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CRAG FROM A BOREHOLE AT OVERSTRAND, NORFOLK.

A boring through a landslip at Overstrand during the winter of 1962-63 provided an opportunity to inspect the Weybourne Crag fauna at this site (GR/TG 235415, between Overstrand and Cromer). The Crag is usually below low tide level at this locality.

One borehole (S2) section was (data from Dr.J.N.Hutchinson) - (top of hole c.43 feet above modern beach level).

Sand	10 ft. 6 in.
Till	c.40ft. 6 in.
Flaky siltstone	c. 1ft.
Fossiliferous grey sand	c. 12ft.
Stone bed	2ft.
Chalk	

The normal cliff-section shows -

Sand and till, contorted.
Till
Cromer Forest Bed.

The following fauna was extracted from the grey fossiliferous sand (of more than one borehole sample).

Bivalves
- Arctica islandica
- Mya arenaria
- Macoma obliqua
- Macoma balthica
- Astarte semisulcata
- Astarte motagui
- Astarte sulcata
- Mytilus
- Cardium
- Acila cobboldiae
- Yoldia oblongoides
- Pholad
- Inoceramus (derived)

Gastropods
- Littorina
- Nucella

Foraminifera

Barnacle valves

Fish bones

Carbonaceous material

The lithology and fauna agree with the Weybourne Crag of C. Reid.

The borings were carried out as part of the research programme of the Building Research Station, Garston, Watford, Herts. (Ministry of technology), in connection with a study of coastal landslip problems.

The writer wishes to thank Dr. J. N. Hutchinson for allowing him to inspect the fossiliferous sand, and for general discussion and for reading the manuscript.

R. Markham.

NOTES ON FORAMINIFERA FROM THE SCROBICULARIA CRAG AT CHILLESFORD.

METHODOLOGY

These notes are taken from part of an undergraduate project, and reference should be made to Ipswich Geological Group, Bulletin No. 11, December 1972, "A Review of the Chillesford Beds.", for a more complete background, and sample sites.

Samples were collected from the pit behind the church at Chillesford (map ref. TM 382523) on October 2nd, 1971. The samples were taken from three horizons within the Scrobicularia Crag:- typical "crag" (unit 11), a mud drape horizon (unit 10) and a loam (unit 6) - all from location "D".

The samples were dried and each was weighed to 250 grams. The crag was disaggregated in a solution of Calgon, while the loam and mud drape samples both needed boiling in a solution of Na_2CO_3 for disaggregation. Each sample was washed in a wet seive of 150 micron mesh, and then dried. A final dry seiving separated the coarse sediment greater than 1 mm. diameter, which was examined for macrofauna. Because the residues obtained for each sample was large and sandy, each residue was treated with carbon tetrachloride, and the forams floated off. Slides were prepared for each of three samples and the residues briefly checked for any remaining fauna.

A comparison of the foram assemblage from each sample was thus able to be made, with particular emphasis on variations shown by different lithologies.

SYSTEMATIC DESCRIPTION

The following descriptions are brief, giving an outline for identification. The specific identifications are tentative only.

1)Bulimina elegans (d'Orbigny)
test triserial, tapering, with numerous rather inflated chambers, acute below, obtuse above.

2) Discorbina rosacea (d'Orbigny)
Test helicoid with low spire, showing several chambers, inflated; sutures depressed; lower face of test planar.

3) Lagena laevis (Montagu)
Test flask-shaped, smooth, with oval body and pronounced tubular neck.

4) Lagena sulcata (Walker and Jacob)
Test flask-shaped, with surface ornamentation of parallel costae extending from one end of the shell to the other; neck short.

5) Nodosaria raphanus (Linne)
Fragment consisting of two spherical chambers ornamented by numerous stout parallel ribs running from end to end of the whole shell.

6) Polymorphina complanata (d'Orbigny)
Test compressed, elongate/subrhomboidal; chambers elongate, oblique, arranged in two regularly alternating series; septal lines slightly evacuated.

7) Polymorphina lactea (Walker and Jacob)
Test ovate, gibbous, slightly asymmetrical; anterior acute; posterior obtuse, rounded. Chambers few, oblong, oblique, somewhat inflated - up to four visible; chambers sufficiently ventricose to disturb general outline regularity; suture lines marked by a slight depression. Cross section nearly circular.

8) Polystomella crispa (Linne)

Test lenticular, spiral, involute; numerous narrow, arcuate, flexuose segments. Anterior border of each segment prominent, smooth, forming a raised septal line - the central portion and posterior border more depressed; sculptured into numerous transverse crenulations, most conspicuous near their junction with the preceding segment. Peripheral margin thin. Apertures numerous, arranged in a [illegible]- shaped series, close to the surface of the antecedent convolution.

9) Polystomella striatopunctata (Fichtel and Moll)

Test lenticular, spiral, involute; segments numerous, arcuate, somewhat ventricose; margin rounded and more or less lobulated; septal lines and umbilicus generally depressed. Retral processes well developed. This form differs from

P. crispa in the generally smooth condition of the shell and its rounded margin.

10) Rotalia beccarrii (Linne)

Test composed of four or five convolutions. Superior surface convex; inferior surface flattened. All the chambers are visible on the spiral surface, the last convolution only on the lower. Septal lines limbate and hyaline on the spiral surface; irregularly excavated and obscured by granulation on the inferior face. Aperture single, simple, on the inner margin of the terminal chamber.

11) Textularia agglutinans (d'Orbigny)

Test elongate, conical, oval in cross section; chambers horizontal, compact, presenting a pentagonal aspect on the side of the shell. The shell wall consists of agglutinated sand grains.

12) Truncatulina lobatula (Walker)

Test suborbicular, plano convex, consisting of two or three convolutions, of which the outermost alone is visible on the convex surface. Each convolution composed of seven or eight segments. Convex surface depressed at the umbilicus. Segments ventricose on the upper, flat and truncate on the lower surface of the shell. Orifice single, large at inner margin of the terminal chamber.

COMMENTS

Table showing number and percentages of each species found in each sample

	CRAG		LOAM		MUD DRAPE	
	number	%	number	%	number	%
Bulimina elegans	0	0	45	4.6	12	2.0
Discorbina rosacea	0	0	0	0	1	0.1
Lagena laevis	0	0	11	1.1	0	0
Lagena sulcata	0	0	8	o.8	2	0.3
Nodosaria raphanus	0	0	1	0.1	0	0
Polymorphina complanata	0	0	7	o.7	0	0
P. lactea	12	2.6	8	0.9	0	0
Polystomella crispa	37	8.0	198	20.2	186	30.6
P. striatopunctata	178	38.5	262	26.8	250	41.1
Rotalia beccarrii	135	29.2	270	27.6	76	12.5
Textularia agglutinans	2	0.4	4	0.4	3	0.3
Truncatulina lobatula	98	21.2	164	16.8	78	12.8
	462		978		608	

Because the forams act as sedimentary particles, most are rolled, and many are broken; it is also very difficult to differentiate between derived and indigenous faunas.

The loam has the highest number, and the crag the least number of individuals and species. Perhaps this is because the crag was formed in conditions of high turbulence, the forams being wafted away. The loam, on the other hand, may represent an accumulation in calmer water, where winnowing was less effective.

The most apparent and perhaps significant differences of the percentages are seen in Polystomella crispa and P. striato-punctata, which have the highest percent in the mud drape sample. Truncatulina lobatula and Rotalia Beccarrii also show a distinct differentiation, the highest percentage being in the crag, and the lowest in the mud drape horizon. The significance is not clear; it may represent a degree of indigenuity or, conversely, differentiation on a sedimentological basis.

REFERENCES

The identifications and descriptions are based on:-

Jones, T.R., Parker, W.K., and Brady, 1866. "The foraminifera of the Crag." Monogr.Palaeont.Soc.

Interested readers are referred to:-

Dixon, R.G. 1972. "A Review of the Chillesford Beds." Ipswich Geol. Group Bull. 11. Dec. 1972.

Markham, R.A.D. 1972. "A Bibliography of the Foraminifera of the Crag." I.G.G. Bull. 11. Dec. 1972. (special reference should be made to Funnell, 1961, and to Macfadyen, 1932.)

R.G. Dixon.

FOSSILS FOUND AT SOME RED CRAG SITES.

IPSWICH, LADY LANE.

- site of Civic Centre carpark excavations, mid 1960's.
- fragments of

Cardium	Turritella
Chlamys	
Glycymeris	Barnacle valves
Mya	'Wolf-fish' teeth

The Red Crag rested on London Clay.

HASKETON

- specimens from an old borehole sample, exact locality unknown; made available by Mr. C. Goodman.

Chlamys (opercularis group)
Spisula
Macoma
Cardium (cerastoderma group)
Cardium (interruptum group)
Mya
Pholad

Turritella
'Natica'

FELIXSTOWE, BRACKENBURY CLIFF

- excavations for sea-defences
- specimens collected by Mr. J.D. Rayner.

Glycymeris glycymeris (including young; also double valve)
Cardium edule
Macoma obliqua
Spisula
Astarte obliquata
A. basterati
A. sp.
Lucina borealis
Mytilus edulis
Corbula
Mya
Chlamys cf. opercularis
Pholad

Barnacle valves

Sphenotrochus intermedius
Balanophyllia calicula
Flabellum woodi ($\frac{1}{2}$)

Lacuna suboperta
Sipho
Natica multipunctata
"Natica" sp.
Turritella incrassata
Potamides tricinctus
Neptunea contraria
N. (dextral sp.)
Nucella lapillus
Trivia
Capulus

Shark teeth
Ray teeth
Thornback ray, spine base.

R.A.D. Markham.

HUNSTANTON CLIFF

(This note is a copy of the field-sheet issued on one of the earliest Group meetings in early 1966, and is reproduced here as a record of that meeting.)

Three distinct rock layers may be seen dipping gently to the north. The lowest is a brown sandstone (Carstone), best seen at the southern end of the cliff. On this rests a thin pink limestone (Red Rock), which is in turn overlain by white and grey limestone (Chalk). These beds contain fossil marine animals, evidence that the (now hardened) sand and lime-mud layers were deposited in ancient seas which covered the site of present day East Anglia, about 100 million years ago.

Carstone :-

Coarse sandstone with pebbles (mainly quartzite and chert); locally current bedded. Brown colour - strongly ferruginous (limonite coating quartz grains, plus limonite ooliths). Excellent building material - many houses in local villages. Grades upwards into Red Rock.

Hunstanton Red Rock :-

4 feet of pink, ferruginous limestone with small pebbles. Richly fossiliferous - brachiopods ("lamp-shells"), bivalve molluscs, belemnites (tail skeletons of extinct cuttlefish), etc. (i.e. marine). High iron content - sediment probably derived from a lateritic land surface undergoing tropical weathering. Deposition of the Red Rock was slow (the equivalent Gault Clay in Cambridgeshire has a thickness of 150 feet). Top sharply differentiated from overlying Chalk.

Chalk:-

Reaches thickness of 1,350 feet in Norfolk (lower part is seen here). 18½ feet of Varians Chalk - fairly hard, coarse chalk - (due to shell fragments), is overlain by 2 feet of Totternhoe Stone - tough grey gritty chalk. Several planes of marine erosion occur. Fossils (marine) include sea-urchins, brachiopods, bivalve molluscs, etc; (note casts of burrows of soft-bodied organisms). The Chalk is best examined in fallen blocks.

R. Markham.

REPORT OF FIELD MEETING TO THE PLIOCENE OF SUFFOLK, APRIL 24th, 1971.

This was a joint meeting of the Tertiary Research Group and the Ipswich Geological Group. (Report based on a report sent to the T.R.G., by the author.)

Three Coralline Crag (Pliocene) localites were visited by the six people attending. The Coralline Crag is named after the "corallines" (bryozoa) found in it.

SUDBOURNE PARK, near Orford, Suffolk (TM 407514).

A shallow disused pit; there is little exposed, but digging (holes must be backfilled) provides a fauna of which bivalve molluscs and bryozoa form the bulk. There are several solution pipes in the loose shelly sands, and thin hard limestone bands are common near the surface.

The commonest fossils are Cardita senilis (Lamarck), Chlamys opercularis (L.), and species of Astarte; Arctica islandica (L.), Pecten maximus (L.), Venus casina L., Pseudamussium gerardi (Nyst), and Verticordia cardiiformis (J. Sowerby) are some of the other bivalves found here. Gastropods, except for Turritella, are not so common. Large specimens of Terebratula and fragments of Echinus occur. Members found double valves of some bivalves, including Chlamys and Gastrana.

RAMSHOLT "ROCKS", Suffolk. (TM 298428).

Coralline Crag fossils (mixed with London Clay, Red Crag and Recent forms) are found loose on the foreshore; a small cliff outcrop of Coralline Crag is seldom exposed. Perhaps the most interesting Pliocene form found is the coral Cryptangia woodi (Edwards and Haime) which is enclosed in a mass of bryozoa. Members also found several Eocene forms, and possibly the London Clay ash band.

SUTTON, Suffolk. (TM 305 441).

The fauna at this locality is richer in species than the previous localities, but of mainly small forms in the present day exposure. Gastropods include Emarginula, "Scala" and Calliostoma; other fossils include foraminifera, corals (Shenotrochus), bryozoa, echinoids, barnacles, bivalves, scaphopods, Brachiopods (including Lingula dumortieri Nyst), annelids and fish otoliths.

R.A.D. Markham.

WALTON-ON-THE-NAZE FIELDTRIP REPORT, DECEMBER 30th, 1972.

Six members assembled in the car park at Walton-on-the-Naze, and then proceeded northwards along the beach looking at the London Clay, at the base of the cliffs and on the foreshore. As the tide was low it was possible to continue along across the saltmarsh, examining the Recent deposits on the way, as far as the entrance to Hanford Water. At Stone Point the members searched the beach for flint implements, and one worked flake tool was found (by me !).

On the walk back along the marshes a muddy hole was discovered from which emerged an equally muddy human, who was excavating, apparently, the wreckage of a World War II fighter plane.

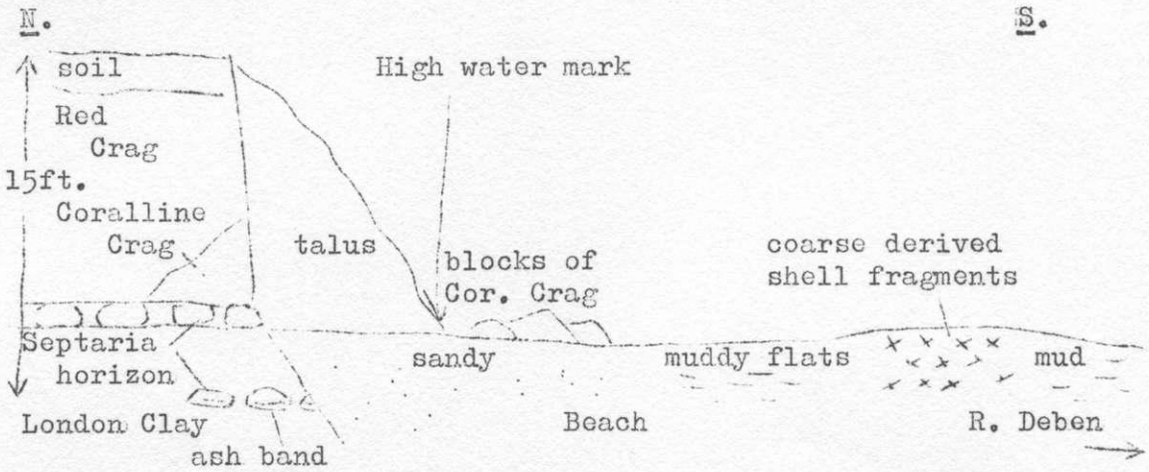
The Red Crag deposits in the cliffs were examined, and the various pereglacial structures in the upper part, on the way back to the car park.

P. Grainger.

REPORT OF FIELD EXCURSION TO RAMSHOLT (THE ROCKS), APRIL 29th 1973.

After a dismally wet morning, 12 members of the Geology Group met at the Rocks, Ramsholt. Fortunately, the sun appeared and dispelled any misgivings we may have had.

The section consists of Red Crag banked up against Coralline Crag, which in turn rests on London Clay. Owing to large amounts of talus, neither of the two boundaries was actually seen in situ, but Coralline Crag was observed resting on London Clay in a small landslip.



SCHEMATIC CROSS SECTION OF RAMSHOLT ROCKS

London Clay :-

This was not studied in detail, but the suppos ed ash band in a septaria nodule horizon was found on the foreshore. This ash band has been traced at Harwich and has been correlated with one in the Belgian Eocene. It is fine grained, contains feldspar lathes, and occurs as an irregular dark band in the lighter grey of the septaria.

Coralline Crag :-

The Coralline Crag of Ramsholt is well known for the relative abundance of several fossils including the giant barnacle, Balanus concavus (Brown), an oyster Ostrea edulis (Linne), and the epifaunal association of the coral, Cryptangia, and bryozoan, Cellepora. These were all found in some quantity on the beach. Also found were large blocks of Coralline Crag showing typical "sea mat" polyzoa associations, including Meandropora tubipora (Busk).

Red Crag :-

Apart from several sharks teeth, bone and the more common Mollusca, unusual specimens included a fragment (tooth) from a sword-fishes sword and several Scaphella lamberti (Sowerby).

It was interesting to note that many large, common lug worms were found stranded on the foreshore. Some were partly in their burrows, but none seemed capable of making much movement. All were entire. No satisfactory suggestion was made to account for this phenomenum.

Stones used for building the tower of Ramsholt Church were examined. They include London Clay septaria, beefy calcite, Red and Coralline Crag, Jurassic freestone, flint and quartzite. The mortar contains Red Crag shells.

R.G. Dixon.