SHINGLE STREET: SUFFOLK

A brief geographical introduction

by R. T. COBB

IT has long been regarded as axiomatic that the general direction of movement of beach material along the east coast of Norfolk and Suffolk is southward—and the great masses of material which divert the Yare at Great Yarmouth, which form Orford Ness, and which narrow the Stour-Orwell estuary at Felixstowe, persist as imposing pointers to the truth of this statement. But as the result of detailed investigations it is becoming more and more obvious that this general picture is not true for all the coast, nor for all conditions (1). More detailed studies of specific coastal areas are essential if any attempt is to be made at fully understanding and appreciating the factors at work upon the British coastline.

One such place, where studies of both a physiographical and ecological nature are being made, is Shingle Street, an expanse of shingle on the south-west bank of the Ore estuary, opposite North Weir Point, the southern terminus of Orford Ness (see Fig. 1). These researches are not yet complete, and it will be many years, if ever, before the full explanation of events in the area can be given. But it is felt that sufficient is already known to justify the writing of a brief introduction and guide, in particular for those students who visit Flatford Mill Field Centre and who may spend at least one day of their course at Shingle Street. It is hoped that next year Mr. F. J. Bingley, the Warden at Flatford, will write of the ecology of Shingle Street, to fill in and embellish the outline presented here.

The development of the beach phenomena at Shingle Street cannot be divorced from the changes which occur in the position of North Weir Point, which is the distal end of the shingle mass of Orford Ness. For many purposes the estuary must be regarded as a whole—to take one obvious example, the extent of Orford Beach will clearly offer a varying degree of shelter to Shingle Street, especially from north-easterly winds, the dominant

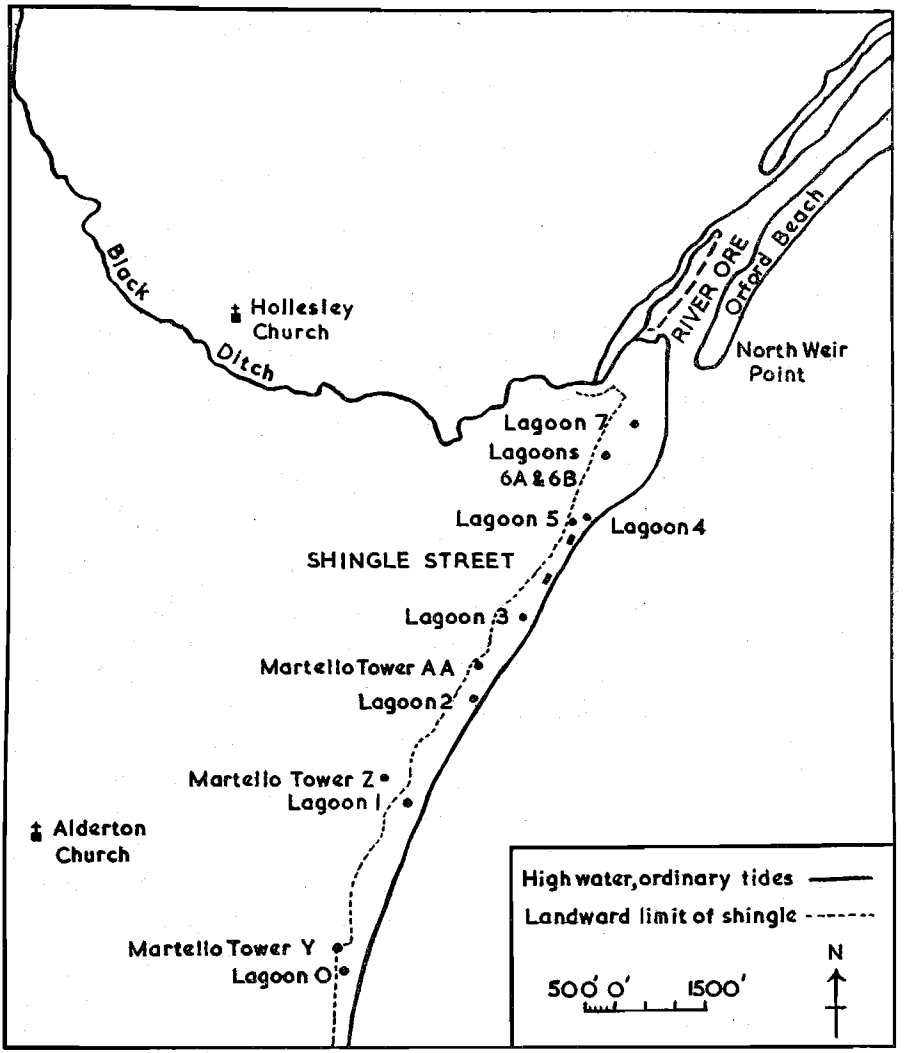


FIG. 1

The estuary of the River Ore (based on the Ordnance Survey map, by permission of the Ordnance Survey).

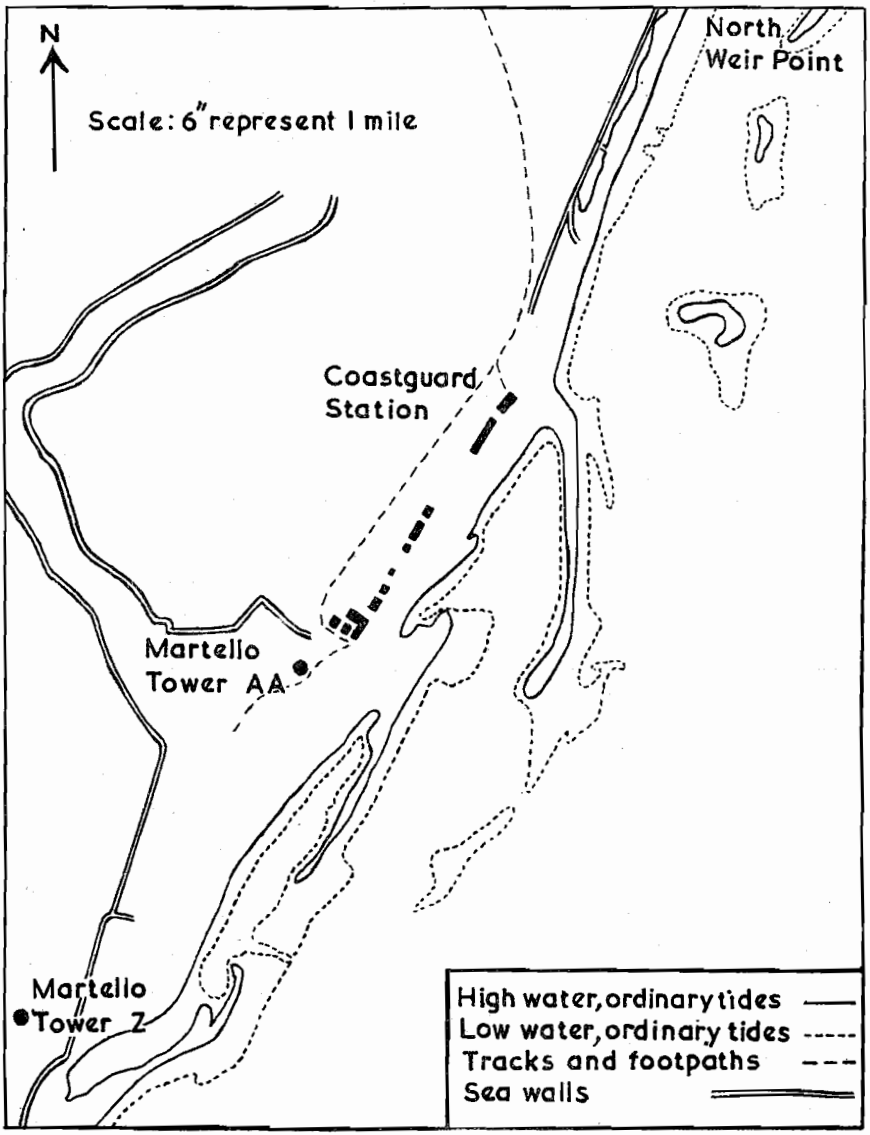
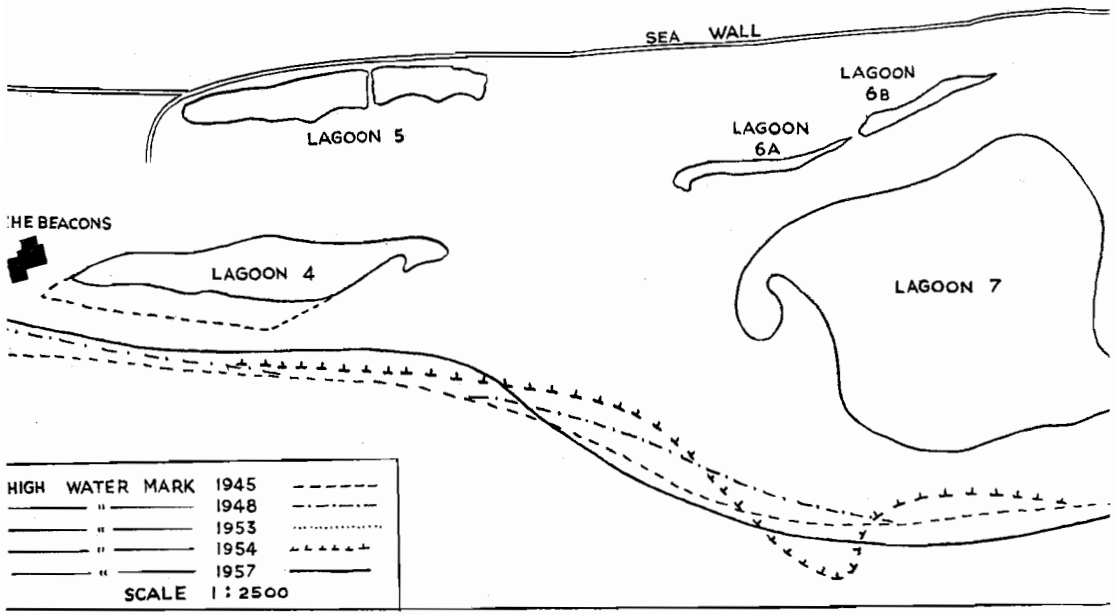


FIG. 2

Shingle Street in 1902 (from the Ordnance Survey map published in 1904. By permission of the Ordnance Survey).



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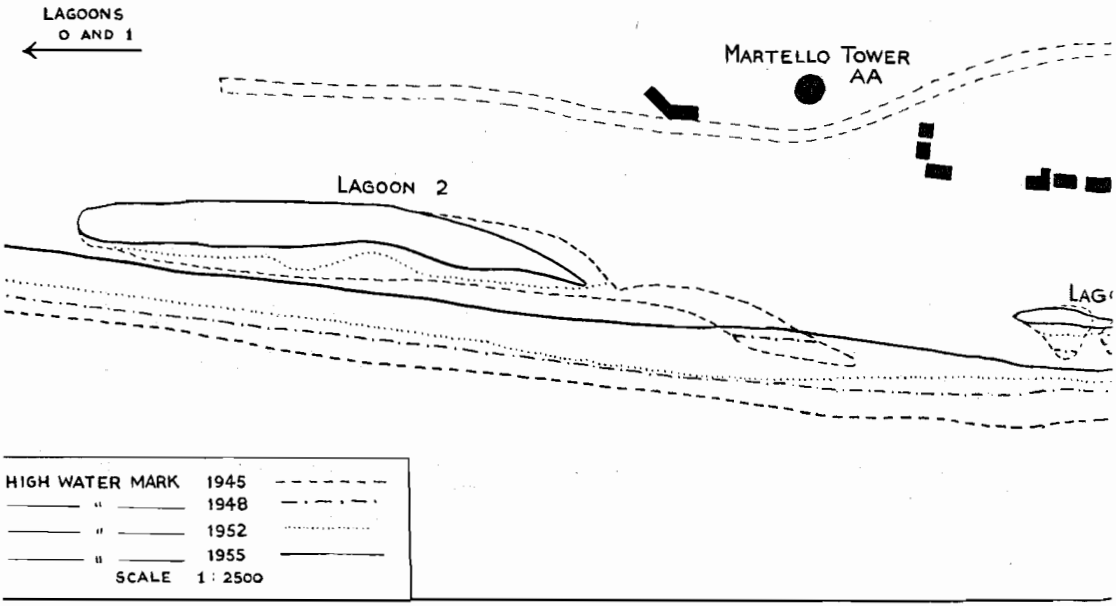
Coastal changes at Shingle Street, north end, since 1945



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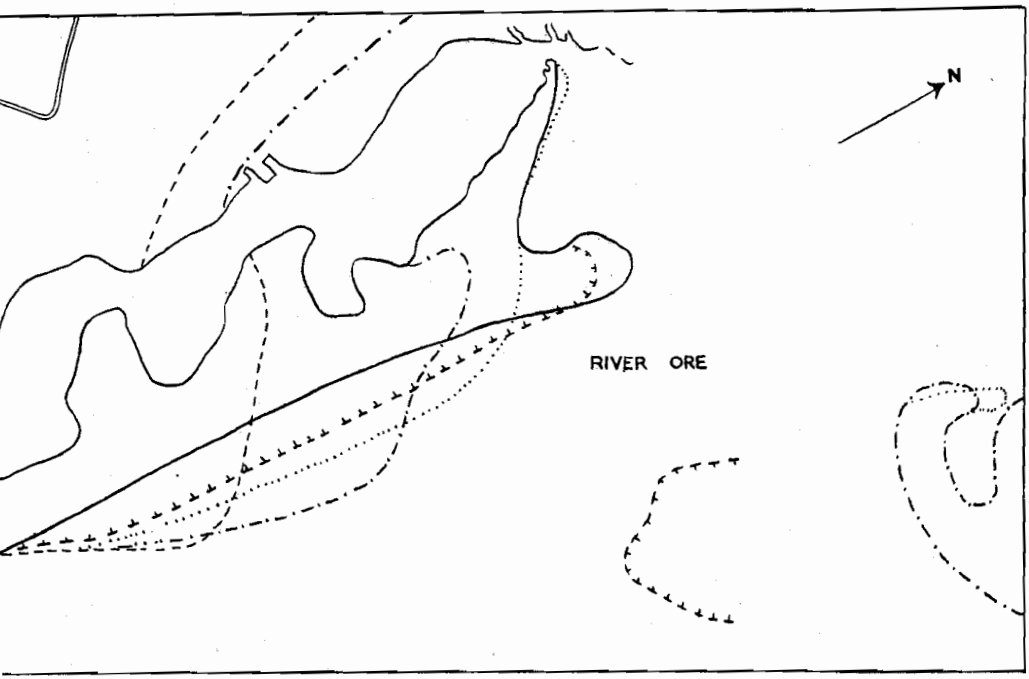
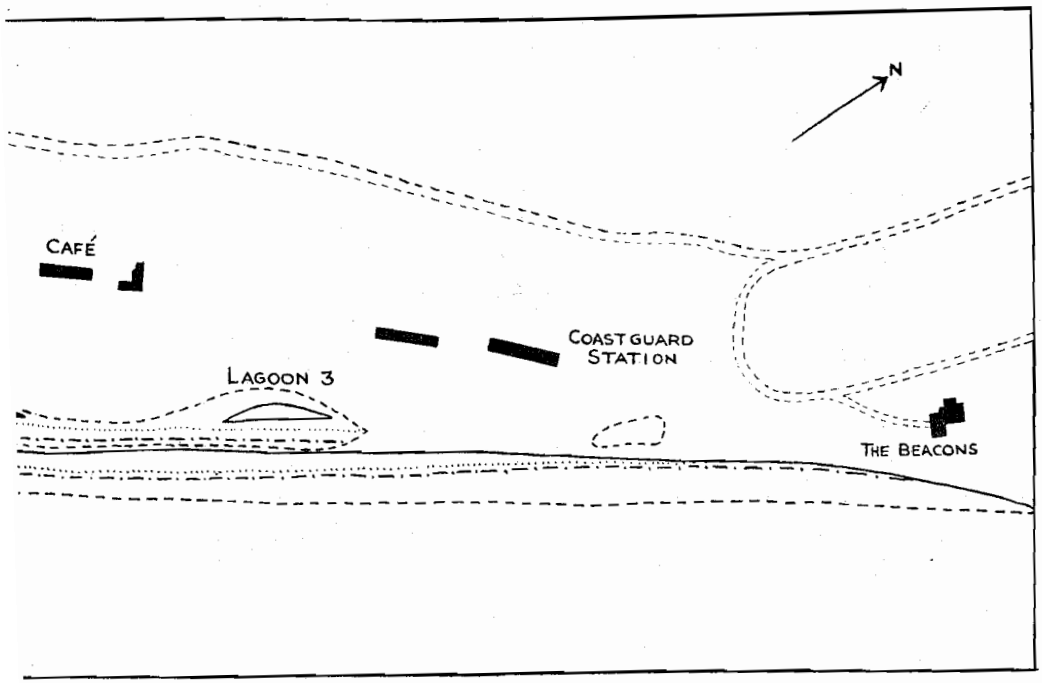
Coastal changes at Shingle



the author's surveys and aerial photographs).



end, since 1945.

winds on this coast. Study of old maps and Admiralty charts shows in fact a cyclic development in the estuary. The cycle begins with North Weir Point at, or to the north of, its present position, with a series of amorphous islands and banks tailing off southwards. There is then a period of consolidation during which the islands and banks are smoothed and are incorporated in the Ness as it extends southwards, until a point approximately level with Martello Tower AA is reached (see Fig. 1). This appears to be a critical position for North Weir Point for, on each of the two occasions which it is possible to trace, this stage has marked the end of the cycle. A violent storm breaks the southern end of the Beach into a mass of islands and banks, and the cycle recommences.

The end of one such cycle can be seen in an Admiralty chart of 1811, and the new cycle may be traced through Ordnance Survey maps and Admiralty Charts until 1892, when once more North Weir Point was abreast of Martello Tower AA (2). The storms which swept the East Coast between the 18th and 20th of November, 1893, broke up the southern end of Orford Beach, an effect which is well shown on charts of the period. The Ordnance Survey map of 1902, on the scale of 6 in. to 1 mile, shows conditions at the beginning of the present cycle of development (Fig. 2). The later stages of this cycle (which appears to be less regular than the one preceding it) have been recorded in some detail by surveys and aerial photographs.

As Figs. 3 and 4 show, the beach at Shingle Street is diversified by a series of lagoons, which have been numbered 0 to 7 from the south. Lagoons 0 and 1, which have changed but little since 1945, lie to the south of the area mapped. These lagoons fall into two categories. The first, and simplest, type comprises those to the south of the bungalow known as "The Beacons". They are tidal lagoons, although separated from the open sea by shingle banks. They were all floored with alluvium, almost certainly once part of the Ore's bed, but of late this alluvium has been hidden in places beneath a shingle cover as the sea has filled the lagoons with beach material.

The history of these lagoons is comparatively simple. They can be seen in embryonic form in Fig. 2, the map of 1902. They appear as much more permanent features of the landscape in Ordnance Survey maps of 1924, and indeed, this period seems to have been one of accretion, with the

accumulation of shingle along this section of the beach. From 1945 onwards the infilling of lagoon 3 proceeded remorselessly, as Fig. 4 shows. Between 1945 and 1948 the obvious effects were restricted to the northernmost of lagoons, which virtually disappeared. But between 1948 and 1952 the larger lagoons were affected by the landward movement of material. One was divided into two by infilling, and as the result of the storm surge of February, 1953, these virtually disappeared. Now only the merest remnants of them remain, and they obviously represent an ephemeral feature of the beach. In Fig. 4, changes are only shown until 1955. This is to avoid undue confusion with lagoon outlines and the high water mark on the seaward side. More recent surveys only continue the trend so obviously shown already.

To the north of "The Beacons" a different set of conditions prevails. Lagoon 5, close to the sea wall, is the only one in this area to appear on the 1902 Ordnance Survey map (Fig. 2). It might have originated as a borrow-pit from which material was dug for the construction of the sea wall—its position hugging that feature supports this idea, and lagoons in a similar position further south, by Martello Tower Z (Fig. 2), have sides and, in parts, floors of laid septarian blocks, which suggests that the whole feature is the result of man's activities. Similar doubt surrounds the origins of lagoons 6A and 6B. They are situated very close to an area which was worked for shingle in the Second World War, and this suggests that they are man-made; on the other hand, they could have formed quite naturally, as have the other lagoons at Shingle Street.

Lagoon 4 is interesting in that it shows the least change of all the lagoons near to the sea. Apart from some infilling in its southernmost part between 1945 and 1948, it has remained unchanged since. The period of its decrease in size was also the period of the infilling of the small lagoon just south of "The Beacons". But since 1948 this short stretch of beach appears almost to have maintained a state of equilibrium, whilst to both south and north there have been considerable changes in the coastline.

Lagoon 7, the largest and northernmost of the lagoons, is also the most interesting physiographically. Floored mainly with alluvium, it is for the most part less than 3 feet deep, even at high tide. But a central channel, which winds its way throughout the length of the lagoon, shelves sharply to depths of 8 feet or more. At its northern end, it opens to the Ore

estuary through a narrow exit with shingle to the east and low alluvial cliffs to the west. The alluvium, shown diagrammatically in Fig. 3, is subject to rapid erosion, and its outline changes frequently. The shingle to the west, or landward, side of the lagoon is heavily colonized by plants, having vegetation both on the fulls and in the swales. Moreover, the dominant plant in this cover of vegetation is the False Oat-grass (*Arrhenatherum elatius*), a later colonizer in the shingle-bank succession (3). No date can be given to the arrival of the shingle—all that can be said is that it was not thrown there by the storm of 1893, as Fig. 2 shows, but the evidence of the vegetation suggests that it has been there for an appreciable period of time. There is one further point of importance—the fulls on the western side tend to bend southward, indicating that they were built from the north, as are most other features along this coast.

But all this is in marked contrast to the eastern arm of the lagoon. Here the whole trend of the fulls is northward, indicating a southern origin for the shingle, and this is confirmed by recent surveys and aerial photographs (see Fig. 3 and aerial photograph elsewhere in this Report). The beach material, without doubt, is here moving northward, against the general direction of movement along this coast. The exact limits of the area affected by this northward movement are difficult to determine, but shingle held in groynes at Bawdsey, less than two miles to the south, shows a southward drift of material. For reasons which are explained below, it is possible that the limit of the northward drift is "The Beacons" bungalow or thereabouts.

The first definite information available for Lagoon 7 is an aerial photograph of 1945. The limit of the eastern arm was as shown in Fig. 3, well to the south of the present limit. North Weir Point was also some distance from its present position—in this case well to the north of it. From 1945 to the present (1957) is a period of northward growth from Shingle Street and southward growth from Orford Ness. The period of most rapid change was from 1945 to 1948, and this period also saw considerable changes at North Weir Point.

In both 1945 and 1948, isolated shingle ridges are shown as having been thrown onto the saltings on the north-west side of the lagoon (Fig. 3). Although the floods of 1953 took shingle some way landwards, their main effect was to modify features which already existed. When northward

growth was subsequently resumed, it took the form of a comparatively narrow strip which, whilst consisting of a series of curving fulls, shows nothing like the massive recurved hooks of earlier stages in the development of the spit. Moreover, the rate of advance northward has slowed up, and this, combined with the comparative narrowness of the modern additions, means that much less material is being shifted northwards now than in the past. At the same time, North Weir Point has transgressed so far south that all present growth northward at Shingle Street takes place in estuarine waters, sheltered from direct attack by waves from all directions except a narrow sector of the south-easterly quarter.

The origin of the beach material at Shingle Street is not easy to determine. The bulk of the shingle is flint, as it is along most of this coast, and has probably resulted from the action of the sea upon the glacial deposits of the East Anglian seaboard. It has also been suggested that the offshore banks and shoals might provide some beach material (4). But the most likely immediate source of material would seem to be North Weir Point, with its southward moving shingle. The route by which the material crosses the Ore estuary is clearly indicated by the underwater topography. The shingle masses on both sides of the Ore shelve seaward but gently, forming a plateau of alluvium and shingle which is covered by only a few feet of water even at high tide. In the centre of the estuary, however, the plateau is gouged by a steep-sided submarine gorge which goes down to a depth of more than 3 fathoms. This channel shallows to seaward, where the estuary is almost blocked by an arcuate mass of shingle joining North Weir Point with Shingle Street. In some places the water is deep enough for small craft to cross, in others, the shingle appears at low water in low, hump-backed masses, or skerries. The skerries change their position, size and altitude with some frequency. But at low tide the arc is always well marked by a line of broken water.

There is a tendency for material to accumulate at the Shingle Street end of this arc, and to form promontories or noses. One such nose appears in Fig. 3, on the outline for August, 1954, and another smaller one was built in the summer of 1957, after the date of the survey plotted in Fig. 3. They seem to be short-lived features of the coast. The 1954 nose built out to a distance of 60 yards in eighteen months, persisted until the winter of 1954, and then was dissipated entirely between December, 1954, and

March, 1955, a period of particularly strong and persistent easterly and north-easterly winds. The temporary effect of a period of strong north-easterly or easterly winds can be most marked. The disappearance of temporary promontories has already been described, and some spectacular results accrued from a period of attack by waves from this quarter during the spring of 1957. Then the waves cut into the central part of the spit by Lagoon 7, cutting back a distance of some 80 feet to a full well-colonized by the Sea Pea (*Lathyrus maritimus*). The long roots of these plants hung and withered down the shingle. But within a short while the beach was aggrading again, and most of what had been lost was rapidly replaced, although the new full-crests are not so high as the old ones had been.

As has already been emphasized, the distal end of the eastern arm of Lagoon 7 is now so far within the Ore estuary that it is almost completely protected by North Weir Point, and only waves from a fine southerly bearing can act effectively on the end of the spit. And yet it is still growing northwards. Even allowing for the marked slowing down in the rate of accretion in the last few years, it does not seem likely that the movement of material within the estuary is attributable directly to wave action. There is, however, a very strong current in this particular estuary, reaching speeds of 6 knots on the full flood, which is northward, and it would seem that this is the force which moves the shingle after waves have lifted it into suspension. An underwater survey carried out in 1957 in fact produced direct evidence of some shingle moving along the bottom beneath the strongest current. Additional indication of the effect of currents in the estuary may be obtained by a study of the changes which have taken place on the landward side of North Weir Point. Here the 1948 position is that the terminus of the spit took the form of a recurved hook, partly enclosing a small lagoon on the landward side (see Fig. 3). By 1951 the spit had built further south, and the recurved hook of 1948 had been smoothed out northward, so that the small lagoon was almost completely enclosed (Fig. 3). In short, whilst shingle was moving south on the seaward side of North Weir Point, it was moving north on the landward side, in a position so sheltered that wave action is a most unlikely cause of the effect recorded. Nor is this unique—there are similar features but short distances further north from the Point. It must be emphasized that it is not current

action alone which is being invoked to explain conditions at Shingle Street, but a combination of wave and current action—the former to lift the shingle into suspension, the latter to move it when at full flood.

If this explanation is correct, it would seem that the following might well be the track of moving material in the vicinity of the estuary. A southward movement of material along Orford Beach to North Weir Point is continued across the submarine feature already described. On reaching the Shingle Street side of the estuary, the material divides, some of it being taken northward by combined wave and current action, some of it continuing to move south, with occasional temporary accumulations into "noses". The recent changes at Shingle Street could then be largely explained in terms of the supply of beach material. Since the early 1920s there has been considerable accretion north of "The Beacons", and the resultant starving of the beach south of this point is reflected in the landward movement of high water-mark. Since the Ordnance Survey revision of 1924, high-water mark at the Coastguard Station has moved landwards by over 500 feet, i.e. at an average rate of $15\frac{1}{2}$ feet per year. With the decrease in the northward growth since 1953, there seems to have been a slowing down in the rate of encroachment of the sea in this area, although farther south, by Lagoon 2, this is not so apparent. Only repeated surveys can determine whether this trend continues or not.

Enough has been written to show that this stretch of coastline is one of considerable geographical interest. Peculiar things are happening to the landscape which require explanation—and it must be emphasized that the explanations put forward here are purely tentative. Much work remains to be done. But it is hoped that this short introduction to the area and its problems will stimulate interest in them, and will be of some assistance to those who visit this part of the Suffolk coast.

REFERENCES

(1) See, e.g., Williams, W. W.—An East Coast Survey—*Geographical Journal*, Vol. CXXII, p. 317.
Footnote in Steers, J.A. (1953) *The Sea Coast*, p. 13.

(2) Full details of the charts and maps are as follows:
Admiralty Chart 101 (A1)—1811.
One inch Ordnance Survey map—1838.
Admiralty Chart 2052 (A1)—1847.
Admiralty Chart 2052 (B2)—1872-8.
One inch Ordnance Survey map—1879.
Admiralty Chart 2052 (B10)—1892).
Admiralty Chart 2052 (B12)—1894.

(3) Tansley, A. G. (1953) *The British Isles and their Vegetation*—Cambridge, p. 888.
(4) Robinson and Cloet—Coastal evolution in Sandwich Bay—*Proc. Geol. Ass.*, 64, p. 80.

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SHINGLE STREET:

The Ore Estuary, March, 1955 (reproduced by permission of the Air Ministry, Crown copyright reserved).

The interpretation of this photograph is simplified by reference to Fig. 3 of this article. It illustrates very clearly the varying trends of the fulls at Lagoon 7 and the Ore's mouth—southward to the west of Lagoon 7, northward to the east of it, and southward again at North Weir Point. The broken water and patches of exposed shingle in the river mouth show the approximate position of the skerries and submarine banks which join North Weir Point and Shingle Street. The reduced wave-action within the shelter of these features is also illustrated.