of macroscopic remains of plants



Fig. 4. Remains of flax found inside wreck P-2

(88 samples) were carried out. The palynologic research concerned 20 extracted samples from the bottom and top layers of the organic sediments. The age of the sediment bottom layer, in three profiles, ranges between 10 000 and 9 000 years BP. Whereas the floor of the profile 10 E/59 appeared to be surprisingly young. It contains pollen of hornbeam *Carpinus*, beech *Fagus*, cereals (*Triticum* type, *Hordeum* type, *Secale* and *Cerealia*) as well as ribwort plantain *Plantago lanceolata*, which are characteristic of the late Holocene and which can be connected with early medieval times (Latałowa, Badura, 1998). The age of the top layer of the sediment may be divided into two groups: profile 1 and 3 represent the decline of the boreal period and the beginning of the Atlantic period. Whereas profiles 2 and 4 differ considerably from the previous ones. Both of them represent the late Holocene. They contain little but constant amount of hornbeam and beech, and also grain and other anthropogenic indicators, and they may represent earlier medieval times.

Profile 10E/59 no 4 is the most interesting. It was the only one where the late Holocene sediments were encountered directly on an older sediments, and where considerable, over a metre and a half thick sediment appeared which is most probably fully connected with early medieval times. M. Latałowa and M. Badura suggest that this profile is probably located at the site where there used to be a water track which was intentionally deepened or where boats used to be pulled towards the shore destroying at the same time the natural base (Latałowa, Badura, 1998). The created hollow could quickly be filled with debris after it had stopped to be used. Such an interpretation would explain the lack of cultural stratification connected with long lasting activity of the settlement and port on the remaining area, which is now under water. Specific location of the wrecks situated in the direct neighbourhood of the discussed area seems to confirm it.

Remains of two other boats were discovered next to profile no 4 (Fig. 3). The older one P-3 (12 c.), was lying in the higher layers than the wreck P-5 dated from the 13<sup>th</sup> century (Litwin, 1995). The stratigraphy of the sediments determined from an excavation in the southern end of the wreck suggests that it sank at the edge of the deepened basin/canal leading to the local

boat-building workshop. The location of the boat P-3 wreck, which looked as if it had been prepared for repair works, seems to confirm that. The appearance of a great number of wood-chips, from wood processing, around the wrecks and inside their hulls, was also characteristic (Kola, 1990).

Similar situation was observed during the study of wreck P-2. It is a remnant of a wooden boat with a specific construction being a mixture of Scandinavian and Slavic features (Stepień, 1987). The wreck was lying under a thick layer of sand and peat, along the south-western/north-eastern axis, at a depth of 190 cm. The starboard of the vessel's forebody stuck out from the sea bottom whereas the midship layed at the depth of about 80 cm. Towards the damaged stern part it appears again on the surface.

The wreck's construction was intentionally fixed to the sea bottom with the help of dowels of 5-7 cm in diameter. The bottom of the vessel in its starboard part and around the midship was carpeted with flax (Fig. 4). The undermast block had traces of burnt material and the remains of a fireplace were preserved in its neighbourhood.

Analysing the position of the wreck, the state of its preservation, and its content, it may be assumed that it was located in the coastline area, only partly submerged in water, and sometime used for soaking flax before its further processing. To protect the boats construction from sliding into water, it was fastened with the use of wooden dowels, 5-7 cm in diameter. The eastern part of the vessel occurring on the shore was used for bonfires, protected from the sea breeze by remains of boards (Fig. 5).

In the light of these observations, the newest dating, which verifies the previous results, appears to be very interesting. During the research performed in the nineteen eighties, samples of wood were extracted from the staves of the wreck P-2 plating as well as from the fascine fastening the construction to

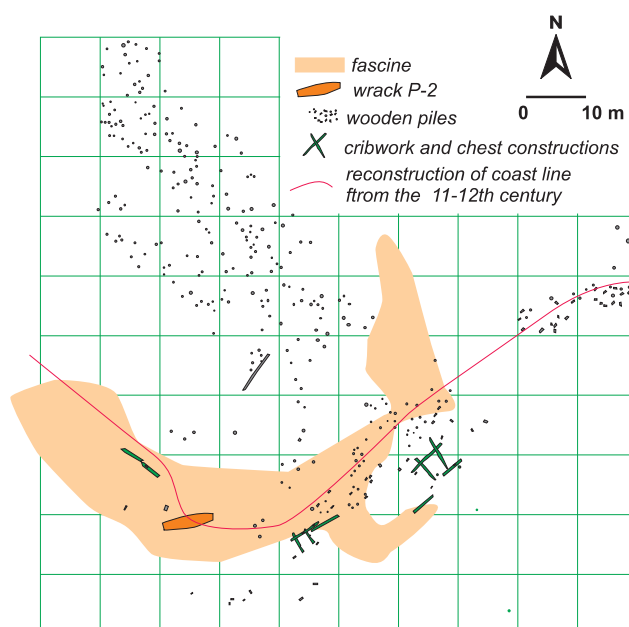


Fig. 5. Location of wreck P-2

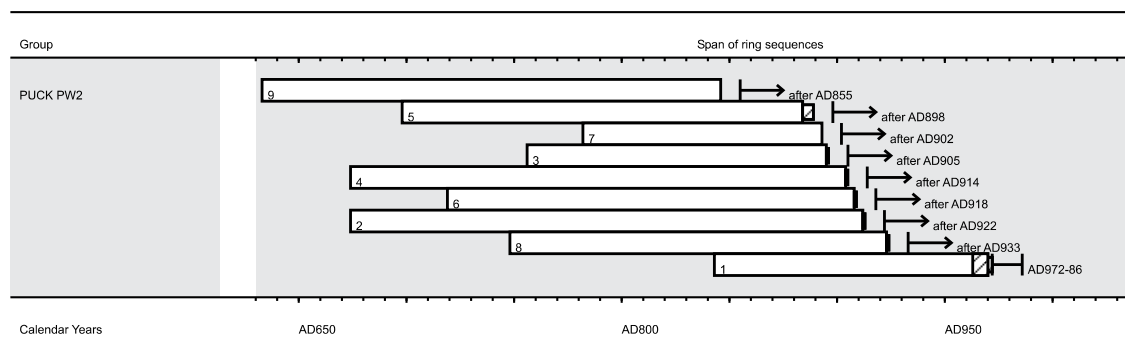


Fig. 6. Bar diagram which showing chronology of wreck P-2 (according to Ważny, 2001)

the bottom, and were sent for radiocarbon analyses to the Laboratory of the Physics Institute of the Silesian Technical University in Gliwice and to the Radiochemistry Laboratory of the Archaeological and Ethnographic Museum in Łódź. M. Pazdur dated the wreck for the first half of the 9<sup>th</sup> century. W. Stepień suggested moving this date to the second half of the 8<sup>th</sup> century. Samples taken from the fascine were dated with the use of

the same method estimating their age for the second half of the 10<sup>th</sup> century (Stepień, 1987). The newest results of dendrochronological analyses of wood collected in 1999 from the staves of the plating move the boat's construction date to the first half of the 10<sup>th</sup> century (Fig. 6) which is concordant with the dating of the oldest piers located in the northern part of the stand (Ważny, 2001).

## SUMMARY

Archaeological research and the performed analyses show that the stand may be divided into three zones. The northern part is a well-preserved line of the oldest shore including the perfectly preserved line of the North-South trending pier. The oldest date in this region (912/13) represents the earliest dating for the entire stand. The western and middle parts, occupying the largest part of the object, constitute a shore strengthened with fascine as well as a boat building and fishing base areas periodically flooded with water. Wooden constructions located in this region date from the middle of the 10<sup>th</sup> century to the 14<sup>th</sup> century. And finally, the south-eastern part is probably the remnant of a wading place and a bridge connecting the main land with the fishing and harbour base.

Taking into account both the layout of the construction working as defence of the swampy alluvial estuary of the Płutnica river, parallel to the present coastline, and chronological layout of the stand which gets younger and younger the closer you get to the present shore, it may be assumed that

the location changes of the harbour construction were influenced by fairly quick deepening of the basin and movement of the medieval shore line to the south. Changes of this kind were suggested previously by Zbierski (1986) who based his conclusions not only on the observations in Puck but also on findings brought among others from his research on medieval Gdańsk. He estimated that the sea level in the Puck area has risen since the 9<sup>th</sup> century by about 2.5 meters. This explanation, however, seems to be contradicted by the results of geological and palynological research as well as by the lack of preserved medieval layers over the most of the stand. In the light of the latest archaeological and natural sciences research, this change seems to be slightly smaller, and it does not exceed 70 cm.

Research carried out up to date by the Polish Maritime Museum in order to connect the development of an early medieval Puck harbour to the changes of the coastline are to form basis for further interdisciplinary research project of this stand.

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