acta
geologica
polonica

Vol. 26, No. 3 Warszawa 1976

KRYSTYNA KOPCZYŃSKA-LAMPARSKA

Radiocarbon datings of the Late Glacial and Holocene deposits of western Pomerania

ABSTRACT: Seashore cliff exposures near Niechorze in western Pomerania display organic deposits of the two local lakes infilled during the last deglaciation of the Pomerania region, related to the Baltic (Würm) Glaciation. Palynological and diatomological analysis of these deposits, and radiocarbon datings of peat horizons made it possible to identify the Oldest Dryas for the first time in northwestern Poland, as well as to establish stratigraphical subdivision of the whole section. One of the lake profiles comprises deposits representing all the post-Oldest-Dryas periods of the Late Glacial as well as the Pre-Boreal, Boreal, Atlantic and Sub-Boreal periods of the Holocene.

INTRODUCTION

The seashore cliffs exposed near Niechorze in western Pomerania (Fig. 1) display organic deposits of the two lake basins. The eastern lake is situated about 2 km, and the western one about 2.5 km west of the village. This contribution deals with the deposits of the eastern lake which are better exposed for detailed studies, the palynological analysis (by E. Brykczyńska, M. Sc.) and diatomological analysis (by Dr. B. Marciniak) including.

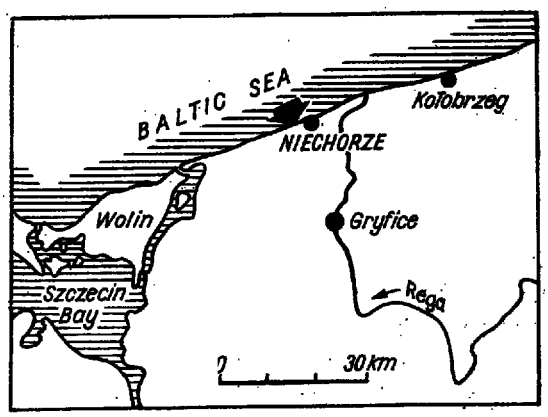


Fig. 1

Location map of the investigated profile (arrowed) exposed in the sea-coast at Niechorze in western Pomerania

The organic deposits from the cliffs near Niechorze were known to Hartnack (1926) who interpreted them as interglacial. The authoress' studies and radiocarbon determinations, kindly performed by Prof. Dr. W. Mościcki, Silesian Polytechnic at Gliwice, have however shown that they are of post-Glacial age. It follows that this is the first record of deposits of the Oldest Dryas, that is, the oldest Late Glacial age ever recognized in NW Poland (*cf.* Wasylikowa 1964) and adjacent areas in northern G.D.R. (*cf.* Cepek 1968).

GEOLOGICAL SETTING

The investigated lake deposits are exposed in the cliff cut mainly in two horizons of tills of the Baltic (Würm) Glaciation (Kopczyńska-Lamparska 1974). The formation of the lake was connected with younger till horizon, as the organic deposits, resting on sandy-gravel ones, fill a depression in tills of the older horizon (Fig. 2). The eastern part of the exposure mainly displays brown till, and the western — sandy-gravel locally loamy deposits with streaks of sandy silts and grey-brown and brownish tills. The latter are sometimes hardly distinguishable from overlying sandy-gravel deposits, the deposition of which directly preceded the formation of the lake basin.

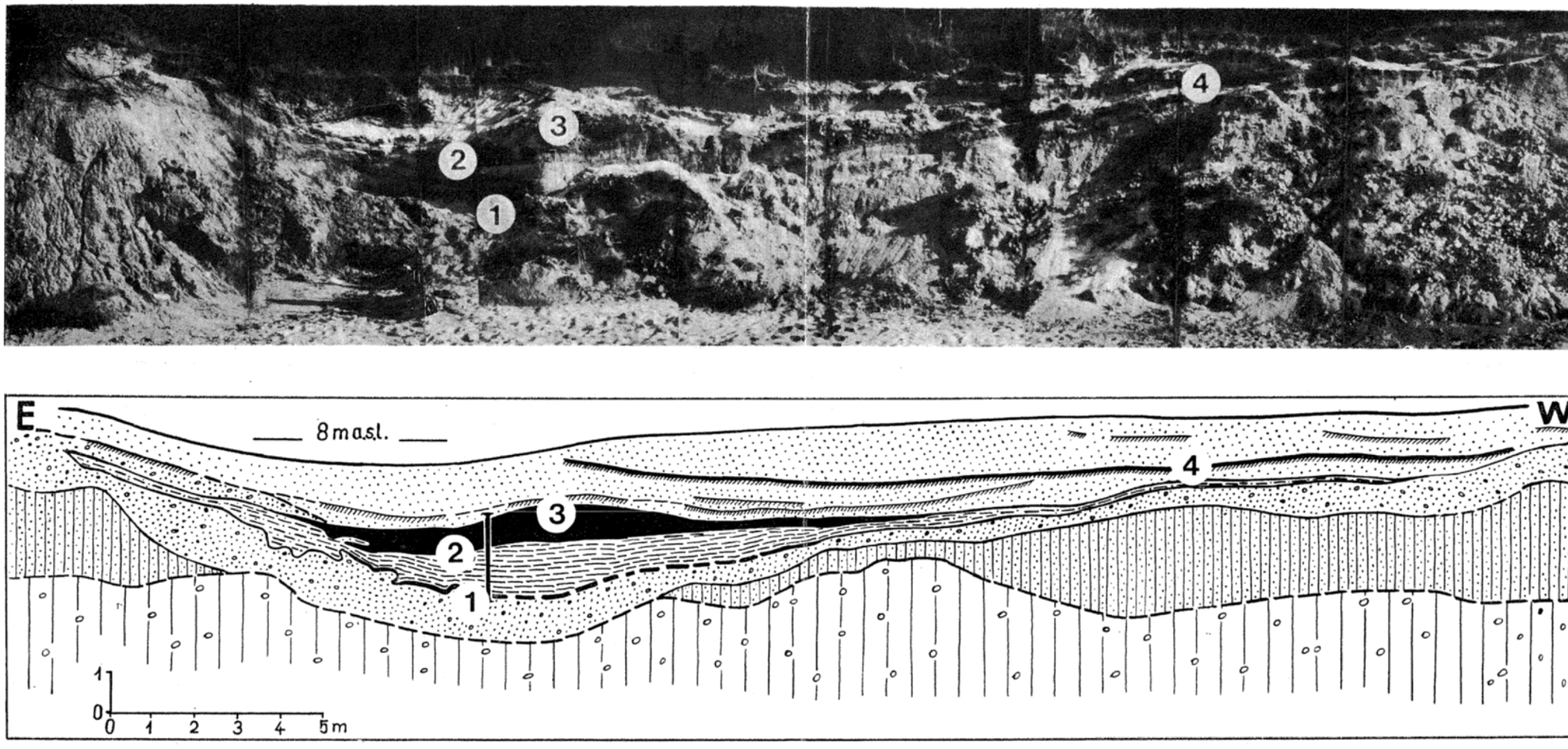
The basin is fairly small; the organic deposits continue at a 30 m distance along the cliff and at about the same distance to the south, as indicated by shallow boreholes; their thickness is the greatest in the cliff, up to 2.85 m, rapidly decreasing towards the shores of the lake (0.5 m in a distance of 17 m, south of the cliff).

LAKE DEPOSITS AND THEIR STRATIGRAPHY

The onset of lacustrine conditions is marked by grey silt layer (8 cm thick) with spots of brown sandy silts (Fig. 3). The number of these spots decreases upwards, which may be explained by diminishing supply of coarser fraction to the basin. The silt yields some diatoms and pollens. The radiocarbon dating of the overlying peat layer (7 cm thick) at 12,920 ± 330 y. B. P. (Fig. 2, sample *1*) makes it possible to assign both the peat and silt layers to the Oldest Dryas (*cf.* Środoń 1973).

The silt and peat layers of the Oldest Dryas are characterized by a fairly constant thickness whereas the younger series of lacustrine silts rapidly changes from 1.35 m in central part of the basin to a few cm in its marginal parts (*cf.* Fig. 2). Along with increase in distance from the center of the basin, the silts of this series yield more mineral matter and coarser grains and even thin sandy-loamy streaks appear. Well-developed slope structures were found in the eastern part of the basin. A rapid change in thickness of lacustrine silts and especially the setting of the

Exposure at Niechorze displaying the deposit sequence of the eastern lake



A — photo taken (by Dr. Z. Lamparski) in 1973; numbers denote the samples of peat, dated by radiocarbon

B — sketch drawn from the preceding photo (geological boundaries marked with continuous lines), supplemented by data from field work in 1974 and 1975; geological boundaries marked with dashed lines); the place of detailed profile (Text-fig. 3) is indicated by a black column

1 black till, *2* brown and grey-brown till associated with gravelous-sandy deposits, *3* sands with gravel, *4* lacustrine silts, *5* peat, *6* eolian sands with layered accumulations of humus

Oldest Dryas deposits repeating the outline of lake floor evidence the development of the basin above a dead ice. The end of accumulation of the silt series is determined by the age of sample taken from the bottom part of overlying peats, 6310 ± 170 y. B. P. (Fig. 2, sample 2), corresponding to the beginning of the Atlantic period. These radiocarbon datings as well as palynological data indicate that the silty series originated dur-

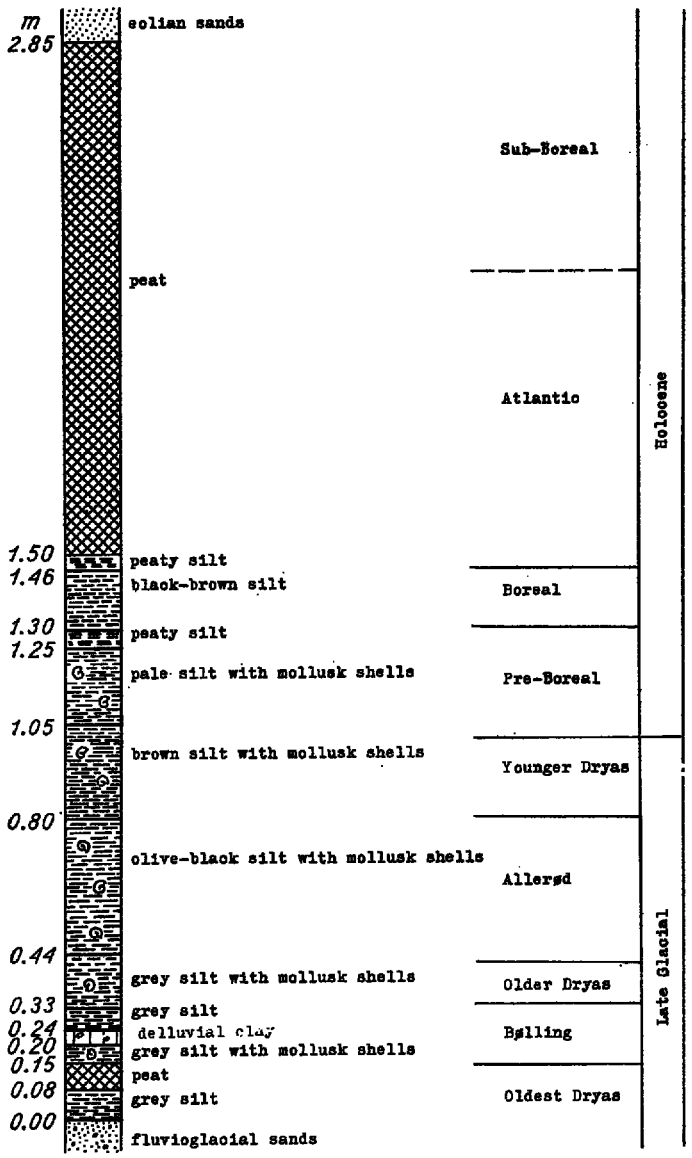


Fig. 3. Profile of the lacustrine deposits (eastern lake); taken at the place indicated in Text-fig. 2*B*

ing the Bølling and younger periods of the Late Glacial as well as two earliest periods of the Holocene.

The Bølling period is represented by grey, fine-laminated silt (5 cm thick) with single small mollusk shells, and overlied by a delluvial clay layer (4 cm thick) and a grey silt layer (9 cm thick) without mollusks (Fig. 3). This sedimentary sequence originated due to amelioration in climate in relation to the Oldest Dryas. The climatic change has intensified melting of dead ice blocks, leading to formation of the water basin (silts with faunal remains) and subsequently to mobilization of material melted out of ice blocks in the neighbourhood and thus to increased supplies of mineral material to the basin (delluvial clay and silts without faunal remains). It may be inferred that, in the contrary to the areas of central and southern Poland (*cf.* Wasylikowa 1964, Środoń 1973), this climatic change from the Bølling times did not result in the development of vegetational cover sufficiently dense for preventing solifluction processes; whereas, in central and southern Poland the Bølling is characterized by the formation of peats, the solifluction flows being typical of more severe climate, and especially of the Oldest Dryas times when vegetational cover was markedly scarce (*cf.* Wasylikowa 1964, Środoń 1973). These differences in sedimentary conditions in Central Poland and western Pomerania are partly related to differences in mean temperatures, and therefore, in values of evaporation coefficient.

The Older Dryas deposits from Niechorze are represented (*cf.* Fig. 3) by grey silts with mollusks increasing in number upwards, which reflect deepening of the basin. The supply of clastic material was markedly smaller than during the Bølling. This may be explained by entrapment of material in the vicinity of the basin by frost action, as this area was still situated in the proximity of the Scandinavian icesheet.

The beginning of the Allerød is marked by the silt (4 cm thick) identical as that of the Older Dryas, but the bulk of Allerød deposits are represented by silts (36 cm thick) with characteristic olive-black colour and yielding mollusk shells and black macrofloral remains. The lower part of the Allerød yields single brackish diatoms which may reflect influence of the Late-Glacial Yoldia Sea existing at these times in the Baltic area (*cf.* Rosa 1968).

The Younger Dryas is represented by a layer of silt (20 cm thick) differing from the Allerød silts only in colour. It is light-brown except for a dark-brown intercalation (3 cm thick) in the middle of the layer. Some spots of olive-black silt are marked in the basal part of the layer.

Amelioration in climate after the end of the Younger Dryas, at the beginning of the Holocene (Pre-Boreal period), similarly as that from the beginning of the Allerød, is reflected by a change in sedimentation with some delay. The basal part of the deposits comprises a layer (5 cm thick) of light-brown silts comparable to those of the Younger Dryas. Upwards,

the colour of the silts changes into baige, and the silty layer (20 cm thick) yields mollusk shells and macrofloral remains. The uppermost part of Pre-Boreal deposits reflects a fairly sharp change in sedimentary conditions. This is marked by deposition of black peaty silt (5 cm thick) with spots of black-brown silt with numerous macrofloral remains and a marked admixture of mica. Neither mollusks nor diatoms were found here. This deposit evidences a remarkable shallowing of the basin, which has resulted from the progress in climatic amelioration continuing till the Atlantic period.

The basin still existed during the Boreal period. In these times was formed a layer of dark-brown silt (16 cm thick) with spots of peaty silt and rich in mica and macrofloral remains.

At the beginning of the Atlantic period the basin became a peatbog. A layer of peaty silt (4 cm thick) marks the complete infilling of the basin. Peatbog, represented by 1.35 m layer of peat, developed through the Atlantic period and almost the whole Sub-Boreal period. The end of its development is dated at 2760 ± 130 y. B. P. (Fig. 2, sample 3 taken from the topmost part of the peat).

/ERLYING DEPOSITS

The organic deposits are covered by eolian sands intercalated by several humus layers. These intercalations were not subjected to paleopedological studies; that is why it cannot be stated which of them represent fossil soils. A peat layer occurring directly above one of humus layers was dated by radiocarbon method at 750 ± 120 y. B. P. (Fig. 2, sample 4), that is at the 13th century. This date falls within the interval of formation of the so-called yellow dunes in the coastal zone (cf. Prusinkiewicz & Noryśkiewicz 1966), which were supposedly being formed since the 5th to 17th century.

Institute of Geology of the Warsaw University
Al. Żwirki i Wigury 93, 02-089 Warszawa, Poland

Manuscript accepted in April 1976

REFERENCES

CEPEK A. G. 1968. Quartär. *In: Grundriss der Geologie der Deutschen Demokratischen Republik.* Bd. 1, 385—420. Berlin.

HARTNACK W. 1926. Die Küste Hinterpommerns unter besonderer Berücksichtigung der Morphologie. *Jahrb. Geogr. Ges. Beih. II zum* 43/44. Greifswald.

KOPCZYŃSKA-LAMPARSKA K. 1974. Genesis and stratigraphy of tills of the cliff near Rewal. *Zesz. Nauk. Uniw. A. Mickiewicza, Geografia,* **10**, 167—176. Poznań.

PRUSINKIEWICZ Z. & NORYŚKIEWICZ B. 1966. Problem of age of podzols on brown dunes of bay bars of river Świna in the light of a palynological analysis and dating by radiocarbon C^{14}. *Zesz. Nauk. Uniw. M. Kopernika, Geografia*, 5, 75–88. Toruń.

ROSA B. 1968. The South Baltic area during the last glaciation and the Holocene. *Prace Geogr.*, 74, 121–155. Warszawa.

ŚRODOŃ A. 1973. Rozwój roślinności w czwartorzędzie Polski. *In: Metodyka badań osadów czwartorzędowych*, 79–99. Wyd. Geol. Warszawa.

WASYLIKOWA K. 1964. Vegetation and climate of the Late-Glacial in Central Poland based on investigations made at Wilków near Łęczyca, *Biul. Perygl.*, 13, 261–417. Łódź.

K. KOPCZYŃSKA-LAMPARSKA

DATOWANIE METODĄ ^{14}C OSADÓW PÓŹNEGO GLACJAŁU I HOLOCENU KOŁO NIECHORZA NA POMORZU ZACHODNIM

(Streszczenie)

Przedmiotem pracy są odsłaniające się w klifie nadmorskim koło Niechorza (fig. 1) osady organiczne dwóch zbiorników wodnych powstałych podczas ostatniej deglacjacji obszaru Pomorza. Osady te, podścielone piaskami ze żwirami, leżą w obniżeniu glin zwałowych dwu najmłodszych nasunięć lądolodu zlodowacenia bałtyckiego (fig. 2). Wykonane przez mgr E. Brykczyńską diagramy palinologiczne, a dla zbiornika położonego bliżej Niechorza wykonany przez dr B. Marciniak także diagram diatomologiczny (częściowo finansowane przez Instytut Geologiczny CUG) oraz datowania metodą ^{14}C poziomów torfowych (finansowane przez Komitet Badań Czwartorzędu PAN) pozwoliły po raz pierwszy na wyróżnienie w północno-zachodniej Polsce osadów najstarszego dryasu (12,920 ± 330 B. P.) oraz na stratygraficzny podział całego profilu osadów organicznych (fig. 3). Na tej podstawie wyróżniono osady jeziorne wszystkich młodszych od najstarszego dryasu okresów późnego glacjału oraz dwu starszych okresów holocenu: preborealnego i borealnego. Osady te przykryte są torfami, które narastały poprzez okres atlantycki i subborealny (od 6.310 ± 170 do 2.760 ± 130 B. P.), a w końcu — piaskami eolicznymi z cienką warstewką torfu pochodzącą z okresu subatlantyckiego (750 ± 120 B. P.).