THE GEOLOGY AT SÄRDAL

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Cretaceous rocks in the vicinity of the new exposure

Little is known with certainty with regard to the geographical distribution of the Upper Cretaceous rocks around the Särdal locality. Mr. Östen Rinaldo reports that he used to find fossils or subfossils at some potholes (jättegrytor) approximately 150 m north of the new locality (UC 552920 in the grid net of the map Fältkartan 4C Halmstad NV). A boring for water at Rinaldo's farm Lunden (UC 553920) made in 1959 by Mr. Bror Hellring of Björklid, Holm, met a fissure with soft greenish material (glauconitic?) 51 m below the surface (Karna Lidmar-Bergström, personal communication). The boring site is in the size order of 100 m NE of the new Särdal locality (the grid reference of which is UC 552919). Moreover, a boring made in 1947 or 1948 at Busör 300 m SSW of the new locality is reported

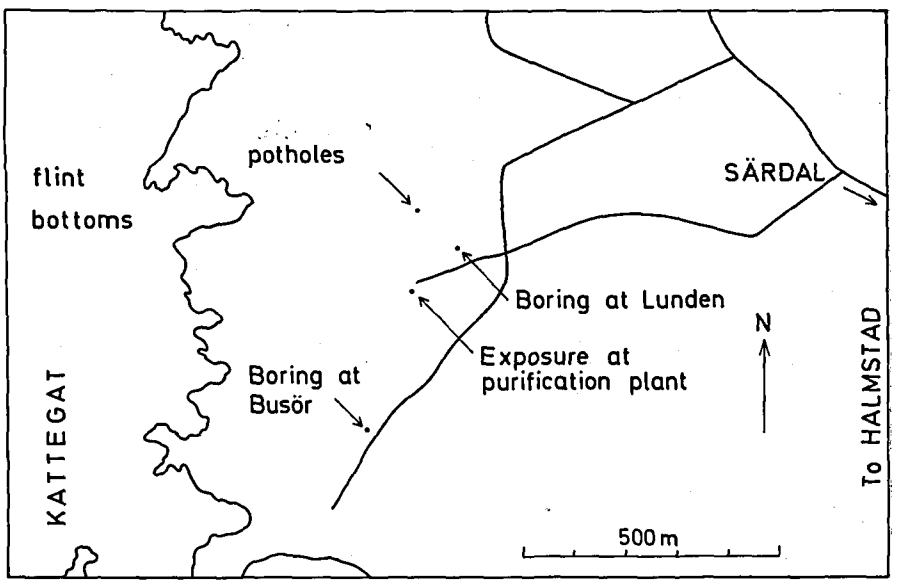


Fig. 2. Map covering the Särdal localities. For orientation see Fig. 1. The grid references are given in the text. The exact position of flint bottoms in the Kattegat is not known, but they are only of local occurrence.

to have pierced Cretaceous rocks in situ at 3–5 m (grid reference UC 551916; Mr. Ingvar Nilsson of Halmstad, personal communication). Finally, Mr. Edvin Gustavsson of Halmstad reports that the sea bottom is particularly rich in flint nodules a few hundred metres from the shore just west of Lunden. It is probable that most of these localities represent sites where Cretaceous rocks are preserved. Because of the proximity to the new locality it is quite possible that Santonian rocks are present at some of the sites. On the other hand, the flint shoal may indicate younger beds or at least a different lithology.

The locality at Lunden, Särdal

The temporary exposure was situated about 100 m south-west of the farm Lunden in Särdal. At this spot the first and more easterly of two planned filtration basins in the purification plant was finished in the summer of 1971. The position in the grid of the topographic map (Fältkartan) 4C Halmstad NV is UC 552919.

The excavation was circular in shape, with a diameter of 30 m. The depth was about 3–4.5 m, and the horizontal bottom level was approximately 5 m above sea level. The Cretaceous sequence was exposed in the wall of the two southern quadrants; it is said to have been exposed on the floor before our first visit. To the south-east the sequence abuts against a gneiss wall. In pl. 1, fig. 3 the gneiss is visible as a whitish triangle far to the left. On the eastern side the gneiss is cut through, and the bedrock is divided by fissures into large blocks, which have moved up to some 10 cm from their original position. The fissures between and below the blocks are filled with conglomeratic limestone. 5 m north-east of the main pit there was a smaller depression in the gneiss filled with conglomeratic limestone. This pit is visible to the right in pl. 1, fig. 1.

Lithological description of the Cretaceous and Quaternary sequence

Division A, Conglomeratic limestone

The rock is poorly sorted and consists of conglomerate pebbles, cobbles and boulders in a white argillitic calcarenite with glauconite grains either dispersed or, at some irregular surfaces, concentrated to dark bands. Glauconite also covers many shells and pebbles. A coating of phosphorite in some instances, and limonite in others has been observed. The stones are commonly between one and 20 centimetres long and consist mostly of gneiss of the local type or

of richly fossiliferous limestone referred to as derived phosphatised rock fragments. However, two cobbles consist of a brecciated white quartzitic sandstone. An objective identification of the origin of this rock appears impossible, but it is in all probability from the Precambrian. It should be mentioned that Precambrian quartzite occurs as boulders in the Cretaceous rocks in the Bjärnum area about 80 km SE of Särdal. At Bjärnum, the quartzite occurs as local remnants of a former sedimentary cover of the Precambrian gneiss (Troedsson, 1921). The quartzite specimens belong to Mr. Rinaldo of Särdal.

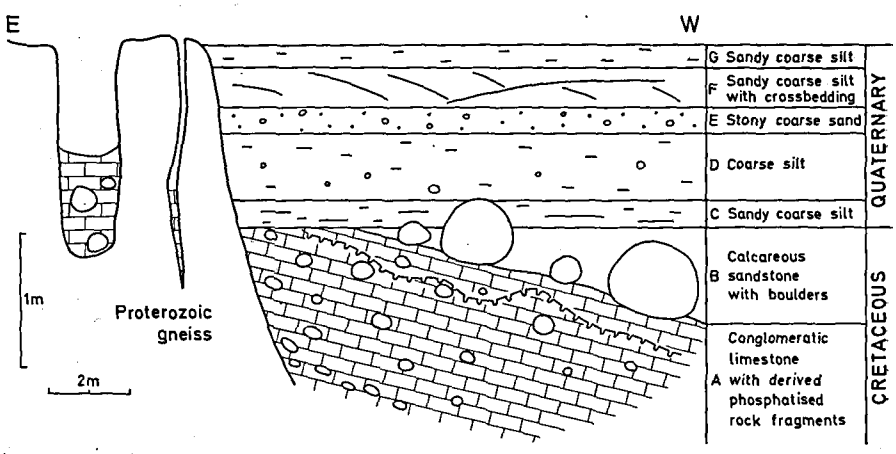


Fig. 3. Schematic section of the temporary outcrop at Lunden, Särdal.

The derived phosphatised rock fragments consist of fossiliferous grey limestone and deserve particular notice. This type of rock was observed only as isolated but fairly abundant pieces in the white limestone, but it may have formed the bedrock in the lowest part of the section, which was filled in before we had the opportunity to visit the locality. The grey limestone is a fine grained, light-coloured calcarenite with scattered grains of glauconite. It is rich in shells, which mostly are undamaged when not redeposited. Redeposited shells and pieces of limestone tend to be corroded and covered with glauconite. Some pieces are covered with limonite or are phosphatised. As noticed above this rock, which may be Cenomanian (and possibly younger), is similar to the matrix in the Tormarp Conglomerate of the Båstad area.

There is no even bedding within this rock unit and no obvious way to determine the dip. The upper contact surface dips about 10° towards the west. However, that surface may have been eroded before deposition of the next division. The underlying boundary with the gneiss has not been seen in situ by any geologist but is said to have been exposed. Towards

the east, the rock unit apparently abuts abruptly against low but steep gneiss walls, and it has been observed as fissure fillings in the eastern side of the excavation. About 10 m to the north-east a digging penetrated into a pit in the gneiss surface in which the Cretaceous rocks were also present.

The maximum measured thickness of this unit is about 130 cm.

Division B, Calcareous sandstone

The upper rock unit consists of conglomerate boulders sparsely arranged in one level and a matrix of richly fossiliferous sandstone. The boulders all consist of local type gneiss and measure about 0.5–1 m across. They are generally well rounded and undoubtedly indicate the former presence of a shoreline. The boulders commonly protrude both below and particularly above the boundary surfaces of the rock unit as formed by the sandstone surfaces. Despite the presence of oysters with the habit of adhering to hard substrates no specimens were found adhering to the boulders.

The sandstone reaches a maximum thickness of 70 cm. The lithological change between divisions A and B is very abrupt. The sandstone consists largely of loosely cemented subangular, well sorted quartz grains with a size of approximately 1 mm. The quartz grains make up roughly half or slightly more of the volume of the rock. Intermingled with the quartz grains are mostly smaller grains of feldspar, hornblende, probably redeposited glauconite, and a fairly large amount of calcareous detritus. Also there are scattered large shells and belemnite rostra. Some of the rostra are well preserved, whereas others are more or less corroded and covered with a glauconite crust. Several rostra belonging in the latter category show adhered pieces of rock that no doubt belong to the limestones of division A; these rostra evidently have been redeposited in division B.

The dip is about 10° to the west. The upper contact is erosive and cuts successively deeper toward the east, where the sandstone wedges out.

Divisions C to G

The Cretaceous rocks are overlain by about 1.5 m of Quaternary sediments. In these beds there is a slight degree of consolidation caused by interstitial carbonate in the lower part and by iron compounds in the upper part. No original moraine is present. We wish to thank Dr. Bertil Ringberg, Lund, for aid with the determination of the Quaternary material.

Division C

20 cm of sandy, coarse silt (sandig mo) with distinct lamination. Upwards this division grades into the next by a decrease of the sandy laminae.

Division D

50 cm of homogeneous coarse silt (finmo) with occasional pebbles and cobbles, which make the soil look like a moraine. However, like division C, this division is obviously of aquatic origin. The pebbles and cobbles decrease decidedly in size westwards, that is away from the protruding gneiss exposure. The material is mostly gneiss, but specimens of Cretaceous origin are also frequent. Among these specimens are flint nodules and shark teeth in rock fragments from division A.

Division E

20 cm of coarse sand with gravel and pebbles (stenig, grusig sand). This is apparently a shore deposit consisting of reworked moraine.

Division F

30 cm of sandy coarse silt (sandig mo) with ripples. Like the following division this one has been deposited in water.

Division G

20 cm of sandy coarse silt (sandig mo) with a reddish tint from included ferrous iron. The original surface was destroyed before our first visit but was apparently less than 50 cm higher up.

The entire Quaternary sequence apparently consists of material that has been washed out from moraines in the vicinity and of occasional particles from the local rock surface. The thickness of redeposited moraine material is by no means exceptional for the area. According to the geological map sheet (Caldenius et.al., 1966, p. 51) the thickness of redeposited moraine material is at least 6 m at Högen, which is approximately 1400 m ENE of the Särdal locality.

Plate 1

Fig. 1. The pit for the purification plant at Lunden, Särdal, as seen from the east, Kattegat is in the background. The low topography is typical for the local areal. The main exposure is in the shadow to the left in the large pit. Most of the opposite wall consists of Quaternary sediments, while the gneiss comes to the surface in the foreground. Just under the end of the wood pile is a pit in the gneiss surface with Santonian rocks. Photograph Christer Johansson.

Fig. 2. Part of the exposure to the left in the foregoing figure. The arrows mark the lower and upper boundaries of the calcareous sandstone, in which a few gneiss boulders are seen. To the left of the hammer the conglomeratic limestone (division A) is visible, and the top of the figure is formed by silty Quaternary sediments belonging to the division C and D. Photograph Christer Johansson.

Fig. 3. View of the exposure in the southern wall of the pit at Lunden. To the left is gneiss *in situ*. The loose sandstone has been removed by collectors, leaving gneiss boulders well visible on the right side of the photograph. Below the visible boulders and extending towards the left side is the conglomeratic limestone, while Quaternary sediments (reworked moraine with pieces of Cretaceous and Proterozoic rocks) overlie the sandstone and boulder horizon. The circular bottom of the pit is 30 m across. As in the foregoing figures letters indicate the rock divisions distinguished in text-fig. 3. Photograph Jan Bergström.

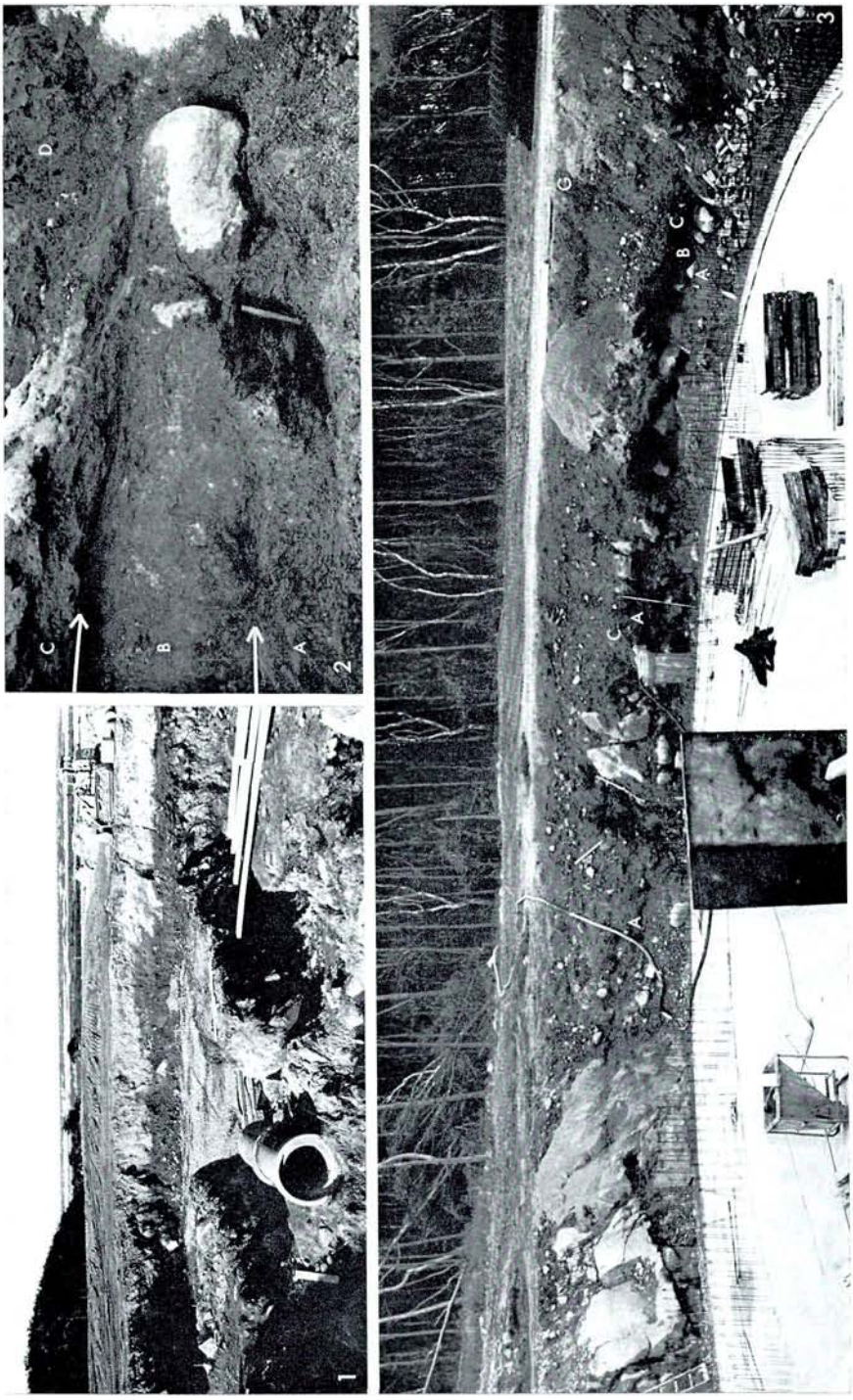
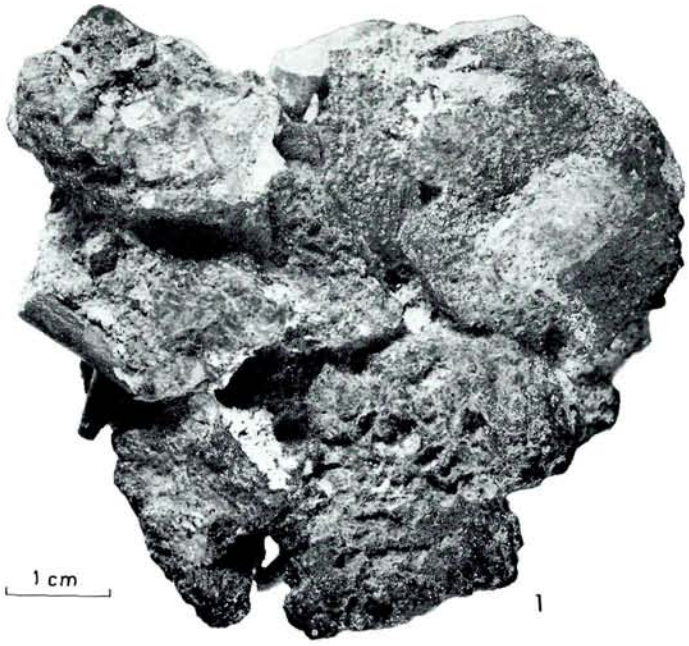

1
2
A
B
C
D
3
A
B
C
G

Plate 2

Fig. 1. A derived phosphatised rock fragment, probably of Cenomanian age. Four belemnite fragments are visible. Photograph Sven Stridsberg.

Fig. 2. The conglomeratic limestone (division A) in the central part of the exposure in the south wall. The conglomeratic aspect appears to decrease in a westerly direction. A glauconitic surface is visible at the arrow. Photograph Jan Bergström.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1


2