

the bones composing the zygomatic arch are broader in the young than in the adult: how to account for this I do not otherwise know, than that it is a contrivance of nature to give greater strength to the jaw in the young, before the remainder of the cranium is sufficiently ossified to bear the strain of the large temporal muscles without such support; but on referring to the skeletons of the young and old otter, I find the same difference to exist as regards the posterior portion of the arch. This, therefore, does not appear to be a character of any value.

The dentition in all the specimens is the same, and agrees with that assigned to the genus; the canines in the adult are, however, slightly larger than in the younger one. No other points, throughout the whole skeleton, of sufficient importance to call for observation, present themselves. I think, however, that my readers, from what I have said, will agree with me in saying, that it is at least most probable that the young of the Common Marten has been mistaken for a distinct species, and that no such animal as the Pine Marten exists in the British Isles.

It may, perhaps, while on the subject of British animals, not be out of place here to advert to a short account of the Irish Hare, published by me in vol. ii. p. 283, of the Magazine of Zoology and Botany, (1837) since which period another paper on the same subject has been published in one of the Irish Transactions, by Mr. Thompson of Belfast, to whom I take this opportunity of returning my thanks for it. He adverts in it to some disparity between his measurements and mine.

On the receipt of his paper I immediately referred again to my skeletons, and found the measurements to agree perfectly with those I had already published; but having obtained another Irish Hare and another English one, I found that I could compare them either so as nearly to agree with his measurements or my own: thus a comparison between the second specimens obtained, agreed very nearly with Mr. Thompson's, and the original specimens with my own; but a comparison between one of the last with one of the first differed from either.

This, I think, proves the necessity of being very careful in the admission of measurements as distinctive marks of species, unless the limit of variation in each species is to a certain extent ascertained.

XXXIV.—*On the Occurrence of two Species of Shells of the Genus Conus in the Lias, or Inferior Oolite, near Caen in Normandy.* By C. LYELL, Esq., F.R.S., F.G.S., &c.

THE discovery by MM. Deslongchamps and Tesson of fossil shells of the genus *Conus*, in the lias of Normandy, in 1837, has by no means attracted the attention it deserves, either in

France or in this country. The fact, indeed, has remained almost unknown, a brief notice of the fossils, unaccompanied by figures or a specific description, having alone appeared in a report of a meeting held in 1837, by the Linnæan Society of Normandy.

Although fossil shells belonging to Lamarck's family of the *Enroulés* are sufficiently abundant in the tertiary strata, a very few examples have yet been recorded of the occurrence of any of these shells in any of the more ancient fossiliferous rocks. The *Enroulés* of Lamarck comprise the genera *Ovula*, *Cypræa*, *Terebellum*, *Ancillaria*, *Oliva*, and *Conus*. Of these, the only examples known to me in secondary formations, are a species of *Cypræa*, which I have mentioned and figured in the Geol. Trans. (2nd Series, vol. v. p. 243.) as occurring in the upper chalk of Faxoe in Denmark, and a Cone called *C. tuberculatus*, of which a single specimen was found by M. Dujardin in the chalk near Tours, of which he has given a figure in les Mém. de la Soc. Géol. de France, tom. ii. deuxième partie, 1837. Plate 17. p. 232.

I was greatly surprised, therefore, during my late visit to Caen (June, 1840) to see in the cabinets both of Prof. Deslongchamps and M. Tesson, several specimens of Cones which they told me had been discovered in the lias of La Fontaine-Etoupe-four, about six miles south of Caen. We find it stated in the report before alluded to, that M. Deslongchamps had found in the Commune of Bretteville sur Laize, three species of Cones in the lias, and that M. Tesson had afterwards found a fourth and more perfect individual of the same genus in the quarries of Fontaine-Etoupe-four not far from the locality before-mentioned. In both these places the lias is described as resting on the quartzose sandstone of the transition formation (terrain intermédiaire). Two of these specimens only retained the shell itself, the others were casts. (See Figures.)

In order to satisfy myself of the correctness of the alleged geological position of these Cones, I visited in June, 1840, Fontaine-Etoupe-four in company with M. Deslongchamps, and ascertained to my full satisfaction that the rock from which the Cones had been extracted was full of *Ammonites*, *Pleurotomaria*, and other fossils, which must belong either to some member of the inferior oolite or upper lias.

The fundamental rock consists of highly inclined vertical, and in some places curved, beds of reddish and white quartzite, alternating with greenish talcose schists. Upon these ancient rocks the brown fossiliferous limestone rests unconformably and in horizontal stratification. At many points are seen at the contact deep rents traversing the inferior quartzose

rock, which have been filled from above with rubbish, consisting of angular fragments of quartzite, pieces of limestone, and numerous fossil shells, the whole imbedded in a calcareous matrix resembling that of the incumbent strata. The most perfect fossils, together with the greater part of the Cones, have been all found in this breccia filling the rents, and the upper parts of the breccia unite with the lowest strata of fossiliferous limestone in such a manner as to make it clear that the fissures were filled before or at the time of the deposition of the lowest strata of the limestone. The quarries in which these sections are exposed have been opened, not for the sake of the limestone but for the subjacent quartzite which is used for making roads, and which at some points comes up nearly to the surface. This quartzite, however, and the accompanying transition schist, are only found at a moderate depth along a certain line from N.N.W. to S.S.E., in which direction they form an underground ridge stretching for many leagues beneath the platform of limestone. At the distance of a few yards either east or west of this narrow ridge the incumbent oolite or lias is of such thickness that the quartzose stone cannot be worked with profit.

Among the Ammonites which I collected myself in the rent or in the bed immediately covering it, or which were given me from this locality by M. Deslongchamps, were the following, which have been examined by my friend Mr. Lonsdale, of the Geological Society:—

1. *Ammonites Walcottii*, Alum shale. Phillips, Geol. Yorkshire, p. 164; Hunton, Geol. Trans., vol. v. part 1, p. 220; Williamson, *ibid.*, p. 242; Cheltenham, Murchison, Geol. Cheltenham, p. 17.
2. *A. corrugatus*, Inferior oolite. Dundry, M. C. tab. 451; Gloucester, Lonsdale, M.S.
3. *A. Stokesii*, Inferior oolite? Bridport, M. C. tab. 191. *Marlstone*, coast of Yorkshire, Williamson, Geol. Trans., vol. v. part 1, p. 242.

Among many others which were shown me at Caen and named by M. Deslongchamps, were *Ammonites planicosta* and *A. Bucklandii*, which occur in the lias in England, *A. falcifer*, found in the alum shale near Cheltenham, and *A. Strangwaysii* and *A. Murchisonæ*, both from the inferior oolite of England. Associated with these I saw a Belemnite, several species of *Pleurotomaria*, fragments of a *Pentacrinite* and other fossils, which in the opinion of M. Deslongchamps indicates that the formation constitutes either the upper member of the lias, or is intermediate between the lias and the inferior oolite.

Since my return from Caen I have seen M. Alcide D'Orbigny, who has also visited lately the quarries of Fontaine-Etoupe-four. A consideration of the numerous fossils obtained by him from the rock in which the Cones occur leads him to the opinion that the breccia filling the rents is of the age of the upper lias. Among other liassic species he pointed out to me the *Pentacrinus cingulatus*. These and other well-known species were accompanied by many others new to the oolite, of the genera *Nucula*, *Arca*, *Delphinula*, *Trochus*, *Cirrus*, and several more, for which new genera must be established.

It may be objected that the mineral character and colour both of the breccia filling the rent and of the overlying beds differ totally from those of ordinary lias, for the rock is a pale brown ferruginous limestone. But Mr. Lonsdale informs me that near Radstock the great deposit of blue lias is represented by only a few feet of a pale brown granular rock, so like inferior oolite that the quarry men apply the same name to it. But this gritty lias is clearly not inferior oolite, being separated from that rock by blue clay from 100 to 200 feet thick. (See Lonsdale, Geol. Trans., vol. iii. 2nd series, p. 245.) The "corn-grit" above-mentioned is a granular light brown limestone, but of a closer and finer grain than the gritty lias. Yet Radstock is only seven miles S.W. from Bath, where the lias is well-developed, with its usual characters.

In proceeding from Caen to Fontaine-Etoupe-four the geologist obtains no sections which display the superposition of the different members of the oolitic series, but he finds the white oolite of Caen give place to the ferruginous oolite of Eterville, which resembles in appearance the oolite of Dundry. Travelling still further south he meets with the beds of Fontaine-Etoupe-four already described. As all these formations appear to be everywhere horizontal, and the surface of the country, following the direction above-described, is constantly attaining a higher level, we might naturally have expected to reach newer instead of older beds. But it must be remembered, that a slight dip, and one quite inappreciable in the space of a quarry, as for example, an angle of five degrees, might in a distance of six miles cause a difference of level of more than 800 feet, so as to allow beds which may be concealed beneath the oolite building-stone at Caen to crop out in a high platform at Fontaine-Etoupe-four.

Having offered these remarks on the position and age of the containing rock, I shall now describe the Cones themselves, in which task I have had the assistance of Mr. George Sowerby, who examined the original specimens at my request during a late visit to Normandy.

I am indebted to the liberality of M. Deslongchamps for the principal drawings.

*Conus cadonensis*. Shell smooth, slender, with six or seven volutions and an acuminated spire, posterior edge of each volution carinated, and slightly crenulated. Posterior part of each volution rather concave, and very finely longitudinally striated.

Fig. 1.

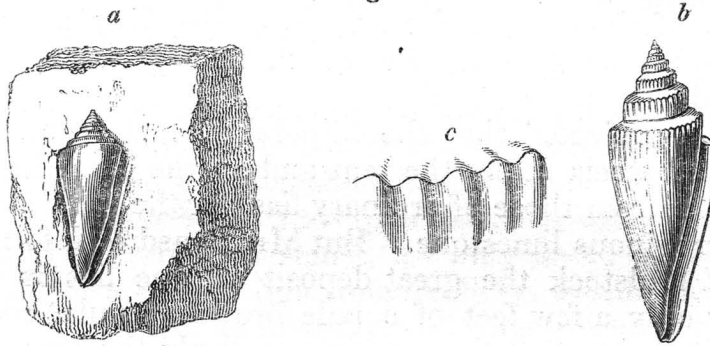


Fig. 1. *a*. represents an internal cast of a variety with a shorter spire. This cast is still imbedded in the limestone in which it was found. It is regarded as a mere variety of *b*, because it is well known that in this genus the height of the spire differs greatly in the same species, as for example, in *Conus antediluvianus*, to which *C. cadonensis* approaches most nearly.

Fig. 1. *b*. A perfect specimen of *Conus cadonensis*, in the possession of M. Tesson, in which the entire shell is extant.

Fig. 1. *c*. A magnified representation of a part of the crenulated posterior edge of one volution of *C. cadonensis*.

*Conus concavus*. Shell smooth, conical, contracted near the middle, with a concave depressed spire, consisting of nine volutions, each volution carinated at the external edge, and very slightly longitudinally striated.

Fig. 2.

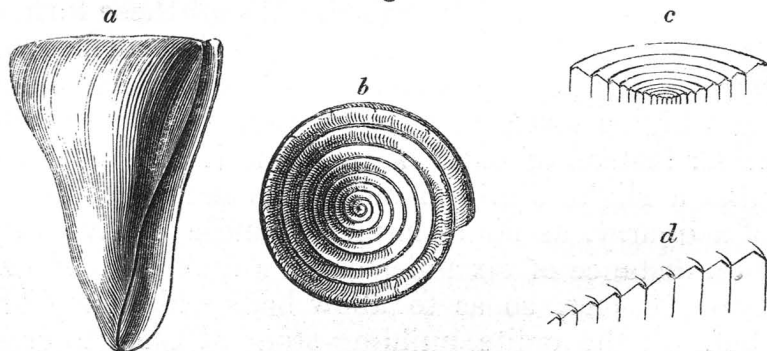


Fig. 2. *a*. A perfect specimen of *Conus concavus* in the possession of M. Tesson, from a drawing by M. Deslongchamps. In this specimen the shell itself is extant.

Fig. 2. *b*. represents the concave spire of the same.

Fig. 2. *c*. is a section of the spire, showing the depth of the concavity.

Fig. 2. *d*. A magnified section of a portion of the same, showing the form of the volutions.