

#### IV.

### ON THE RELATION BETWEEN A RAISED BEACH AND AN IRON AGE MIDDEN ON THE ISLAND OF LEWIS, OUTER HEBRIDES. BY DONALD BADEN-POWELL AND CHARLES ELTON.

#### 1. INTRODUCTION.

The problem of the geological date of the separation of certain parts of the British Isles from each other has occupied our attention for some time, and we decided that the Outer Hebrides possessed certain features which made this an important area in which to start investigations. Accordingly, in 1933 and 1935 we undertook field work in capacities as geologist and animal ecologist, with the general object of discovering as much as possible about the physiographical and biological history of the islands, especially of Lewis.

Three papers have already been published (Elton, 1934 and 1936, and Hora, 1934) dealing with the parasites of certain Hebridean mammals, which are believed to be important as indicators of the Pleistocene history of these islands, and another on freshwater animals (Elton, 1936). In that part of the general work which deals with the more recent history of Lewis, it became important to find out the connection between the periods of human occupation and the natural events, such as the formation of peat, river deposits, raised beaches, and ancient sand dunes, and during this part of the field work a raised beach was discovered and its relation to a kitchen-midden was proved. The archaeological objects from the midden have been deposited in the National Museum of Antiquities of Scotland at Edinburgh, the animal bones in the Royal Scottish Museum, and the shells from the midden in the University Museum at Oxford. The descriptions of the animal bones in the present paper are quoted from manuscript reports by Miss D. M. A. Bate and Miss M. Platt, and copies of these reports are kept at the Bureau of Animal Population at Oxford.

We are greatly indebted to the Ancient Monuments Board for Scotland and to the officials of the Galson Estate for allowing us to carry out excavations. We also wish to thank Dr Graham Callander for working out the pottery and implements; Mr A. J. H. Edwards for supplying us with a list of bones found by him, and identified by Professor James Ritchie; Miss D. M. A. Bate and Miss M. Platt for their careful investigation of the fragmentary animal bones found by us; and Dr R. M. Craig for advice about conditions in Lewis.

## 2. THE GALSON SECTION.

The site showing the connection between the raised beach and the kitchen-midden is on the west coast of Lewis opposite Galson Farm House, about 7 miles south-west of the Butt of Lewis. This is the site from which occupation layers, including an earth-house, were described by A. J. H. Edwards (1924), and its position has also been recorded by Dr Callander in the *Report of the Royal Commission on Ancient and Historic Monuments of Scotland* (1928, p. 9). The midden layer is exposed at intervals near the top of a high talus slope of sand, which occupies the coast between Teampull nan Cro Naomh and the mouth of the South Galson Burn, a distance of about 200 yards; the vertical height from the modern beach to the top of the slope is about 35 feet. On the western part of this slope—that is, towards the track from Galson Farm to the sea—fine raised-beach shingle crops out about 25 feet above present high-water mark. It should be mentioned here that all heights were measured from high-water mark, which was taken as the highest point at which seaweeds were growing on the rocks; measurement was made by means of a small hand-level. The general state of the site before excavation consisted of this talus slope of sand, with an intermittent outcrop of the midden near the top of the slope, an outcrop of raised-beach shingle rather over half-way up the slope towards the west end.

Four small excavations were made by us with the two special objects of—

- (a) Discovering the stratigraphical relation of the midden to the raised-beach shingle.
- (b) Collecting as many animal bones and archæological objects as possible from the midden layers in the short time at our disposal.

*Excavation A.*—In the midden layer only, towards the eastern end of the exposure. Depth, 4 feet 2 inches.

*Excavation B.*—A trial hole was put down in the talus slightly farther east than Excavation A, starting from the level of the base of that section. This was sunk to a depth of 7 feet without striking the raised-beach shingle. It is possible that the shingle is missing, both here and vertically under Excavation A.

*Excavation C.*—A vertical section was cut through the midden at a point much nearer the western end of the exposure, and was continued down through underlying dune sand until the shingle was found, and a

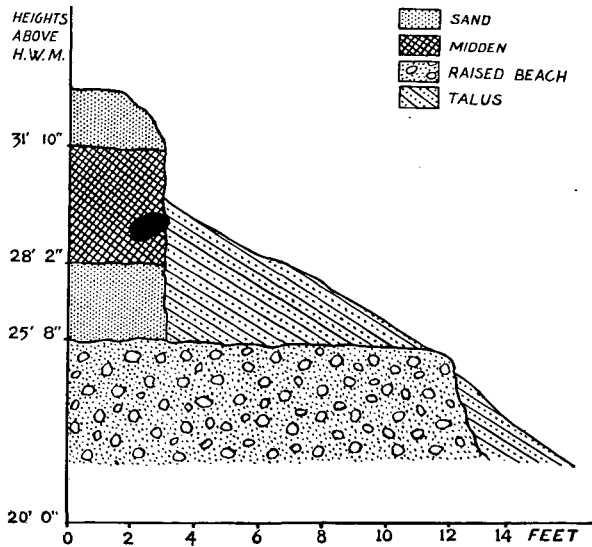


Fig. 1. Section at Galson raised beach.

volume of midden layer, 3 feet 8 inches thick, was removed over a horizontal area measuring 4 feet 6 inches by 3 feet.

*Excavation D.*—A trench was also cut a few yards east of Excavation C through the talus and sand at right angles to the direction of the exposure, and was taken down to the surface of the raised-beach shingle at its base.

A general section through Excavations C and D is shown in fig. 1.

The raised beach at the base consists of fine, well-rounded beach shingle, with practically no interstitial sand, and there is no doubt that this deposit is continued under undisturbed dune sand as well as under the talus. Unfortunately, no fauna was found in the raised beach; but this is not surprising, considering how rare shells are on a pure shingle beach at the present day. No artefacts or pottery were found.

*The dune sand* consists largely of comminuted shell fragments, and no stones or whole shells or any archæological objects were seen in this deposit. In this it differs from the sand making up the talus, which contains large angular stones, animal bones, shells, fragments of pottery, and in one case a small worked piece of flint. All of these objects have slipped down from the midden above.

*The midden layers* consist of hearth sites in the sand, mixed with refuse, and will be described in greater detail below. It seems that the human occupation of the site began in the middle of the period of dune formation, and both at Excavations A and C it was proved that there were at least 2 or 3 feet more dune sand which accumulated after the site had been evacuated.

### 3. THE GALSON MIDDENS.

The two sections, A and C, which were cut through kitchen-midden material are not connected by a continuous outcrop, but are separated by a wide gap covered by sandy talus. This gap was already in existence at the time of Mr Edwards's excavation, and he suggests (1924, p. 186) that either the removal of the sand was "for some utilitarian purpose or the effect of a severe storm." As the archæological objects found by us were not quite identical in sections A and C, they will be described separately, but in Dr Callander's opinion there is no great difference in age, either between the two sections or between the top and bottom of each section.

#### *Excavation A.*

The layers exposed in Excavation A (in 1933) were as follows:—

	Thickness of Layers.	
	Feet.	Inches.
Blown sand, with impersistent line of sea-shells . . . . .	3	0
Layer of large stones . . . . .	..	..
Hearth layer, brown earthy sand towards the top, black towards the bottom . . . . .	0	8
Blown sand . . . . .	0	6
Thin black layer . . . . .	..	..
Blown sand, base not seen . . . . .	..	..

*Metal Objects.*—Three small rusted pieces of iron were found in the top part of the hearth below the layer of large stones. One of these is described by Dr Callander as a small iron knife. No iron objects were seen in the black part of the hearth nor in the lower part of the section. One bronze pin, 3 inches long, was found above the hearth layer (fig. 2).

*Bone Implements.*—One borer made from a splinter of bone, length just under 2 inches, and one well-polished bone pin, just under 5 inches long, were both found in the hearth layer. In the same layer there was also found an object described by Dr Callander as a “bone whorl, of domical shape, made from the epiphysis of an animal’s leg bone,  $1\frac{3}{4}$  inch in diameter and  $\frac{1\frac{5}{8}}$  inch in height.” Miss Bate has also examined this object and considers it to be a human bone: “There is one human bone in the collection from the hearth; this is the head of a femur which had not yet become completely fused to the shaft of the bone. The depression for the insertion of the *ligamentum teres* has been artificially enlarged to form a hole through the bone.” No other human bones were found either in Excavation A or C.

*Stone Objects.*—One flat stone whorl was found in the thin black layer 6 inches below the hearth. A few flakes of flint occurred in the brown part of the hearth, but cannot be recognised as implements. These must have been brought by human agency from some distance, as no flint was seen by us to occur naturally in Lewis, even in the glacial drift. The pieces of flint in this hearth are not derived from the flinty crush rock of Eastern Lewis, with which they have been compared carefully by us.

*Pottery.*—Small pieces of dark grey pottery were found in the hearth layer. None of these was decorated, but two of them were rim fragments. There were not enough pieces to fit together so as to get any idea of the original size or shape of the utensils. Some of the pieces of decorated pottery which were collected later from the talus (fig. 4) were not far away from Excavation A.

*Excavation C.*

The position of this excavation is towards the west end of the outcrop of the midden, near where the track from Galson Farm reaches the shore. It is situated above the outcrop of the raised



Fig. 2. Bronze Pin from Galson, Lewis. (†)

beach, and the main object of undertaking a fresh excavation here (in 1935) was to find out the relation between the midden and the raised beach; also better pottery was found here than in Excavation A. Excavation C showed that the midden layers are 3 feet 8 inches thick at this point, and that there are conspicuously large stones between the

depths of 1 and 2 feet down from the top of the midden. The lower part of the midden contains oblique layers of burnt red earth and pellets of greenish clay, and at the base there is a prepared platform of the same clay, which occurred also in between the large stones.

*Metal Objects.*—No pieces of iron were found in this excavation, and the only finished metal object found was a bronze rivet, from the very top of the midden. Dr Callander reports that many similar rivets have been found from the Glenluce Sands, Wigtownshire, and that such rivets are known to have been used for fixing patches on an Iron Age bronze cauldron.

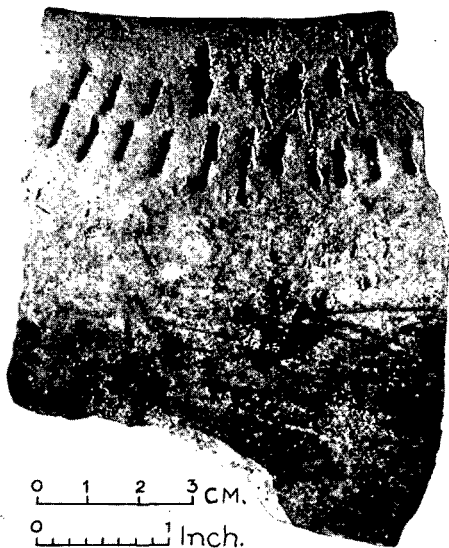


Fig. 3. Pottery from Galson.

*Pottery.*—Fragments were found at all levels throughout the midden layer, and the depths at which they were obtained are measured from the top of the layer. The pieces of greatest chronological value were:

At 1 foot 2 inches, a rim and wall fragment of dark brown ware, rim flat on top and projecting outwards very slightly, showing two rows of deep, almost vertical incised lines under the brim (fig. 3).

At 1 foot 4 inches, rim fragment of dark ware, the rim hollow on the top, and projecting outwards and inwards, with finger-made depressions under the rim (not figured).

At 2 feet 3 inches, one piece with applied (wavy) decoration (fig. 4, bottom left).

At 2 feet 6 inches, rim and wall fragment of thin red ware, rim everted, and decorated with short vertical incised lines under rim. At the same level there was a small fragment (of a different pot) with incised lines (curved) (fig. 4, centre and top right).

Several decorated fragments were found on the talus between Excavations A and C. One rim fragment, everted at the lip, and two wall fragments, all of thin red ware, the first wall fragment bearing

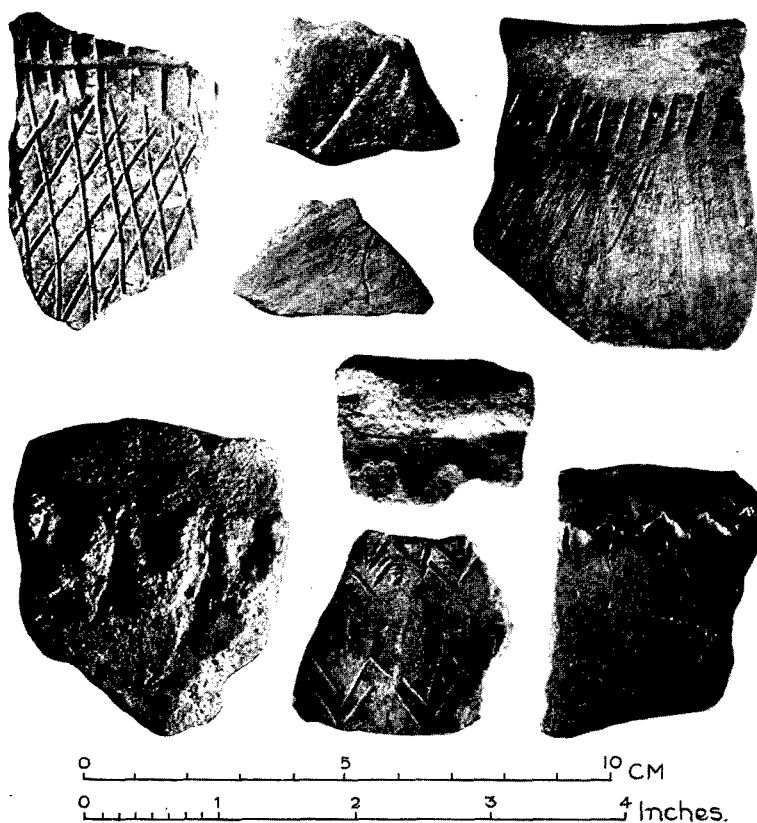


Fig. 4. Pottery from Galson.

double zigzags and the second a lattice design, all incised. Also three decorated fragments with applied wavy line (fig. 4).

It was noticed in the field that the thinner red ware tended to be found in the lower part of the midden layer and the coarser grey ware towards the upper part, but the excavation was not on a large enough scale to show whether this observation has any great significance. In any case, the pottery as a whole is considered by Dr Callander to belong to one period—the early part of the Christian Era. Similar ware has

been found in many of the kitchen-middens and earth-houses in the Outer Hebrides, and although hand-made pottery continued to be produced until well into the nineteenth century, Dr Callander considers these pieces from Galson to be comparatively early.

The large stones consist of angular pieces of the local Lewisian gneiss, some of which had been artificially broken. The dimensions of the largest measured were 2 feet 3 inches by 1 foot 7 inches by 6 inches. In both Excavations A and C well-rounded beach pebbles were found, which measured up to about 5 inches long. These are bigger than the pebbles seen in the raised beach in the immediate locality, which are only 1 inch in grade, although pebbles up to 4 inches grade occur in the raised beach at a point about one-third of a mile farther west along the coast. If, therefore, these pebbles are from the raised beach, they may have been brought a short distance, but it is more likely that they were collected from the contemporaneous shore by the men who inhabited the Galson site. The petrology of these beach pebbles in the middens has not been worked out in detail, but they consist mostly of acid gneiss, hornblende gneiss, and pink granite gneiss, all rocks which occur in the neighbourhood. Pebbles of Torridonian sandstone were also found, but these need not have been brought any distance, as they occur both in the raised beach and in less rounded form in the boulder clay farther north along the coast. Dr Callander found no sign that the pebbles submitted to him had been used as hammer-stones, but as the natural matrix of the midden deposit is dune sand, they were presumably brought to the site by the hand of man. The green clay found associated with the hearths is like a greenish boulder clay found to the south of Galson, and the pottery may have been made from this boulder clay. Angular fragments of vein quartz were found in the hearths, which almost certainly came from this boulder clay, but it is not possible to say whether these show any artificial flaking.

Two pieces of slaggy material were found in Excavation C, at different levels, and we are indebted to Mr F. Parker for making a chemical examination of these specimens.

The first was found at a depth of 6 inches in the midden layer, and it appears to be a piece of iron ore, but as it is slightly vesicular it has been subjected to heat. It was found by qualitative analysis to contain the following:—

Iron, 64·5808 per cent.

Silicon, abundant.

Magnesium, calcium, and aluminium, a trace.



Under the microscope this material is opaque, except in very thin fragments, which are reddish brown, and isotropic, as they show no interference figure. This substance does not give the normal streak for limonite.

The second of these two objects was found at a depth of 3 feet 6 inches in the midden layer—that is to say, near its base. It is much more vesicular and slaggy in appearance than the first piece, and, in fact, appears to be a true iron slag. Chemical examination proved that it contains:

Iron, 31.441 per cent.

Silicon, abundant.

Magnesium and phosphorus, fairly common.

Calcium, a trace.

Carbonate, a trace.

Under the microscope, a white mineral which is present was proved by its optical properties to be quartz, but the darker part of the specimen was not mineralogically determinable. This specimen gave no streak. The quartz was included in the above analysis, mixed with the darker fraction.

It is quite certain that neither of these two specimens are natural volcanic rocks, as their iron content is much too high. Considering the rarity of iron ore in Lewis (see Jehu and Craig, 1934, p. 847), it is unlikely that these stones were introduced accidentally. It seems, therefore, that their presence in the Galson midden, as ferruginous material which has been subjected to great heat, suggests that iron-smelting was practised not far away.

#### 4. ANIMAL REMAINS.

One of our objects in excavating at Galson was to obtain dated information about the past faunal conditions on Lewis. Except for deer and a wild cat, most of the remains of mammals belong to domesticated species.

The list which follows includes the animal remains found both by Mr Edwards during his excavations of the earth-house, and by ourselves.

[TABLE.

	Excavations.				Earth-house.
	A.		C.		
	Hearth.	Below Hearth.	Upper part.	Lower part.	
<b>Mammals:</b>					
<i>Felis sylvestris</i> Schreber (Wild Cat)	-	-	-	×	-
<i>Oryctolagus cuniculus</i> (L.) (Rabbit)	-	×	×	-	-
<i>Cervus elaphus</i> L. (Red Deer)	×	×	×	-	×
<i>Bos longifrons</i> Owen (Celtic Shorthorn)	×	×	×	-	×
<i>Ovis</i> sp. (Sheep)	×	×	×	×	×
<i>Sus</i> sp. (Pig)	?	×	×	×	×
Whale	-	-	×	×	×
<b>Birds:</b>					
<i>Larus marinus</i> L. (Great Black-backed Gull)	×	-	×	-	-
<i>Larus argentatus</i> Pontopp. (Herring Gull)	×	-	×	-	×
<i>Numenius phaeopus</i> L. (Whimbrel)	×	-	-	-	-
<i>Fratercula arctica grabæ</i> (Brehm) (Puffin)	×	-	×	-	-
<i>Sula bassana</i> (L.) (Gannet)		×	×	×	-
<i>Phalacrocorax carbo carbo</i> (L.) (Cormorant)		×	-	-	-
<i>Calidris alpina schinzii</i> (Brehm) (Dunlin)		×	-	-	-
<i>Turdus merula merula</i> L. (Blackbird)		×	-	-	-
? <i>Pyrhcorax pyrrhcorax</i> (L.) (Chough)		×	-	-	-
? Some kind of Eagle	-	-	×	-	-
"Duck"	-	-	-	-	×

	Excavations.				Earth-house.
	A.		C.		
	Hearth.	Below Hearth.	Upper part.	Lower part.	
<b>Fish:</b>					
<i>Gadus callarias</i> L. (Cod)	×	×	×	×	×
<i>Gadus pollachius</i> L. (Lythe or Pollack)	×	-	-	-	-
<i>Gadus virens</i> L. (Saithe)	-	×	-	-	-
<i>Molva molva</i> (L.) (Ling)	-	×	-	-	-
<b>Crustacea:</b>					
? <i>Cancer pagurus</i> (Auct.)	-	-	×	-	×
<b>Mollusca:</b>					
<i>Mytilus edulis</i> L.	×	-	×	×	×
<i>Pecten maximus</i> L.	×	-	-	-	×
<i>Patella vulgata</i> L.	×	-	×	×	×
<i>Gibbula</i> cf. <i>cineraria</i> (L.)	-	-	×	-	-
<i>Littorina littorea</i> (L.)	×	-	×	×	-
<i>Littorina littoralis</i> (L.)	-	-	×	-	-

### Mammals.

Miss Platt has identified one complete small rib from Excavation C as belonging to the Wild Cat, an animal which is no longer found living on Lewis.

Red Deer were represented by an upper cheek tooth row, ribs, a small hyoid bone, fragments of pelvis, tibia, radius, ulna, humerus, and tarsals. The three associated upper molars have a total antero-posterior length of 59 mm. These remains of Deer, which were more common in Excavation A than in C, belong to a small race. This was considered by Miss Bate, who only saw the specimens from Excavation A, to resemble a kind now found in Norway; but Miss Platt identified them with the true Scottish Red Deer.

The remains of Rabbit are probably intrusive, as none of the bones

belonging to this animal were calcined, whereas those of some of the other animals did show signs of having been in the fire. The only other bones of a wild mammal which were found, if we omit the possibility of pigs having been wild, belong to some species of whale, but were not further identifiable.

The domestic animals from Galson are cattle, sheep, and pigs. Of these the cattle are the most interesting, and belong to the small Celtic Shorthorn type. They are represented by ribs, scapula, carpals, a fore phalange, and many teeth. No entire skull was found, but parts of the skull of a young animal were represented in Excavation A by the frontal, nasal bones, and an ear bulla, also by a complete lower jaw with all the milk molars present and the first permanent molar just showing. Altogether three horn cores were found, one of which has a length of 15 cm., taken along the curve, and a circumference at its base of about 15.5 cm. Harvey-Brown and Buckley (1888, p. 43) record that remains of *Bos longifrons* have been found in a Picts' house in Harris.

The remains of sheep represent both adult and very young animals, and consist of scapula, rib, cannon bones, small vertebræ, humerus, tibia, and a lower jaw which has both the permanent molars and the third milk tooth present. As no horn cores of sheep were found, the exact breed of these animals is not known.

Except for fragments of ribs and limb bones, the remains of pigs consist of fragments of skulls, while deciduous molars were found at more than one level. These remains were more numerous in Excavation C than in A, and one canine tooth from below the hearth in Excavation A belonged to a very young pig, and many of the other remains of this species belonged either to young or small individuals.

No remains of horses were found.

#### *Birds.*

Sea-birds are by far the most common among those represented, although remains of the chough and the blackbird were also found. Bones of birds occurred more frequently in the upper than in the lower part of each excavation.

The sea-birds were identified as follows:—

Great Black-backed Gull, various limb bones and a quadrate bone.

Herring Gull, limb bones.

Whimbrel, one leg bone from Excavation A. Miss Bate observes that this species is said to breed at the present time on the island of North Rona (which is rather over 50 miles north-east of Galson).

Puffin, a few bones, including tarso-metatarsus.

Gannet, only found in Excavation C, a tibia and a wing bone.

Bones of Cormorant and Dunlin were only found in Excavation A.

Among non-marine birds, Miss Platt recorded from Excavation A "a wing bone, which has not been fully identified, resembling in size that of a Chough (*Pyrrhocorax pyrrhocorax* (L.))." From Excavation C, "the vertebra of a bird, some kind of eagle (*Falconidæ*)." One of the most interesting finds was the remains of the Blackbird (Excavation A), which is essentially a woodland and garden species, and this record may help to throw some light on the biological history of Lewis, which is so conspicuously devoid of natural woodland at the present day.

#### *Fish and Crustacea.*

Fish remains were extremely numerous, the most common being cod. Both vertebræ and fragments of the head were found, and in addition to cod there were also pollack, saithe, and ling. In the material from Excavation C Miss Platt recorded "part of the large pincer of a crab, possibly the edible variety (*Cancer pagurus*)."

#### *Marine Shells.*

By far the most common shells in the occupation layers were limpets (*Patella vulgata*) and winkles (*Littorina littorea*), but other shellfish which might have been used for food or as bait, such as mussels (*Mytilus edulis*), were also found. These three species occurred at both the excavations; but in Excavation A winkles were definitely more common than limpets, and another species found at this part of the site were fragments of a large edible scollop (*Pecten maximus*). At Excavation C, however, limpets were more abundant than winkles throughout the layers of occupation, and it was especially noticed that they were collected in heaps at the foot of the large stones. Two other species, *Gibbula cineraria* and *Littorina littoralis*, were also found in Excavation C.

We can see from the contents of the Galson middens that fishing was practised, cod being a favourite article of food. Cattle, sheep, and possibly pigs were tended, but there is no evidence that horses were kept; wild deer were hunted. The diet of these people was also varied by crab, limpets, and winkles, and it is interesting that the winkles of this coast are still highly esteemed by the crofters of the neighbourhood, and we were told that these shellfish are at present exported from here to London. It is also interesting to compare the inferred habits of these

Iron Age people, who occupied the Galson site, with the tastes of the recent St Kildans. According to Heathcote (1900, pp. 154-7), the most valuable sea-birds to the St Kildans at the time of his visit were fulmars, and second in importance to these, gannets. No remains of fulmars were discovered in the Galson excavations.

The animal remains found by Mr Edwards during his excavation of the earth-house at Galson were identified by Dr Ritchie, but have not previously been published in detail. They are almost the same as those found by us in the midden layers; the most common domestic animal being the Celtic Shorthorn, the next in order of frequency being sheep, and thirdly the pig. Of wild animals which probably had been used also as food, a Red Deer was represented by a small fragment of an antler. The only other mammal found was some kind of whale, represented by a few bone fragments and an intervertebral disc. Birds were represented by a fragmentary wing bone, apparently of the Herring Gull, and apparently by ducks. Cod was the only fish identified; the only invertebrates found were: one mussel, two limpets, one scollop (*Pecten maximus*), and part of the claw of an edible crab. Edwards (1924, p. 196) states that the pottery from the earth-house is the same as that from the midden. The two probably do not differ greatly in age.

##### 5. THE GALSON RAISED BEACH.

Before describing the extent of the raised beach at Galson, we must point out that very little work has been done on the distribution of raised beaches on the Outer Hebrides, because the geologists who have visited these islands have usually made the study of the pre-Cambrian rocks their main objective. Even James Geikie was mainly concerned with the glaciation, although he hinted at the presence of a late "post-glacial" raised beach (1894, p. 160).

Jeffreys gives "Stornoway Raised Beach" as a locality for *Trochus cinerarius* and *Fusus antiquus* (vol. iv. p. 325, and vol. v. p. 203), but it is possible that the reference is to the interglacial marine beds of Northern Lewis, because a species allied to *Fusus* is common in these deposits. These marine beds are much older than the Galson raised beach, and do not come within the scope of the present paper. Jehu and Craig (1934, p. 842), after remarking on the general scarcity of raised beaches along the coasts of Lewis, drew attention to the fact that the peninsula to the east of Stornoway which unites the Eye Peninsula with the mainland of Lewis consists "partly of blown sand and partly of beach gravel." During our field work we were able to confirm the suggestion that marine

material forms a substratum of this neck of land, but it is not certain whether this can be described as a true raised beach. Gregory reported a raised beach at Lochmaddy at a height of about 10 or 12 feet above O.D. (1928, p. 119), but he mentions that this is the only example seen by him in the Outer Hebrides. In a paper on the surface features of Lewis, Panzer (1928, p. 195) hints that low-level raised beaches may exist at Tarbert (Harris), but he gives no details.

*Galson.*—The coast at Galson is completely exposed to the open Atlantic, and storms here are extremely severe, especially in winter. One is therefore forced to make sure that the apparent raised beach along this coast is not built of shingle thrown up by storms at the present time. But at Galson at least this is disproved by several considerations. Firstly, the pebbles in the raised beach are of fine grade, at Galson itself a size of over 1 inch being exceptional, whereas the beach now forming at the same place consists of very coarse material, the average pebbles being 6 inches long. Secondly, this difference of grade cannot be due to any sorting action by the existing waves, because the raised beach outcrop occurs on the small capes along the coast, and the tendency of storm action at present is to drive the shingle up into the bays. Thirdly, we have to explain the undoubted fact that the blown sand at the midden site at Galson was formed later than the raised beach, and was laid down on top of it.

As regards its lateral distribution, the raised beach was traced in an easterly direction from the site of the midden as far as the mouth of the North Galson Burn—that is, for a distance of about half a mile. (The names used here will be found on the 1-inch Ordnance Map, Popular Edition, Sheet 8.) The coast immediately north-east of the North Galson Burn has not yet been examined, but as the whole coast from this point to the cape at Cobha Sgeir opposite the Dell Rock consists of high ground, it is unlikely that extensive outcrops of the raised beach will be met with in this direction. Beyond Cobha Sgeir the whole coast was examined from the mouth of the Dell River as far as Bad an Fithich, but no sign of a low-level raised beach was seen. To the south-west of the site of the midden the raised beach was traced for about half a mile along the coast, as far as the place, easily visible on the 1-inch Ordnance Map, where the 50-foot contour first bends out towards the coast. So far no attempt has been made to trace the raised beach farther in this direction.

No marine shells were found in the raised beach at Galson, except for a few *Patella vulgata*, of which the provenance is doubtful. Where the base of the beach is not hidden by the storm beach now in process of

formation, it rests on an eroded platform of Archæan rocks; but at the farthest point to which it was traced towards the south-west it appears to rest on boulder clay, though the section is obscure and would be very difficult to clear. There are two types of boulder clay in Northern Lewis, one of which is brown in colour, and contains erratics of Torridonian arkose and sandstone, while in the other, greenish boulder clay, these erratics are extremely rare, or altogether absent. The boulder clay on which the raised beach appears to rest to the south-west of the Galson site is that which does not contain erratics from the Torridonian. These erratics, however, do occur in the raised beach, and have therefore been derived from the north-east, beyond the North Galson Burn. We should mention that the remarks about the small size of the shingle in the raised beach at Galson only apply to the immediate neighbourhood of the midden site, and that to the south-west there is a development of alternate layers of coarse and fine shingle.

As no fauna has been found in the raised beach near Galson, it would be rash at present to attempt correlation with raised beaches elsewhere, especially outside Lewis. It is also difficult to estimate the amount of submergence represented by this raised beach, because it consists of a shingle bank facies along its entire length, as far as it was seen by us. The height of the base of the beach was only 5 feet above high-water mark towards the mouth of the North Galson Burn. As already noted, at the midden site itself the base of the beach was not seen, but the top of the shingle was at about 25 feet above the same datum. The height at the point to the south-west where it rested on boulder clay was 16 feet above present high-water mark. The coast from this point to the mouth of the North Galson Burn is backed by an unusually flat strip of land, behind which the ground rises abruptly from an altitude of 30 feet O.D., and, considering these facts, we can say that the submergence represented by the raised beach is somewhere between 10 feet and 30 feet. As regards the age of this beach, it seems impossible that it is in any sense "Pre-Glacial," because even if we ignore the obscure section in which it appears to rest on boulder clay, we still have to account for the Torridonian erratics, which were almost certainly derived from the "Torridonian Boulder Clay" to the north-east.

*Stornoway.*—During our field work of 1933 we found that Loch Branahuie, 3 miles east of Stornoway, is held up by two ancient marine beaches, respectively north and south of the loch. These beaches can only doubtfully be called true raised beaches, as the only sections we saw in them were poor. But it would seem that the sand-dunes which cover most of the surface of the ground here have been formed on top



of the marine feature, though the evidence is not as clear as at Galson. At their base they were seen to rest on the Stornoway Conglomerate (probably of Torridonian Age), and although boulder clay occurs quite near, below Melbost, the junction of the boulder clay and beach was not shown in section. The height of these ancient beaches was found by measurement to be 10 feet, both on the north side of the peninsula at Melbost and at the western end of the south side. Since 1933 the section on the south side has been covered over by the building of an embankment to protect the road. Where there are no sea-walls, the sections are much obscured by modern beach sand.

Eight species of Mollusca were found in the marine deposit between the north side of Loch Branahuie and Melbost:

*Donax vittatus* da Costa.

? *Solen marginata* Montagu. (*Solen vagina* Lamareck.)

*Patella vulgata* Linné.

*Gibbula cineraria* Linné.

*Littorina littorea* Linné.

*Littorina littoralis* Linné. (*L. obtusata* Linné.)

*Trivia europæa* Montagu.

*Purpura lapillus* Linné.

These shells represent intertidal conditions, except for *Donax vittatus*. According to Stephen (1930, p. 532), this species lives at or below low-water mark at the present day in the Outer Hebrides, but empty valves are washed up by wave action to high-water mark. Elton found empty valves of *Donax vittatus* similarly washed up on the shore of Pabbay (South Harris), and Baden-Powell has also found valves of this species in a like situation at Studland in Dorset and at St Andrews (Fife). The presence of this shell as a fossil is therefore no indication of the depth of deposition, and the assemblage as a whole represents the intertidal zone. As regards climatic indications, all the species in this list are to be found living round the Outer Hebrides at the present day.

If this deposit at Loch Branahuie is a raised beach, the amount of submergence is between 5 and 15 feet. It is therefore possible that we are dealing here with a raised beach of the same age as that at Galson, but much evidence is needed before this can be considered as proved. It is also tempting to correlate with Gregory's raised beach at Lochmaddy, at a height of 10 to 12 feet, but one would like to see more faunal or archæological evidence before coming to a decision about this. There does, however, appear to be a bench cut in the Stornoway Conglomerate on the Eye Peninsula, which may be a continuation of the Branahuie

raised beach. This feature is mentioned and figured by Jehu and Craig (1934, p. 865, and pl. ii. fig. 2), and this site at Dun, near Garrabost, was investigated in 1935; the height of the bench was only 5 feet above present high-water mark, and it certainly has the appearance of a marine-cut platform, but it is difficult to decide whether it represents differential movement of sea-level.

#### 6. CONCLUSIONS.

The facts which have been established by the excavations at Galson are that—

(1) There is a raised beach on the west coast of the Island of Lewis at a height of 10 to 25 feet above existing high-water mark.

(2) This raised beach was formed earlier than an overlying kitchen-midden, which has been dated by its archæological content to the early part of the Christian Era. The raised beach is also probably earlier than an Iron Age earth-house at the same site.

(3) This raised beach is believed to be younger than a greenish-coloured boulder clay at Galson, but verification is needed of this relation.

(4) The animal remains in the midden, besides giving a picture of the food-habits of the people, show that the fauna about 1500 years ago was very similar to that of the present day. One species, however—the wild cat—was not previously known to have lived in the Outer Hebrides. There is a suggestion that the fauna of Lewis is derived partly from an earlier woodland fauna. This wild cat, the recently extinct pine-marten, the occurrence of long-tailed field mice (*Apodemus*), whose nearest relatives on the mainland are predominantly woodland forms, the pigmy shrew (partly a woodland form), an island race of song-thrush, and also the presence of blackbird in the midden, all support this suggestion. The woodland facies of the fauna is especially striking in view of the almost entire absence of any trees in the Outer Hebrides except those planted within the last hundred years or so, or buried in older peat deposits.

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