

WERE THERE LOCALLY TWO ANCYLUS STAGES IN THE BALTIC?<sup>1</sup>LARS-KÖNIG KÖNIGSSON<sup>2</sup>

## ABSTRACT

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Radiocarbon dates from shells in *Ancylus fluviatilis* bearing deposits on the islands of Öland and Gotland in the Baltic are reported. The deposits are situated at a much lower altitude than the *Ancylus* limit for the two islands and have been dated at the pre-Boreal pollen zone (IV, Jessen). *Ancylus* layers in Finland have been dated at approximately the same ages. In 1927 the Early *Ancylus* Substage (A I) was defined by Thomasson for the pre-Boreal. It is suggested that the numerous deposits on the Island of Gotland with 'too low' *Ancylus* faunas should be studied for further evidence of pre-Boreal age, and to elucidate the question of whether these finds belong to the classical *Ancylus* stage or to an earlier stage separated from the classical by the *Yoldia* stage.

## INTRODUCTION

A few years ago Matti Eronen published some radiocarbon measurements of sediments from the Hangassuo bog in Eastern Finland (ERONEN, 1976, p. 65-76). He presented a new description of a site, which had already been discussed several times (SALMI, 1948; DONNER, 1952; SAURAMO, 1958). Eronen concluded that the *Ancylus* Stage seems to have started much earlier than hitherto assumed, for his radiocarbon datings yielded  $9280 \pm 190$  BP for the lowermost transgression layer and  $8870 \pm 170$  for the uppermost. The transgression must, therefore, have started before the oldest date and terminated later than the youngest, its duration being at least 900 years. GLÜCKERT & RISTANIEMI (1980) recently provided additional radiocarbon measurements for *Ancylus* layers from the area of Lohja within the 2nd Salpausselkä not very far from Helsinki. The earliest parts of the assumed transgressional sediments were apparently deposited about  $9710 \pm 150$  BP,

and the transgression was already complete in  $9060 \pm 160$  BP, when the lacustrine sedimentation in the basin had been in progress for some time.

In his survey of the shore displacement in the western Baltic, FREDEN (1980) surmises that the *Ancylus* transgression may have started in Sweden c. 9250-9150 BP (7200-7300 BC), while my results on the island of Öland suggest a start there c. 8900 BP and a termination at the latest c. 7700 BP (KÖNIGSSON, 1968).

*Schematic development of the Baltic*

When the continental ice sheet melted away from the Baltic basin a fresh-water lake was formed. The drainage pattern is not completely known, but at least parts of the water masses were drained through Öresund and the Danish straights. Later a series of subsequent drainage zones have been suggested (and doubted) across Southern Sweden.

At Mount Billingen in Western Sweden (some 150 km south of the Stockholm latitude) a catastrophic drainage occurred about 10,000 B.P., when the water surface of the Baltic fell about 25 m. This happened during a recession of the ice to the northern part of Mount Billingen; a continuation of the retreat resulted in the development of a strait which

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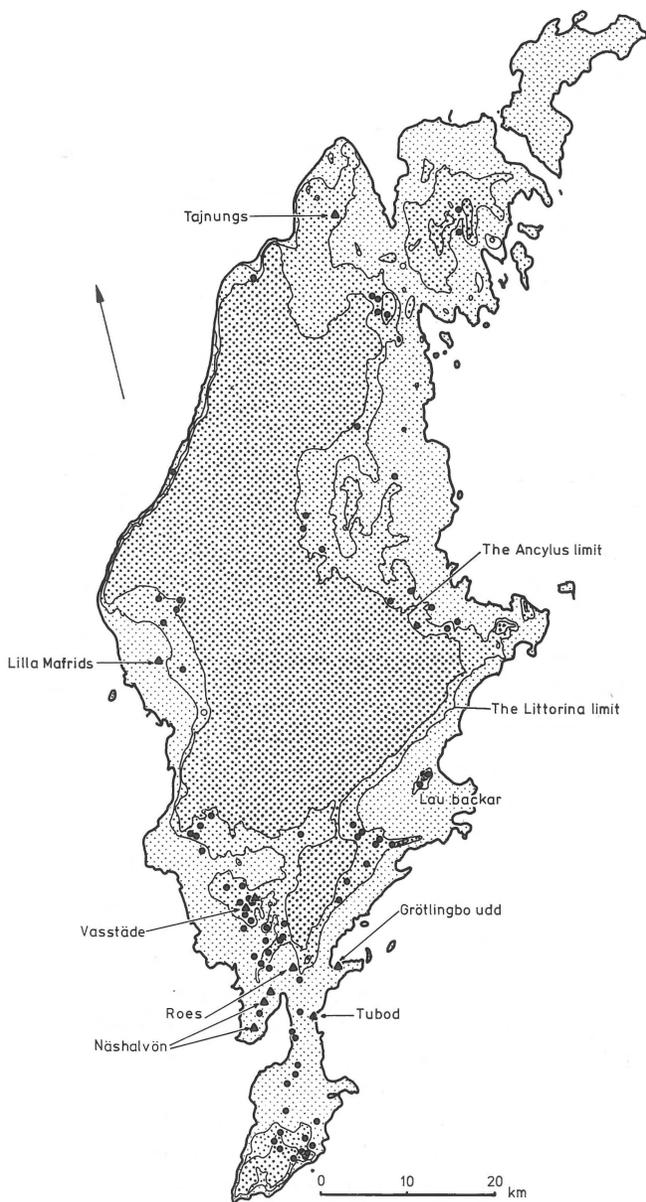


Fig. 1  
Map showing Munte's sites for *Ancyclus* faunas at and below the *Ancyclus* limit on Gotland. Also the *Littorina* limit has been drawn into the map. Heavy dots: above *Ancyclus* limit; lightest dots: below *Littorina* limit. Dots: old finds; triangles: new finds.

permitted the marine influence to enter the Baltic basin from the ocean and the North Sea in the west. This marine or semimarine stage has been named the Yoldia Sea and the preceding stage was the Baltic Ice Lake.

The glacio-isostatically caused upheaval of the land is uneven, but gradually higher towards the north. This upheaval led to a drainage of the strait through which the salt water passed into the Yoldia Sea, and another fresh-water lake (the *Ancyclus* lake) was formed about 9000 B.P. A successive and continuous upheaval made the Baltic basin water masses flow towards the south, and the ultimate result of this was the flooding of Öresund and the Belt straits and the

erosion of their present courses. This was probably finished 8000 B.P. and the marine *Littorina* stage succeeded the *Ancyclus* Lake. A transitional stage between two main stages has been named the *Mastogloia* Sea; this had a brackish character.

The marine influence has persisted since.

#### ANCYLUS FAUNAS AT TOO LOW ELEVATIONS

In 1964 I published finds of morphologically very low lying *Ancyclus* faunas from Northern Öland. They are situated approximately 25 m below the *Ancyclus* limit for that particular area. I suggested that these deposits may have formed during the early part of the transgression (KÖNIGSSON, 1964). This was doubted by BERGLUND (1964) but supported in several papers from the Baltic Soviet Republics, for instance in KESSEL & RAUKAS (1967). Meanwhile I found further sites with *Ancyclus* faunas in similar position on the island of Gotland, and tried to date these and the Öland deposits by analysing the pollen contents of some silt and clay layers. The results indicated that the Nyby Orde site on Öland possibly belonged to an early part of the transgression (*Alnus* pollen were present but in very small quantities) but not to the *Mastogloia* Sea phase which succeeded the *Ancyclus* lake as suggested by BERGLUND (1964). Tajnungs in northern Gotland could be contemporaneous with Nyby Orde, while Lilla Mafriids and Roes on southern Gotland belonged to a very early part of the transgression or were still older (KÖNIGSSON, 1967).

#### RADIOCARBON MEASUREMENTS OF SHELL MATERIAL

It was evident that some redeposited pollen were present in the pollen material registered, and I tried to have radiocarbon datings made on the shells to check the pollen datings. Two years ago a sufficient quantity of the thin shells were collected for this purpose (it took one full day at each site with two people). The results were published recently (KÖNIGSSON & OLSSON, 1981). Three fractions have been dated for each sample (outer, middle, and inner) and the results are represented in table I.

Table I  
Radiocarbon measurements on shells in *Ancyclus*-bearing deposits on Öland and Gotland.

Nyby Orde, Öland, O	U-4309	10200 ± 140 BP
Nyby Orde, Öland, M	U-4310	10430 ± 130 BP
Nyby Orde, Öland, I	U-4311	10470 ± 130 BP
Roes, Gotland, O	U-4312	8470 ± 150 BP
Roes, Gotland, M	U-4313	8450 ± 100 BP
Roes, Gotland, I	U-4314	9980 ± 130 BP

As may be seen from the table, the results from Nyby Orde are in agreement, while an anomaly is present in the Roes sample

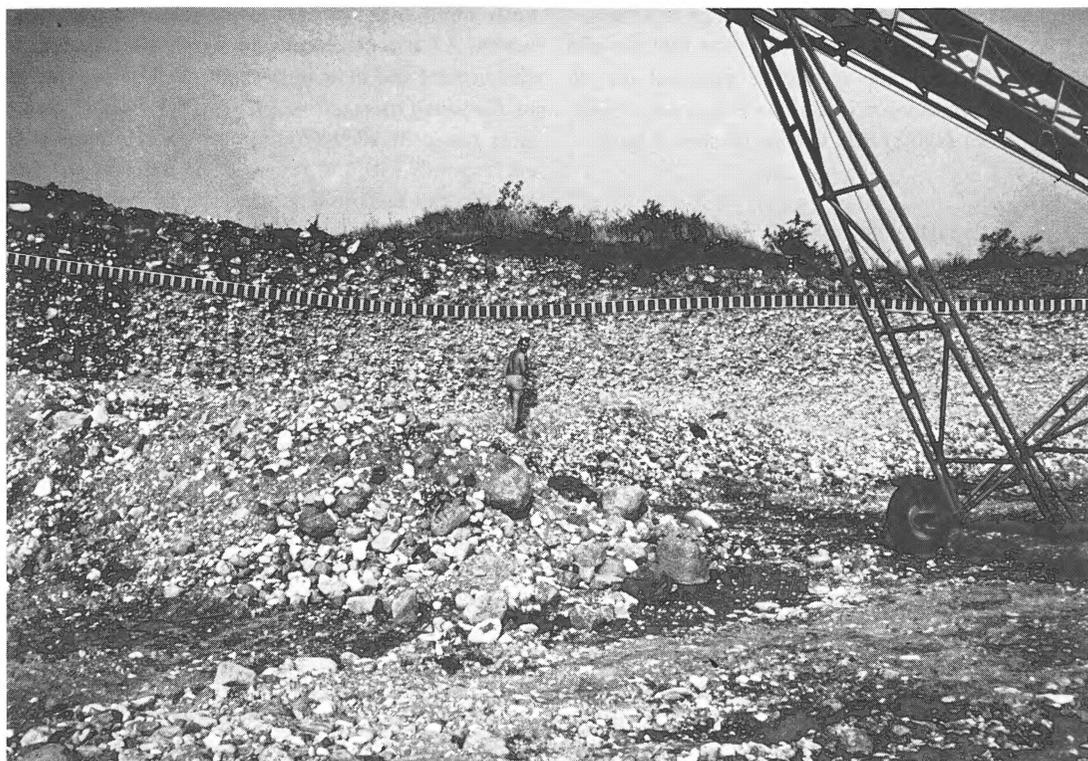


Fig. 2  
 The Nyby Orde deposits. The *Ancylus*-bearing deposits are overlain by marine deposits containing *Litorina litorea*, *Mytilus edulis* and *Macoma baltica* shells. The limit between the two parts has been marked. In the lower part one may find the fresh-water shells in rather coarse material, mainly below larger stones and in a sandy matrix. The shells are extremely fragile and have to be picked out one by one with the aid of a small wet brush, a time-consuming procedure.

since the range within the three fraction datings is so large. Roes must, therefore, be considered as not too reliable and another attempt will be made to secure material for an additional dating (see discussion in KÖNIGSSON & OLSSON, 1981). Only the datings from Nyby Orde will be discussed here.

## DISCUSSION

Very little is known about the reservoir effect in the Baltic proper, so that shell datings must be handled with some care. Still less is known about the reservoir effect in the Baltic pre-stage some 10,000 years ago. However, it can hardly exceed the reservoir effect of marine materials of pre-bomb times, so the effect has been estimated as 300 years (KÖNIGSSON & OLSSON, 1981). It is then possible to estimate an age for the deposits at Nyby Orde of around 10,000 years, which coincides with the Billingen catastrophic drainage (or the alternatives to that event which are now suggested, cf. FREDÉN, 1977, 1980), the transition time between the Baltic Ice Lake and the *Yoldia* Sea. It also coincides with the Pleistocene-Holocene boundary, and with the start of the forest growth in the area, which implies that a favourable climate prevailed.

It is of course evident that the material is too small for far-ranging conclusions, but it is still sufficient to establish a working hypothesis for further investigations.

Returning to the Salpausselkä results of Glückert & Ristaniemi, radiocarbon dating of the lowermost parts of their transgressional sequence yielded  $9710 \pm 150$  BP, which means that the transgression must have started somewhat earlier. It is interesting to observe that their dating and the age of the Nyby Orde deposits agree very well. Their sediment is indeed rather poor in organic material, and low carbon contents in sediments may mean that the radiocarbon ages are too old. If we assume that the dating is as correct as the dating from Nyby Orde (cf. OLSSON, 1979) the two deposits cannot be attributed to the classic *Ancylus* stage and transgression (MUNTHE, 1887; DE GEER, 1890). They may belong to a later stage within the Baltic Ice Lake development or (more likely) a transitional period between the Baltic Ice Lake and the *Yoldia* Sea, when the salinity fell short of values outside the ecological range of *Ancylus fluviatilis* and its companions.

The conclusion would then be that two *Ancylus* stages existed in the Baltic, not one. This suggestion, however, is by no means new. The Swedish geologist THOMASSON (1927), invented a great number of Baltic pre-stages in addition to the classical ones. Most of his stages were never recognized by his colleagues, but some were indeed, and his system was at least hotly discussed. Among his stages were at least four differ-

ently numbered *Ancylus* levels (*A I - A IV*), the oldest of which, *A I*, was placed in what we should name the pre-Boreal pollen zone and in its upper half, well before the immigration of *Corylus* (THOMASSON, 1927). This would correspond to a year range of 9800-9700 BP or so. Thomasson's *A I* level corresponds with the radiocarbon date for the transgression layer in the Salpausselkä previously mentioned (GLÜCKERT & RISTANIEMI, 1980) and with the age of the Nyby Orde deposits. Future studies will elucidate the question of whether there were, faunistically seen, locally two *Ancylus* stages in the development of the Baltic.

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