BULLETIN No. 4.

A REPORT ON THE CIRRIPEDES FOUND IN AN EXPOSURE OF THE RED CRAG AT BEGGAR'S HOLLOW, IPSWICH.

Cirripede remains from an exposure in the Pleistocene Red Crag at Beggar's Hollow, Ipswich, occur in great numbers and, and for the most part, in good condition. So far, the following five species, listed in order of abundance, have been recognised:-

Balanus dolosus Darwin.
B. crenatus Bruguiere.
B. concavus Bronn.
B. tintinnabulum Linn.
B. balanus (Linn).

Of these, B. dolosus and B. crenatus have been found attached to molluscs of various species and to pebbles, whilst the other three species are represented only by isolated fragments of the compartments (or parietes) and opercular valves.

By far the most common attached species is B. dolosus which has been found on, and within the mouth of the gastropods:-

Nucella (Purpura) lapillus L. This was much the commonest species used as host, whilst:

Nucella (Purpura) tetragona (J. Sow.), which, although as common as the former species was rarely used.

Neptunea despecta (L) was a relatively common host and contrasts sharply with:

Neptunea contraria (L.) which, although an abundant species, yielded only one juvenile shell used as a host, during a whole season's work at the site.

B. dolosus was also found, although rarely, on fragments of Cardium parkinsoni J. Sow., whilst large colonies, mixed with B. crenatus, covered the flat surfaces of rocks and many pebbles.

The opercular valves were frequently found in situ and a microscopic examination of the scuta revealed a smooth outer surface (apart from growth lines), which is one of the principal distinguishing features between this species and an allied form, B. bisulcatus Darwin, with which it could be confused. The scuta of the latter species are traversed by two to four longitudinal grooves extending from the apex to the basal margin. The average size attained by the specimens of B. dolosus collected was 5 mm. along the major axis.

B. crenatus occured much less frequently, it was recorded on:-

Nucella (Purpura) lapillus, on rocks, in company with B. dolosus and small pebbles. The average length was 6 mm., although a small unattached group of an elongated variety (possibly old individuals living under cramped conditions) reached 8 mm. in height, by 3 mm. in width (along the major axis).

Among the large amount of material examined, only two instances were noted of the above two species occuring on the same host-shell. Since, however, the external features of these species are very similar and only one or two individuals per host were broken down for microscopical examination, this may have no significance.

As mentioned above, B. concavus and B. tintinnabulum have been found only as isolated fragments of the compartments and opercular valves, of which latter, some fine scuta of B. concavus up to 28 mm. in length occured.

The rarest species from this site seems to be B. balanus, of which only fragments of the parietes have been found (The characteristic arrangement of the septa between the parietal pores is clearly to be seen and is unmistakable.).

It is interesting to note that the majority of the remains of the last three species mentioned show signs of having been rolled. This would

indicate that either the animals grew in deep water, away from the normal, or, more probably, that they were derived from the destruction of the Pliocene Coralline Crag as the Red Crag sea encroached upon the older land mass. The prescence of abundant fragments of typical Coralline Crag polyzoa would seem to verify this.

From the evidence thus afforded, it appears that ideal conditions existed in this area for the growth of the smaller species of barnacles.

Thanks are due to Mr. H.E.P.Spencer for kindly allowing me to examine the material that he collected and for much technical advice.

Bibliography:

Darwin, C. 1854. Monograph on the Sub-class Cirripedia; II. The Balanidae; the Verrucidae. Ray Soc. Lond..

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J. S. H. Collins.

PORTUNUS DEPURATOR (LINNE.) FROM THE CORALLINE CRAG OF SUFFOLK.

ABSTRACT

A fine specimen of the Cleanser Swimming-Crab, Portunus depurator (Linne.), from the Coralline Crag of Suffolk is described.

MATERIAL

An almost entire carapace which has sustained a little damage to the tips of some of the antero-lateral spines.

P. Cambridge Esq. collection No. Q2551.

HORIZON AND LOCALITY

Pliocene, Coralline Crag of Gedgrave, Suffolk.

OBSERVATIONS

The carapace is that of an almost fully grown individual and is exceedingly well preserved, only the tips of some of the antero-lateral spines have been broken off. A decorticated area extends across about half of the branchial region, but this in no way mars the appearance of the surface ornamentation.

According to Bell (1853) "The sculpture (Surface ornamentation) in this species varies greatly in degree". In comparison with several Recent specimens, which show numerous unequal sized granules giving the carapace a scabrous appearance (particularly on the branchial region), the fossil shows the granules to be more even in size and somewhat more sparsely scattered.

A line of regular sized granules borders the orbital and frontal margins from the anterior side of the external orbital spine and these are seen to be slightly coarser than those on the Recent specimens examined.

Numerous exceedingly fine pits, which are scattered irregularly over the whole surface of the carapace, may be seen more clearly on the fossil than on the Recent specimens.

Only a small portion of the right sub-orbital region remains of the underside of the specimen.

COMPARISONS

The species is near to Portunus corrugatus (Pennant), but the carapace may be distinguished from it by the presence of a sharp tooth over the inner angle of the orbit and the nature of the surface ornamentation.

MEASUREMENTS

Length: Along mid-line.	38.2 mm.
Width: Between 4th-5th antero-lateral spines.	43.2 mm.

ACKNOWLEDGEMENTS

The writer conveys his thanks to Mr. P. Cambridge for kindly loaning this specimen for examination.

REFERENCES

Bell, T. 1853. A History of the British Stalk-eyed Crustacea, London, p.101.

Linnaeus, C. 1766. Syst. Nat. XII. 1043, 23.

Glaessner, M. 1929. Fossilium Catalogus 1: Animalia, ed. J.F.Pompeckj. Pars 41, Crustacea, decapoda, Berlin. p. 464.

J. S. H. Collins.

PRELIMINARY NOTE ON CORALLINE CRAG FROM BOREHOLES BETWEEN ORFORD AND ALDEBURGH.

F.W.Harmer, in a paper of 1898 ('The Pliocene Deposits of the East of England: The Lenham Beds and the Coralline Crag', Quart. Journ. Geol. Soc., London, Vol. 54, pp. 308-356) gave details of the divisions and thickness of the Coralline Crag between Gedgrave and Sudbourne Park (summarised in Fig. 7 of his paper) and his views on the northward extension to Sizewell Rocks (see his Fig. 5). More recently, A.P.Carr of the Physiographical Section of the Nature Conservancy has given details of the London Clay surface between Gedgrave and Aldeburgh (Carr, A.P., 1967, 'The London Clay Surface in Part of Suffolk', Geol. Mag., Vol. 104, No. 6, pp. 574-584), necessitating modification of earlier work.

Samples from commercial boreholes made in connection with the Nature Conservancy work have been made available to the writer by Mr. Carr, and I wish to express my thanks for the opportunity to inspect this material.

Seven sites are represented; a small amount of each sample has been sieved (using a 1mm. mesh diameter sieve, and water) and partially sorted.

Site 1 (GR/TM 422505), plus 22ft.O.D..

- Sample A (plus 2' to -10') -loose, orange-brown rock-bed, with bryozoa (especially Cellaria) and some fragments of calcite molluscs (Chlamys identifiable).
- Sample B (-10' to -23') -similar to 1A, except that shell fragments much commoner and include aragonite forms (e.g. Astarte); Chlamys, bryozoa and echinoid spine are also present.
- Sample C (-23' to -51') -loose shelly material, grey in colour; highly comminuted and only Yoldia and Chlamys, and echinoid spine immediately identifiable.

Site 2 (TM 433526), plus 10ft.

- Sample A (plus 10ft. to -29') -similar to 1A, but slightly coarser; several bryozoa genera, also Chlamys.
- Sample B (-29' to -33') -yellow-grey shelly material, with small thin pieces of brown clay (derived from 2C?); numerous shell fragments, several phosphatic nodules; sample fairly coarse grade in appearance. Fossils include Corbula (commonest shell), Chlamys (opercularis and harmeri groups), Cyclocardia, Pteromeris corbis, Astarte, Digitaria digitaria, Spisula, Venus ovata, Arctica?, Cardita senilis?, Turritella and Scala (all molluscs), echinoid (spine), barnacle (valve) and bryozoan remains.
- Sample C (-33' to -40') -brown clay (= London Clay)

Site 6 (TM 446553), -1ft.O.D..

- Sample A (-11' to -31') -pale-coloured rock-bed, some loose, some compact; bryozoa. Small pieces of flint and quartz common (intrusive?).
- Sample B (-31' to -39') broken shell material, not so coarse as 2B, not so fine as 1C; colour similar to 2B. Fossils include Ensis, Glycimeris, Corbula, Spisula, Cyclocardia, Pteromeris corbis, Chlamys, Anomia and Turritella.

Site 3 (TM 454536), -1ft.O.D..

- Sample A (-13' to -31') -compact Rock-Bed, including bryozoa and Chlamys.
- Sample B (-31' to -39') -similar to 1B; includes fragments of aragonite shells, e.g.Turritella; also Chlamys and Cellaria.
- Sample C (-39' to -51') -similar to 6B; one or two pieces of phosphatic material. Fossils include Spisula and Turritella (fragments), both common; Astarte, Pteromeris corbis, 'Natica' and other gastropod fragments, Chlamys, Dentalium, Cellaria and a barnacle valve.
- Sample D (-51ft. to -54') -similar to 6B. Fossils include Corbula, Spisula, Venus ovata, Cyclocardia, Pteromeris corbis, Astarte omalii, Digitaria digitaria, Limopsis pygmaea, Chlamys, Turritella, Scala, Cellaria and barnacle valve.

Site 4 (TM 452544), 0ft.O.D.

- Sample A (-12' to -45') -compact Rock-Bed, with casts of aragonite molluscs, also fragments of calcite molluscs and a barnacle valve.
- Sample B (-45' to -55') -loose shelly material, but aragonite fossils not well preserved; Turritella, Corbula and Pteromeris corbis identified, also Chlamys and barnacle valves. Small subangular pieces of phosphatic stone common.

Site 5 (TM 456551), plus 2ft. O.D.

Sample A (-12' to -28') -similar to 1A; a few small subangular pieces of black stone, apparently flint (intrusive?); bryozoan genera, & Chlamys.

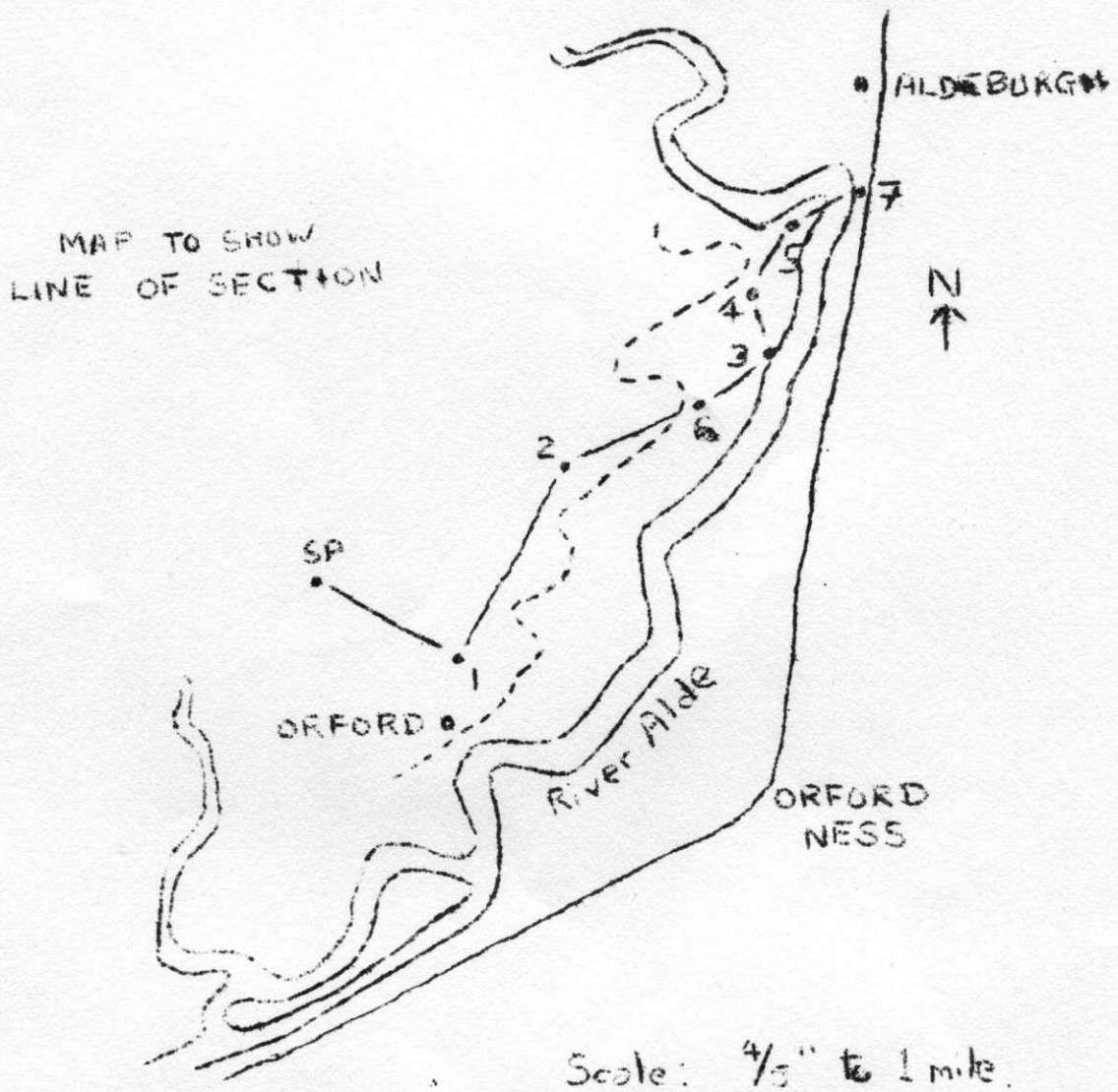
Sample B (-28' to -38') -loose Rock-bed, slightly coarser than 1B. Some small stones, include flint and phosphatic nodules; bryozoan genera and Chlamys.

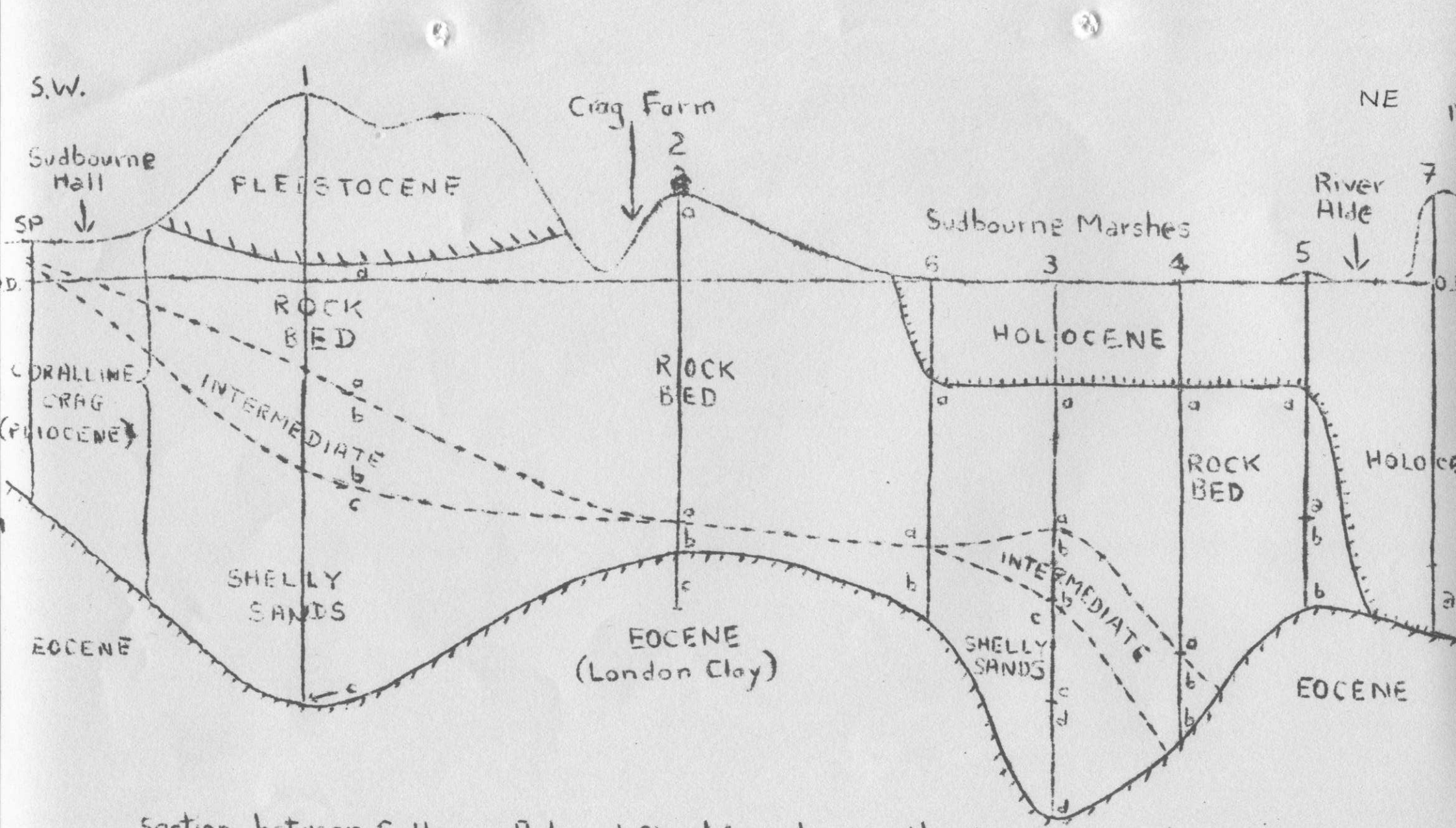
Site 7 (TM 463555), plus 10ft. O.D.

Sample A (-34½' to -42½') -stony sand, with many subangular and rounded flints, Cardium and Littorina? Also Cellaria and Turritella (both derived).

All the samples may be referred to the Coralline Crag, except 2C and 7A. 2C appears to be typical London Clay; Harmer recorded blue Crag resting on blue London Clay at Gedgrave and Sudbourne, but 2C is brown (oxidised) -possibly because the Crag (2B) above is also oxidised. 7A is a Recent (Holocene) deposit.

The bores show the two main forms of the Coralline Crag, the 'Bryozoan Rock Bed' (a rather ferruginous soft limestone, containing calcite fossils; samples 1A, 2A, 6A, 3A, 4A, 5A, 5B) resting on the 'Shelly Sands' (a light-coloured, unconsolidated shelly sand, containing both calcite and aragonite fossils; samples 1C, 2B, 6B, 3C, 3D). It is known that the Rock-Bed is an altered condition of the Shelly Sands, and the samples 1B, 3B and 4B show this transition, occupying intermediate positions stratigraphically and from the point of view of decalcification (of aragonite). Further variability of the deposit is typified by a comparison of 1A, 3A and 4A (Rock-Bed), and of 1C and 3C (shelly sand).





Section between Sudbourne Park and Slaughden, showing the divisions of the Coralline Crag, and their relations to other deposits.

Scale: HORIZ: c. 2" to 1 ml.; VERTICAL: 1" = 15ft.

The positions of the boreholes and of Sudbourne Park crag pit (SP) are given on the accompanying map (page 4), and the section (page 5) shows the top and the base of the Coralline Crag and its divisions from just north of Orford to just south of Aldeburgh. This section continues Harmer's Fig. 7 in a north-easterly direction, and modifies his Fig. 5; the Crag-Eocene junction is shown to be more undulating, and by the time the River Alde is reached, the Bryozoan Rock-Bed rests directly on the London Clay, the shelly sand apparently not reaching this far north (at least not along the line of section). A maximum thickness of about 50ft. is shown for the Coralline Crag (53ft. in borehole 1, 50ft. in 2, 51ft. in 3; erosion has obviously removed a certain amount). The grey beds (1C) may be similar to the 'blue crag' recorded by Harmer.

The fossil content of the samples varies, but this is quite typical of the Coralline Crag; the deepest crag in the troughs (e.g.3D) does not appear to have any peculiarities palaeontologically. Examination of greater quantities of the samples should give larger faunas and further information.

Small phosphatic nodules occur in samples 2B, 4B and 5B, also one or two in 3C. It may for the moment be noted that they are small, are generally near the base of the deposit (when they are present) but do not seem to be present in the deepest parts of the 'troughs' (1C and 3D).

In the accompanying section, the positions of the junctions between the Pliocene (Coralline Crag) and other deposits are based on the data given with the borehole samples, and information given on fig. 2 of A. P. Carr's paper.

R. Markham.

A DERIVED BRACHIOPOD FROM THE RED CRAG.

Among the problems of the Red Crag is the presence of derivative material with no clear indication of its source. This includes Jurassic material which does not outcrop anywhere within the area either now or during Crag times.

Among examples of this type of material in my collection are eight specimens of Thurmanella thurmanni (Voltz), a small rhynchonellid brachiopod. Examples come from Bawdsey Cliffs, Brightwell and Martlesham, in all cases either in the base of the deposit or else in minor pebble and nodule bands in the Crag sands.

Dr. D.V. Ager kindly examined and sectioned one of these specimens and he remarks that "this species occurs in the Upper Oxfordian (Lower Calc Grit) of Yorkshire but the specimens seem even more like topotype material from Germany."

This seems to outline the two main possibilities. Either they came from the British Jurassic outcrop or they have been transported by some means from a southerly direction.

Direct derivation from the British Jurassic would involve transport by river, coastal drift or glacial action. It is difficult to envisage a suitable river system; coastal drift is unlikely over so great a distance; and up to the present no pre-Crag glaciation has been proved, although this has been suggested to account for the large unworn flints in the base of the Crag.

Large rivers certainly flowed from the direction of the Continent during the Pleistocene and affected the Red Crag and even more so the later Crag beds. It is not beyond the realms of possibility that they brought with them these Jurassic fossils. All the Jurassic material in the Crag is very worn and rolled. Work done earlier this century suggested a southerly origin for the heavy minerals in the Crag sands.

Another possibility is that these Jurassic fossils were present as remanie examples in some later formation but the Red Crag seas do not seem to have had access to a suitable deposit. A further study of all the Crag erratics may prove useful - in the meanwhile it is interesting to record the presence of this species in fair numbers.

P. Cambridge.

"The Stratigraphical Range of Macoma balthica (L) in the Pleistocene of the Netherlands and Eastern England" by G. Spaink and P.E.P. Norton. Mede delingen van de Geologische Stichting Nieuwe Serie No. 18, 1967.

Shells of Macoma balthica in "Older Pleistocene" material of the Netherlands Geological Survey, Haarlem, catalogued by Heering have been re-examined. Many shells belong either to Macoma praetenuis (Woodward, Leathes MSS) or to M. obliqua (Sowerby) except those from borings at Vlissingen and Biggekerke where the deposits containing the shells are now known to be Eemian/Holocene. Diagnostic characters of the Macomas are discussed. When correlating the marine sequences of the Netherlands and the English Crags we can dismiss the supposed occurrence of a Weybournian Horizon in the uppermost marine 'Icenian' of the Netherlands.

> "In England, no occurrence of M. balthica earlier than the Weybournian Crag (as defined by Harmer) is substantiated. Spurious records from the Norwich Crag, Bramerton and the Chillesford Clay (as defined by Harmer) also exist."
> "Thus, as we conceive it in the Southern North Sea Basin, the stratigraphic range of M. balthica is from the Weybourne Crag (uppermost part of the marine Lower Pleistocene) of East Anglia and the marine Holsteinian of the Middle Pleistocene in Holland, to the present".

Excellent illustrations of Macoma obliqua, praetenuis, calcarea and balthica are given on two plates.

The difficulty of determining single, worn or juvenile shells of this genus should be emphasized. The examples of "Tellina obliqua" from the March and Kelsey Hill gravels quoted by Baden Powell (1956) should be treated with suspicion as should many of the records by Claude Morley in earlier vols. of Trans. Suff. Nat. Soc.. In general many old records of Macoma in this country need substantiating by further collecting and examination of museum material where it has been preserved.

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"Marine Molluscan Assemblages inthe Early Pleistocene of Sidestrand, Bramerton and the Royal Society Borehole at Ludham, Norfolk" by P.E.P. Norton. Philosophical Transactions of the Royal Society of London, Series B, No. 784 Vol. . 253, 1967.

An extremely important paper dealing with the mollusca of the Icenian, their ecology and environment. This paper is complementary to work on the Foraminifera by Funnell (1961) and West (1961). It now remains for complementary work on the mammalia and non-marine mollusca to determine the terrestrial temperature during this period. Vole teeth and non-marine shells arecsufficiently numerous to indicate abnormal conditions for a marine deposit and it would seem to me that much of the Icenian Crag area was deposited in the outer deltaic regions of a large river system or systems. This must have had considerable effect on the marine mollusca of the area.

It is a pity that none of the studies so far have attempted to correlate the section at Chillesford with those further north. At Chillesford, Transition Beds with some Red Crag forms and a great deal of derivative Red and Coralline Crag material, rest on Red Crag and these Transition Beds may be equivalent to the LM1 or LM 2 stages at Ludham.

One or two exceptions can be taken to determinations and notes in the Appendix. For instance the name L. littorea var. carinata Woodward, is used for forms at Bramerton. A number of "varieties" have been described based on the abnormal group of Littorina at Bramerton but these are clearly monstrosities rather than varieties in the accepted sense.

The existance of the Leda myalis Bed has never been completely proved, and Yoldia myalis which is a North American species probably does not occur in our Pleistocene.

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"Nuova Classificazione di Alcuni Briozoi Pliocenici, Precedentemente Determinati Quali Idrozoi del Genere Hydractinia van Beneden" by P.G. Caretto, Mem. Della Societa Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano, XV, 1.

The author studied various colonial invertebrates encrusting gastropods from the Pliocene of Italy and the Crag of EastbAnglia. Changes in nomenclature are suggested and some species previously described as Hydroids are re-allocated to the Bryozoa.

Hydractinia circumvestiens (Wood) is redescribed as a polyzoan, Gemelliporidra circumvestiens (Wood). The horizon is given as Coralline and Red Crags but examples from the Red Crag are almost certainly derivative and it must be considered as a Pliocene species.

Hydractinia pliocaena (Allman) is redescribed as Cellepora pliocaena.

Examples of both species are illustrated from the East Anglian Crags (Plate 2).

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Tasselia ordam de Heinzelin by P. Schuyf, Grondboor en Hamer, Nederlandse Geologische Vereniging, No. 2, April 1967.

A description of concretions found in the Merksemien near Antwerp, De Kauter in S.W. Holland, and in the shell accumulations of the Westerschelde near Ellewoutsdijke. The examples from Belgium were described by de Heinzelin in 1964 who supposed them to be formed by organisms of the phylum Pogonophora.

Examples of similar concretions occurred rarely as derivatives at the base of the Red Crag and have been referred to corals, hydrozoa and even fossil fruit. The reviewer possesses examples of a smaller more cylindrical form from the Coralline Crag (= Lower Scaldesien) and from the Scaldisien of Antwerp Docks, thus increasing the range to the Pliocene.

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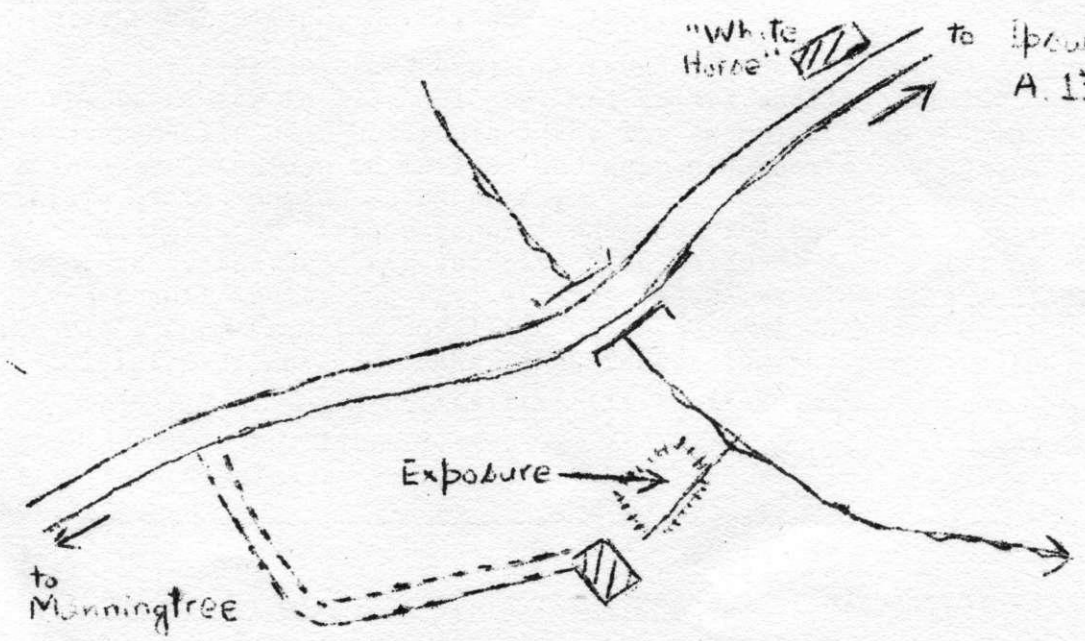
P. Cambridge.

A TEMPORARY EXPOSURE AT TATTINGSTONE (O.S. TM/134379)

The exposure consists of a shallow reservoir being excavated by a small bulldozer on farm in the valley at Tattingstone. Three visits were made to the site, and the following information obtained.



The floor of the pit slopes gradually with the valley-side, and at a cursory glance, ignoring the material deposited during excavation, seemed to show Red Crag at the upper end, and London Clay at the lower end. By digging in the base of the pit the former was indeed shown to overlie the latter as would be expected; however a closer examination of both deposits revealed that although they consist mainly of material from these horizons, they are in fact secondary depositions.

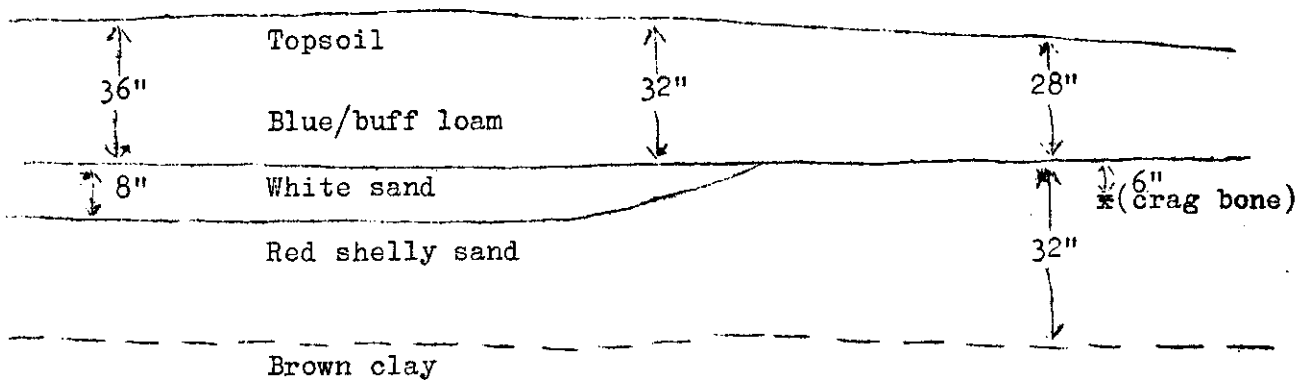
In particular, the clay is oxidised (brown) even where freshly dug and contains a small amount of vegetable material. It was decided, therefore that this is a valley brickearth derived from London Clay, upon which it probably rests. No identifiable fossils were found in this deposit.

The shelly red sand exposed at the other end of the pit appears to be unbedded and rather loose; the shells in it are mainly fragmentary. Also, the deposit is stony throughout, but does not contain a specific basement-bed at the junction with the underlying clay as would be expected. This deposit is therefore considered by the author to be material either washed down or moved by solifluction, from Red Crag higher up the valley-side. The latter suggestion is made after studying the pebbles so abundant in this deposit (seiving on a one-centimetre scale obtained a shell-to-stone ratio of about 1:5). They are mainly angular or sub-angular flints up to 2", showing some good examples of thermal flaking; as the material came from 4' below the present surface, it seems unlikely that this flaking has occurred recently, hence the idea that it may be glacial in origin.

On the first two visits to the pit (29 and 30.7.67) a loose, white quartz sand was seen overlying the red sand in the N.W. face, and containing numerous shell fragments. An examination of these shells showed a very similar fauna to the underlying red sand. It is therefore considered to be a leached or stream-washed derivative of the latter. This section had been destroyed by the third visit (11.9.67) as excavation continued.

Above these deposits is 2'-3' of a stiff, stony, blue/buff loam. This contains crag shell fragments, much recent plant material in places, and recent bones (a canine jaw, bovine tooth and tibia fragment were found). This is fairly recent hill-wash and stream alluvium, passing upwards into the top-soil.

N.W. Face of Pit



The following faunal list was compiled (mainly from fragments; N.B.this is not a good collecting site).

a) From the Red Sand

Invertebrata

Lamellibranchia

Glycimeris glycymeris (v. common).
Cardium edule
C. parkinsoni
C. interruptum
Chlamys opercularis
C. harmeri
Pecten maximus
Astarte omalii
A. obliquata
A. sp.
Spisula ovalis
S. sp.
Venus casina
Cardita senilis
Cyclocardia sp.
Pygocardia rustica
Corbula gibba
Dosinia exoleta
Mya arenaria
Woodia digitaria
Anomia ephippium
Mytilus sp.
Ensis sp.
Ostrea sp.
Pholas sp.
Panopaea sp.
"Tapes" sp..
Inoceramus

Gastropoda
- Neptunea contraria (common)
- Nucella lapillus
- N. incrassata
- Emarginula reticulata (unusually common)
- Trivia coccinelloides
- Leiomesus dalei
- Hinia reticosa
- Lacuna suboperta
- Scaphella lamberti
- Capulus sp.
- Lunatia sp.
- Natica sp.
- Sipho sp.
- Turritella incrassata

Scaphopod
- Dentalium sp.

Coelenterata
- Balanophyllia caliculus
- Sphenotrochus sp..

Polyzoa
- Trigonophora sp.

Brachiopoda
- Terebratula sp.

Arthropoda
- Balanus sp..

Vertebrata
- Unidentifiable fragment of large bone.

b) From the White Sand

Invertebrata

Lamellibranchia
- Glycimeris glycymeris
- Cardium edule
- C. interruptum
- Astarte spp.
- Cyclocardia sp.
- Venus casina
- Dosinia exoleta
- Mya arenaria
- Pholas sp.
- Panopaea faujasii

Gastropoda
- Turritella incrassata

Arthropoda
- Balanus sp.

The writer wishes to express his thanks to Messrs. J. Norman and S. MacFarlane for accompanying him on the first two visits to the site, and to Mr. R. Markham for helping with the identification of the collected fossils.

P. Grainger.

GEOLOGICAL

AN INTRODUCTION TO THE COLLECTIONS OF IPSWICH MUSEUM.

The geological collections of the Ipswich Museum are large, containing many thousands of specimens. The local series is particularly fine, especially in fossil molluscs and mammals, and there is a general series which is fairly representative of British geology.

There are two geology galleries. The General gallery (south side of the building, ground floor) contains the displayed minerals, and rocks and fossils representing the main geological periods; the Local gallery (at the rear of the building) demonstrates the richness of the local deposits. Palaeolithic (Old Stone Age) implements are shown at one end of the Archaeology gallery (on the first floor). Although the displayed collections are large, it is neither possible nor desirable to show everything, and the stores contain much reference and research material for the attention of specialists.

The earliest reference to fossils in Ipswich Museum appears to be that by Edward Charlesworth in the Magazine of Natural History, 1837, where he notices teeth of the giant shark Carcharodon megalodon.

The major portion of the Crag material was collected in the second half of last century, when the local 'Coprolite' pits were being worked as a source of raw material for the manufacture of artificial fertilisers. Mr. Edward Packard (of Messrs. Packard and Co.) gave many specimens, and the important collection of the Rev. Henry Canham of Waldringfield was obtained through Sir Richard Wallace. The more important specimens were figured in 19th and early twentieth century geological literature, and the student may be referred to 'A List of Type and Figured Specimens in the

Geological Collection', by Alfred Bell (Journal of the Ipswich and District Field Club,1917).

The collection of Palaeolithic implements and Crag flints was greatly enlarged between the wars, particularly from excavations carried out by J. Reid Moir, who published most of the important material in the Proceedings of the Prehistoric Society of East Anglia.

In the last twenty years, the collection of Pleistocene mammalia has been enlarged by important finds by Mr. H.E.P. Spencer, who has published his studies of them in the Transactions of the Suffolk Naturalists Society.

Museum staff, pit owners and workers, students, amateur geologists and the general public have all made important donations to the ever-growing collections of the Museum.

GENERAL COLLECTIONS

MINERALS AND ROCKS

A good general collection, containing representative series of most of the common metal ores and non-metallic minerals.

General collection of rocks, also specimens from most of the chief stratigraphical divisions. Polished pebbles.

PALAEOZOIC ERA (600 to 225 million years ago; includes Cambrian, Ordovician, Silurian, Devonian, Carboniferous and Permian Periods).

A general collection of Palaeozoic fossils, the Silurian (including some interesting brittle-stars) and Lower Carboniferous (Carboniferous Limestone) being well represented.

MESOZOIC ERA (225 to 70 million years ago; includes Triassic, Jurassic and Cretaceous Periods).

A general collection, the Lower Jurassic (including an ichthyosaur skeleton from Street, Somerset), Gault Clay, Cambridge Greensand, and Chalk being fairly well represented.

CAENOZOIC ERA (70 million years ago to present day).

A general collection, with emphasis on Eocene fossils. Some foreign material, particularly Paris Basin Eocene molluscs, and French Eocene and Siwalik Hills (India) Neogene mammalian remains.

LOCAL COLLECTIONS

MINERALS AND ROCKS

The Ipswich area is not rich in mineral specimens, but the local collection includes examples of gypsum, calcite, and marcasite; amber is well represented, ther being several large specimens from Felixstowe.

The oldest rocks exposed at the surface near Ipswich are of Upper Cretaceous age, but deep borings (searching, unsuccessfully, for coal) have reached Lower Palaeozoic rocks, and some of this material is preserved in the museum. An interesting series of local Crag and Glacial deposits is kept for reference purposes.

CHALK (for local geological succession, see table at end).

Large collection of echinoids (sea-urchins) of the genus Echinocorys from the Chalk, mainly from Bramford. Other specimens, added recently, include belemnites (Tails of extinct cuttlefish) Gonioteuthis and Belemnitella from Claydon, and the 'sea-lily' Marsupites from Great Blakenham.

EOCENE

'Lower London Tertiaries'- Wood from the 'Thanet Beds' of Bramford is the only common fossil of these or the 'Reading Beds'; there are a number of large sarsen-stones (concretionary Sandstone) from local sites. Beds of pebbles and sands ('Oldhaven Beds') below the London Clay have yielded a limited fauna from such sites as Bramford, Harkstead, Ipswich (Dales Road, Birkfield Drive, Hoghighland) and Kyson (near Woodbridge); molluscs (Astarte, Ostrea, etc.) and shark (odontaspid) teeth are the commonest fossils, and the ancestral horse Hyracotherium is represented.

London Clay - Wood is common, including Cercidiphyllum (nowadays a Far East genus); an imprint of an oak-leaf from Bawdsey is an interesting specimen. Turtles are represented by specimens from Harwich. Several genera of bivalve (e.g. Modiolus) and gastropod (univalve)(e.g. Aporrhais) molluscs, plus a few specimens of other groups (e.g. nautilus, crustaceans, fish vertebrae) have been found.

CRAG DEPOSITS -'Crag' is a Suffolk term for shelly sands of Pliocene-Pleistocene age found in East Anglia; several divisions are recognised.

CORALLINE CRAG

The beautifully preserved fossils of the Coralline Crag (in this country, found only in Suffolk) are well represented, particularly from Sutton and Ramsholt. Molluscs are the most abundant, and the double-valved examples of many bivalves (e.g. Thracia, Mya, Pholadomya, Ensis, Panopea, Arctica, Astarte) may be noted; there are numerous gastropods especially of the smaller genera. Bryozoans ('corallines') include many species, the unusual forms Meandropora (Fasciculariа) and Alveolaria reaching large, often fist- size: the coral Cryptangia woodi (embedded in a bryozoan) is also well represented. A lobster (Homarus) from Aldeburgh, crabs (including a perfect carapace of the spider crab Maia), and sea-urchins (Echinus, Temnechinus, and several irregular forms) are interesting finds. Brachiopods are well represented by the giant Terebratula maxima, and it interesting to note the specimens of Lingula dumortieri , the last British member of the genus after a stay of about 500 million years. Balanus concavus is a large barnacle, and the Museum has some fine groups from Ramsholt.

RED CRAG BASEMENT BED

An extremely fine collection, most of the material being obtained last century when the local 'coprolite' pits were being worked. (A bed of stones often occurs at the base of the Red Crag, and contains coprolite and fossils derived from earlier deposits; derivative material is older than the deposit in which it occurs, having been eroded from an earlier formation and incorporated in the newer bed).

Whales are the mammalian group best represented and there is a large series of whale teeth, rostra, ear-bones, vertebrae, etc.. Teeth of Mastodon (an ancestral form of elephant) include some very fine specimens. Walrus, rhinoceros, axis deer, tapir, three-toed horse (Hipparoin) and pig are well represented, much rarer being the Hyaena tooth from Trimley and the Halitherium Skull from Foxhall.

'Boxstones' are 'cobbles' of sandstone, often containing fossils of species not otherwise known in Britain: they are thought to be derived from a deposit completely eroded by the Crag sea. The Museum has a large series, being rich in molluscs (including such interesting forms as Conus) with occasional members of other groups (e.g. teeth of the giant shark, and whale specimens).

Most of the derived land mammals are of Pliocene age, the Boxstones have affinities with the Miocene.

Shark teeth are common, the Museum having many hundreds; the most spectacular are those of the giant shark Carcharodon megalodon, often five inches in length. Many others are well represented -Lamna obliqua, Carcharodon rondeleti, Isurus hastilis, Odontaspis, Notidanus, also teeth rays and wolf-fish, spine-bases of thornback-rays, fish vertebrae, etc..

Lobsters and crabs (mainly derived from the London Clay) form an important part of the collection: Cretaceous material (e.g; belemnites) is not uncommon, but particularly interesting is derived material of Jurassic (e.g. ammonites) and earlier ages.

'Coprolite' includes both fossil faeces and other phosphatised material (mudstone, fossils), the most intriguing perhaps being the spiral examples.

RED CRAG

Numerous localities are represented by fossil specimens, but those from Waldringfield and Foxhall should be noted.

Balanophyllia is the commonest coral and shows several interesting variations. Barnacles are well represented and include examples of the rare fossil Coronula diadema (which attaches itself to humpback whales at the present day) from Waldringfield, Falkenham and Woodbridge. The minute Echinocyamus is the commonest Red Crag sea-urchin and is well represented.

Of the molluscs, Neptunea, 'Natica', 'Nassa', Nucella, Turritella, Cardium, Astarte, Glycymeris, Macoma and Spisula are well represented; numerous other genera are present, including fine examples of Atractodon, Galeodea, and Emarginula. There is an interesting series of boring shells

in their burrows, also a number of freshwater shells from Butley. The oyster collection, both fossil and recent, is very fine.

A small but important series of contemporary (as opposed to derived basement-bed material) Red Crag mammals includes some interesting specimens. A shed right antler of the deer Euctenocerbs falconeri from Bramford is the most complete British specimen known; two well- preserved molars of Elephas meridionalis (the earliest British elephant) from Falkenham are also to be seen. Very rare is the porcupine tooth from Bramford. The gazelle horn-core from Felixstowe represents the earliest British antelope.

Flaked flints from the Red Crag (and the basement-bed) have been the source of much debate as to their human or natural origin, and the collection includes numerous important and instructive specimens.

NORWICH CRAG SERIES

A number of sites, e.g. Chillesford ('Chillesford Crag'), Thorpeness, Easton Bavents and Covehithe are well represented by molluscs.

There is an important collection of mammals, particularly from Easton Bavents andHolton. Deer and elephant are relatively common: a Dama nesti (fallow deer) antler from Holton may be noted, also a fine lower jaw of the 'zebrine' horse Equus robustus from Southwold and an incomplete tooth of a sabre-tooth 'tiger' from Covehithe.

Holton has provided a number of interesting stones from these beds, including igneous rocks and coal.

CROMER FOREST BED

A small collection, including elephant, rhinoceros, deer and beaver remains.

GLACIAL ERRATICS

There is a very good collection of glacial erratics (ice-transported stones), from local deposits, particularly from Great Blakenham (mainly Lowestoft Glaciation), Creeting (mainly Gipping Glaciation) and Barham. Rhomb-porphyry (transported from Scandinavia by ice) is among the interesting igneous rocks; Jurassic and Cretaceous sedimentary rocks are the commonest erratics and include numerous belemnites, ammonites, bivalves (especially Gryphaea), flint sponges and sea-urchins. Of the ammonites, a large specimen derived from the Spilsby Sandstone, and Amoeboceros (derived from the Ampthill Clay) are of importance. Jurassic shelly limestones and mudstones are common, the latter often containing fine calcite crystals -some interesting pieces of these 'septarian nodules' are in the Museum. Of particular interest are the remains (vertebrae, limb-bones, teeth) of large marine reptiles (ichthyosaurs, plesiosaurs) derived from Jurassic deposits.

'ICE AGE' MAMMALIA

The museum contains a fine collection of Middle and Upper Pleistocene ('Ice Age') mammalian remains. These may be divided into interglacial (temperate) and glacial (cold) faunas.

Interglacial - a small but interesting collection from Hoxne includes teeth of Elephas antiquus (straight-tusked elephant), horse and beaver, and deer remains. Bones from sites at Clacton (antlers of Dama clactoniana and Megaceros giganteus), East Mersea and Worlington ('lion' and hippopotamus) are in the collections.

Stoke Tunnel (Ipswich) , Brundon (near Sudbury) and the Stutton & Brickearth of the Stour Valley have yielded many important specimens of the Last Interglacial period. From Stoke, remains of horse, red deer, elephant, bovid, rhinoceros, wolf, 'lion', bear and freshwater tortoise; also note the mandible of an embryo elephant from Maidenhall. From Brundon, particularly interesting are a skull of a female giant deer (Megaceros giganteus) and a tiger mandible.

The brickearth of Stutton and Harkstead has yielded elephant remains, including a milk tooth of a mammoth embryo (found with the bones of its mother, which probably died when calving) and the lower jaws of a mammoth, the basal portion of a skull and a nearly complete left antler of a large red deer, several lion or tiger bones, bovid teeth and limb-bones, remains of freshwater tortoise, and many freshwater shells including Corbicula fluminalis (related to a shell now living in the rivers Nile and Euphrates); a few specimens (a red deer bone and two elephant teeth) have been worked and polished by prehistoric man.

The Bobbitshole (Ipswich) site of Last Interglacial age has yielded seeds, freshwater molluscs, and freshwater tortoise.

Cold Fauna - animals of the colder periods of the latter part of the Ice Age are represented by specimens from the Gipping and Waveney Valleys. A very large antler of reindeer has been found at Bramford, and interesting specimens from Barham include mammoth remains and an incomplete mandible of hyaena.

A remarkably complete skull of a woolly rhinoceros (with two premolars and two molars on each side) from Weybread is complemented by two less complete specimens from Bramford Road (Ipswich) and Homersfield.

The Palaeolithic collection is large and includes Acheulian implements from the important sites of Hoxne, Barnham, and Foxhall Road (Ipswich), and Middle and Upper Palaeolithic material, especially from the Orwell-Gipping Valley. Fossil remains of man are rare, and an incomplete, heavily-mineralised femur (Homo sapiens) from Barham should be noted.

Material dredged from the sea and rivers includes some phosphatised teeth of elephants, and a mammoth skull found 30 miles east of Lowestoft.

The collection also includes skeletal material of living species, for comparative work.

There is a fairly large collection of geological literature, largely material of the latter part of last century and the beginning of this.

Simplified Local Geological Succession

CAENOZOIC	Holocene (Post-Glacial)	-present day
	Pleistocene - Last Glaciation	-c.10,000 years ago
	Pleistocene - Ipswichian Interglacial	
	Pleistocene - Gipping Glaciation	-'Ice Age'
	Pleistocene - Hoxnian Interglacial	
	Pleistocene - Lowestoft Glaciation	
	Pleistocene - Cromer Forest Bed Series	-c.400,000 years ago
	Pleistocene - Norwich Crag Series	
	Pleistocene - Red Crag	
	Pliocene - Coralline Crag	-c.7,000,000 years ago
	major break in Suffolk (Oligocene and Miocene absent)	
	Eocene - London Clay	
	Eocene - Lower London Tertiaries	-c.50,000,000 years ago
	major break in Suffolk (Maastrichtian, Danian and Palaeocene absent).	
MESOZOIC	Cretaceous - Upper Chalk (Senonian)	-c.80,000,000 years old.
	- older rocks not exposed at the surface.	

Notes on Caenozoic terminology

'Ice Age' broadly equivalent in time-range to Palaeolithic.
Pleistocene + Holocene = Quaternary.
Paleocene + Eocene + Oligocene + Miocene + Pliocene = Tertiary
Tertiary + Quaternary = Caenozoic
Paleocene + Eocene + Oligocene = Palaeogene.
Miocene + Pliocene + Quaternary = Neogene.
Palaeogene + Neogene = Caenozoic.

BELEMNITES AT LACKFORD

In a gravel pit at Lackford (Rampart Field N.G.790720) I found, whilst visiting it late last summer, something that I have not come across before. In a small layer about a foot high, half way up the N. Eastern side of the pit there was a large accumulation of belemnites. They average ¼"-½" in length; the species is indeterminable. The pit is supposed to be of Lowestoft Till and includes many erratics.

The layer with the belemnites continued for about 20 yards either side and contained no other fossils except for small fragments of 'Gryphaea' (very common at this pit).

P. Christie.

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R.M.

CIRRIPEDES OF THE CHALK (U. CRETACEOUS) OF NORFOLK

The cirripede assemblage of the Norfolk Chalk is quite prolific; so far, ten genera containing seventeen species and four sub-species have been recorded (Withers 1935). The earliest species which fanges into the Chalk is*Arcoscalpellum angustatum* (Geinitz) and this is first recorded from the Albian (Gault: H. orbignyi (Spath) subzone), it is common in the Cambridge Greensand and extends to the Middle Senonian, M. coranguinum zone. One species only, Cretiscalpellum glabrum (Roemer), has been recorded throughout the Chalk of this area; it first makes its appearance in the Cambridge Greensand and extends to the Maastrichtian, Chalk with O. lunata subzone.

A fragment of a tergum attributable to Loriculina laevissima (Von Zittel) was found in the B. mucronata zone near Norwich and has been included in the list (see table). The species is better known in this country from the Turonian of Hampshire and Surrey, and the Upper Senonian of Wiltshire.

The Upper Senonian, B. mucronata zone about Norwich appears to have been particularly favourable to the growth of cirripedes, since valves of some of the commoner species attain a larger size here than in the Hampshire Basin, with the possible exception of those found at Studland, Dorset.

The geographical distribution of many of the species is widespread. Some, like C. glabrum, which is the commonest species, and A. fossula (Darwin), have been recorded from Dorset, Wiltshire, Sussex, Kent and Surrey, and abroad from the Isle of Rugen, Belgium, Maastricht, France, Czechoslovakia and other localities. While one species, C. paucistriatum (H.Woodward) has been found elsewhere only near Limbourge, Holland, two species, A. bellulum Withers and Eoverruca hewitti Withers, appear to be confined to Norfolk. Both the species are very small (the valves not exceeding 3.5mm. in length) and where the former is known by two valves, the latter is said to be fairly common in the Uintacrinus zone.

A further sixteen species and two subspecies are recorded from Chalk deposits in other parts of the country.

The system of zones adopted here is after Peake and Hancock(1961).

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J.S.H. Collins.

(for Table see over)

Table; Zonal Distribution of the Cirripedes of the Norfolk Chalk.

ZONES	SUBZONES	
B. lanceolata	with O. lunata	I
B. mucronata		II
Gonioteuthis		III
Marsupites		IV
Uintacrinus		V
M. cor-anguinum		VI
H. planus		VII
	H. roussianum	VIII
Subglobosus Chalk		IX
Totternhoe Stone		X

	I	II	III	IV	V	VI	VII	VIII	IX	X
Brachylepas naissanti (Herbert)	x	x								
B. fallax (Darwin)	x	x								
Verruca prisca (Bosquet)		x								
Eoverruca hewitti (Withers)					x					
Proverruca vinculum (Withers)					x					
Stramentum expansum (Withers)		x								
Loriculina laevissima (von Zittel)		x								
Virgiscalpellum beisseli (Bosquet & Müller)		x								
Arcoscalpellum bellulum (Withers)		x								
A. maximum (J.de C.Sow.)	x	x	x							
A. Maximum var. sulcatum (J.de C.Sow.)		x								
A. maximum var. solidulum (Steenstrup)		x								
A. maximum var. triminghamensis (Withers)	x									
A. fossula (Darwin)	x	x		x						
A. angustatum (Geinitz)						x	x	x		
A. trilineatum (Darwin)									x	
Cretiscalpellum paucistriatum (H. Woodward)	x	x								
C. striatum (Darwin)	x	x		x			x	x		
C. striatum var. dissimile (Withers)							x			
C. glabrum (Roemer)	x	x			x			x	x	x
Zeugmatolepas cretae Steenstrup)		x	x							

A SCALARIA FROM ST. ERTH, CORNWALL

Only one example of the gastropod Scalaria seems to have been recorded from the St.Erth Beds (these deposits include a fossiliferous clay, the fossils of which have been compared with those of the Crag by some authors); A. Bell (1898) notes it as "Scalaria,sp.(?)pulchella, Biv. (see Philippi,1836); A small acute-spired shell, with flattish whorls, set with fine, narrow, close-set ribs. Unfortunately the only specimen was destroyed by an accident." Harmer (1914-24) does not mention any Scalaria from St.Erth, and says (p.503) "Many of the characteristic and abundant groups of the Red Crag univalves, moreover, are unrecorded from St.Erth, as, e.g. certain species of Nassa, Buccinum, Ocinebra, Neptunea, Sipho, Searlesia and Scala."

It is therefore of interest to record the finding of another specimen of Scalaria (= Scala) from St.Erth, when the writer (accompanied by C. Garrod) visited the site in September 1966. The shell was complete except for the apical whorl; it has since unfortunately had the outer

lip broken.

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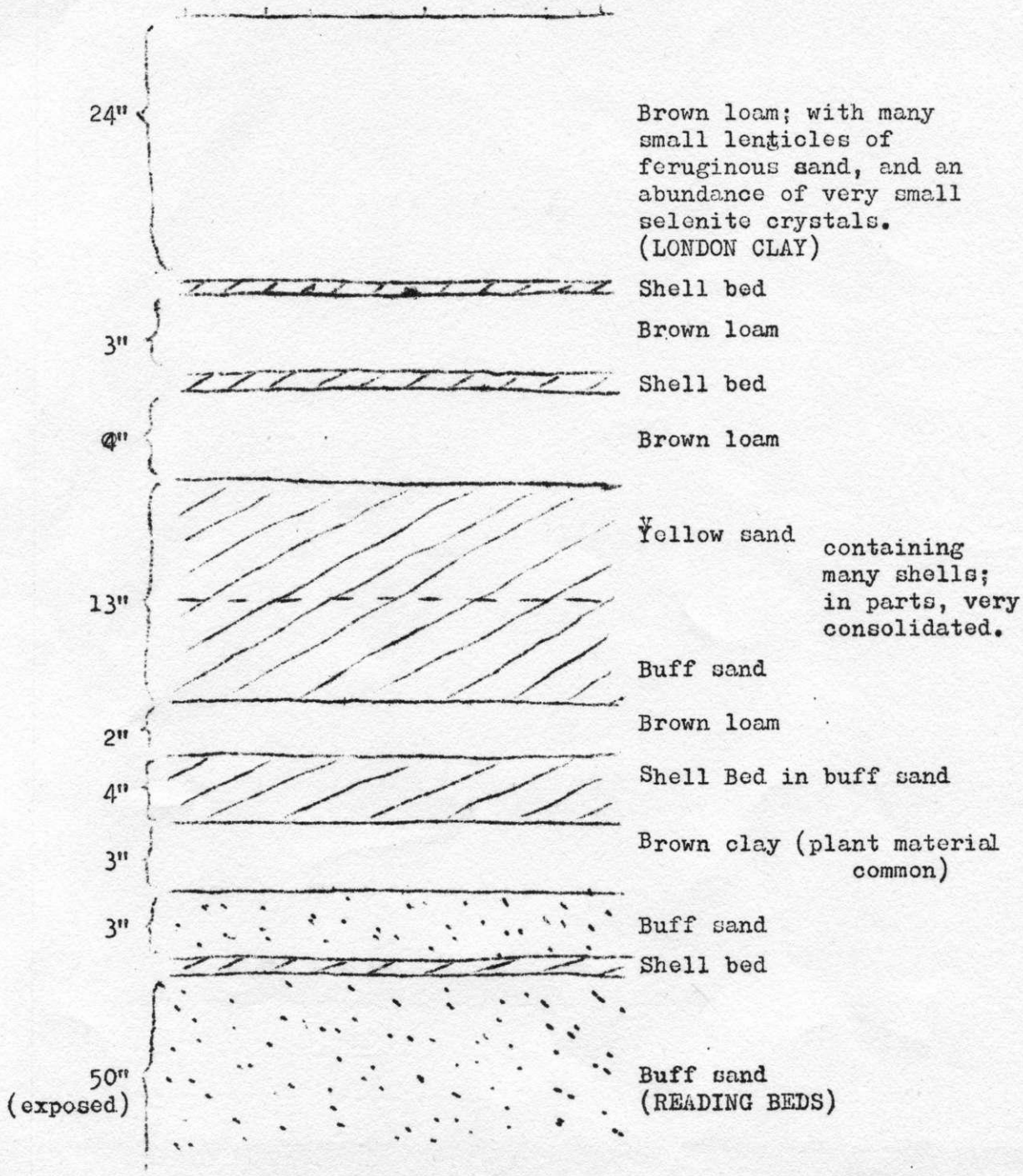
R. Markham.

A SECTION THROUGH THE BASEMENT BED OF THE LONDON CLAY AT GROVELANDS PIT, READING (for comparison with that in the Ipswich area)



In other parts of the pit, at a lower level, a mottled mixture of orange sand, white/green sand, grey and dark red loam is exposed, overlain by well-bedded pale sandy loam, which is possibly the base of the buff sand shown above.

P. Grainger.

GEOLOGICAL GROUP, IPSWICH. JUNE 1968 (Bulletin no.4, for February 1968).

Editor, R. Markham, c/o The Museum, High Street, Ipswich, Suffolk.

Apologies are offered for the late publication of this bulletin, and the quality of duplicating of some of the sheets.

The editor wishes to thank the people who have made this bulletin possible -contributors, subscribers, S. MacFarlane for much practical work, Ipswich Museum for facilities granted; stencils typed by editor and P. Grainger (pp. 11-18).

The top two lines on page 2 of this bulletin should read - "indicate that either the animals grew in deep water, away from the beach, or, more probably, that they were derived from the destruction of the"

The articles by J.S.H.Collins have previously appeared in the following publications-

'Cirripedologists' Newsletter, Vol.2. no.2, June 1966' (Norfolk Chalk Cirripedes)

'Freelance Geological Association Journal, Vol.2, no.3, March--December 1964' (Beggar's Hollow cirripedes, and Coralline Crag Portunus).

Several notes on Claydon (Church Lane pit) have had to be held over for the next bulletin.