IPSWICH GEOLOGICAL GROUP

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Contents

GEOGRAPHIC AND GEOLOGICAL NOTES ON THE IPSWICH DISTRICT

By H. E. P. Spencer, F.G.S.

East Suffolk has beds of sand and clay deposited during the closing chapters of the series of geological epochs. In the region there are probably the greatest number of formations to be found in any such limited area.

Basically everything rests on the Cretaceous chalk laid down over 70 million years ago. Locally there are at least 250' missing of the upper chalk which is represented on the Norfolk shore at Trimingham by the *Ostrea lunata* zone. In the Gipping Valley the chalk outcrops between Claydon and Needham Market where it is singularly free from flint and about 98% calcium carbonate. Fossils are not abundant. Chalk gave rise to a number of industries most of which are discontinued – namely lime burning, whiting manufacture (the basis of distemper and whitewash). New industries are chalk for agricultural purposes and the manufacture of Portland Cement. The latter was only possible because of the adjacent masses of boulder clay – a product of the "Ice Ages".

Resting on the chalk are a series of Eocene deposits, which from the base upward are the Thanet Bed with its Basement Bed of curiously shaped flints, and the "Bull Head Bed". Next are the Reading sands and clays which like the Thanet are exposed only in temporary sections. Small remnants of Oldhaven Sands with pebbles etc. occur at Hoghighland and Bobbitshole. The uppermost part of the Eocene series is the London Clay which in some places has been completely destroyed. One of these is the Belstead Brook Valley near Gusford Hall where the early Pleistocene Red Crag rests on Reading Beds; another is Bramford Chalk Pit.

The Pliocene Coralline Crag is next in the series and exists only as remnants of which the smallest (seldom seen) is at Tattingstone; another, and perhaps the best documented, is in the Ramsholt-Sutton area. The largest extends northward from the Butley River to Thorpeness and is exposed in the Aldeburgh Brickyard and on the Aldeburgh-Leiston Road. At the base of the Coralline Crag is a stony basement from which teeth and antler fragments of Pliocene terrestrial mammals have been obtained. The most interesting of these are of Mastodons considered as ancestors of the elephants) and an axis type of deer, *Axis pardenensis* (C.& J.). The presence of these animals remains represents earlier Pliocene formation of a continental phase of the epoch which was destroyed by the inundation of the Pliocene sea in which the oldest of the Suffolk Crags was deposited. Traces of this vanished era have been found at Dove Holes in the Pennine region.

In addition to evidence of a former Pliocene stage the Basement Bed contains also rolled pebbles and cobbles of brown sandstone. Of these about 20% contain fossil mollusc and, rarely, teeth of the extinct giant shark *Carcharodon megalodon*. If teeth are an indication of size proportionate to modern sharks this monster may have been about 70' long. These remains prove the former existence in eastern Britain of vanished Miocene strata which, like the early Pliocene continent, was destroyed by the Coralline Crag sea – and perhaps partly by ice. Teeth of the *Mastodon angustidens* etc. imply an earlier terrestrial stage.

Following the Coralline Crag epoch the established cycle of events seems to have been repeated as is shown by the curious mixture of erratic rocks and fossils assembled in the Basement Bed of the Early Pleistocene Red Crag. This Basement Bed is much better known than that of the earlier Crag because it was exploited for the phosphatic nodules ("coprolites") during the last century. This gave rise to the artificial fertiliser industry, now represented by Fisons Ltd.

In the Red Crag Basement Bed fossils from most of the earlier formations have been found as far back in time as the Jurassic (140-170 million years) and the Cretaceous (70-140 million years). There are also teeth of Hyracotherium (the ancestor of the horse in the eastern hemisphere), with Coryphodon and Lophiodon, Eocene representatives of the early Age of Mammals. Boxstones occur which were derived from the Coralline Crag Basement Bed together with Miocene Carcharodon teeth, Mastodon and other Pliocene fossils and, most important, Pleistocene mammals of the elephant and horse family, the presence of which proves that the bed really belongs not to the Pliocene (as was generally believed) but to the Pleistocene. This evidence was consistently overlooked, ignored or explained away until the Plio-Pleistocene boundary revision during the International Geological Congress in London, 1948. Cretaceous and Jurassic rocks in this mixture cannot have been transported to Suffolk except by ice and these together with striated stones suggest a pre-Red Crag Glaciation which may perhaps represent the Gunz of the Alpine sequence, or the earlier Donau. The latter is the last of some half dozen earlier glacial phases identified in southern Europe.

It is evident from observation that the incursion of the Red Crag Sea completed the destruction of an earlier Pleistocene landscape and such earlier deposits as had survived the pre-Red Crag ice. The quantity of derived Coralline Crag debris of polyzoan fragments proves the destruction of a large part of that formation in the Ipswich area and implies the Pliocene Crag was one widespread deposit.

The earliest Red Crag recognised is at Walton on Naze where the presence of large numbers of the "Left-handed Whelk", *Neptunia contraria*, which at present lives mainly in a Mediterranean climate, implies a warmer climate than we have now. This crag has been divided into arbitrary zones based on percentages of living and extinct species of marine molluscan fossils which are so abundant in this formation, but at no time did the vertebrate fossils receive any serious attention until recent years. At Walton the *Neptunea* shells are average size but in the Newbournian zone some giants of the species existed suggesting an even more favourable climate. In the Butleyan zone not only do the shells deteriorate so far as size in concerned, but species occur which prove the climate was cooler.

A widely held theory is that during a glaciations ("Ice Age") large quantities of water are locked in the ice and consequently the lea level is lowered. Under these conditions the oldest part of the Red Crag is undetected since the lowest Crag is unknown. The base of the crag on London Clay is between 40-50' O.D. at Walton; at Wix it is at 100' at Battisford there is a pebbly Crag beach at about 150', the highest level known in Suffolk. This unpublished data suggests the Red Crag is an interglacial deposit. It also reflects the geographical changes of the area more clearly than do the earlier formations with their fragmentary data.

The Red Crag is the southernmost of the Pleistocene Crag Series which includes the Red, Norwich and Weybourne Crags. It has been proved that the Norwich Crag at Southwold extends downward to -170' (below present sea level) and has a total thickness of about 300'. There is a possibility that the lower strata may perhaps be the missing lower portions of the Red Crag. Published maps show the outcrop of the Crag extending from Sudbury to Bramford and northward to Norwich and Weybourne. This is far from representing the limits of the Crag Sea as to the west and north of this line at least 100' of Crag sands have been revealed by numerous well bores.

The terrestrial indigenous mammals of the Pleistocene Crag period include the earliest British elephant *Archdiskodon meridionalis, Equus robustus*, sundry deer, *Megaceros verticornis, M. savini, Euctenoceros sedgwicki, E. falconeri, E. Tetraceros and Dama nesti nesti*. The early elk, *Libralces gallicus* is first recorded from Norwich Crag and the fauna is now known to be ancestral to the better known fauna of the Cromer Forest Bed series.

The Chillesford sands and clays rest on the Red Crag in the Butley and Orford area, but the laminated clays at Aldeburgh and Easton Bavents have been proved to belong to the Norwich Crag series of sands and clays by means of the fossil pollens.

Following the Crag and Cromerian series are the series of glacial and interglacial beds with the latter generally regarded as the first interglacial; most of the mammals of that epoch are extinct. The earliest TILL (deposit laid down in situ by ice) is the Cromer Till. (Till is equivalent to the term Boulder Clay; all tills do not contain boulders, but many do.) This till does not extend south into Suffolk, but the Norwich Brickearth, which is considered to be equivalent, occurs as far south as Covehithe cliff and at Easton Bavents and Holton overlies the Norwich Crag. The brown colour and included derived shells of the Norwich Brickearth seem due to the inclusion of much material from the Norwich Crag over which the ice progressed. (It must be stated that the

Norwich Crag, with its beds of sand, gravel and clay, bears little resemblance to the Red Crag which is generally redder – due to hydroxide compounds of iron – and where not decalcified, its abundance of shells.)

Overlying the Cromer and Norwich Tills is the Corton sands, a very controversial deposit, which in all probability represents an interval (interstadial) between the first and second advances of "Mindel" ice. The second advance is responsible for depositing the Lowestoft (Kimmeridgian) Till which blankets northern Suffolk and occurs patchily in this area. This ice brought rocks from West of the Pennines and the Midland plain, and fossils of Jurassic marine reptiles, Ichthyosaurs, Plesiosaurs and Pliosaurs, occur in it. It extended southward to the Thames valley.

This glaciation was followed by a temperate period when the 'straight' tusked elephant, *Hesperoloxodon antiquus*, was the sole pachyderm in Britain. Prehistoric man hunted in the Hoxne and Ipswich areas and his Acheulian "Hand Axes" have been found sporadically over much of the region. The interval is known as the Great Interglacial when the Thames flowed N.E. over Essex past Clacton and Walton and our east coast rivers were tributaries. At the end of this interval there was a great deal of denudation which, as had happened so frequently in earlier ages, resulted in the destruction of most of the deposits of the era. Geographic change is marked at Hoxne where ancient lakebeds (or what remains thereof) lie on the plateau and new valleys have been excavated by streams on each side. Similarly at Foxhall Road, Ipswich, remains of a lake, or perhaps an old riverbed, occur on the plateau, high above the Orwell Valley. High level gravels and brickearth in N.E. Essex imply similar geographic changes.

Again ice spread from the north bringing rocks from lowland Scotland, the Cheviots, Yorkshire and Lincolnshire into Suffolk; this also extended into Essex. This is now known as the Gipping glaciations which produced the upper Chalky Till (Riss).

Another interglacial followed and temperate terrestrial formations and their fossils testify to climatic change from cool to warm and back to cool. Mammaliferous beds occur at Brundon, and the Stutton Brickearth Bobbitshole Lake Beds and Stoke Hill loams have all yielded fossils proving abundant animal life. Notable among these was the S. European Pond Tortoise, *Emys orbicularis*, which can only breed in a climate as warm as Southern France. This with *Corbicula fluminalis*, a mollusc not now found nearer than the River Nile, show the climate was warm during the middle of the interglacial. During the middle period the Mammoth, Rhinoceros, Horse, Red Deer, Bos and Bison, Bear, Lion, Wolf and Fox all lived here. Toward the end of this warm interval the Red Deer was replaced by the Reindeer and the Woolly Rhino appeared. Hyaenas seemed to have favoured a diet of Woolly Rhino as more gnawed bones of the animal have been found than any other beast.

Lastly another cold period, when no actual ice sheet reached the area, finally modified the landscape leaving the flat plateau and clogging the valleys with a gravelly till.

In post glacial times only marsh and fen deposits have been formed and limited areas of sand dune which have been largely destroyed by man.

COAST EROSION

The following quote is from the British Association Report of 1895 (Ipswich meeting), they in turn having quoted it from 'An Historical Account of Dunwich, anciently a City, now a borough;

Blithburgh, formerly a Town of note, now a Village; Southwold, once a village, now a Town-corporate; with Remarks on some Places continguous thereto.' By Thomas Gardner: London, 1754. – It is hoped that it will be of interest. **R. Markham**

An Account of Dunwich in 1589 by Radulph Agas

'The Toune of Dunwich, a Coaste Toune, neare the Midle of the Sheire, is scituate upon a Cliffe fortie Foot hie, or there about; bounded on the Easte with the Otian Sea; on the Weaste with the Toune of Westleton, and is girt on the Weaste and South, neare to the bodie of the Toune, with an Auntient Bancke, whereof Parte is now builte with the Wall of the Graieffriers; the North ans South ends are environed with diverse Marishes, Shredds, and divided with Fleetes, Crickes, and Diches; the Auntient Haven there was sometime at the North Ende of the Toune, where standeth now their Keie, which Haven was utterlie choaked upp, with a North-Easte Winde, the foretene Daie of Januarie, Anno 1 Edward III. notwithstanding if it were recovered woulde not onlie preserve the Toune from Danger of the Sea; but bie Helpe of a Sluce weasteward, woulde be soe mainetained the same as might likelie bringe the same Toune neare to her former estate and condition. At the Losse of this Haven, another was opened verie neare the Place, where Dunwich Men have, now in a shorte time, bie Helpe of Nature, prepared a Passage as by ancient Inquisit, and other evidence maie plainelie appeare, videlez, fere duas leucas ab antique Portu: That this Haven hath been oftentimes chaunged; for the whole Raunge of Shingle assureth it in noe Place certaine, causing it to runne Southward bie trussing, and choakinge the same with Beach, appeareth bie sondrie evidence, videlez. that the Men of Bliborough, Walberswick, and Southwold, shall paie duelye to Dunwich men their Toules and customes, ubicunq portus ille mutari contigerit. That as novi portus ac filum aquae ejusdem shall be the Boundes betwene the Toune of Dunwich, and the Lordship of Bliborough, ubicunq dictum novum portum in futurum diverti vel mutari per jactum sabuli vel aliunde contigerit; as also bie the view of the Place itselfe. Notwithstandinge were it now runneth these have bie good happe lighted on an owse Banke at the South Side of the Haven, which causeth the back Water to turne of the Beache, and to lie straight againe the Mouthe, as hath happened divers times since the same was opened first. And although the North Easte Windes have been, since the same was opened, most violent and extreme, as also the 10, 11, 12, and 13 of this present Moneth, yet the verie nexte Daie affter, being the fourteenth Daie, divers loaden crayers went readilie out of the same. and whereas there are now to Flattes, on the North Side of the Haven, which the Walberswick and Southwold Men would willinglie turne Dunwich men unto; being notwithstandinge Owners, under her Majestie, of the same Haven there, and more than a Mile above, and the intended Cuttes of the said Walberswick and Southwold men there, very dangerous to all Passengers, bie Reason of certaine Flattes called Passelie Sands, yf a Cutt were made both on a Levell, and as appeareth Owessey Ground, from the Weaste Flatt toward their keies, they should remedie those Flattes, and perfect the Haven as bie this Platte may better appear.'

THE CRAG EXPOSURE TO THE WEST OF THE WATER TOWER ON RUSHMERE HEATH

S. J. J. MacFarlane

The site lies on the side of a small stream valley which runs along the western edge of the water tower enclosure and the Foxhall stadium. The crag was exposed in a large square pit approximately 25'-30' square dug to accommodate a drainage appliance.

Three faces of crag were seen in this pit, the fourth side being blocked by a concrete bastion; unfortunately the faces of crag did not run the whole length of the side of the pit, at each corner a ramp of talus led down into the pit and the slope of the sides themselves was such that they were easily obscured by soil slipping from above.

The face to the north of the pit which I will all face (A) was partially obscured and divided into an upper and lower face (see diagram).

Profile of pit side (Diagram not included here)	Soil	2 ins	On the left is the succession through which the pit was dug at FACE A
	Brownish sub soil	3 ins	
	Fine gravel	18 ins	
	Yellow sand	6 ins	
	Obscured	18 ins	
	Upper shell bed	2 ins	
	Yellow shelly sand	8 ins	
	Lower shell bed	7 ins	
	Yellow sand	2 ins	

Species recorded from Face A (lower shell bed)

Mya arenaria	Natica sp
Spisula sp.	Nucella lapillus
Venus casina	Turritella sp.
Chlamys sp.	
Macoma obliqua	Ditrupa subulata
Gastrana laminosa	
Mytilus edulis	Barnacle sp.
Cardium angustatum	
Cardium parkinsoni	
Ostrea sp.	
Glycimeris glycimeris	
Pholas sp.	

It is to be noted that an extensive collection was not made and that most of the above species were fragmentary.

The face to the east of the pit, Face (B), was a clear face of crag; however it was obscured above the fine gravel. The remainder of the face where the crag was seen was quite clear however.

	OBSCURED	1 ft	
(Diagram not included here)	Fine gravel	15 ins	Succession through
Pit side profile	Fine brown sand	13 ins	which pit passed on
	Upper shell bed	10 ins	face B
	Yellow shelly sand	7 ins	
	Lower shell bed	7 ins	
	Yellow sand	4 ins	
	Hard brown clay	2 ins	

Species recorded from Face B

Upper shell bed

Glycimeris glycimeris	Turritella incrassate
Spisula sp.	Natica multipunctata
Tellina obliqua	Neptunia or Nucella sp. (juvenile)
Cardium edule	
Cardium parkinsoni	
Mya sp.	
Pholas sp.	Barnacle sp.
Mytilus	

Lower shell bed

Astarte sp.	Nucella lapillus
Spisula sp.	Natica sp.
Glycimeris glycimeris	Turritella sp.
Mya arenaria	Neptunea contraria
Cardium edule	Hinia reticosa
Cardium angustatum	Natica multipunctata
Cardium parkinsoni	Turbonilla sp.
Dosinia exoleta	
Corbulomya complanata	
Mytilus sp.	
Macoma sp.	
Pholas sp.	Echinocyamus pusillus
Chlamys opercularis	

Also from below the lower shell bed in the yellow sand were found

Astarte sp.	Natica sp.
Macoma sp.	
Mya arenaria	

These species were also very fragmented.

The third face of crag on the south side was very poor indeed, no collection was made.

MARSUPITES FROM THE GIPPING VALLEY CHALK

A few plates of the zonal crinoids (sea-lily), showing the characteristic patterning of the genus Marsupites, were found by C. Allen and R. Markham in the Chalk of the deepest part of 'Masons Quarry', Great Blakenham, about half a dozen years ago. The outcrop of this zone had been recorded in the Brett Valley, and may now be recorded from the Gipping Valley, due to the depth to which this quarry is excavated. Two or three additional plates have recently been found by J. Norman and R.M.. **R. Markham**

NOTE OF SOME CRAG FOSSILS IN THE MUSEUM OF THE GEOLOGY DEPARTMENT OF BIRMINGHAM UNIVERSITY

The more interesting of the specimens noted during a visit in 1961 are listed here:

No. 1994 Hippochrenes ampla, "Red Crag, derived from Eocene". (the preservation, and the species, made me doubt its Crag origin; the specimen needs examination).

---- Galeodea bicatenata with infilling of calcite crystals. (An interesting specimen of this rare gastropod).

---- 'Elephas' meridionalis?, L.S. and T.S. of molar. Red Crag, Trimley. (Elephant teeth are rare in the Red Crag).

1637 Ceratorhinus schleiermacheri, part of upper molar, Red Crag, Woodbridge. (Upper molars, of more value for species determination than lowers, are also much rarer in the Crag).

---- Mastodon arvernensis. Norwich Crag, Easton Bavents. Also labelled "Forest Bed". (!) (a tooth? – no note was made at the time).

R. Markham

(The short articles in Newsletter 1 are more appropriate to the Bulletin, and are repeated). Table on page 8-10 not included here.

SECTION THROUGH JUNCTION OF RED AND CORALLINE CRAGS, "THE ROCKS" RAMSHOLT

Section as seen 29th August – 4th September 1963.

A section about a yard wide was cleared.

The exposure showed some 7 feet of Red Crag resting on Coralline Crag seen to 3 feet.

The Red Crag was represented by shelly sands with ferruginous bands, together with coprolites and small black flint pebbles, many of which had been broken and imperfectly rounded. False bedding was not noticed and the ferruginous bands were approximately horizontal.

The basal layer, (A), showed yellowish sands with large, almost unworn flints unevenly distributed throughout. These flints often measured nearly a foot in diameter, and one was encrusted with barnacles. The layer was bounded above by a band of almost unworn to rounded flints, generally about six inches in diameter; and ¼ inch thick iron pan band at the base.

The Coralline Crag below the iron pan was represented by 2 ½ inches of hard, marly sandstone with comminuted shells. The under surface of the iron pan contained lamellibranch casts. The remainder of the Coralline Crag consisted of pale yellow sands, with a zone of whitish sand (B) at the base.

Bryozoans were collected, but other fossils were not observed during a cursory search.

The base of the deposit was not seen, but London Clay outcrops on the beach. **Colin Holcomb**

List of fossils from Red Crag, Ramsholt 'Rocks'

Phacoides borealis
Chlamys opercularis
Chlamys harmeri
(Pecten pusio)
Pecten maximus
Mytilus edulis
Spisula spp.
Tellina praetenuis
Macoma oblique
Glycimeris glycimeris
Cardium parkinsoni
Cardium edule
Cardium ?interruptum
Ostrea sp.
Dosinia exoleta
?Venus ovata
Venus ?imbricata
Ensis ?siliqua
Corbula sp.
Cyprina ?spp.
Cardita senilis
Cardita scalaris
Astarte omalii
Astarte basteroti
Astarte obliquata
Astarte sp.
Pholad
Tapes

Searlsia costifera
Neptunea contraria
Nucella lapillus
Turritella communis
Nasa reticosa
Nassa ?granulata
Scaphella lamberti
Liomesus dalei
?Lunatia sp.
?Polinices sp.
?Trochus sp.
Buccinum ?undatum
Trophon clathratus
Trivia coccinelloides
Melampus pyramidalis

Cellepora
Cheilostome bryozoans

Cliona (borings)

Barnacles

Echinoid spines

Terebratula sp.

Crustacean (fragment)

Sphenotrochus sp.

(All of the above were found in situ. Help with identifications was given by R.M.; the determinations were made nearly three years ago, and have not been checked for this bulletin. R.M.)

The famous paper on the Hoxne Palaeoliths, by John Frere, is duplicated below. It first appeared in Archaeologia, vol. xiii. p.204, 1800. It was reprinted in 'On the Occurence of Flint Implements, associated with the Remains of Animals of Extinct Species in Beds of a Late Geological Period, in France at Amiens and Abbeville, and in England at Hoxne, by

Joseph Prestwich, F.R.S., F.G.S., from the Philosophical Transactions, Part II. It is taken from the latter paper. R.M.

(It is hoped that repeats of the original and historical works by John Frere (last page) and William Smith (this page) will be of interest. R.M.)

Extracts from 'Strata identified by Organised Fossils', by William Smith, June 1, 1816.

(There are several other notes of interest. The frontispiece is a Mastodon tooth. R.M.)

(Some extracts not included here.)

FOSSILS COLLECTED FROM THE LONDON CLAY, 1963

Wood in the form of twigs enclosed in septaria has been collected from:

I. The Deben foreshore, nearly opposite Waldringfield at 294492
II. The Orwell foreshore, near Bridge Wood at 185415
III. The Stour valley at Stutton, 150330

Also from site I. above, two small bone fragments, enclosed in septaria, presumed to represent fish remains.

In the cliffs near site III., at c. TM 139331, carbonaceous, lamina 'charcoal like' matter occurs in nodules and in cylindrical masses near the base of the cliffs (c. 4ft. above beach level). This carbonaceous material is associated with grey 'amorphous' powdery deposits and a brown 'humus like' substance. The whole association is often enclosed in, or associated with gypsum crystals. These features, along with groups of gypsum crystals occupy a zone about 18" in thickness running parallel to a layer of tabular septaria 2ft. above.

Pyritised wood is also relatively abundant on the shores of the Orwell around site II., although I have never observed any in situ there.

From another site in the Stour valley, a set of thirteen shark vertebrae were collected in Jan. 1962, from a platform of clay below high water mark at Harkstead cliffs, 187338. The vertebrae were lying approximately in their natural position, eight being in contact and in line on a horizontal plane, the rest being slightly displaced. The bones had been cleared sufficiently by tidal scour to be visible above the relatively unweathered clay in which they were imbedded, although they were themselves very fragile. It was obvious that any similar bony remains higher in the clay appearing in the cliffs above high water mark would not survive to be weathered out of the dry surface.

From the beach at Stutton, B. Keeble has recently collected a well preserved shark tooth (*Lamna sp.*) which has, from its appearance, presumably been weathered out of the London Clay in the area. **C. Allen**

SIMPLIFIED TABLE OF LOCAL STRATA

(Not included here)

AN EXCAVATION IN THE CORALLINE CRAG AT TATTINGSTONE

An attempt (unsuccessful) to dig to the base of the Coralline Crag at Tattingstone (TM 143374) was made by C. Allen, B. Keeble and R. Markham on April 13, 1963, by kind permission of Mr. R. Caldwell.

At this locality (see diagram, page 23), Red Crag is seen to rest on Coralline Crag, exposed (13.4.'63) to a maximum depth of 4 ½ ft.. Excavation proved another 4ft. of Coralline Crag before the water table was reached; digging then became more difficult with the increasing inflow of water (necessitating baling) finally stopping operations after a further 2 ½ ft., making a total of 11ft. of Coralline Crag recorded (without reaching base).

The section (page 23) may be briefly noted ---

J -Red Crag, shelly.

I -Red Crag-Coralline Crag junction – exact line of junction sometimes difficult to tell (disturbed -?reworked- Coralline Crag in places; Coralline Crag material included in Red Crag). Apparent dip of junction in southern part of the section, c. 6° to South.

H -nodules at 8" and less from top of Coralline Crag.

G -ferruginous band, 18" from top of Coralline Crag.

F -nodule band, 46" below G. (5'4" from top of Coralline Crag).

E -nodule band, 11" below F. (6'3" from top).

D -nodule band, 6" below E. (6'9" from top).

C -pink layer and nodule band (a *Diplodonta* found just above this layer); 12" below D (7'9" from top).

B -17" light-coloured crag. (bottom 3" in part black stained). (Base of B 10'0" from top).

A -12" orange-coloured crag (base not seen). Some concretionary structures (not so Hard as nodules higher in section) at junction of A and B. Lowest level of water (1) 1"-2" below top of orange crag; excavation stopped after another 10"-11", as impossible to bale (needed continuously) and dig at same time in restricted space. Deepest part of hole 11'0" below top of Coralline Crag).

2 -approximate level of water table (13.4.1963); 10" below C (8'7" from top of Coralline Crag).

(N.B. –the 'nodules' of the nodule bands are indurated shelly limestone).

List of fossils collected from Coralline Crag, Tattingstone, 13.4.1963
(not checked since 1963)

Pelecypods
- Arca lacteal
- Limopsis pygmaea
- ?Limopsis aurita
- Glycimeris glycimeris
- Astarte sp.
- Woodia digitaria
- Ostrea sp.
- Anomia sp.
- ?Mya sp. (fragment)
- Corbula sp.
- Spisula sp. (large)
- Cardita corbis

Gastropods
- Natica sp.
- Turritella sp.
- ?Emarginula sp.
- Scalaria sp.
- ?Gibbula sp.
- Calliostoma ?zizyphinum

Foraminifera

Echinoid spine

Bryozoans

Diplodonta rotundata	Trigonophora
Chlamys ?opercularis	Celleria
Chlamys ?harmeri	
Ensis ?ensis	Coral
?Tellina or Donax? (fragment)	Sphenotrochus intermedius
Venus ovate	
Cardium decorticatum?	Barnacles
	Fish otoliths

R. Markham

(Notes on previous work below.)

"Report of an Excursion to Bentley, Suffolk" by P. G. H. Boswell, Proceedings of the Geologists' Association, Vol.XXIV, part 5, 1913. Pp.327-331.

".....Before reaching the (stackyard) pit, however, 'scratches' of the bed were pointed out near the house. The accompanying sketch-map (p.329 of article).....indicates the areal extent of the bank.....of Lower Crag. It is clear that the out-crop is not so large as.....indicated on the old one-inch map, the.....area being rather over double that on the more modern map. .....

.....one of the few whole fossils obtained from the Coralline Crag on the excursion was a perfect little *Venus ovata* Pen."

"The Pliocene Deposits of Britain", Mem.Geol.Surv.,1890, by Clement Reid, p.35.

".....Tattingstone Hall, 4 ½ miles S.S.W. from Ipswich and nearly 10 miles from the nearest of the other sections (of Coralline Crag); but the pits in it are now overgrown."

"The Geology of the Country around Ipswich, Hadleigh, and Felixstowe", Mem.Geol.Surv.,1885, by W. Whitaker, pp.26-7.

"At Tattingstone Hall, on the left side of the stream, there is a small outcrop of Coralline Crag, little more than a quarter of a mile along the bottom of the valley from south to north, and only an eighth of a mile wide at most. It is bounded westward by the narrow alluvium on the other side of which London Clay crops out, and elsewhere by Red Crag.....

The section given by the two pits here (almost touching each other) was as follows, in 1877, when the southern one was given up and its lower part filled in, so that the Coralline Crag could not be seen. I had, however, seen it there better and to a greater depth than in the other pit:-

(Glacial Drift – up to 8 feet.
Red Crag –up to about 20 feet thick, resting tolerably evenly, but irregularly on-)
Coralline Crag –Evenly bedded, firm, made up of finely broken shells, mostly buff, hardened into stony lumps in discontinuous layers; about 5 feet, but has been deeper.

At the back of the buildings between the pits brown shell-less Red Crag sand overlies the Coralline Crag."

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Prof. Prestwich. Quart.Journ.Geol.Soc.,vol.xxxvii,p.342 (1871).
-section showing Red Crag resting on and abutting against Coralline Crag. (is also reproduced in 'The Geology of the Country around Ipswich'. Mem.Geol.Surv.,1927 by P. G. H. Boswell, p.35.).

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Sir C. Lyell. Mag.Nat.Hist.,ser.2,vol.iii,pp 314-5. (1839). "On the Relative Ages of the Tertiary Deposits commonly called 'Crag' in the Counties of Norfolk and Suffolk"

-speaks of Coralline Crag as consisting "chiefly of greenish marl, with only a few stony beds" and again he says "I caused a pit about seven thick to be sunk in the yard at Tattingstone Hall farm, piercing the lowest part there exposed of the Coralline Crag, through green marls, with intervening layers of flaggy limestone, two or three inches thick. At the bottom of this pit I found marl of the same character, containing a large *Nucula*, *Venus ovata*, and some other shells; when the workmen were stopped by the large quantity of water which flowed in. One of the flaggy beds of limestone was almost of a brick red colour, and consisted chiefly of comminuted shells, like the green marl".
(abstracted from Mem.Geol.Surv.1885).

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Mr. Charlesworth. Phil.Mag.,ser.3,vol.vii.,pp.83-4. (1835).

-speaks of Coralline Crag exposed for about 70 yards. Its thickness was 6 feet, and in attempting to dig through it work was stopped by the appearance of water at the further depth.

———

WALDRINGFIELD CRAG

The Red Crag (about 2 ½ cu. yd.) kindly donated and delivered by Messrs. Wilding and Smith Ltd. (from their Waldringfield Heath pit) for the National Nature Week 1966 Exhibition at Ipswich Museum has been sieved and sorted, yielding the fauna listed below. Many have been identified from fragments, and 100% accuracy is not guaranteed. (The Red Crag used as a foundation for Civic Drive, Ipswich, apparently came from this pit, numbers of Arctica islandica being common to both places

PELECYPODS
- Glycimeris glycimeris
- Nucula sp.
- Ostrea edulis
- Pycnodonte cochlear
- Anomia sp.
- Pecten maximus
- Aequipecten opercularis
- Chlamys harmeri
- Chlamys ?tigerina
- Mytilus edulis (thick and thin)

GASTROPODS
- Liomesus dalei
- Nucella lapillus
- Nucella tetragona
- Neptunea contraria
- Neptunea (dextral sp.)
- Searlsia costifera
- Sipho sp.
- Buccinum sp.
- Nassa reticosa
- Nassa granulate

Lucina borealis
Diplodonta astartea
Dosinia exoleta
Venus casina
?Venus ovate
Arctica islandica
Pygocardia rustica
?Tapes sp.
Cardita senilis
Cardita scalaris
Cardita chamaeformis
Cardita corbis
Astarte omalii
Astarte basteroti
Astarte obliquata
Astarte burtini
Astarte gracilis
Ensis siliqua
Donax sp.
Macoma oblique
Macoma praetenuis
Arcopagia crassa
Cardium edule
Cardium parkinsoni
Cardium angustatum
Cardium ?interruptum
Panopaea faujasi
Mya arenaria
Corbula sp.
Spisula arcuata
Spisula constricta
Spisula sp.
?Mactra glauca
Syndesmya sp.
Pholad
Corbulomya complanata

VERTEBRATES

Fish vertebrae and bones
Thornback Ray spine
Wolf-fish teeth
Ray teeth

Sharks teeth -Isurus hastilis
-Odontaspis
-?Lamna oblique

Bone fragments (indeterminate)

Nassa labiosa
Turritella incrassate
Turritella sp.
Potamides tricinctus
Lacuna suboperta
Littorina littorea
Natica multipunctata
Lunatia sp.
Polinices hemiclausa
Scaphella lamberti
Bela sp.
Rostellaria lucida
Calliostoma sp.
Trivia coccinelloides
Capulus ungaricus
Diodora sp.
Burtinella bognoriensis

SCAPHOPOD

Dentalium sp.

CEPHALOPOD

?belemnite (derived, Cretaceous)

BRACHIOPODS

Terebratula sp.
Rhynchonellid (derived, Cretaceous)

ARTHROPODS

Barnacles
Crab claw

CORALS

Balanophylia calycula
Sphenotrochus intermedius
Sphenotrochus boytonensis

BRYOZOA

Cellepora
?Lunulitiform bryozoans
?Trigonophora
Cheilostomes (on Glycimeris and Arctica).

ECHINOIDS

Cidarid spine
Cidarid? Spine in phosphatic nodule.

WORMS

Polydora (boring in Cyprina)
?Protula
Ditrupa subulata

SPONGES

Cliona (borings in Glycimeris)
?sponge (in flint) (Cretaceous)

?ALGAE

?borings in Glycimeris

R. Markham

NOTES ON WEAVERS PIT, TUDDENHAM ST. MARTIN
c.TM194493

Three main units visible (Spring and Summer 1966), -

D -Brown Till, 8ft.plus
C -Buff Gravel and Sand, c.12ft..
A -White Sand, 17ft.plus

About 4ft. of sand and greenish loam (B) occurs between A & C.
Further notes below.

D ---brown till (chalky in part). C.8ft. measured (probably greater).
- not studied in detail (has appearance of Gipping Till).

C ---buff – pale-coloured gravel and sand, c.12ft.; cross-bedding -small channels. Some (apparently) shell and carbonaceous fragments (see below). Quartz pebbles prominent (see below); one vein-quartz measured c. 4”x3”x2 ½”. A fragment of mineralised bone found loose by P. Grainger may have come from this horizon. Rests irregularly on B.

B ---predominately flat-bedded sands and silts, 4ft. maximum. Small channels at top (with greenish loam) and base (often stony at their base). Upper channels and flat-bedded deposits -thinly- bedded loamy sand (grey, green, buff, with brown staining, also some black staining), occasional thin green and brown loam. Rests irregularly on A.

A ---whitish sand, c.17ft., base not seen. Small-scale cross-bedding; scattered stones, Sometimes in thin bands, more common towards top. Ferruginous staining - a few small lenticles (seemingly not always co-incident with bedding); short vertical, tubular, ferruginous structures common; c.6ft. ferruginous staining in upper part of sands in part of pit; orange-coloured sand below pit floor (water level c.2ft. below floor); shell(?) fragments more noticeable in ferrug. lenticles. Thin patches of detrital (?carbonaceous) fragments along many bedding planes. Four samples looked at in more detail -

i. sand at water level - pale orange colour, some mica flakes; many minute black fragments; some fragments of ?shell, but indeterminate.
ii. ‘carbonaceous’ sand - light grey sand, some white mica flakes; some fragments of ?carbonaceous material.
iii. ‘shelly’ sand - pale-brownish sand; ‘shells’ - pieces of white flint cortex. One fragment of rotted, silicified *Inoceramus* shell.

iv. pebbly sand from upper part - light brownish-yellow colour; shell fragment -?*Mytilus*?; ?shell fragments (including ?*Cardium*?); fragment of black wood.

(note: wet and dry colours of sands are slightly different).

No comment on age of sand is made for this note on pit; it may be possible at a later date.

Further notes on Gravel C -

Four samples were further examined-

i. 'shelly' sand - what appeared to be shelly sand in the field contained nothing definitely determinable as such, the fragments in question all apparently being white cortex (of flint); a few pieces of ?carbonaceous matter.

ii. 'carbonaceous' - pieces of black powdery (?some carbonaceous) matter common (giving dark grey colour to specimen); fragments of ?shell (indet.).

iii. sieved gravel - ¼ " diameter and greater. 714 stones in sample for identification; majority broken open; with small stones, identification often difficult or impossible, especially those listed below under 'chert' and '?volcanics' (difficulty to see constituents and structures).

		%tage
Flint	397	55.61
Quartz	164	22.97
Quartzite and quartzitic sandstone	48	6.72
Chert	38	5.32
Ironstone	28	3.92
Sandstones	26	3.64
Volcanic Rocks?	8	1.12
Silt	2	0.28
(Lost in breaking)	3	0.42
Total		

(Flint 55.61%; Non-flint 43.97%

Notes on Rock Types-

Flint -various colours; total includes a few white, apparently cortex. One specimen with mould of echinoid spine.

Quartzitic and Quartzitic Sandstone -quartzite generally compact. Various colours -white, brown, reddish, purplish. The fine-grained specimens difficult to identify with certainty.

Chert -various colours and appearance (some porous, some compact; one with mould of crinoids ossicle). Identity of many of these uncertain; various fine-grained siliceous looking; possible some volcanic rocks.

'Ironstone' -some clay-grade; some sand-grade.

Sandstones -containing material additional to quartz; light-coloured, brown etc.. Identity of finer-grained specimens often uncertain.

Volcanic Rock? -dark to light in colour; difficult to tell.

Silt -one hard, one soft.

iv. sieved gravel -larger stones looked at:- generally, of the larger flints, the majority are subangular; the quartz is generally subrounded.

(The above notes are not meant as a 'formal' report on the pit; they are given in the hope that they may gradually be added to through the medium of this bulletin).

Sources of pebbles in gravel:-

Flint -source presents little or no difficulty. Two points may be noted with respect to the lack of rounding of much of this material -i) it is in marked contrast to the rounded quartz (which must have a longer history of wear, either having been derived from a greater distance, or from an older deposit in which it was already well rounded); ii) it is similar in this respect (of angularity) to material in Glacial gravels rather than to Crag pebble gravels (the apparent lack of contemporary fossils is also in agreement with this).

Non-Flint -various sources of the non-flints of Early Pleistocene gravels have been suggested by authors -e.g. from Southern Midlands, Thames Valley, Weald, local, Rhine drainage basin. I have no comments in connection with the Tuddenham stones.

Name of Gravel:-

-gravels of this type are generally included in the Westleton Series (a broad term - includes Westleton Beds of Westleton, in which quartz and quartzite are not present in the quantities seen at Tuddenham). Several gravels with high percentage of quartz and quartzite are known; it is here suggested that the name 'Tuddenham Gravel' be used to describe this type found near Ipswich, until more is known of its relationships and stratigraphic position; this name is of course only meant for this bulletin.

The Westleton Series is usually placed somewhere in the stratigraphic range of the Norwich Crag, Cromer Forest Bed, or Norwich Brickearth.

Previous work:-

-little appears to have been published.

Prof.J.Prestwich (1890), Quart. Journ. Geol. Soc., 46, p.126, mentions "In the lane leading from Witnesham Street to Tuddenham

Light brown Boulder-clay	5ft.
White sands and gravel (Westleton)	2-4ft.
Red Crag	8ft.

Notes made by R.M. in the mid-1950's (when at school) record brown chalky till resting on white sand. There seems to have been no trace of the gravel C in the section then measured; the white sand then included an orange-coloured layer with clay-ironstone layers. The thickness of the sand was approximately the same as that now recorded for A and B (and possibly included that I have here separated as B).

R. Markham

ACKNOWLEDGEMENT -a great deal of useful fieldwork and laboratory work has been achieved this year (1966), much of which will find its way into these bulletins. I wish

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R.M.

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