Crag Farm, Sudbourne, Suffolk

[TM 4280 5232] and [TM 4298 5235]

Highlights

The pits at Crag Farm present the largest and most spectacular exposures of the cross-bedded calcarenites in the Sudbourne Member of the Coralline Crag, for which it is also the type locality.

Introduction

The large quarry just to the west of Crag Farm has long been a popular locality for field parties by virtue of its large size, accessibility and the spectacular cross-bedding displayed in its faces; it is one of the most frequently visited of all Coralline Crag sites. A Crag pit only slightly smaller than today was depicted on the tithe map of 1841. It was recorded by Harmer (1898) as 'locality 18'. Spencer (1971b) records that a long section in this pit was reopened in 1953. A second large quarry at Crag Farm occurs 100 m east of the above pit and shows similar geological features. This second quarry was not recorded in Harmer's survey. Recent studies at Crag Farm include Balson (1990b), Balson *et al.* (1991, 1993), Hodgson and Funnell (1987) and Taylor *et al.,* (1981).

Description

In this quarry about 5.6 m of leached Coralline Crag sediments belonging to the Sudbourne Member are very well exposed. A recent borehole at this site (Balson *et al.,* 1993) showed 6.3 m of the Sudbourne Member overlying 5.9 m of the Ramsholt Member beneath the quarry floor, with the surface of the London Clay at approximately 10.4 m below OD (Figure 10.17). The sediments of the Sudbourne Member consist of skeletal calcarenites containing less than 5% mud and are partly lithified by a calcite cement that fringes carbonate grains (Balson, 1983) to form a porous, crumbly limestone. The weathered faces show excellent cross-bedding structures with set thicknesses of between 0.5 and 2.0 m (Figure 10.18). The migration direction implied by the dip direction of the cross-bedding is unidirectional to the southwest. Pit faces at right angles to the direction of migration often show broad troughs indicating some sinuosity of the bedform crests. Reactivation surfaces in the cross-bedded units are rare. Occasional thin silty laminae are seen mostly within the bottomsets. In some cross-bedded units, poorly defined graded cycles are visible, which may be the result of tidal cyclicity (Figure 10.19). In contrast with the Red Crag, the identification of tidal rhythms in the Coralline Crag is difficult. This may be due to a less asymmetric tidal ellipse in the Coralline Crag sea or may be the result of the coarser skeletal nature of the sediments and the effects of post-depositional diagenetic changes, which have obscured fine detail in the structures.

The Coralline Crag here is fissured by an orthogonal joint set which may reflect tectonic subsidence within the southern North Sea area during the late Pliocene or early Pleistocene (Balson and Humphreys, 1986). Some of these fissures are infilled with shelly sediments of probable early Pleistocene age. Many of the fissures are partly infilled by white micritic calcite, which often shows rhizocretion structures. The micritic calcite is derived from solution of the upper surface of the Crag and may also be seen along bedding surfaces, particularly towards the top of the pit faces. The timing of the precipitation of the calcite is not precisely known but post-dates both the aragonite dissolution of the Coralline Crag and the infill of the fissures with Pleistocene sediment, and probably occurred during subaerial exposure of the outcrop.

The fauna of the Coralline Crag at this locality is rather sparse and consists dominantly of transported, abraded fragments of calcitic molluscs and bryozoans. The fauna can be subdivided into (a) transported skeletal fossils and (b) demonstrably in-situ fossils which are rather rare. The transported fauna includes occasional abraded fragments of the bryozoans *Meandropora* and *Blumenbachium* as well as other bryozoan debris. The inferred in-situ fauna includes large well-preserved colonies of the eschariform bryozoan '*Eschara*' *pertusa* which are often found in abundance in the foreset sediments.

The most abundant mollusc is the calcitic *Aequipecten opercularis.* Trace fossils include lined vertical burrows (*Skolithos*) and unlined, sinuous, horizontal or subhorizontal burrows (*Planolites*).

Interpretation and evaluation

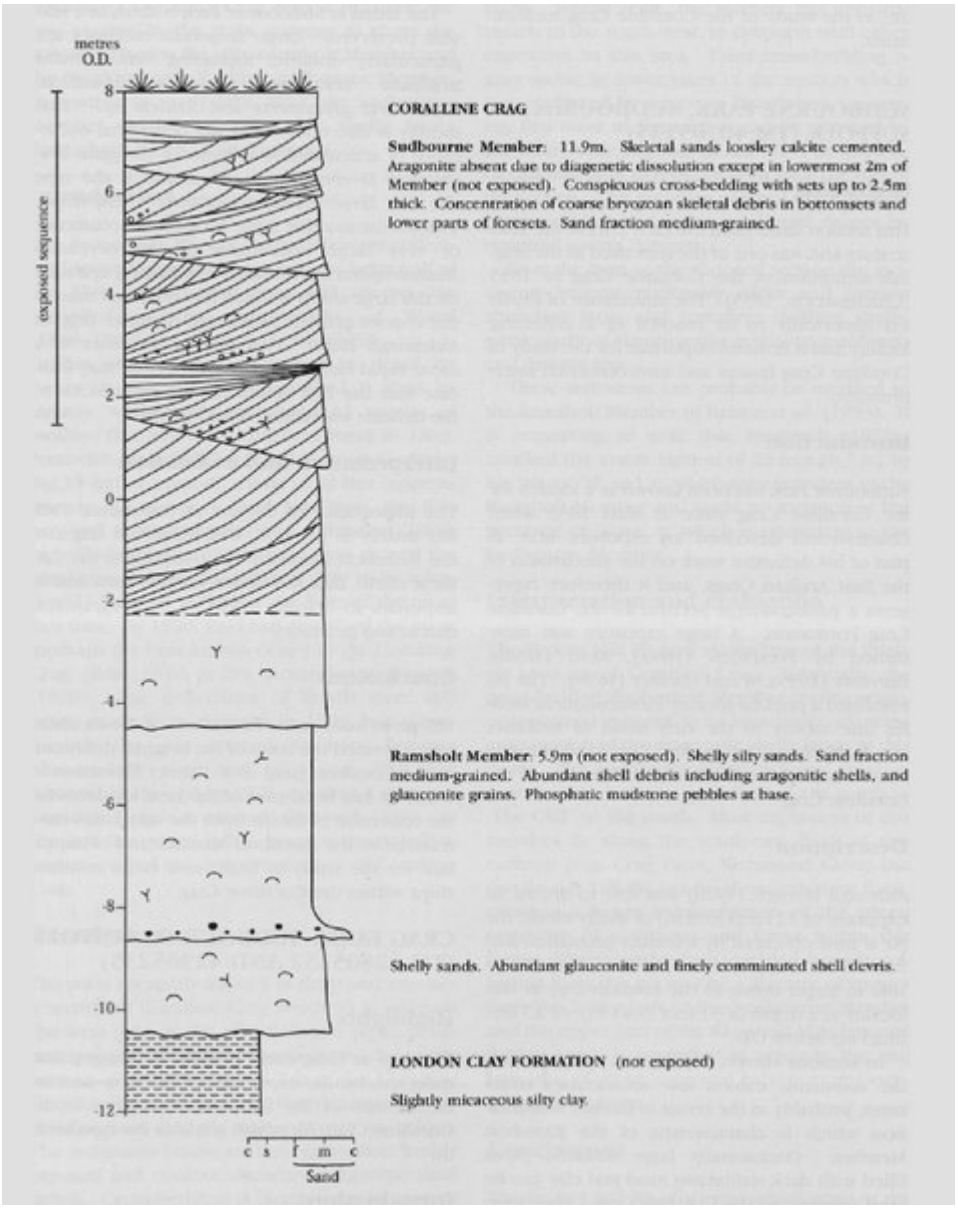
The size of the exposed sections at Crag Farm, both in terms of length and height, provide the best opportunity to examine the cross-bedded Sudbourne Member of the Coralline Crag. The geometry of the bedforms which produced the cross-bedding can be established through examination of sections at right angles to each other more easily at this locality than any other. The locality is approximately midway along the elongate main outcrop of this member and the deposits show some contrasting characteristics to localities to the north, e.g. at Red House Farm, and to the south, e.g. Richmond Farm. The preservation of fragile bryozoan colonies within cross-bedded calcarenites is particularly notable at this locality.

The calcarenites were deposited by large sandwaves (height approximately2–3 m) which migrated towards the south-west. Deposition was primarily on the avalanche slopes of the sandwaves which formed an unstable substrate for benthic organisms. However, large and often well-preserved eschariform bryozoan colonies of *Tschara'* sp. are frequently found in foreset beds. These colonies probably became established during periods of reduced sedimentation and subsequently were broken and rapidly buried by influxes of sediment (Balson, 1981b). Fragments of eschariform and abraded celleporiform bryozoan colonies frequently are seen to have accumulated at the base of the foresets. The bryozoan fauna also includes abundant well-preserved fragments of species with flexible, articulated crisiid, catenicellid and cellariid growth forms which may also have been able to colonize the mobile sediment substrate (Balson, 1981b; Cadée, 1982).

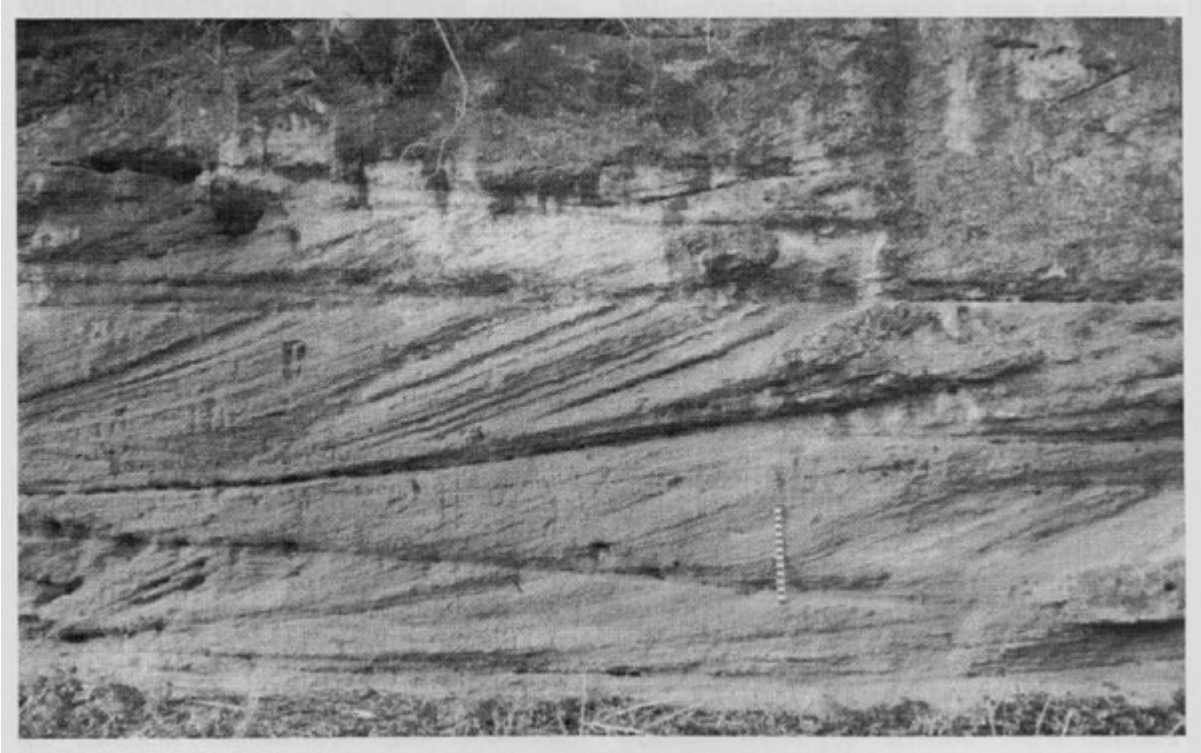
Conclusions

The pits at Crag Farm exhibit the best exposures of the Sudbourne Member of the Coralline Crag to illustrate the nature and facies of a cross-bedded skeletal calcarenite. Many aspects of the sedimentary structures are better seen at this site than at any other.

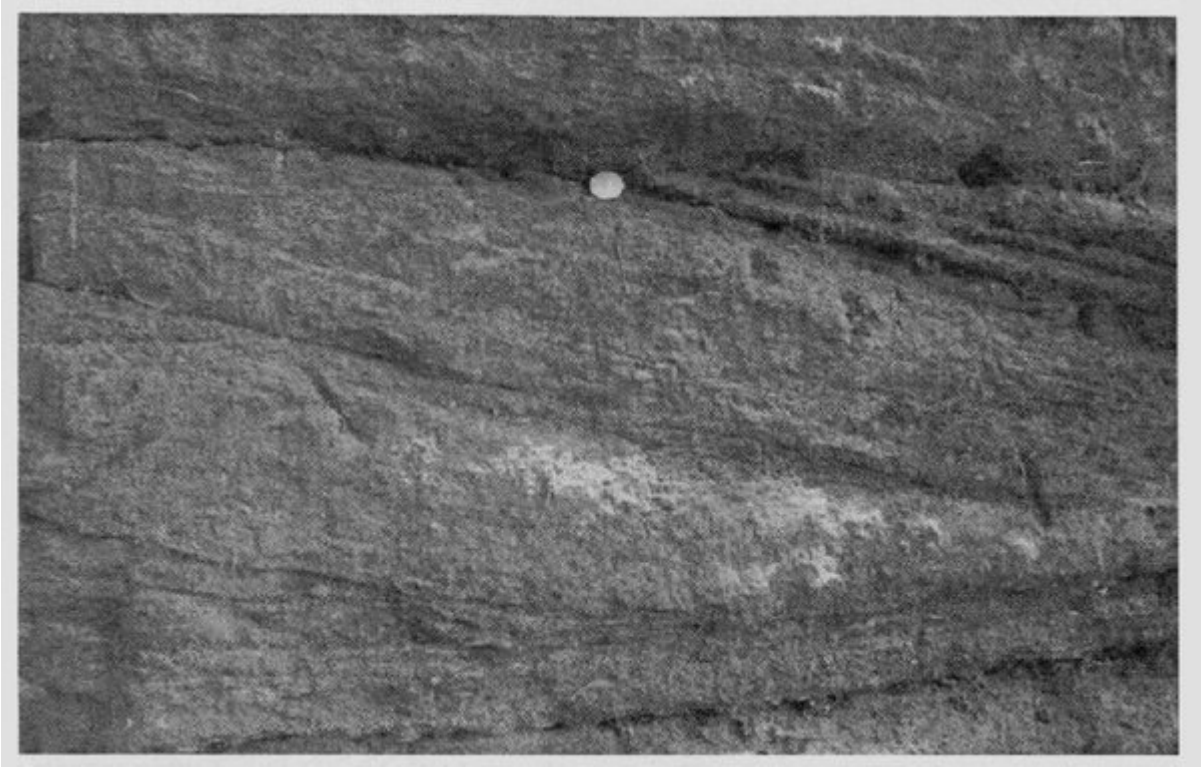
References



(Figure 10.17) Composite log of Coralline Crag section at Crag Farm. Clay =c, silt = s, fine = medium = m, coarse = c. (After Balson et al. 1991.)



(Figure 10.18) Cross-bedded calcarenites of the Sudbourne Member at Crag Farm. Scale is 0.5 m long. (Photograph: P Balson.)



(Figure 10.19) Cross-bedded calcarenites showing possible tidal rhythms, Crag Farm GCR site. Coin is 30 mm diameter. (Photograph: P Batson.)