25. *On the EXISTENCE of a SUBMARINE TRIASSIC OUTLIER in the ENGLISH CHANNEL, off the LIZARD.* By R. N. WORTH, Esq., F.G.S. (Read May 12, 1886.)

It is with great pleasure that I am able to report to the Geological Society the existence of a submarine Triassic outlier in the English Channel, off the Lizard. The possibility of the presence of Triassic rocks in the Channel-area has been more than once suggested, and the occasional dredging of a fragment of sandstone has strengthened the hypothesis; no distinct evidence has, however, until now been procured.

A short time since Mr. Matthias Dunn, of Mevagissey, who is intimately acquainted with all the conditions of the Channel fishery, called my attention to the fact of the frequent occurrence of sandstone fragments in the bed of the Channel in a certain direction, and at my desire promised to supply me with a series of specimens. This he has now done, and the facts thus revealed are of a very remarkable character. All the examples were brought up entangled in the hooks of the fishermen's "long lines," which are laid along the sea-bottom for distances ranging even up to six miles. The positions from which the rocks come can therefore be ascertained with considerable precision; and each specimen or group of specimens was accompanied by its compass-bearing on some well-known point of the land, and the distance thence in miles. The bearings are magnetic and strictly correct; the distances are estimated, and therefore liable to a certain amount of error; though from constant practice and their knowledge of the peculiarities of the sea-bottom the fishermen are singularly accurate in these estimates.

The evidence that the rocks were *in situ* when entangled (partly by the marine growths upon them, and partly by their irregularities and the holes bored by *Pholades*) is clear. With two exceptions only, to be referred to hereafter, the specimens retained the characters of the original bedding. The upper surfaces of the fragments are, as a rule, bored; the lower are either free from marine organisms, or show only such minute ones as would grow on the under surface of a slab of rock that was gradually working loose from its parent reef. In all probability most of my specimens were detached from their places by the hooks that brought them to the surface.

The list of these rock specimens is as follows:—

1. Lizard, 10 miles N.W.—Fine-grained, soft, red Triassic sandstone, in layers $1\frac{1}{2}$ to 2 inches thick.
2. Lizard, 15 miles N.W.—Triassic sandstone of coarser grain, mottled red and grey.
3. Manacles Rocks, 16 miles N.W.—Fine-grained soft sandstone, grey, with a passing red tinge in places, in parts highly micaceous,

containing both black and white micas, the former rather segregative.

4. Falmouth Castle, 18 miles N.N.W.—Fine-grained, compact, red, jaspideous sandstone, much bored, possibly an altered rock. The specimen shows portions of two joint-faces, at right angles to each other, which have evidently been protected from the ravages of the *Pholades*.

5. Deadman, 25 miles N.E. by N.—This one spot supplied examples of four distinct Triassic rock-forms:—

a. Chocolate marl, spotted white. The edges of this nodule were rounded, but it could hardly be called rolled. From its softness this is very easily worn.

b. A "Potato Stone," partially coated with marl, and filled with pinkish calcite. The inside of the shell was studded with small brilliant pyramids of quartz. Five inches in longest external diameter.

c. Grey sandstone.

d. A nodule of Triassic trap, which may have been partially rolled, but was apparently in its form originally concretionary. It is a hard red rock of meagre feel, slightly micaceous, and very closely resembles some varieties of the Triassic trap of Thorverton, with affinities, so far as macroscopic observation goes, to those of Pocombe and Cawsand.

6. Deadman, 20 miles N. by E.—A light salmon-tinted drab calcareous sandstone, in a slab nearly two feet in longest diameter, the under surface intact and slightly pitted. This is the only example of the series that I am unable to match distinctly among the Red Rocks of Devon; but its associations here are apparently Triassic, and I therefore include it in my notes. Probably it may be identified by those more familiar with Triassic detail than myself; though, indeed, it may not be Triassic at all.

It will be seen that the affinities of this series are with the Keuper of Devon, and particularly with the rocks in the vicinity of Sidmouth.

A comparison of the bearings given will show that the rocks from which these specimens were derived lie to the S.E. of the Lizard promontory, occupying an area of which the centre may approximately be given, on the data to hand, as about 10 miles S.E. of the Lizard Head, and most of which lies beyond the 40-fathom line, and all beyond the 30-fathom. Of course with the information at present existing no attempt can be made to map out the boundary of this submarine Triassic outlier; but there is some evidence that it does not extend to the eastward, approximately, beyond the meridian of the Nare Head, in the fact that rocks brought up from the following positions do not include any of Triassic character:—Deadman, 3 miles N.W.; Deadman, 4 miles E.; Deadman, N.E. 10 and 12 miles; Deadman, 27 miles N. by W.; while the position which yielded the calcareous sandstone (No. 6) has produced pebbles of granitic, granitoid, and quartzite rocks, with flints, with no distinct example of Trias. So far as Falmouth Bay is concerned, we have

the evidence also of the occurrence of ochreous ash 10 miles S.W. of Falmouth itself.

I do not think it advisable to attempt more precise localization ; but there can be little doubt that this submarine Triassic patch is considerably larger than any of the land outliers of Devon. Hitherto Portledge and Peppercombe in Barnstaple Bay, and Cawsand in Plymouth Sound, have been the most westerly points known of the English Trias. We are now enabled to carry it some fifty miles further to the south-west.

DISCUSSION.

The PRESIDENT pointed out the great interest of the facts observed by the Author, and thought that his conclusions were highly probable.

Rev. A. IRVING owned to a feeling of uncertainty as to whether the Author's conclusions could be regarded as well founded. He thought that the probability was that off the Lizard there are a number of erratic boulders, many of which may be derived from the Trias, but at the same time he indicated the difficulty of identifying these sandstone rocks when there was no palæontological evidence to go upon.

Mr. HUDLESTON thought the evidence of the rock being *in situ* was satisfactory.

Rev. A. IRVING remarked that large boulders would split along the bedding-planes.