# Ramsholt Cliff, Ramsholt, Suffolk

[TM 298 429]–[TM 297 427]

## Highlights

The section at Ramsholt Cliff is of great historical, palaeontological and stratigraphical significance. It can be considered to be a type section for both the Coralline and Red Crags and is the type locality for the Ramsholt Member of the Coralline Crag Formation. It exhibits an abundant and interesting fauna that has figured strongly in many of the classic monographs of Crag fossils. It is the only locality where the basal contact with the London Clay can be examined at the present time. It also represents the most southerly exposure of the Coralline Crag now accessible.

## Introduction

This locality was first described in detail by Charlesworth (1835) although fossils were recorded from 'Ramsholt, near Woodbridge, out of a newly discovered bed of clay' as early as 1821 by Sowerby. Until 1835, the 'crag-formation' had been considered as a single geological formation. Charlesworth recognized that at Ramsholt Cliff two lithologically and palaeontologically distinct formations were present. The upper was termed the 'Red Crag' after its distinctive ferruginous colour. The lower of these two formations he termed the 'Coralline' Crag after the great abundance of 'corals' later recognized to be the skeletal remains of bryozoans, within the sediment. The observation led to a good deal of controversy with Woodward who believed in the uniformity of the crag deposits and held that 'corallines' were in fact absent from Charlesworth's lower division (Woodward, 1835). In fact, 'corallines' or bryozoans are a conspicuous and abundant component of the fauna of the Coralline Crag at this locality. Ramsholt is one of four identifiable localities used by Charlesworth in his description of the Coralline Crag and can therefore be considered as a parastratotype for the formation. More recently the section was designated as the type locality for the Ramsholt Member of the Coralline Crag by Balson *et* al. (1993).

Ramsholt Cliff was well known among early crag geologists, including Sowerby, Lyell and Prestwich. The fauna was known for the abundance of certain species such as *Balanus concavus* and *Culicia woodii* which are rare elsewhere in the Coralline Crag. The section here was described in detail in Prestwich's early definitive works on the East Anglian Crags in 1871 (Prestwich, 1871a). Authors since that time have been content to quote his work, the section having become much less accessible and overgrown in more recent years.

## Description

Ramsholt 'Cliff' is in fact a densely overgrown slope on the north bank of the River Deben. Usually the Coralline Crag is not exposed but erosion along the toe of the much-slipped river bank may intermittently expose small sections of disturbed Coralline Crag. In recent years most of the information regarding the Coralline Crag at this locality has come from temporary excavations either in the river bank or in the field above.

The section at Ramsholt Cliff shows a maximum of about 2.9 m of Coralline Crag, unaffected by aragonite dissolution, resting with marked unconformity on an undulose, erosional surface of London Clay and in turn overlain unconformably by the Red Crag. At the base of the Coralline Crag, resting on the plane of unconformity, is a conglomeratic deposit known in the past as the 'coprolite bed', 'nodule bed' or 'Suffolk Bone-Bed' (Figure 10.6). The thickness of the Coralline Crag varies laterally between the upper and lower planes of unconformity.

The conglomeratic material includes abundant phosphatic nodules, occasional fragments of phosphatized bone, irregular cobbles of a phosphate-cemented sandstone ('boxstones') and large irregular fragments of calcareous mudstone. The origins of the diverse elements of this phosphorite remanié (reworked) deposit and their context in the regional stratigraphy of East Anglia is discussed in detail in Balson (1980).

Much of the material, such as the phosphatic nodules and calcareous mudstone blocks, is derived from the underlying London Clay. Elsewhere the phosphatized bone and cobbles of phosphate-rich sandstone (the 'boxstones' of authors) were derived from a formation of Miocene to Pliocene sands which once covered part of this area of Suffolk, informally termed the 'Trimley Sands' by Balson (1990a). Winnowing of this deposit left the relatively dense bones and sandstone cobbles as a remanié deposit on the surface of the London Clay.

A similar phosphorite deposit is also found at the base of the overlying Red Crag. Elsewhere the Red Crag phosphorite deposit was formerly worked for phosphate in the mid-19th century, the extraction reaching a peak in 1857 when *c.* 12 000 tons of phosphate was obtained (Reid, 1890). The deposit below the Coralline Crag at Ramsholt was never worked commercially but at Rockhall Wood nearby, commercial exploitation of the Coralline Crag phosphate deposit occurred for a few years in the 1860's (Prestwich, 1871a).

The Coralline Crag fauna at Ramsholt Cliff is an interesting and important one. As mentioned above, many species that are common here are rare or absent elsewhere. The species include the large cyclostome bryozoan *Multifascigera debenensis* (Balson and Taylor, 1982) for which Ramsholt Cliff is the type locality and the large barnacle *Balanus concavus* for which the locality was in the past renowned (e.g. Charlesworth, 1835). Large irregularly branching colonies of the bryozoan *Turbicellepora coronopus* are abundant. The colonies are often found to be enclosing the corallites of the coral *Culicia woodii* figured in the monograph of British Tertiary corals by Milne Edwards and Haime (1850). Although *C. woodii* is rare elsewhere in the Coralline Crag this is due in part to the infrequency of large *Turbicellepora* colonies elsewhere to act as hosts, and also to the lack of preservation of aragonitic skeletal material, of which the coral is composed, which is characteristic of many other localities. Associated with the coral is a commensal barnacle *Pyrgomina anglicum* that has a similar limited distribution. These interesting faunal relationships are described in greater detail by Cad& and McKinney (1994) and Tilbrook (1997). The large *Turbicellepora* colonies also form the substrate for encrusting bryozoan species. The molluscan fauna is abundant and well-preserved and figured strongly in the monograph of Wood (1848–1882). Of particular interest is the occurrence of large aragonitic bivalve species such as *Glycymeris glycymeris,* which are occasionally found with both valves articulated. Other common species include *Dosina casina, Arctica islandica, Venericardia aculeata scaldensis* (Figure 10.7) and *Astarte omalii.*

The Red Crag at Ramsholt Cliff is similarly poorly exposed. It consists of reddish brown shell-rich sands that overlie the Coralline Crag or rest directly upon the London Clay. Its thickness is laterally variable but probably exceeds 2 m in places. The basal sediments contain abundant phosphatic pebbles and boxstones. A list of the fauna of the Red Crag at this locality was given by Holcombe (1966) and includes the molluscs *Aequipecten opercularis, Mytilus, Glycymeris, Cerastoderma, Astarte* and *Neptunea contraria.*

## Interpretation and evaluation

The section at Ramsholt Cliff is important because it is the only Coralline Crag locality where the basal contact showing its sharp unconformity with the London Clay Formation or Harwich Formation can be exposed. The unconformity represents a gap of around 50 Ma between the two formations. Derivative material in the lowermost sediments of the Coralline Crag represents formations eroded during this long time-span. In fact the only evidence of marine conditions between the mid-Eocene and mid-Pliocene in the area comes from this derivative material. It is, however, likely that for much of this period the area was subaerially exposed. The bulk of the derivative material is derived from the London Clay Formation itself, which at Ramsholt Cliff has been eroded away to rest upon the underlying Harwich Formation. Argillized ash bands, typical of the Harwich Formation, are occasionally exposed on the beach at this location at low tide. The London Clay-derived material includes phosphatic pebbles, shark teeth and cobbles of the carbonate-cemented Harwich Stone Band. The provenance of some of the other exotic components, which include fossiliferous Jurassic limestone and quartzite cobbles, is less clear. Large, worn cobbles of the phosphatic 'Trimley Sands' (Balson, 1990a) and phosphatized bones represent the remnants of sediments from one or more, earlier Neogene transgressions.

The Coralline Crag sediments at Ramsholt Cliff are unaffected by the aragonite dissolution seen at most other sites, which allows a more complete interpretation of the fauna. The subsequent Red Crag transgression removed or reworked much of the Coralline Crag deposit, particularly the unlithified sediments of the Ramsholt Member, such that the Coralline

Crag at Ramsholt Cliff is only an erosional remnant separated from the nearby small isolated outcrop at Rockhall Wood approximately 1 km to the north. It is also the only location where the Ramsholt Member is directly overlain by the Red Crag. Elsewhere it is overlain by younger units of the Coralline Crag.

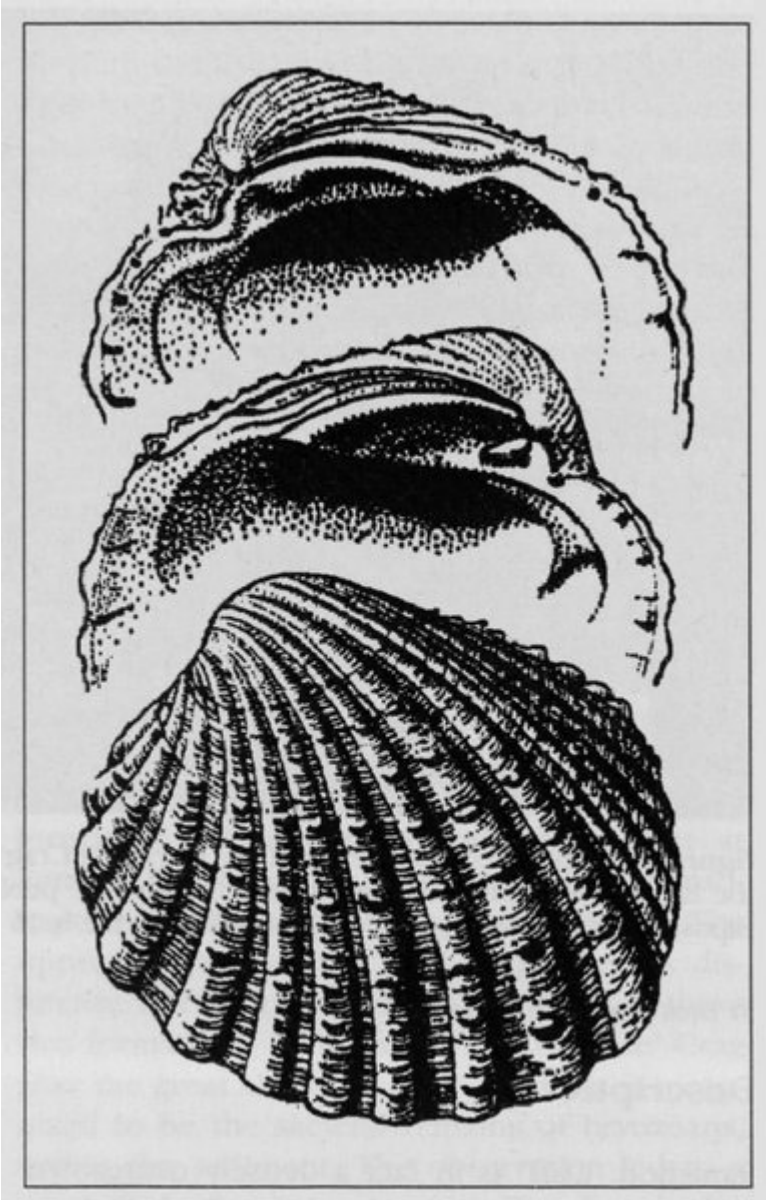
## Conclusions

Ramsholt Cliff is an important site as it is the only locality where the base of the Coralline Crag formation can be exposed easily at the present time. The Coralline Crag section at Ramsholt Cliff is the type locality for the Ramsholt Member. The fauna is an important one and includes elements rare or absent at other locations.

The section is one of the earliest recorded Coralline Crag localities in the literature and was used in the original definition of the formation.

**References**

*(Figure 10.6) Basal contact between the Coralline Crag and the London Clay (arrowed) showing a conglomeratic lag deposit containing phosphatic mudstone pebbles, toxstones' and cobbles of calcareous mudstone exposed in a temporary excavation in 1978 (scale is 15 cm long). (Photograph: P Balson.)*



*(Figure 10.7) Venericardia (Glans) aculeata scaldensis (formerly Cardita senilis). Shell is 35 mm across. (Illustration after British Caenozoic Fossils, Plate 35:1 BM(NH), reproduced courtesy of The Natural History Museum, London.)*