

- b. The dorsal fin two-thirds of the entire length of the animal from the nose. Cervical vertebræ sometimes anchylosed. Neural canal triangular, broader than high. Ribs 11.

5. BALÆNOPTERA.

The second cervical vertebra with a broad, long lateral process, perforated at the base. The first rib single-headed. The lower jawbone moderate, with a distinct, high, conical coronoid process. Vertebræ 50. Ribs 11. Arm-bones slender.

Balænoptera rostrata. (The Little Beaked Whale.)

Hab. Common at the mouths of large rivers.

The "Finner Whales" are mentioned as inhabiting almost all the seas; and doubtless there are a large number of species that have not yet been brought under the notice of zoologists, or of which there are no remains in any European museum.

XXXIX.—On New *Mammalia* from the Red Crag.

By E. RAY LANKESTER.

[Plate VIII.]

DURING a recent visit to Suffolk I had the pleasure of examining a very fine collection of Crag fossils in the possession of W. Whincopp, Esq., of Woodbridge, perhaps one of the most remarkable and interesting collections ever formed from a single deposit, containing as it does remains derived from every stratum from the Greensand upwards, and illustrating in a very striking manner the fallacy of hasty generalizations founded upon the more or less extended distribution of genera or species through any given series of deposits. Though I would by no means wish to impugn the doctrine of strata identified by their organic contents, yet I feel confident that too great caution cannot be exercised in drawing conclusions from the phenomena of *association* when contemporaneity is not demonstrable. In the Red Crag we have derivatives and representatives of nine different faunæ, to some one of which it becomes necessary to refer any new or undescribed fossil that may be discovered therein. There are—(1) Upper Greensand fossils in considerable numbers, portions of Ammonites, Terebratulæ, Saurian teeth and bones, &c. (2) Chalk fossils, represented by flints containing Sponges and Echinoderms. (3) Fossils from the lowest Eocene beds, the Thanet Sands. (4) Nodules, the so-called "coprolites," and very numerous remains of Fish, Crustacea, and (much more rarely) Reptilia and Mammalia, derived from the London Clay. (5) Teeth of *Carcharodon heterodon* and portions of *Edaphodon*,
Ann. & Mag. N. Hist. Ser. 3. Vol. xiv.

from Middle Eocene beds. (6) Teeth of *Mastodon angustidens*, *Rhinoceros Schleiermacheri*, *Tapirus priscus*, and others, derived from the breaking up of a Miocene deposit of the same age as the Epplesheim strata. Remains of *Mastodon* have been found at the base of the *Coralline* Crag, in a débris formed of phosphatic nodules and vertebrate remains. (7) Cetacean remains, consisting of bones and teeth, much worn, teeth of *Carcharodon megalodon* and *Oxyrhina*, also worn, derived from a previous Pliocene deposit, contemporaneous with the Middle Crag of Antwerp, where these same Cetacean remains and Sharks' teeth are abundant in an *unworn* state. These also have been found at the base of the *Coralline* Crag. (8) Shells derived from the *Coralline* Crag—*Pectunculus glycymeris*, *Pyrula reticulata*, &c. (9) The proper fauna of the Red Crag, certain Fish-remains, Mollusca, Crustacea, and perhaps some *Mammalia*.

It seems very certain that the majority of the terrestrial *Mammalia* obtained from the Red Crag have not only a Miocene facies, but are absolutely derived from a Miocene deposit, whilst the Cetacea are of a later period. In the equivalent of the Red and *Coralline* Crag at Antwerp not a single terrestrial mammal has been found; but Cetacean remains are abundant, and the teeth of a species of *Phoca* have been detected. The beds at Antwerp give indications of having been deposited far out at sea, in a much quieter manner than the Red Crag, which appears to have been a littoral deposit, and is in fact a raised beach, in forming which great districts of previous strata were broken up by the sea, which has now destroyed the greater part of the Red Crag in its turn. It is therefore not impossible that, in the process of the formation of the Red Crag, remains of certain terrestrial mammals then living on the shores of its sea should have been imbedded; whilst in the Antwerp strata, more distant from the coast, the remains of none but marine beings could be enveloped. No *Mammalia* have, however, yet been found of which it could be said with any degree of certainty that they lived contemporaneously with the Molluscan fauna of the Crag; and we may be confident, from the position in which they have been found, from their condition and palæontological affinities, that *Mastodon angustidens*, *Rhinoceros Schleiermacheri*, *Tapirus priscus*, *Felis pardoides*, and other Miocene forms, did not live during the deposition of the Red or *Coralline* Crag.

In looking over Mr. Whincopp's collection, I found some Mammalian teeth which have not hitherto been noticed, a description of which I trust may prove of some value as an addition to our knowledge of the fauna of the Red Crag and of the British fossil *Mammalia* generally.

Castor veterior, n. sp.

Two molar teeth, one of which is represented in Pl. VIII. fig. 5, and an incisor of the lower jaw, in fig. 6, belong to Mr. Whin-copp's collection. They were obtained from a Red-Crag pit in the neighbourhood of Sutton, and are in the usual mineralized condition of Red-Crag Mammalian remains, being very heavy and presenting an iron-stained glossy surface; so that any person with a moderate experience in these matters would at once recognize their origin. They unmistakeably belong to a species of Beaver. The molar figured I have carefully compared, with the assistance of Mr. Davies, with the skulls of *Castor Europæus* from the Lincolnshire fens, in the British Museum, as also with teeth from Grays, and a specimen in my own collection of the Canadian Beaver. I find that it is the premolar of the upper jaw of the left side, the dental formula of the Beaver, as given by Prof. Owen, being $i. \frac{2}{2}, pm. \frac{1-1}{1-1}, m. \frac{3-3}{3-3} = 20$. It differs chiefly from the specimens I have examined in the great length of the fang, and also in the arrangement of the folds of enamel on the crown or flat grinding-surface. This resembles that of the *Castor Canadensis* rather than that of the *C. Europæus*, but differs from it in the greater width of the fossæ of dentine between the enamel ridges, and in the greater inward development of the large anterior fold or lobe. In *C. Europæus* the premolar of the upper jaw presents the same general arrangement of the enamel ridges; but certain minor variations may be detected which do not exist in the Crag or Canadian species. These relate merely to the proportion and development of certain folds, and are probably of little value as specific characters. I do not, however, hesitate to consider the Beaver to which the teeth under description belonged as a distinct species. Fossil Beavers have been met with at Perrier and in the Val d'Arno, the latter being a Miocene, the former a Pliocene deposit. The Crag form does not resemble either of these, and I therefore distinguish it as *Castor veterior*. The *C. Europæus* has been met with in a fossil condition at Grays in Essex, and at Ilford, associated with the remains of *Elephas antiquus*, *Rhinoceros tichorhinus*, &c. The *Trogontherium Cuvieri* has a tooth very differently marked from that figured, the age of which would otherwise have induced one to compare the two.

There is little doubt that the Beaver, like all the terrestrial Mammalia found in the Crag which are known (with perhaps one or two exceptions), was derived from a previous Miocene deposit.

I should mention that the incisor tooth, which is imperfect, presents no very striking characters, but is of a very rich black

colour, partly owing, no doubt, to the natural stain which occurs in the incisors of most Rodentia.

Delphinus (Phocæna) uncidens, n. sp.

Of the two little teeth represented in Pl. VIII. figs. 12, 13, one is in my own collection, the other in that of Mr. Whincopp. When first I obtained these, I was led, by their peculiar curved form and great length of fang, to regard them as incisors of a species of *Phoca*, and this the more especially since a Seal had been discovered by the illustrious Van Beneden in the Antwerp Crag. A careful comparison and examination of the teeth, however, has convinced me that they belong to a species of *Delphinus* hitherto undescribed. In those Seals which present incisors having this peculiar hook-like form the tooth is invariably lobed or developed to a small extent on one side; the fang, too, is considerably flattened, so that the antero-posterior breadth is greater than the lateral. In the two teeth from the Crag this is not the case: the unciform crown is perfectly symmetrical, and the fang is flattened in the reverse direction. The form of the teeth agrees very exactly with the conoid denticles of some Delphinidæ, more particularly of the subgenus *Phocæna*. The enamel on the crown is thin, as in most Cetacea, whilst the enlarged fang is very characteristic of that group. I propose therefore to call this species *Delphinus uncidens*. With the teeth I would associate, under this specific name, certain small cetotolites, which have long been known as occurring in the Crag, more particularly in the neighbourhood of Woodbridge (whence also the teeth were originally obtained), but which have never been described. One of these auditory bones is represented in figs. 2, 3. Such examples are very numerous of this size, which would agree very well with the size of the small teeth. They are evidently the "ear-cases" of small Delphinidæ, and present no striking characters which should distinguish the animal to which they belonged from the ordinary forms of *Phocæna* and *Delphinus*. It may be considered a very fortunate circumstance that the teeth and ear-bones can thus be united, and assigned to the same species in so certain a manner, since the disconnected nature of the Cetacean remains of the Red Crag has in many instances prevented a correct appreciation of their specific and generic value.

Delphinus (Phocæna) orcoides, n. sp.

The species to which I have ventured to give this name is represented by three teeth in the collection of Mr. Whincopp, of which two are drawn in Pl. VIII. figs. 14-18. At first sight, the tooth in figs. 14, 15, 16 might also be mistaken for the canine of one of

the Pinnigrada ; but a more accurate examination demonstrates its true nature. The crown of the tooth is conical, but not so curved as that of the preceding species, whilst the fang is broad and twisted, an occurrence which is very frequent in the Grampus and larger Dolphins. The enamel is thin, and, in one specimen, has been worn away so as to form a flat surface. This mode of attrition is frequently observable in specimens of *Phocæna Orca* and *P. Capensis* ; and, indeed, in form and size these teeth agree so well with those of the former species, that I have adopted the specific term *orcoides*. The base of the fang in the specimen drawn in figs. 14, 15, 16 exhibits a structure to which I am anxious to direct attention, as being characteristic of fossil Cetacean teeth. The cement exists in undulating spiral layers surrounding the fang, forming slight ridges where the processes of mineralization have removed the more yielding matter. These spirals or circular ridges I have observed on the base of Cetacean teeth from Antwerp in the collection of M. Van Beneden ; and a similar structure is to be observed in gigantic dental remains from both the Suffolk and Antwerp Crag, which have not yet been assigned to any group of animals. A section of the tooth of the *Phocæna orcoides* is afforded by two specimens, and will completely confirm the assumption of its Cetacean affinities. The lower part of the fang in one tooth is transversely fractured, and shows the osteo-dentine arranged in concentric layers, and filling up the central cavity, which is thus made solid throughout. The dentine and thickened cement are also seen in section. In another specimen, in which the crown is broken off from the fang, the cavity is still retained, running right into the conical cusp, but is small, and shows signs of thickening in the walls ; the dentine does not occupy much extent, whilst the cement is very largely developed, and is covered by a most delicate layer of enamel. The teeth of the *Phocæna orcoides* are not unlike those of the *P. crassidens* described by Owen from the fens of Lincolnshire ; but I am not aware of any reasons for supposing that they are specifically identical. I have seen two or three specimens of large petro-tympanic bones from the Crag, evidently belonging to a Grampus about the size of the one which possessed the teeth figured ; and I therefore venture to associate them as belonging to the same species. I am not able here to give a figure of this larger cetolite, but hope hereafter to do so.

It would be a very desirable thing to identify the tympanic bones described by Prof. Owen as *Balæna definita* &c. with other Cetacean remains ; and I believe that much light will be thrown on this and the nature of the petro-tympanic bones, teeth, and vertebræ of the Crag Cetacea generally by instituting

a comparison between these and the fossil Cetacea of the Antwerp Crag, where specimens so much more perfect and intelligible are discovered. M. Van Beneden is at present, I believe, engaged in working out the generic and specific relations of the Cetacea of that locality.

Ursus Arvernensis, Croiz. & Job.

Professor Owen has already noticed the existence of a form of *Ursus* in the Red Crag, but has not assigned it to any particular species. The tooth figured in Pl. VIII. figs. 1 & 4 is from the collection of Mr. Whincopp, and was obtained, I believe, from a Crag-pit at Newbourn, near Woodbridge. I have very little doubt, after a careful comparison with a cast in the British Museum and De Blainville's beautiful figures, that it is the *Ursus Arvernensis* of Croizet and Jobert which has thus left the canine tooth of the left side of its upper jaw in the Red Crag of Suffolk. The tooth is remarkable for its small size, its flatness, narrowness, and length, and also for a furrowed appearance produced by slight ridges which run longitudinally down the side of the crown. The anterior margin of the tooth gives indication of a considerable amount of usage, being ground down to a perfectly smooth surface.

Hyæna antiqua, Lankester.

I am happy to be able to figure another specimen of a molar tooth belonging to this animal, a careful examination of which has fully convinced me of the accuracy of my former determination of its specific value. It is the second premolar tooth of the left ramus of the lower jaw, and presents the same large antero-posterior measurement and shallowness in the crown which characterized the former specimen. Although much worn, and on the inner side somewhat imperfect, the tooth affords sufficient evidence of these facts. The cingulum also is developed to that very moderate extent only which was observed in the tooth from the upper jaw, and was one of the most marked differences between the *Hyæna antiqua* and the Pleistocene *H. spelæa*. (See Pl. VIII. figs. 7, 8, and Ann. & Mag. Nat. Hist. January 1864, Pl. VIII.)

Canis primigenius, n. sp.

I have given this name, with a certain amount of reserve, to the possessor of the tooth drawn in fig. 11. It may perhaps hereafter be identified with more characteristic teeth, which will enable their discoverer to define the species better than I am at present able to do.

I here subjoin a list of all the species of Mammalia known to occur in the Red Crag.

TERRESTRIAL.

Ursus Arvernensis, *Croizet & Jobert*. (Occurs also at Auvergne, South France.)

Hyæna antiqua, *Lankester*.

Felis pardoides, *Owen*. (Similar species at Epplesheim : Miocene.)

Canis primigenius, *Lankester*.

Pterodon, sp., *Owen*.

Sus palæochærus, *Kaup*. (Occurs at Epplesheim.)

Sus antiquus. (Ditto.)

Equus, sp., *Owen*.

Hipparion, sp., *Owen*. (Occurs at Epplesheim.)

Mastodon angustidens, *Owen*. (Ditto.)

Rhinoceros Schleiermacheri, *Kaup*. (Ditto.)

Tapirus priscus, *Kaup*. (Ditto.)

Cervus dicranoceros, *Kaup*. (Ditto.)

Megaceros, sp., *Owen*.

Castor veterior, *Lankester*.

Coryphodon, *Hyracotherium*, *Palæotherium*. (Derived from Eocene strata.)

MARINE*.

Balæna definita, *Owen*. (Occurs also in Middle Crag of Antwerp.)

— *emarginata*, *Owen*. (Ditto.)

— *affinis*, *Owen*. (Ditto.)

— *gibbosa*, *Owen*. (Ditto.)

Balænodon physaloides, *Owen*. (Also at Antwerp.) [Several species, probably, are included under this name.]

Belemnophius declivis, *Owen*.

— *planus*, *Owen*.

— *angustus*, *Owen*.

— *angulatus*, *Owen*.

— *undatus*, *Owen*.

— *gibbus*, *Owen*.

— *compressus*, *Huxley*.

Delphinus (*Phocæna*) *uncidens*, *Lankester*.

— — *orcoides*, *Lankester*.

Choneziphius and *Belemnophius* occur also at Antwerp.

It will be observed, as a noticeable feature in these two lists, that the Mammalia in the former all have their analogues and representatives in Miocene† or early Pliocene strata, whilst those of the latter are met with elsewhere in later Pliocene strata. This, when taken into consideration with the worn and sea-rolled nature of the dental remains and with certain facts deducible from the study of the Mollusca of the Suffolk and Ant-

* This part of the list is necessarily very imperfect; but the author hopes soon to be able to enlarge and correct it considerably.

† The fragments of *Coryphodon*, &c., of course, form an exception to this.

werp Tertiary deposits, seems to warrant the assumption that there existed previously, along the Suffolk coast, a Miocene and a Pliocene deposit, the one abounding in terrestrial Mammalian remains, as the Epplesheim strata, the other in Cetacean fossils, as does the Middle Crag of Antwerp, and that the Red-Crag sea (and the Coralline also to a less extent) has entirely denuded and partially redeposited these strata in association with its proper Molluscan fauna, and perhaps with some Mammals, which, however, we are not able to designate.

Before concluding this paper (for the errors and defects of which I beg the reader's indulgence), I would wish to guard against the supposition that any of the Mammalia assigned to the Red Crag may have been obtained by mistake from the Mammaliferous Crag. That deposit is never, so far as I am aware, met with in superposition to the Red Crag; and the dental remains from it are light, absorbent, and unmineralized, as compared with those from the lower bed. Moreover the species are very widely different which occur in the two, the only common species being the *Mastodon angustidens*, which in both cases is certainly a derived fossil. The term "Mammaliferous" would doubtless be more appropriate to the Red Crag than it is to the much later Norfolk formation.

EXPLANATION OF PLATE VIII.

- Figs. 1 & 4. Left upper canine of *Ursus Arvernensis*, Croizet & Jobert. Newbourn, Suffolk.
 Figs. 2 & 3. Otic bones of *Delphinus uncidens*, Lankester. Woodbridge.
 Fig. 5. Left upper premolar of *Castor veterior*, Lankester. Sutton, Suffolk.
 Fig. 6. Incisor of the same. Suffolk.
 Figs. 7 & 8. Left second premolar (lower jaw) of *Hyæna antiqua*, Lank. Felixstowe.
 Fig. 9. Crown of premolar of *C. veterior*; enlarged.
 Fig. 10. " " *C. Canadensis*.
 Fig. 11. Canine of *Canis primigenius*, Lankester.
 Figs. 12 & 13. Teeth of *Delphinus uncidens*, Lankester. Felixstowe.
 Figs. 14, 15, 16. Tooth of *Phocæna orcoides*, Lankester. Near Sutton.
 Figs. 17 & 18. Ditto. Ditto.

XL.—*Note on the Gibbon of Tenasserim*, *Hylobates Lar*.

By Lieut-Col. S. R. TICKELL, in a letter to A. GROTE, Esq.*

I SEND a transcript from my Mammalian collection of what I had recorded of *Hylobates Lar*, at least of its wild and tame habits. Notes on its osteology, and soft anatomy, and structure you will not require, as you have a specimen by you, which I

* From the Journal of the Asiatic Society, No. II. (1864).



Lankester, E. Ray. 1864. "XXXIX.—On new Mammalia from the Red Crag." *The Annals and magazine of natural history; zoology, botany, and geology* 14, 353–360.

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