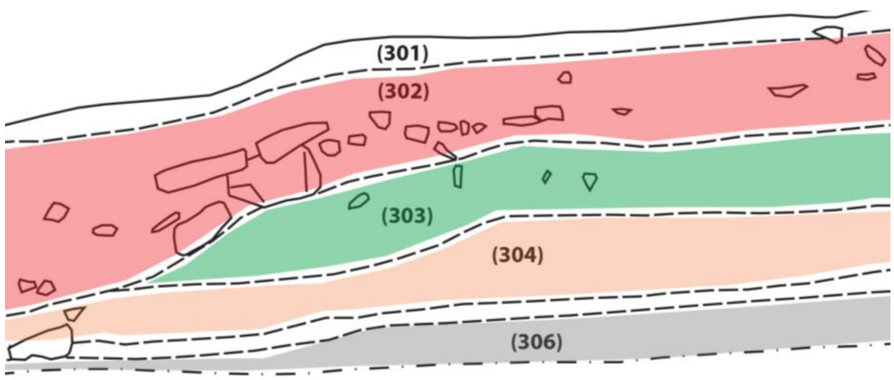
SKOMER ISLAND:

The excavation and luminescence dating of a Bronze Age, Iron Age and Medieval field lynchet associated with the South Stream settlement

April 2017



Royal Commission on the Ancient and Historical Monuments of Wales, University of Sheffield and Cardiff University with Aberystwyth University Luminescence Research Laboratory and the EU-funded Ireland-Wales CHERISH Project

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Community: Marloes and St Brides
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Surveyed by: Louise Barker, Oliver Davis, Toby Driver, Bob Johnston, Prof. Geoff Duller
Report Authors: Driver, T., Duller, G. T., Lloyd, S. and Roberts, H. M., *with* Barker, L., Davis, O., Johnston, B. with specialist contributions by Challinor, D. and James, H.

Illustrations: As above

Comments or queries regarding the content of the report should be made to the author:
RCAHMW, Ffordd Penglais, Aberystwyth, Ceredigion, SY23 3BU

Tel: 01970 621200

World Wide Web: http//www.rcahmw.gov.uk

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Noddir gan Lywodraeth Cymru
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Fourteenth century four-ox plough team; similar scenes may have been common on twelfth century Skomer. Compare to Figure 27.

1. Summary

A collaborative research project between the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), University of Sheffield, Cardiff University and Aberystwyth University completed a fourth season of fieldwork and research on the renowned prehistoric landscape of Skomer Island (SM 7269 0946 NPRNs 24369 & 402711) in Pembrokeshire, west Wales, between 5th-8th April 2017 (see Barker et al. 2012; 2012b; 2013, 2015, 2018; Duller and Roberts 2019). For this season the team were joined by Prof. Geoff Duller of the Aberystwyth Luminescence Research Laboratory as part of the EU-funded CHERISH Project in the first archaeological application of this dating method on a Welsh Island.

The small excavation trench on a deep field lynchet near the South Stream Settlement was opened in a bid to recover undisturbed deposits and buried soils suitable for Optically Stimulated Luminescence (OSL) dating to help to establish absolute chronological markers for key phases in the development of the Island's fields and settlements, and to assist further environmental sampling to more accurately reconstruct the environmental history. The 2017 trench, aligned north-south, measured 6.1m x 0.6m and was excavated to a depth of 1.1m with the lower levels were waterlogged. Seven contexts were identified, revealing an instructive sequence illustrating the clearance of initial field stone early in the history of the boundary, followed by successive build ups of cleared stone and plough soil contributing to the overall depth of deposition in the lynchet.

The results of OSL dating (Duller and Roberts 2019; section 7 below) were received in June 2019, bringing new precision to our understanding of the development of agriculture and settlement on the island. The technique has produced the first scientifically dated evidence for Middle Bronze Age, Middle Iron Age and Medieval clearance and farming on Skomer Island.

The implications of these dates for our understanding of the relict archaeology on Skomer are discussed below in section 9. In particular the twelfth century AD date radically alters our understanding of the history of farming on Skomer, which had previously been thought to have been largely abandoned save for seasonal grazing and rabbit farming from the fourteenth century onwards.

During the same 2017 fieldwork season, the site of the 2014 excavation of Hut Group 8 in the North Stream Settlement (Barker et al. *2014) was revisited for the purposes of OSL sampling of the mound of burnt stone.*

2. Background to Project

Skomer Island is a heavily protected landscape managed largely for the benefit of its extraordinary and internationally-renowned birdlife. It is owned by Natural Resources Wales and managed by the Wildlife Trust of South and West Wales as a National Nature Reserve, with large parts of the island a Scheduled Ancient Monument (PE181), surrounded by a Marine Nature Reserve. In addition to the current research project, two other archaeological studies have been undertaken on the island, both in the twentieth century: the first by Professor W. F. Grimes in the 1940s (Grimes 1950) and the second by Professor John G. Evans in the 1980s (Evans 1990).

This Skomer Island Project is a collaboration between RCAHMW, University of Sheffield and Cardiff University, with the collaboration extended to include Aberystwyth University for the 2016 and 2017 seasons. It was initiated in 2011 and has four aims:

1. Develop a new landscape history of Skomer that takes account of the complex and multi-layered character of the field archaeology.

2. Establish absolute chronological markers for key phases in the development of Skomer's landscape.

3. Reconstruct the environmental history of the island and assess the changing impact of human occupation.

4. Support the organisations responsible for Skomer in applying the research outcomes of the project to the conservation management of the island's historic and natural environment.

Completed archaeological research 2008-2016

The project was initiated following targeted aerial reconnaissance in 2008, which revealed a considerable amount of new information about the island's field systems, particularly relative stratigraphy between elements of the field system, and hinted at greater complexity and longevity of human settlement on the island. This led to the commissioning of a new 0.5m LiDAR survey of the island in 2011, with the archaeology then mapped by Oliver Davis and follow-up ground reconnaissance and survey completed during the first season of fieldwork in April 2011. This involved 3 days of walkover surveys and site visits including characterisation of the northern field system associated with the North Stream settlement (Barker *et al*. 2012a & b) and plans and elevation drawings of new discoveries including standing stone pairs, and a sub-megalithic site in the north of the island (Barker *et al*. 2015). The results of this work revealed new information about the island's settlements, field systems and ritual monuments demonstrating a much deeper chronology for the island than had previously been considered (Evans 1990, 255).

In April 2012, the second season of work saw geophysical survey (gradiometer and resistance) undertaken in two areas of the island, one inside and one outside the scheduled area (Barker *et al.* 2013). There were two objectives:

1. Evaluate the preservation of sub-surface archaeological features within areas cleared and improved in the eighteenth and nineteenth centuries.
2. Evaluate the preservation of sub-surface archaeological features within areas of prehistoric relict field systems and settlements.

The results highlighted the potential of geophysical survey techniques for identifying sub-surface archaeological features.

The 2014 excavation (Barker *et al.* 2014; 2015) demonstrated that undisturbed archaeological deposits survive on Skomer from which it was possible to obtain the first archaeological radiocarbon dates fort the island, and environmental samples. The 2016 field season built on this work and methodology to identify further absolute chronological markers for key phases in the development of the Island.

The 2016 excavation (Barker *et al.* 2018) opened a small trench measuring 0.5m x 4.3m across a large prehistoric field lynchet located 74m due west of Hut Group 6 in the North Stream settlement. The lynchet was found to have developed upon a mass of stones and small boulders cleared from the field, and not to be a simple earthen bank. Despite the high number of stones within the soil matrix, no built revetment was identified and the lynchet was disturbed by deeply penetrating bracken roots. It was felt that a more intact and less disturbed lynchet should be identified for a follow-on excavation, in an attempt to sample secure buried deposits and land surfaces for palaeoenvironmental data. In the event this led to the identification of the more substantial lynchet in the South Stream area in 2017, the investigation of which is the subject of this report.

The results of fieldwork so far undertaken have been published in various editions of CBA Cymru/Wales *Archaeology Wales* (Barker *et al.* 2011; 2012a & 2015) and in a paper by the project team *'Puffins amidst prehistory: reinterpreting the complex landscape of Skomer Island'* in 'Reflections on the Past. Essays in honour of Frances Lynch' edited by William J Britnell and Robert J Silvester (2012b). Information has also been made available through *Coflein* the on-line historic environment record of RCAHMW with project archive placed in the National Monuments Record of Wales (NMRW). See the main online record for the Skomer field systems here and all the records for the excavation campaigns on Skomer Island here.

3. Excavation location

The 2017 evaluation excavation aimed to assess the archaeological potential for undisturbed archaeological deposits and former soil horizons surviving behind, within and beneath the prehistoric field systems on the island, the island's principle archaeological resource. We were keen to establish absolute chronological markers for key phases in the development of the island's fields and settlements along with further environmental sampling to more accurately reconstruct the environmental history of the island. It was also imperative to test innovative dating techniques like OSL on Skomer to see if this was a suitable method to consider for the damp, mixed soils of Welsh islands in the future, within the new funding opportunity offered by the EU funded CHERISH Project, begun in January 2017.

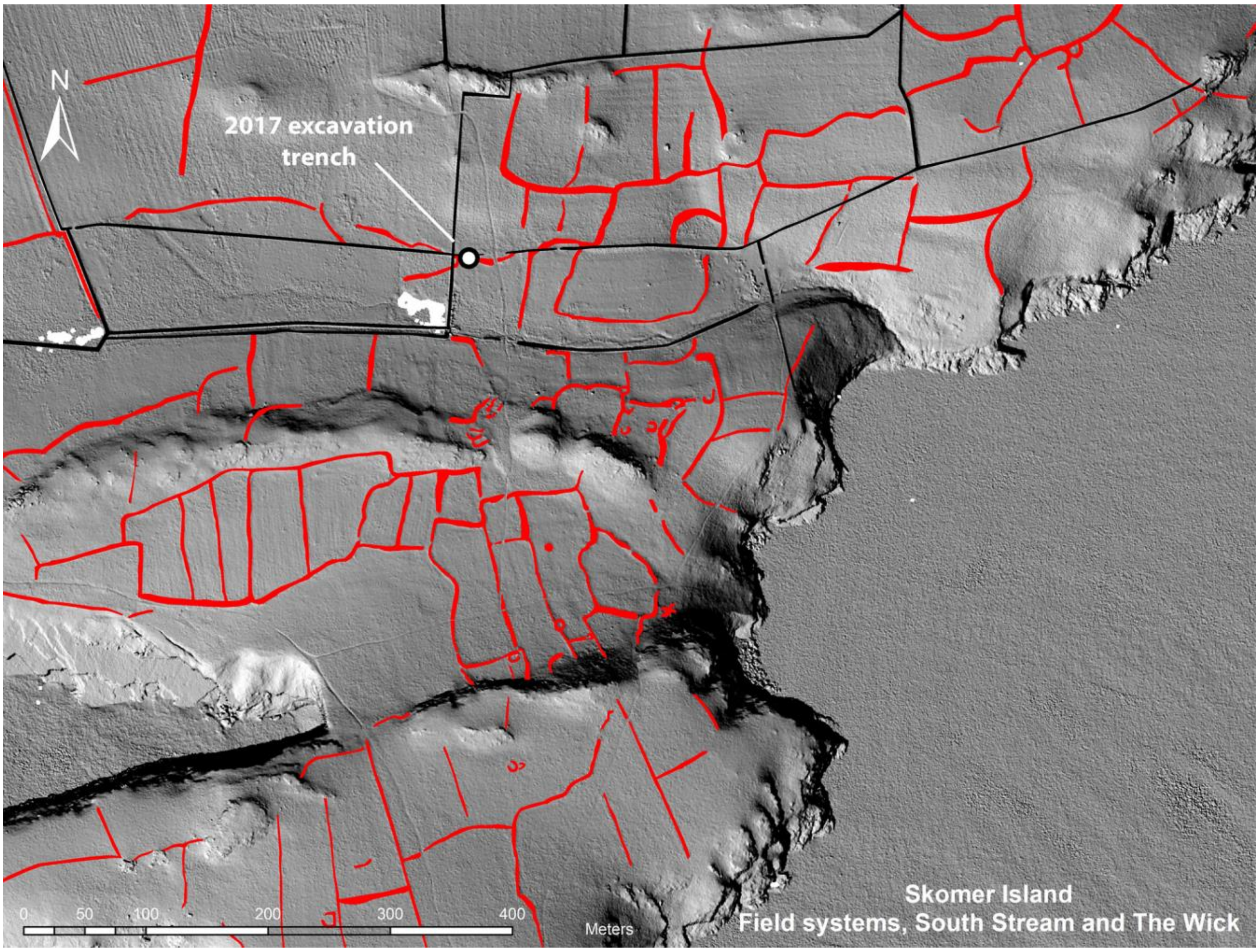


Figure 1. *Skomer Island: location of the 2017 excavation trench in the context of the South Stream Settlement, with The Wick area of settlement and fields to the south. Mapping by Oliver Davis over the 2011 0.5m LiDAR dataset (Crown Copyright RCAHMW).*

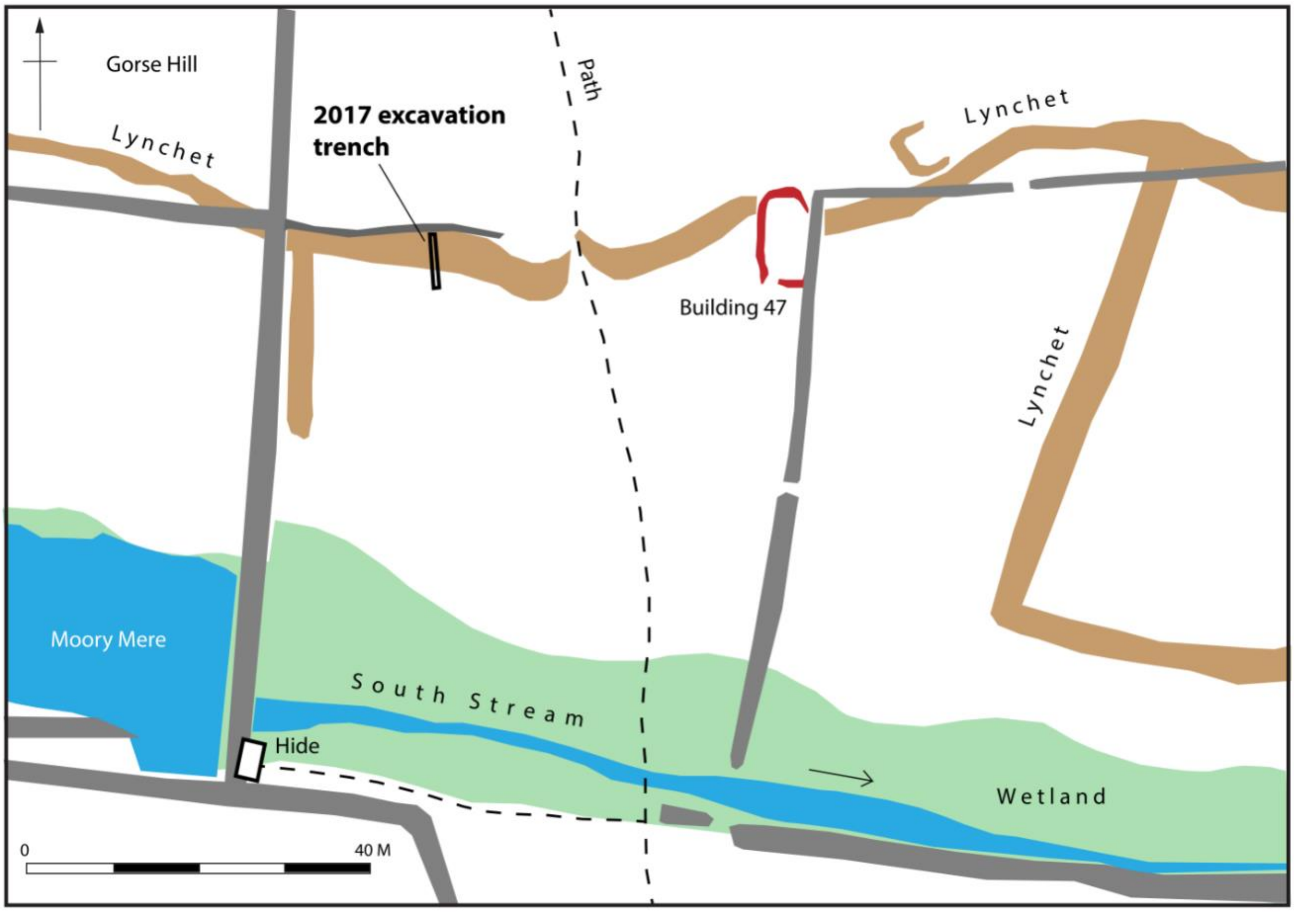


Figure 2. *Detailed location map showing location of the 2017 trench in the context of the earthwork lynchets in the South Stream settlement. Post medieval field walls are shown in grey, prehistoric and medieval lynchets in brown, combining survey data and mapping from 0.5m LiDAR data. Note Evans' (1990) building 47, a probable medieval long house to the east of the excavation trench (Crown Copyright RCAHMW).*

Figure 3. *Location of the 2017 excavation trench seen from the south, with the boardwalk to Moory Mere hide in the foreground (Crown Copyright RCAHMW, DS2017_001_004).*

The 2016 section of a field lynchet in the north stream settlement was successful in allowing the team to characterise the construction of the field boundary; however bracken penetration and a lose stone/soil matrix meant that the lower layers of the lynchet were not sufficiently intact and sealed to allow scientific dating, either by radiocarbon or OSL.

The proposed evaluation excavation for 2017 sought to target and assess the archaeological potential for undisturbed archaeological deposits surviving behind or beneath an alternative prehistoric field boundary on the island. Many field system boundaries are severely affected by burrows and bracken, but some of the largest lynchets have the potential to retain intact sediments towards their base; it was this hypothesis we needed to test. If sealed deposits were successfully encountered it was proposed to obtain samples for palaeoenvironmental analysis, AMS Radiocarbon dating and OSL dating.

The 2017 field proposal in the *Skomer and Skokholm Islands Research Proposal* specified the excavation of a 'deep field boundary', in the Wick settlement or South Stream area. The very visible, stone-defined field boundaries in the Wick area, and deeper terraced lynchets, appeared – on paper - to offer a good candidate for investigation, with the choice to be refined on arrival in the company of the Skomer Warden, to avoid sensitive areas with bird burrows. The shift of focus from the North Stream settlement to the south of the island supported our aim to find a larger and more intact boundary to work on. Relocation of work to the Wick and the South Stream area would also provide further context to the 2014 and 2016 excavations, and the geophysics of the Wick that was completed in 2012. Given the short timescale of the excavation (over 4 days), selection would also be based on a field boundary which presented an achievable objective.

In the event the stone-defined boundaries of the eastern Wick settlement were found to be too disturbed or burrowed, presenting neither a 'low impact' option away from bird burrows to investigate nor a suitably intact boundary for the survival of stratification. Following some discussion between the team and the warden on site, the chosen lynchet was finally selected on the northern side of the South Stream Valley. The trench was positioned across the lynchet to avoid any intact outer stone facing and any larger stones and boulders, in a place where excavation would be less problematic and would allow the recovery of a more intact soil sequence in section. The chosen location lay 38m west of Evans' surveyed structure 'Enclosure 47', a rectangular stone-built enclosure terraced into the hillslope with a southern entrance. It is likely to be one of only one or 2 or 3 medieval longhouses recorded on Skomer (see Figure 29 below; NPRN 424554).

The Skomer LiDAR survey (2011; Figure 1) of the South Stream settlement shows the context of the selected lynchet well. It is the lowest substantial field terrace on a south-facing slope above the valley of South Stream, in an east-west grid of fields. The terraces above South Stream are so substantial that one has the impression of ascending a series of 'steps' moving from south to north, towards the higher ground in the centre of the island. While the lynchet has the character of a prehistoric field boundary, as do others in the South Stream area, there is evidence for historic re-use and intervention; the lynchet is surmounted by a low wall footing, of relatively recent character, and indeed the general line of the lynchet is continued by a 19th century wall to the west although the underlying lynchet diverges north.

Figure 4. *The South Stream lynchet and location of the 2017 excavation trench, strung out prior to the start of work. View looking east (Crown Copyright RCAHMW,* DS2017_001_001*).*

Figure 5. *View of the site of the excavation from the south-east, showing the steep face of the unexcavated lynchet cleared of bracken (Crown Copyright RCAHMW).*

Figure 6: *Post-excavation view of the 2017 excavation trench after backfilling and reinstatement. View looking west* (*Crown Copyright RCAHMW*, DS2017_001_006)

Figure 7. *Site of the 2017 excavation trench photographed a year on, on 20 April 2018, showing successful reinstatement of the trench (centre). View from the south (Crown Copyright RCAHMW).*

4.Excavation Methodology

As with the 2014 and 2016 excavations a sheet of tough silage plastic was laid out alongside the trench (on the west) to allow spoil to be stacked without causing damage to the ground surface. Stones were stacked separately. Turf was initially removed by hand and then excavation proceeded down through the layers of the lynchet. The trench was opened on 5th April and reinstated on the 8th April. The trench was photographed a year after reinstatement on 20th April 2018 (Figure 7) and was found to be recovering well and returning to the condition of the surrounding unexcavated lynchet.

The trench was aligned north-south, measured 6.1m x 0.6m and was excavated to a depth of 1.1m; the lower levels were waterlogged reflecting both a previously wet winter and the proximity of the lynchet to the boggy valley of South Stream. Seven contexts were identified, revealing an instructive sequence illustrating the clearance of initial field stone early in the history of the boundary, followed by successive build ups of cleared stone, plough soil and layers of hillwash from higher slopes to the north which contributed to the overall depth of deposition in the lynchet. Thankfully the soil matrix was compact and relatively undisturbed. Bracken roots only penetrated the upper 0.3m of the trench, affecting only the upper context 301.

Figure 8. *Hand excavation of the narrow trench progressing on the first day, with soil and stones stacked on plastic on the western side of the trench (Crown Copyright RCAHMW).*

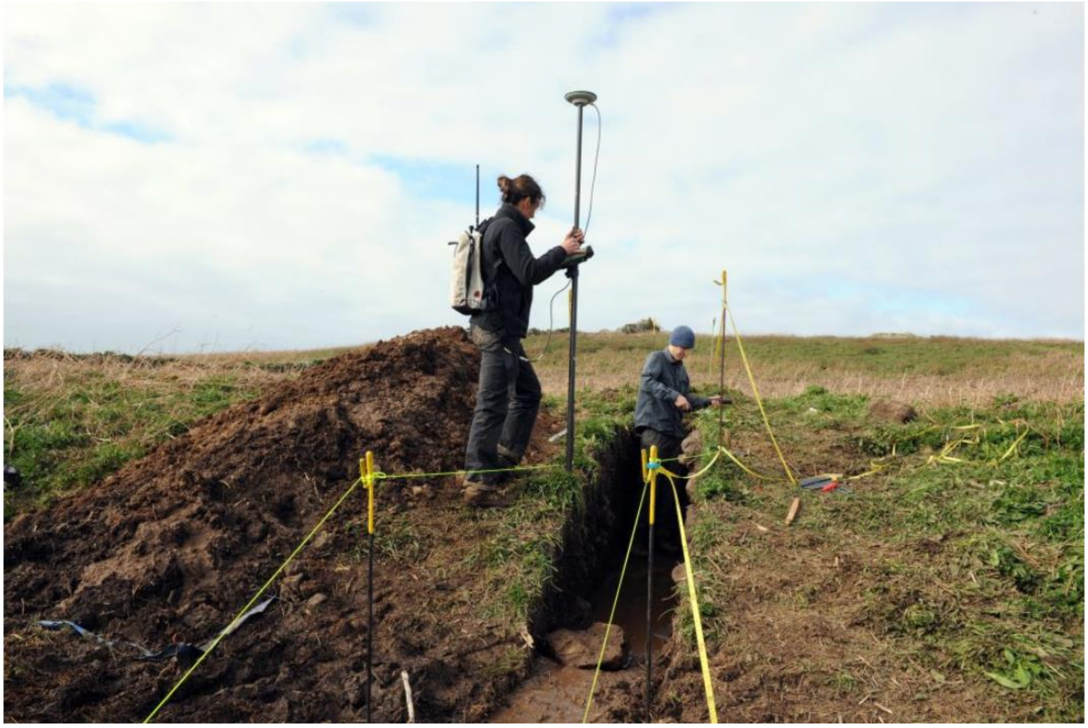


Figure 9. Surveying the trench edges with GNSS with OSL dating in progress (*Crown Copyright RCAHMW*, DS2017_001_003).

Figure 10. *The completed trench, prior to sampling and recording. View from the south, scale 1m. Note the waterlogged ground at the base of the trench (Crown Copyright RCAHMW).*

5. Results of the excavation

Context descriptions and sequence: see section drawings in Figures 12 & 24

The 2017 evaluation trench provided only the second excavated cross-section of a field lynchet on prehistoric Skomer and thus stands as a useful comparison with the North Stream Settlement lynchet excavated in 2016 (Barker *et al*. 2018). The 2017 trench sheds valuable light on the preservation of buried contexts and the potential for the recovery of samples. In all six contexts were identified. The detailed dating of each of these contexts is described in section 9 below.

The lowest contexts show the establishment of the early boundary comprised of distinct plough-horizons at the edge of an area of ploughing, but prior to large-scale clearance of field stone seen in context **307.** The three earliest contexts **306** (a soft yellow-orange brown, silty clay, OSL dated as natural, 12,500 BP ± 1800), **305** (a pale brown-grey, slightly clayey soft silt, undated) and **304** (a grey-brown, soft clayey silt, OSL dated as Middle Bronze Age, 3500 BP ± 190) were established against what is likely to be an earth fast ‘grounder’ stone seen in the west section. By the time of the deposit of context 304 the low lynchet had attained a height of 0.46-0.52m.

The addition of the plough soil deposit **303** (a clayey silt; mid brown and soft with occasional small sub angular stones, OSL dated as Middle Iron Age, 2350 BP ± 100) raised the height of the lynchet to 0.64-0.68m at which point it was beginning to attain a flat summit and steeper southern face, still retained by the 'grounder' stone but becoming a more prominent terrace in the agricultural landscape.

A distinct change in the pattern of land management and cultivation practice of this slope at South Stream is seen with the formation of the upper context **302** (a browny-black, loose, friable silty loam, OSL dated as Medieval/Twelfth century 870 BP ± 60) a plough-derived soil intermixed with a distinctive deposit of cleared field stone 307 (large angular stones up to 0.4m x 0.25m) , more visible in the east section, showing new plough technology at work with a deeper furrow. The quantity of soil movement downslope increases dramatically, pushing the foot of the new lynchet out at least a metre beyond the 'grounder' stone (and burying it in the process) and raising the height of the lynchet to 0.92-0.96m. The final accumulation of the modern turf layer **301** may well have happened in more recent times although the east section displays several angular stones in this upper deposit.

The lynchet was finally surmounted by a wall, of which the base survives (not excavated), probably in the last two centuries of modern farming and enclosure on Skomer.

Figure 11. *Deposit of twelfth century AD cleared field stone 307 within ploughsoil deposit 302, exposed in the east section. View looking east. Scale 1m. This shows the renewed scale of cultivation and clearance in the medieval period (Crown Copyright RCAHMW).*

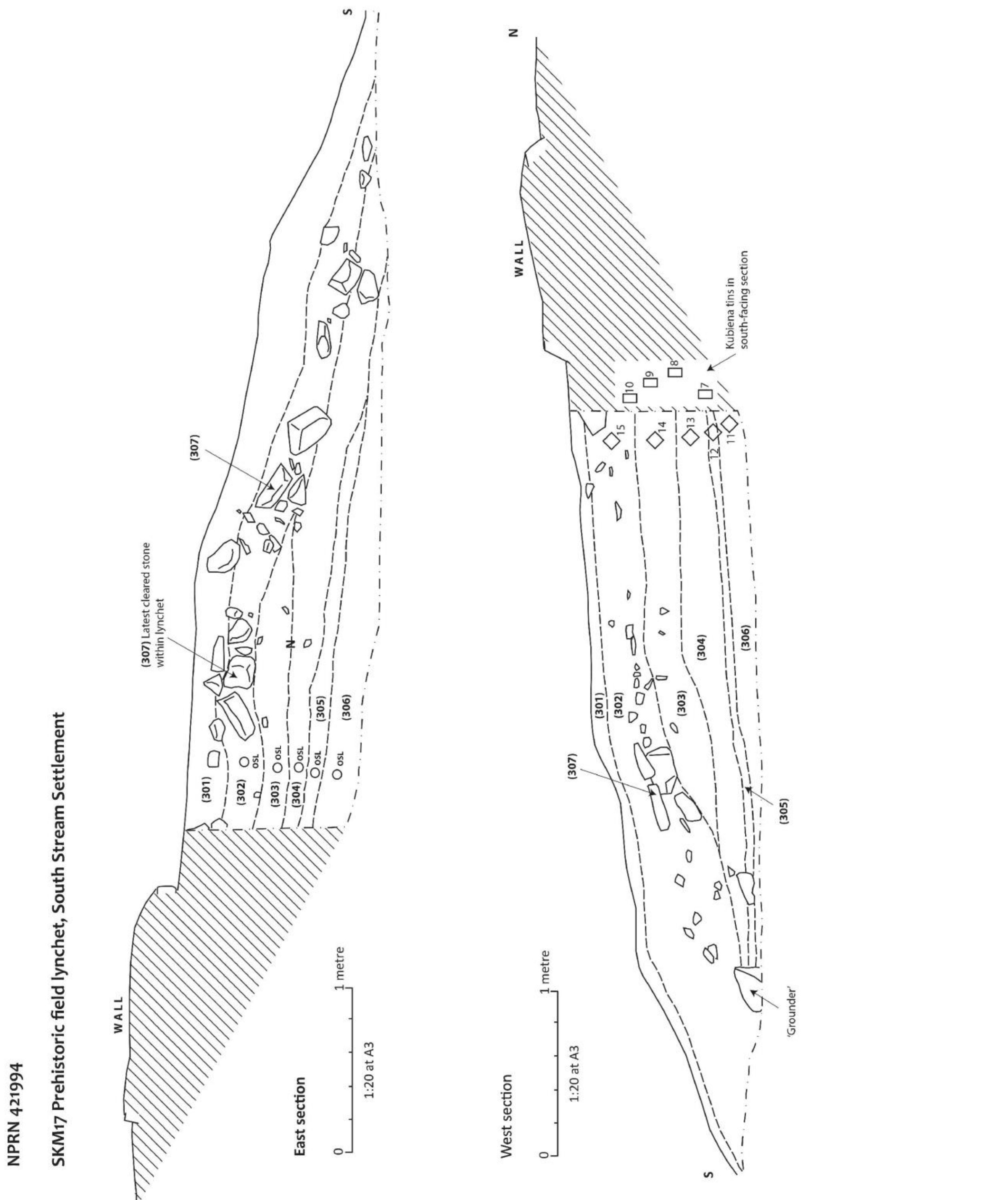


Figure 12. Section drawings of the 2017 trench. *The early, pre-clearance field boundary up to context 303, apparently formed against a 'grounder' stone at the foot of the lynchet. This early boundary developed prior to a renewed phase of more intensive field clearance which saw significant quantities of stone (307) deposited within the lynchet (302) at the edge of the field. Compare with a phased version in Figure 25 (Crown Copyright RCAHMW).*

6. Environmental Sampling

Assessment of Charcoal for radiocarbon dating. D. Challinor

Six samples were submitted for the selection and identification of suitable fragments for radiocarbon dating. The samples comprised the flots and sorted charcoal from the coarse residues. Standard identification procedures were followed, with the charcoal held in a sand bath for examination at high magnification.

The preservation of charcoal in the samples was very low, with few and small pieces recovered. Many of the flots, which were composed of modern rootlets, contained no identifiable charcoal. Three samples of *Cytisus/Ulex* (broom or gorse) were selected for dating. These were all from small roundwood and short-lived; however, it should be noted that fragment size was small (in one case two fragments were put together).

Given the quantity of roots in the flots and scarcity of charcoal, general suitability for dating is not ideal since it could represent intrusive material. The full results are presented in Table 1.

On receipt of the OSL dates from the trench in 2019 (see below) it was decided not to pursue radiocarbon dating for any of the samples due to the caveats and problems identified by DC above.

Sample no.	Context no.	Notes	C14 sample
1	107	No charcoal in flot. Residue material not all charcoal.	*Cytisus/Ulex* rw x 1
2	302	No charcoal in flot. 2 frags in residue, 1 of which disintegrated. Id of remaining piece not confirmed to avoid destruction.	cf. *Cytisus/Ulex* rw x 1
3	303	No charcoal in flot. Residue 1 frag, too small to id or date.	-
4	304	No charcoal in flot. Residue charcoal only small frags, so 2 chosen for dating.	*Cytisus/Ulex* rw x 2
5	305	Flot – 3 frags of *Quercus* heartwood, not suitable for dating. Residue: tiny frags not id'able.	-
6	306	Flot: 1 frag *Quercus* heartwood, not suitable for dating. Residue: 1 cf *Quercus* frag too small for C14.	-

Table 1: Charcoal results

7. Optically Stimulated Luminescence Dating

G.A.T. Duller & H.M. Roberts (taken from Duller and Roberts 2019)

1. Sample collection

On the island of Skomer excavation of a prehistoric field lynchet in April 2017 gave exposure of more than a metre of sediments that had accumulated against this boundary (Figure 13). Five samples for luminescence dating were collected.

Samples for luminescence dating were prepared and measured in the Aberystwyth Luminescence Research Laboratory under the direction of Professor G.A.T. Duller and Professor H.M. Roberts. Sample preparation involves making two sets of measurement associated with the two halves of the equation used to calculate luminescence ages (Eq. 1)

$$Age(ka) = \frac{Equivalent \quad Dose(Gy)}{Dose \quad Rate(Gy/ka)}$$

Equation. 1

The equivalent dose is measured using the luminescence signal emitted by quartz grains extracted from the sample. The radiation dose rate is determined by a combination of geochemical methods and emission counting methods on a milled sub-sample. Further information about the procedures follows are given in this report, and background to the method is provided by Duller (2008a).

Figure 13. The excavation on Skomer showing (right) the position of the three uppermost samples for OSL dating (grey tubes in section). These are SK302, 303 and 304.

NPRN 421994

SKM17 Prehistoric field lynchet, South Stream Settlement

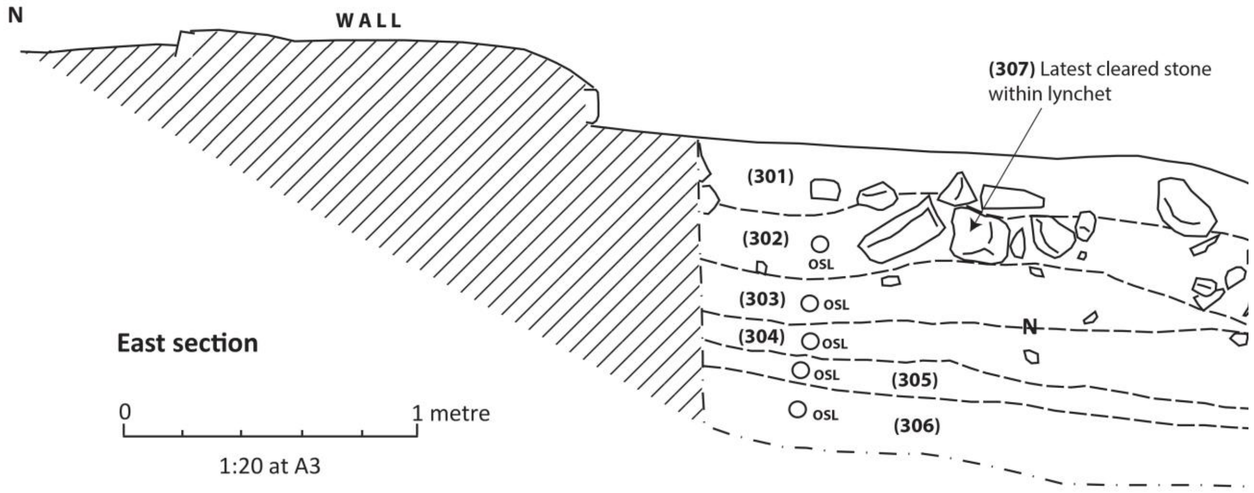


Figure 14: Detail of section drawing shown in Figure 12, showing context numbers and location of individual OSL samples (Crown Copyright RCAHMW).

2. Initial Sample Preparation

Samples were collected in opaque plastic tubes, or in black plastic bags under a tarpaulin. Initial sample treatment occurred in specialist laboratory conditions, with illumination provided only by subdued red light to prevent damaging the luminescence signal. Samples collected in opaque tubes had sediment at the end of the tube removed, to avoid analysis of any material that may have been exposed to light during sample collection. The remaining, light protected material was used for subsequent analysis.

At this stage of preparation, a subsample of sediment was removed to provide material for measurement of the radiation dose rate to the sample. This material was oven dried, and then milled to a fine powder.

For determination of the equivalent dose (De) grains of quartz within a fixed grain size range need to be extracted from the sample. All of this procedure is undertaken under subdued red lighting conditions. Standard preparation techniques to obtain quartz grains (normally 180-250μm diameter) were followed. These involve removal of carbonates and organic matter using HC1 and H2O2 respectively. These procedures have to be undertaken at room temperature to avoid damaging the luminescence signal.

After removal of carbonates and organic matter, samples were dry sieved to obtain grains in the range 180-250μm. Quartz grains in this size range were then isolated using two cycles of density separation, one at 2.62 and one at 2.70 g.cm^{-3}. Grains with density between these limits were etched in 40% hydrofluoric acid for 45 minutes. This treatment serves to remove any remaining feldspathic contaminants, and to etch the quartz grains to remove the alpha irradiated layer. The final stage of treatment is to resieve the grains as a further purification step.

3. Dosimetry measurements

The radiation dose to the quartz grains can be divided into three components: (1) the external beta dose resulting from the decay of K and the members of the U and Th decay series; (2) the external gamma dose rate resulting from the same source and (3) the cosmic dose rate due to highly energetic cosmic rays incident on the surface of the Earth. Three methods were used to calculate these three sources of radiation.

3.1 Beta Dose Rate

A Geiger-mueller counter (Bøtter-Jensen and Mejdahl 1988) was used to directly measure the emission of beta particles by the sample. Three replicate milled sub-samples were measured and compared against two standards of known beta activity. The infinite matrix beta dose rate could then be calculated. The effective dose rate to the grains was then calculated by correcting for attenuation due to grain size and water content.

3.2 Gamma Dose Rate

The gamma dose rate to the samples was measured in two ways. The first was by in situ field gamma spectroscopy performed at the time of sample collection. The second method is to undertake thick source alpha counting. When combined with the results of beta counting, this allows calculation of K, U and Th concentrations in the sediment, and these are then used to determine the gamma dose rate.

The gamma dose rate to the mineral grains was calculated using the conversion factors (from concentration to gamma dose rate) provided by Adamiec and Aitken (1998). The effective gamma dose rate to the grains was then corrected for attenuation by water between the mineral grains.

3.3 Cosmic Dose

The cosmic dose rate was calculated using the equation provided by Prescott and Hutton (1994). This equation requires the depth of burial of the sample.

The dosimetry data for all samples is given in Appendix 1. The final dose rate to be used in age calculated (Equation 1) is the sum of the beta, gamma and cosmic dose rate.

4. Luminescence Measurements

The upper part of the age equation (Eq. 1) is the radiation dose received by a sample since its last exposure to daylight, termed the equivalent dose (De). This is measured using the luminescence signal emitted by quartz grains. The Single Aliquot Regenerative Dose (SAR) protocol (Wintle and Murray 2000) was applied. Measurements were made using a Risø TL/OSL DA-15 reader. Given that these samples are thought to have been deposited as colluvial sediments or anthropogenic movement of sediment, it was decided to undertake measurements on single grains of quartz to assess whether samples had been fully bleached at deposition or not. Two types of instrument were used for single grain OSL measurements. In both instruments, grains of quartz are mounted in a 9.8mm diameter aluminium disc, into which have been drilled a grid of 10 by 10 holes. Each hole is 300 µm in diameter and 300 µm deep. A grain of quartz is placed in each hole (Figure 15). The first is a focused laser system (Duller *et al.* 1999) where a laser beam is steered so that it stimulates each grain in turn. The OSL signal emitted is measured one grain at a time (Duller 2008b).

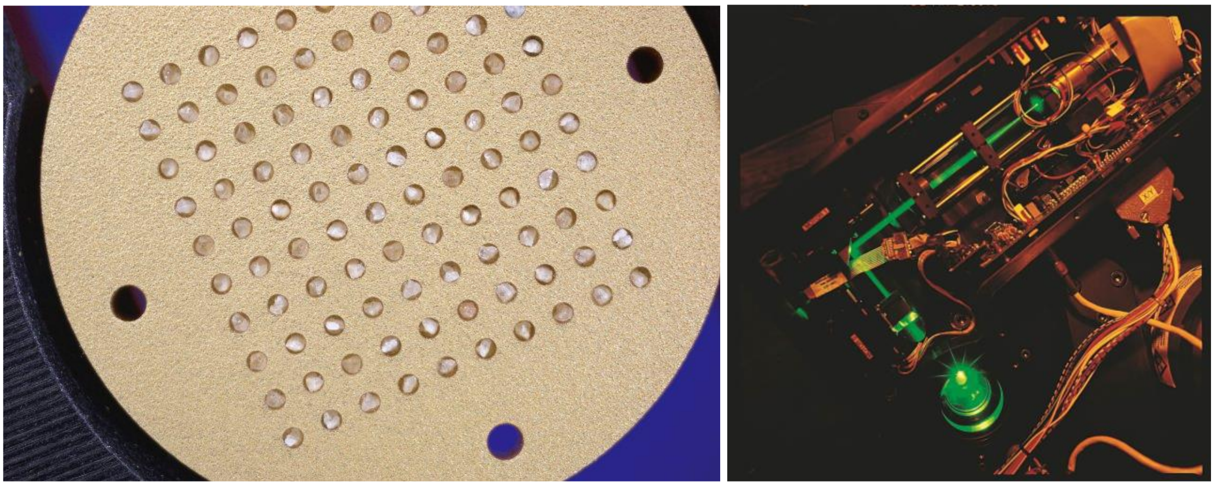


Figure 15. Left - 9.8mm diameter disc into which are drilled 100 holes arranged in a 10 by 10 grid. A grain of quartz is placed in each hole. Right - the focussed laser system used for some of the single grain measurements.

The second method by which single grains were measured is using a state-of-the-art imaging system (Kook *et al.* 2015) that can simultaneously observe the luminescence emitted from all of the grains in the sample holder (Figure 16). The signal from each grain is then separated during analysis of the resulting images. This system is only made possible because the EM-CCD camera used for these measurements is able to measure individual photons of light emitted by the sample.

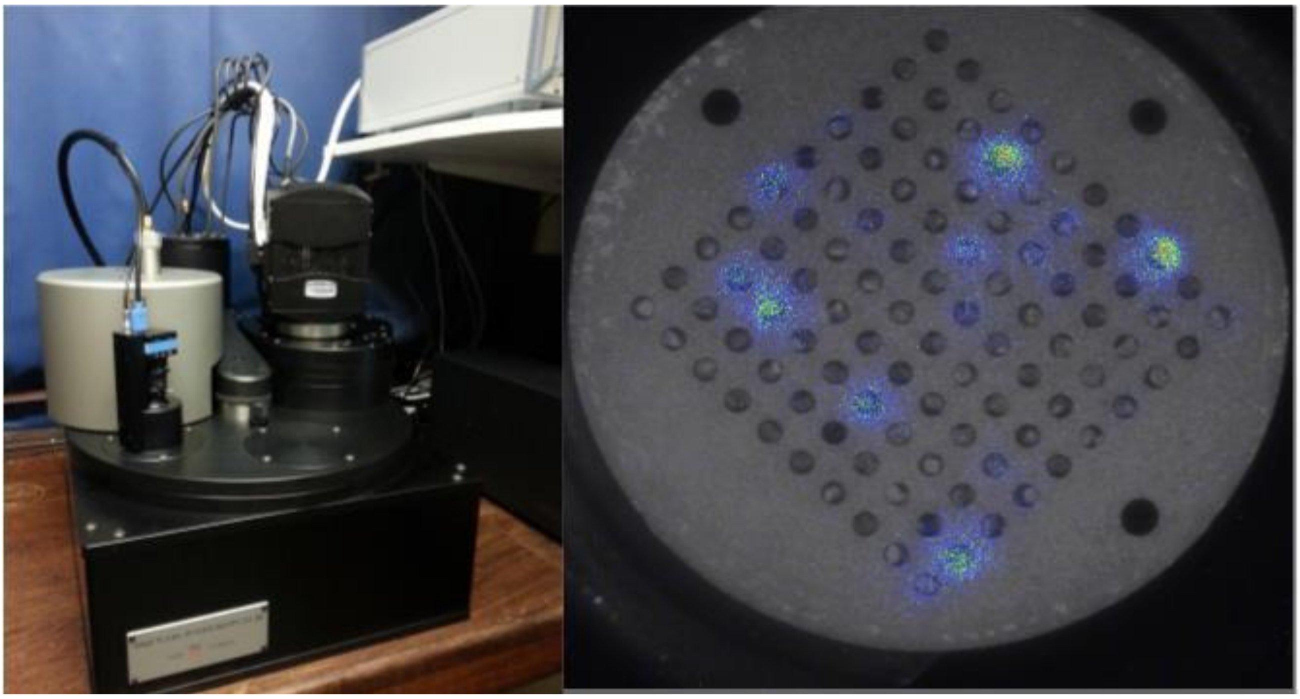


Figure 16. *Left – Electron multiplying CCD (EM-CCD) used for single grain OSL measurements. Right – OSL emitted by individual grains is superimposed on an image of the sample holder. Approximately 10 of the grains in this sample emit sufficient OSL to allow an equivalent dose (De) to be determined.*

For each grain, between 10 and 20 individual OSL measurements were made in order to calibrate the response of each aliquot to radiation from a laboratory beta source. From these data a dose response curve is generated for each grain, and the dose received during burial is calculated by interpolating the natural signal onto this dose response curve (Figure 17). The beta source used in the laboratory is calibrated against an internationally recognised secondary radiation standard in Denmark.

For each sample between 800 and 3400 grains were analysed, with the aim of identifying at least 100 grains that pass the acceptance criteria and provide reliable data. Each grain that passes the acceptance criteria yields an independent measure of the De. The reliability of the data was assessed by testing each aliquot against a number of criteria. Data were only accepted if they passed all of these rejection criteria. The criteria applied were (1) recycling test, (2) IR OSL depletion ratio tests, and (3) whether the signal obtained from the test dose exceeded three times the standard deviation of the background. These tests are designed to ensure (a) that the SAR protocol applied is appropriate, (b) that the OSL signal is dominated by that from quartz and (c) that the OSL signal from the test dose is sufficiently large to be statistically significant. After application of these criteria, between 14 and 106 independent estimates of De remained.

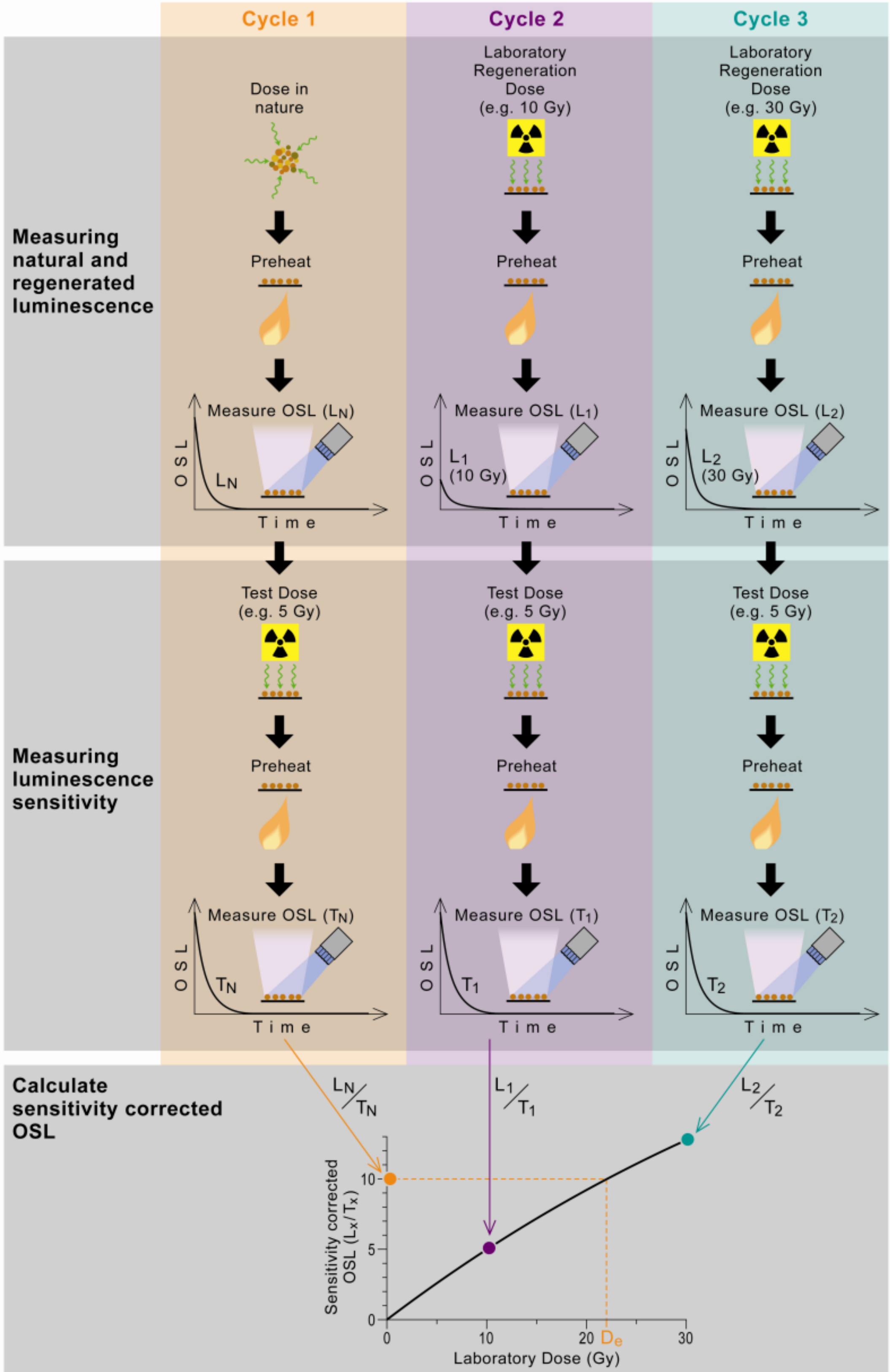


Figure 17. *Schematic diagram of the Single Aliquot Regenerative dose (SAR) protocol. In practice, between 5 and 10 cycles of measurements are made, requiring between 10 and 20 OSL measurements (from Duller 2008)*

5. Results

The water content of the samples was measured when received in the laboratory (Table 2). Samples were collected from excavated sections and sealed in plastic bags for return to the laboratory. For dosimetry calculations a water content of 27±5% was used for all samples.

Sample	Water content (%)
SK302	29.1
SK303	22.1
SK304	22.9
SK305	26.9
SK306	30.2

Table 2: Water content of samples as received at the laboratory.

Gamma dose rates were measured in situ for all of the samples. It is therefore possible to calculate the gamma dose rate both from the *in situ* field gamma spectrometry and from laboratory based alpha and beta counting (as described above). **Error! Reference source not found.**18 compares the results of these two approaches. There is very little variation in gamma dose rate, reflecting the similarity of the material sampled. The only sample with a slightly lower gamma dose rate is SK302. The agreement between the field and laboratory measurements is very good, and suggests that complications to the dose rate due to boulders are minor. The gamma dose rate determined from field measurements has been used in age calculations.

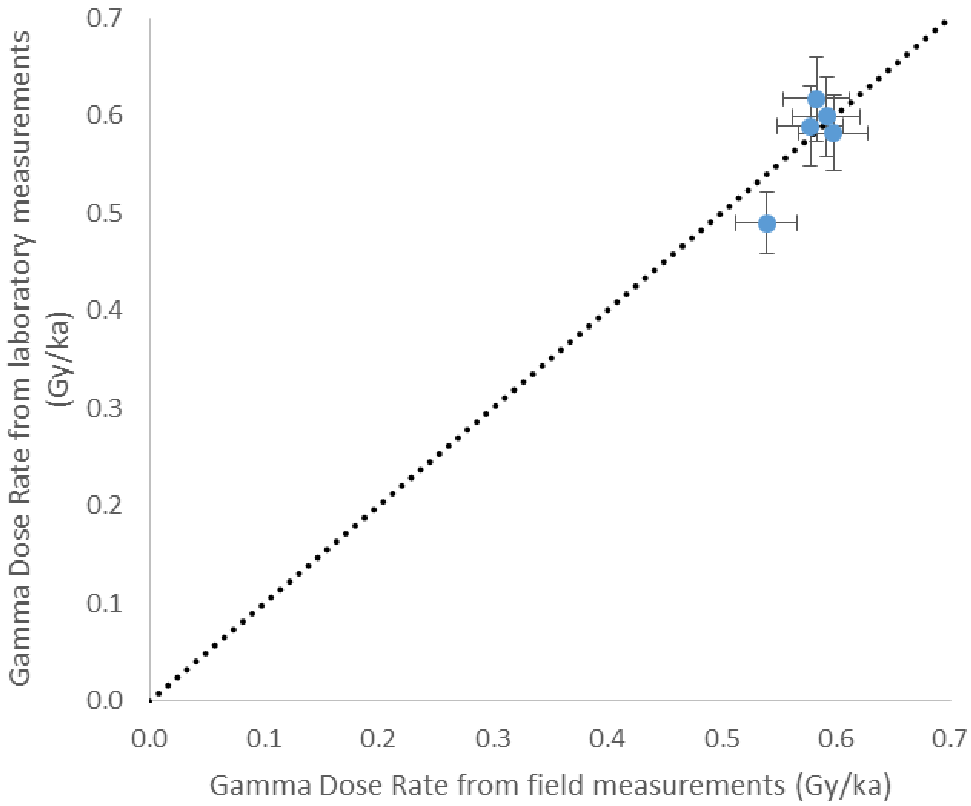


Figure 18. *Comparison of gamma dose rates calculated using field gamma spectrometry and laboratory emission counting*

5.1 Multiple grain dose recovery test

The suitability of the analytical procedure (preheat 240°C/10s and cutheat 220°C/10s) for these samples was tested by assessing whether they could recover a given laboratory dose. Three medium aliquots of each sample were bleached in the luminescence reader and then given a known laboratory dose. The dose used in this test varied so that it was close to the natural dose that the samples received (Table 3). The same range of preheat temperatures as used above were then used to see whether the SAR procedure could recover that dose.

Sample	Given Dose (Gy)	Dose recovery ratio
SK302	1.2	0.92 ± 0.03
SK303	4.3	0.97 ± 0.02
SK304	5.3	1.01 ± 0.01
SK305	9.7	1.07 ± 0.07
SK306	24.1	0.96 ± 0.17

Table 3: Dose recovery data for the 5 OSL samples.

The dose recovery ratios for all samples are within 10% of unity demonstrating that the SAR procedure used is appropriate for these samples.

5.2 Single grain dose recovery test

Since the exposure of the sediments to daylight at the time of deposition may have been limited, dating of the samples was undertaken using measurements on single grains of quartz. Another dose recovery test was undertaken, this time on SK302, where measurements were made using single grains. A suite of 1000 grains were given a dose of 7.71 Gy, and measurements made to see if this dose could be recovered. Of the 1000 grains measured, 175 gave data that passed the acceptance criteria. This acceptance rate of 17.5% is very high for quartz. This may be due to the bedrock from which grains are derived, or may imply that the sediments contain some component that has been burnt. Figure 19 shows the data for this sample. The dose recovery ratio was 0.92 ± 0.01, identical to the value obtained using multiple grain measurements (Table 3). Although lower than is ideal (a value of 1.00 is optimal), this is within the 10% range that is considered acceptable.

This single grain dose recovery test also provides information about how variable different quartz grains are. The overdispersion of this dose recovery data set is 11.4%. When the additional impact of small scale variations in dose rate are added to this, the scatter observed in the natural dose distributions is reasonable.

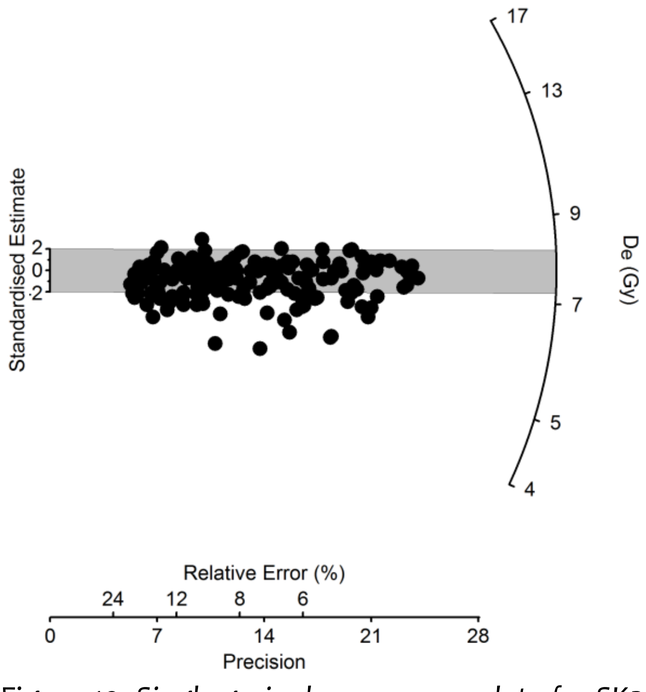


Figure 19. *Single grain dose recovery data for SK302. The grey horizontal bar shows the given dose (7.71 Gy)*

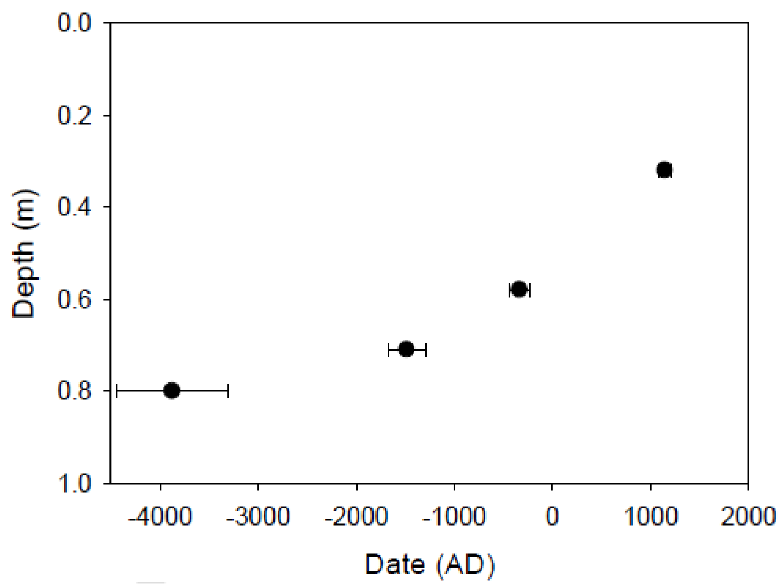


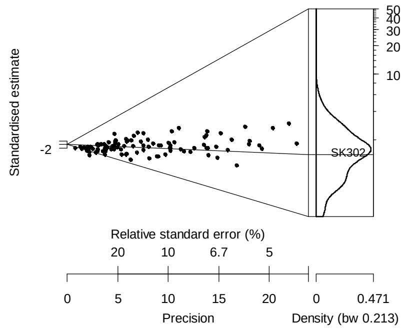
Figure 20. *OSL ages for the 4 youngest samples from Skomer plotted with depth below current surface. The age for the bottom sample (SK306) has not been included as too few grains yielded a signal.*

5.3 Analysis of single grain data

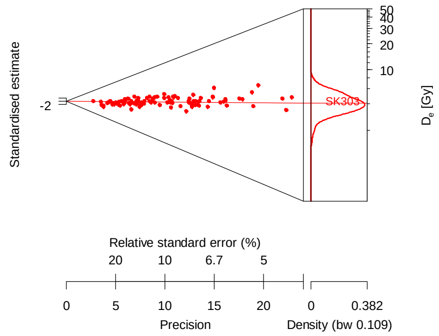
Initial data analysis involved calculating the central age model De for the data from each sample. Abanico plots (Dietze *et al.* 2016) for each of the samples are shown in Figure 20. For all of the samples, except SK305, the De values from the single grains form a coherent population, giving a normal distribution in the kernel density estimate (KDE) plots (shown on the right hand side of each plot). SK305 is different, and the KDE is bimodal (Figure 21d). This may be the result of incomplete bleaching, or mixing materials of two different ages (cf. Jacobs et al. 2008). The finite mixture model (FMM, Galbraith and Roberts 2012) is designed to allow the identification of discrete populations with data like that shown in Figure 20. The FMM was applied to SK305 and shows that there are two populations of grains. The first population makes up 51% of grains, and has a De value of 5.75 ± 0.36 Gy, and the second population makes up the remaining 49% of grains and has a De value of 18.3 ±1.13 Gy. These De values are statistically consistent with the values obtained from samples SK304 (6.11±0.24 Gy) and SK306 (22.0±3.07 Gy). Thus the most likely explanation for the bimodal distribution for SK305 is that the sample constitutes a mixture of grains from the units above and below it. At this stage it is not clear whether this mixing occurred at the time of sampling (for instance the sample tube hammered into the section may have passed through a boundary between two units), or whether this depositional unit was mixed at deposition, or shortly afterwards. Thus no age is calculated for SK305 since it is a mixture of two units.

Data for all five samples are shown together in Figure 22 so that the two results for SK305 can be seen compared with the data for the underlying (SK306) and overlying (SK304) samples.

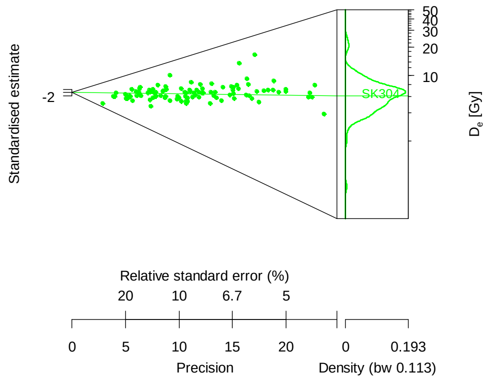
SK302



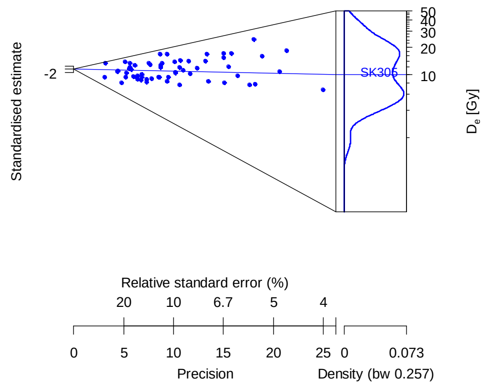
SK303



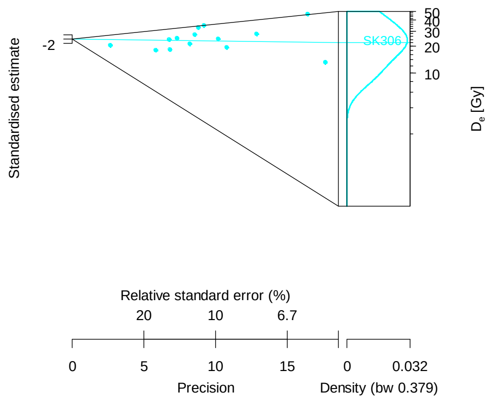
(c) SK304



(d) SK305



(e) SK306



(f) SK302_DR

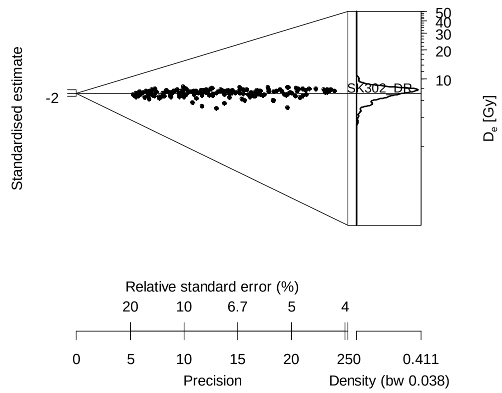


Figure 21. Abanico plots of the data for each sample individually. The vertical axis on the right hand side of each diagram is the same, to allow comparison between samples.

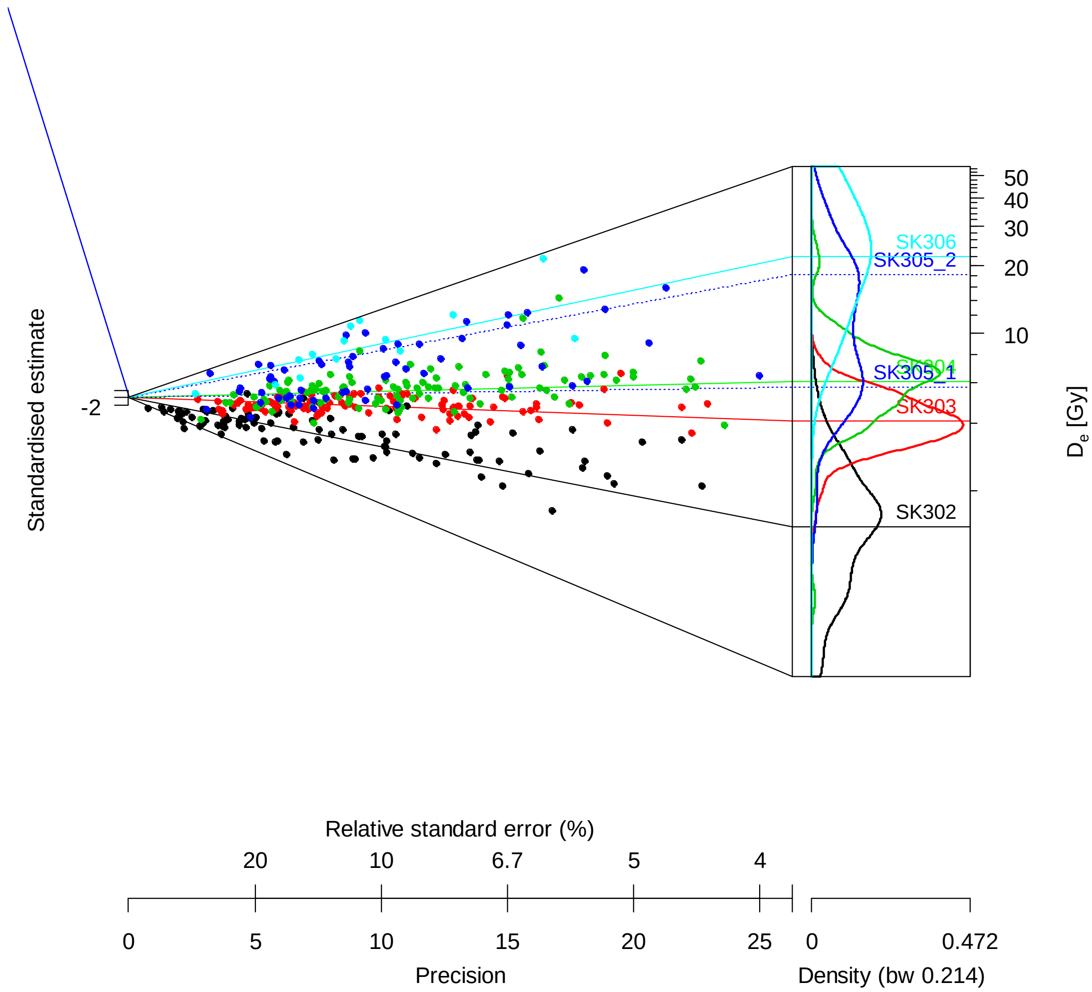


Figure 22: Data for all 5 samples shown on the same plot. For each sample except SK305 the coloured line shows the best estimate of D_e that is used for age calculation. For sample SK305 the results of the finite mixture analysis are shown. The similarity between the two results and the adjacent samples is clear: SK305_1 similar to SK304, and SK305_2 similar to SK306.

6. Discussion and summary of OSL ages

Full details of the analytical results of dosimetry and luminescence measurements are given in Appendix 1, including the ages for each sample expressed in years before 2017 (the date of collection). Ages have been rounded to the nearest decade. The OSL properties of the uppermost 3 samples (SK302, 303 and 304) are excellent, and a high proportion of the quartz grains give an OSL signal. As discussed above, SK305 appears to be a mixture of grains from SK304 and SK306. The luminescence from SK306 is rather dim, and so fewer De values have been obtained.

It is interesting to speculate on why the uppermost 3 samples have such a high proportion of grains giving light. This may be a result of the local geology, but then it is surprising that the bottom samples are different. A potential reason for the bright grains is if they had been heated by burning, as this is known to sensitise the quartz OSL signal. Is it possible that burning of the fields, or the spreading of ash on the fields, has been the cause? The brighter OSL signal for the uppermost 3 samples results in greater precision in the OSL ages.

The OSL ages for all samples are in stratigraphic order (Figure 23). The three uppermost range from 870 ± 60 years for SK302 at a depth of 32 cm, to 3500 ± 190 years for sample SK304 at 71 cm depth. Sample SK305 consists of a mixture of grains from SK304 and SK306. Sample SK306 at a depth of 93 cm gives an age of 12500 ± 1800 years.

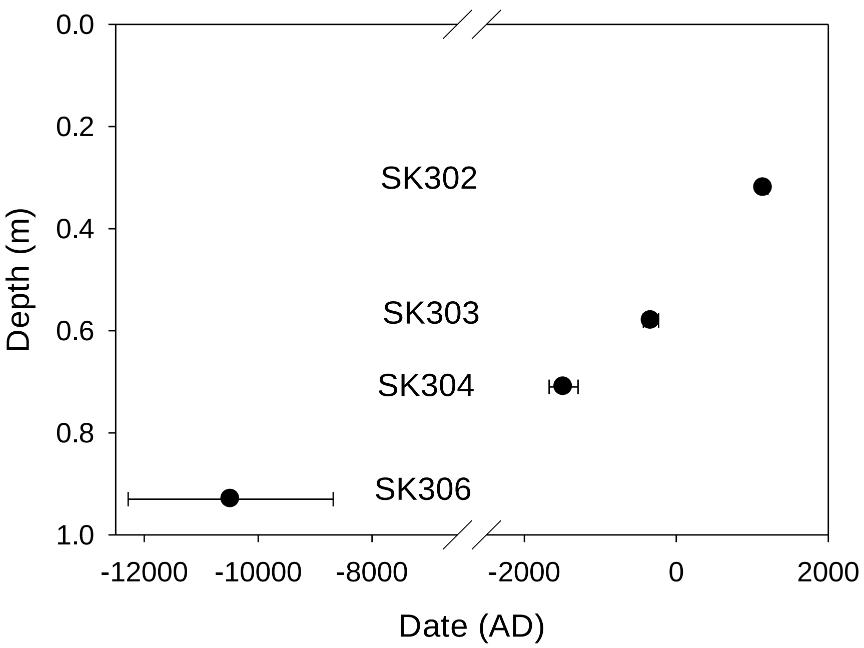


Figure 23. Summary of OSL ages as a function of depth. Note the break in scale to allow SK306 to be shown.

Appendix 1 - OSL age determinations

Aberystwyth Lab. Number	**233 SK302**	**233 SK303**	**233 SK304**	**233 SK305**
Depth (m)	0.32±0.10	0.58±0.10	0.71±0.10	0.80±0.10
Material used for dating	Quartz			
Grain size (μm)	180-250			
Preparation method	Heavy liquid separation (sodium polytungstate); 40% HF etch 45 mins			
Measurement protocol	SAR; OSL 532nm; detection filter 2.5mm Hoya U-340, single grains; and OSL 470 nm; Hoya U-340/UG-11, EMCCD			
Equivalent Dose D_e (Gy)	**1.39 ± 0.09**	**4.09 ± 0.10**	**6.11 ± 0.24**	**Bimodal**
Model	CAM	CAM	CAM	
Number of grains, n	105 (800)	104 (2000)	106 (1900)	60 (3400)
Water content (% dry mass)	27 ± 5	27 ± 5	27 ± 5	27 ± 5
Unsealed α count rate (cts/ks.cm^2)	0.326 ± 0.005	0.419 ± 0.007	0.414 ± 0.007	0.406 ± 0.007
U (ppm)	1.77 ± 0.13	1.73 ± 0.20	2.05 ± 0.19	1.89 ± 0.20
Th (ppm)	3.21 ± 0.41	6.04 ± 0.67	4.78 ± 0.63	5.10 ± 0.65
Infinite matrix β dose (Gy/ka)	1.28 ± 0.04	1.46 ± 0.05	1.47 ± 0.05	1.43 ± 0.05
Calculated K (%)	1.16 ± 0.06	1.30 ± 0.08	1.30 ± 0.07	1.27 ± 0.07
Layer removed by etching (μm)	10 ± 2	10 ± 2	10 ± 2	10 ± 2
External β dose 'wet' (Gy/ka)	0.83 ± 0.05	0.95 ± 0.06	0.96 ± 0.06	0.93 ± 0.05
External γ dose 'wet' (Gy/ka)	0.54 ± 0.03	0.58 ± 0.03	0.59 ± 0.03	0.58 ± 0.03
Cosmic (Gy/ka)	0.23 ± 0.01	0.20 ± 0.01	0.20 ± 0.01	0.19 ± 0.01
Total dose rate (Gy/ka)	**1.60 ± 0.06**	**1.74 ± 0.07**	**1.75 ± 0.06**	**1.70 ± 0.06**
OSL Age$^{\#}$ (ka)	**0.87 ± 0.06**	**2.35 ± 0.10**	**3.50 ± 0.19**	**Bimodal**

Aberystwyth Lab. Number	**233 SK306**			
Depth (m)	0.93±0.10			
Material used for dating	Quartz			
Grain size (μm)	180-250			
Preparation method	Heavy liquid separation (sodium polytungstate); 40% HF etch 45 mins			
Measurement protocol	SAR; OSL 532nm; detection filter 2.5mm Hoya U-340, single grains; and OSL 470 nm; Hoya U-340/UG-11, EMCCD			
Equivalent Dose D_e (Gy)	**22.0 ± 3.07**			
Model	CAM			
Number of grains, n	14 (1000)			
Water content (% dry mass)	27 ± 5			
Unsealed α count rate (cts/ks.cm^2)	0.386 ± 0.007			
U (ppm)	2.04 ± 0.17			
Th (ppm)	4.02 ± 0.56			
Infinite matrix β dose (Gy/ka)	1.50 ± 0.5			
Calculated K (%)	1.37 ± 0.07			
Layer removed by etching (μm)	10 ± 2			
External β dose 'wet' (Gy/ka)	0.98 ± 0.06			
External γ dose 'wet' (Gy/ka)	0.60 ± 0.03			
Cosmic (Gy/ka)	0.19 ± 0.01			
Total dose rate (Gy/ka)	**1.76 ± 0.06**			
OSL Age$^{\#}$ (ka)	**12.5 ± 1.80**			

Ages are expressed as thousands of years (ka) before 2017 AD
* Gamma dose rate is derived from field gamma dosimetry

Notes:
Unsealed TSAC results used for U and Th concentrations and subsequent data analysis.
Beta counts were position corrected.
All were calculated on LDB2016 on ALRL server.

8. Sondage through the burnt mound adjacent to Hut Group 8 in the North Stream Settlement

The site of the 2014 excavation trench through the burnt mound adjacent to Hut Group 8 (Barker *et al*., 2014) was revisited to test the potential of undisturbed deposits of burnt stone for OSL dating.

Following SMC approval from Cadw, a small (0.5m x 0.6m) square sondage trench was excavated down into the mound of burnt stone at a point 0.55m west of the 2014 section to a maximum depth of 0.7m. The sondage proceeded down through the top turf layer 101, through the coarse angular stone deposit of the burnt mound 103 and lower stony deposit 108, with the soft dark yellowish-brown coarse sandy loam deposit of 107 attained beneath the burnt stone at between 0.57m – 0.7m depth.

Luminescence samples of coarse, angular stones from context 108 were taken by Professor Geoff Duller under darkness but were subsequently found to be unsuitable for OSL dating.

Figure 24. *A small (0.5m x 06m) sondage trench excavated through the burnt mound adjacent to Hut Group 8 for the recovery of stones suitable for OSL dating; in the event the deposit was found to be unsuitable. Scale 0.5m (Crown Copyright RCAHMW).*

9. Discussion

Re-thinking the chronology of Skomer

A quest for a detailed chronology

The original aspirations for the 2017 excavation trench at South Stream were to sample a sufficiently deep and undisturbed field lynchet that retained good internal compaction and stratigraphy, to allow a successful first archaeological application of OSL dating in a previously untested environment. The 2016 lynchet excavation in the north of the island, which had commenced with similar aims, uncovered an unexpectedly disturbed lynchet affected by deep root penetration (between 0.42-0.56 into context 206; Barker *et al.* 2018, 12-13) and with an excessively loose, stony soil matrix, thus rendering it unsuitable for OSL.

In the absence of any cultural material from the 2017 trench and given the unsuitability of any charcoal recovered for secure radiocarbon analysis, there was an anxious wait for the results of the OSL dating which arrived in June 2019. This innovative dating method has now revolutionised our understanding of the development of settlement and farming in this part of south-east Skomer from the Middle Bronze Age to the Medieval period, as will be discussed below.

The present Skomer Island Project commenced precisely to take '… account of the complex and multi-layered character of the field archaeology..' and investigate the deeper stratigraphy in the field boundaries first recognised during aerial survey in 2008. Fieldwork has indeed identified apparent pre-Iron Age structures, including a pair of standing stones (NPRN 414607) recognised at The Wick, a probable sub-megalithic chambered tomb surveyed in the north-east of the island (NPRN 414608; see Barker *et al.* 2012b, Figs 13 & 14), a circular pond or sunken structure (NPRN 415713; *ibid*., Figure 10, D) at The Wick conspicuously avoided when the prehistoric fields here were laid out, thus pre-dating the field systems, and a new (2018) survey of Cairn Group 1 on north Skomer (NPRN 415689; Driver 2020) which was framed and avoided by the expanding Iron Age field system.

There has remained a presumption in favour of a Late Bronze Age to Iron Age timeline for the development and use of the majority of visible settlements and fields on the island, partly confirmed in the north by fieldwork in 2014 on a mound of burnt stone adjoining Hut Group 8 (Barker *et al*. 2014). Radiocarbon dates here showed that a flint-using phase of Early Iron Age settlement, possibly with an earlier structure proceeding Hut Group 8 and radiocarbon dated to 751-408 cal. BC, was superseded and overlain by the dumping of a great mound of burnt stone contemporary with, and a product of, Late Iron Age settlement in Hut Group 8 radiocarbon dated to 161 cal. BC to 51 cal. AD. The dates, although there were only two, confirmed the expected date of the northern roundhouse settlements.

Yet a continuing theme of the Skomer Island Project has been an awareness of 'hidden' phases of settlement and landuse from the early medieval to post-medieval periods. Early in the project Heather James reminded the team of the importance of separating historic evidence from prehistory; '.. any evidence for superimposition of the field systems and settlements would be valuable and also more on structures associated with the medieval rabbit 'harvesting' period – if only to distinguish them from prehistoric features (H. James, pers. comm; 25/02/2011). Although the seasonal warreners apparently left no obvious medieval or post-medieval structures on the island, several years of fieldwork strongly suggested the possibility that the 'cleared' examples of prehistoric round houses such at Hut 20 at The Wick (actually an oval structure, NPRN 415556), as well as perhaps the possible footings of the medieval chapel (NPRN 415679) on the The Neck isthmus, may well have been occupied on a temporary or seasonal basis during recent centuries and 'made good' or roofed with perishable materials.

There also remains the question of whether the Vikings ever settled or overwintered on Skomer, a possibility only reinforced by the high proportion of Scandinavian placenames in coastal Pembrokeshire (Driver 2007, 55-6; Redknap 2019). The find of the Viking sword guard (NPRN 389) from The Smalls Reef 25kms west of Skomer places a Viking craft well within the Pembrokeshire archipelago. So far characteristic archaeological evidence is lacking and the successful identification of seasonal or ephemeral occupation from any post-Roman period through surface walkover survey or even remote sensing remains exceedingly difficult.

Previous descriptions of an 'abandoned' medieval island

'In all probability the farming on Skomer developed through the 17th century… No doubt ploughing was carried out for the first time since the days of the Ancient Britons. And it is arguable that this culminated in the building of the present house about 1700.' Roscoe Howells 1961, 48.

The relict field systems on Skomer have always been thought to be almost wholly prehistoric, or Romano-British. Grimes (1950, 3) noted that there was no documentary evidence for any permanent settlement on Skomer, Skokholm and Midland 'throughout the Middle Ages'. He noted (*ibid*.); 'These records imply that throughout the period in question the island had no settled occupants; and this state of affairs is confirmed for the sixteenth century..' and he concluded (*ibid*., 4-5); '…the categorical statements of Leland and Owen can leave no room for doubt that the extensive early field-systems and the great activity which they attest are pre-medieval in origin.'

These authoritative statements no doubt influenced and informed later writers. For researchers seeking a relatively intact later prehistoric farming landscape this was a welcome interpretation of the historic evidence, and Skomer became renowned for the 'untouched' character of its settlements and fields. Indeed Evans (1990, 255) took this narrative a step further to conclude that in fact the field systems were not particularly complex or layered and were likely to have developed over '…no more than a century' of Iron Age or Romano-British occupation, before the island was abandoned over escalating tensions over water and territory. This published conclusion did seem to go against some of the more nuanced findings and unpublished fieldnotes from Evan's several seasons of fieldwork on the island.

However there is good documentary evidence for the historic exploitation of Skomer's (or Skalmey's) land for grazing, rabbit catching and other seasonal activities. Howells in 1961 (42) summarises the early history of the island, noting that in 1324 Skomer appears in the Public

Records along with Skokholm and Midland, as part of the parish of St. Ishmael's. For the next century, revenue from rabbit farming is recorded from all these islands, but is not itemised for individual islands; rabbit catches are recorded for 1324, 1326 and 1358; Howells notes that rabbits were probably introduced in the early 14th century. In 1452 there is reference to the 'farm of birds'. By the late 16th century George Owen (*ibid.,* 45) records both Skokholm and Skomer '…being both great and large Island though not inhabited, but serve only for feeding of sheep, kylne, oxen, horses, mares, and great store of Coneys, these Islands are not so good as the first [Caldey], the cause I think for that it is suffered to lie waste, and not manured.'

The 2019 OSL dates now force a major rethink of the post Roman and medieval history of Skomer.

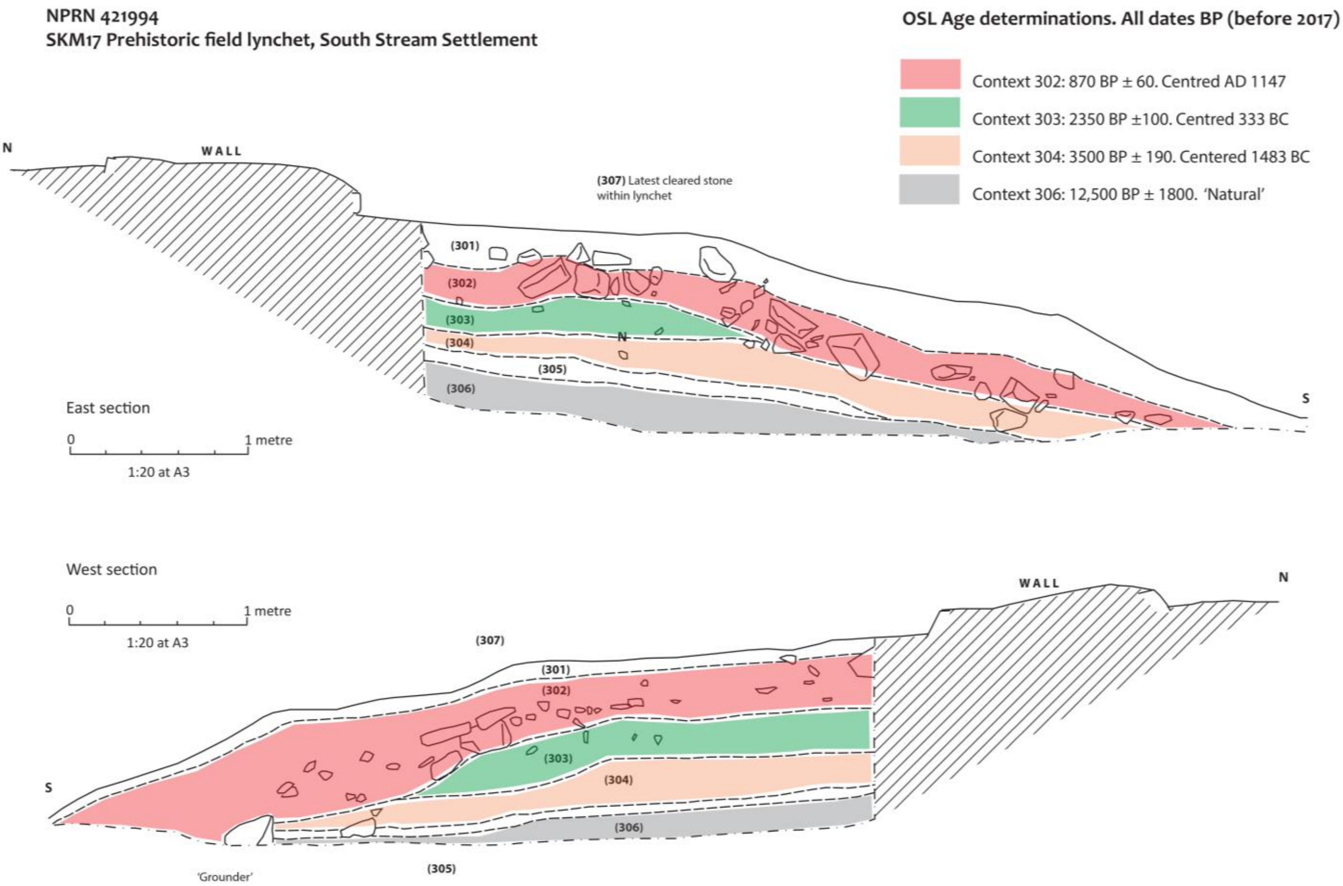


Figure 25. *Coloured section from the 2017 South Stream excavation trench illustrating the key phases in its development, as dated by OSL (Crown Copyright RCAHMW).*

Dating the South Stream Lynchet: A new history of farming and settlement on Skomer

The soils in the 2017 South Stream section responded extremely well to OSL (pp. 32-3 above; Figure 25). Five samples were taken from contexts 302-306 with over 1000 single grains tested. Dates in Figure 25 and in the discussion below are given in years BP (before 2017). Figure 21 above shows abanico plots for each sample where each spot represents a single grain. The precision of the dates obtained is visible on the right-hand side of each diagram where the more tightly focussed the grain results are (the bell-shaped curve), the more exact the date. The undatable bimodal (twin-peaked) curve of context 305 (Figure 21d) is also visible, interpreted by Duller and Roberts (2019) as the probable mixing of two sediments of different ages, unsurprising in such a shallow context. Duller and Roberts (pers. comm. 2019) also note that the upper contexts especially 302, 303 and 304 were particularly well bleached and responded well to OSL, making it likely that heated material (potentially manure, domestic waste or ash) was incorporated into these contexts, improving the bleaching of the grains. The dates are dramatically more precise than could ever be hoped for with calibrated radiocarbon dating, especially for the Middle-Late Iron Age which is effected by the 'Halstatt plateau' discussed below.

At the time of excavation in 2017 the lower contexts of the section suggested the formation of early ploughsoils (304, 305) at the base of the lynchet against a 'grounder' stone visible only in the west section, formed above yellow-orangey natural 306. The date of this 'natural' layer was confirmed in the OSL date of 12, 500 BP. Above this formative lynchet there was a new deposit of ploughsoil, 303, markedly less in volume than 304. The ploughing episode in 303 was dwarfed by a new phase of stone clearance 307, and cultivation 302 presumably the result of better plough technology producing deeper furrows and bringing up more fieldstone. At the same time a renewed phase of ploughing may have exacerbated hillwash down the slope in times of heavy rain.

Context 304. 3500 BP ± 190. Centred 1483 BC. Middle - Late Bronze Age farming

The first identifiable phase of cultivation dates to the Middle Bronze Age, but the date approaches the start of the Late Bronze Age around 1293 BC if the error factor is taken into account. A later Bronze Age date has already been postulated for the great coaxial field boundaries which run north to south on the Wick headland, as a result of analysis and fieldwork based on the Skomer LiDAR survey (Barker et al. 2012b, 292, Figure 10), and these new dates support this hypothesis for an early field system.

At the end of this phase of cultivation the South Stream lynchet stood 0.46-0.52m in height and thus the first system of terraced fields had visibly begun to emerge in this part of south-eastern Skomer. The settlement remains we should be seeking to accompany this period of farming are likely to be ephemeral. Just to the south of the excavation site we do have a platform settlement in the 'pass' between South Stream and the Wick, hut group 19 (Barker *et al.* 2012b, Fig. 7; see Figure 26 below), which Evans (1990 Fig. 12) first likened to '.. Bronze Age unenclosed platform settlements in the Scottish southern uplands' (Evans 1990, 252).

Perhaps it is no coincidence that one of the few 'early' forms of hut settlement on Skomer should be located close to this newly-dated MBA-LBA lynchet at South Stream. However, the flint-using phase which predated the construction and use of Hut Group 8 in the north of the island, excavated in 2014 (751-408 cal. BC, SUERC 54181 at 95%, Barker *et al.* 2014, 3-4), suggested a potentially wider model of Iron Age/Romano-British roundhouses obscuring earlier settlements on the same sites. If ephemeral MBA-LBA stake-walled or timber roundhouses did predate later roundhouses in parts of the island, there would be little or no surface evidence to indicate their existence unless they were constructed on levelled platforms as survive at hut group 19.

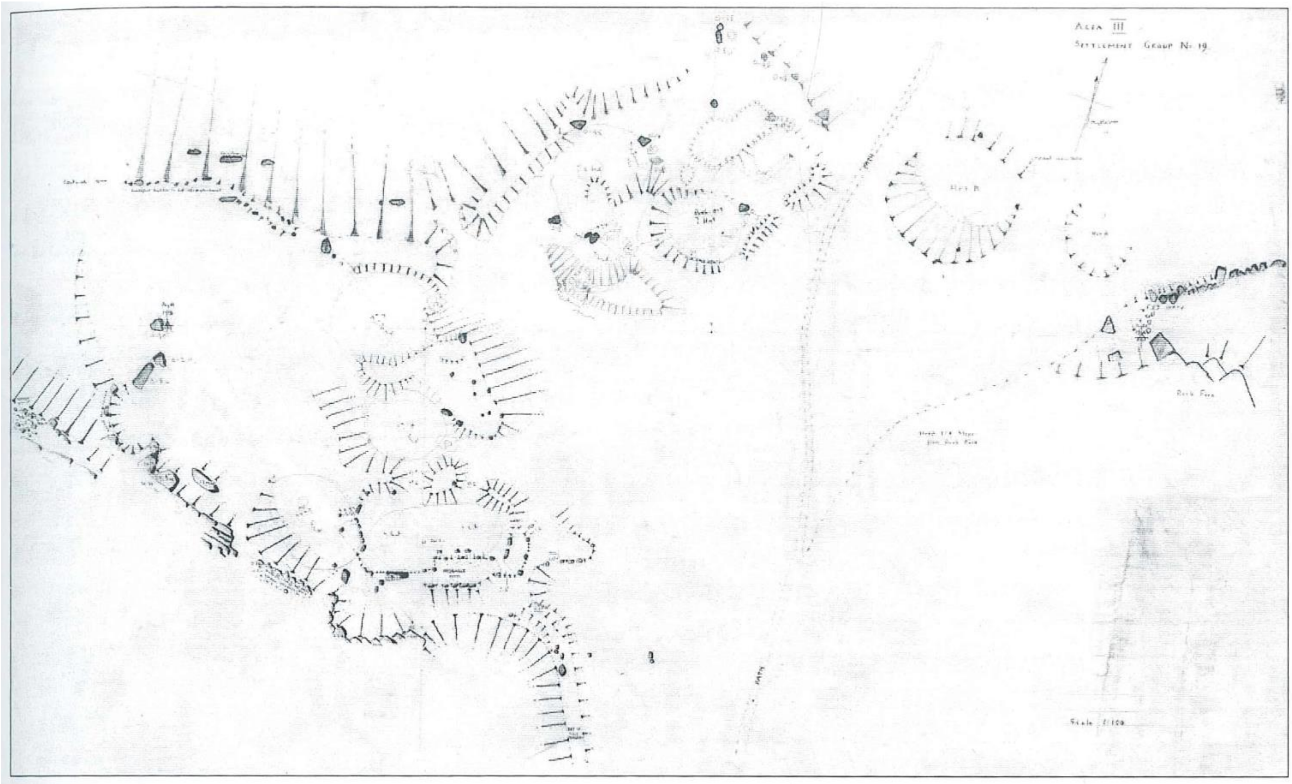


Figure 26. *Evans' original survey drawing for Hut Group 19, just to the south of South Stream and likened at the time to a Bronze Age platform settlement (from the Evans archive; DI2011_0762).*

Context 303. 2350 BP ± 100. Centred 333 BC. Middle Iron Age farming

Radiocarbon dating of Iron Age contexts has long been considered impossible due to the existence of the 'Hallstatt plateau' between approximately 800 and 400 BC in the internationally agreed radiocarbon terrestrial calibration curve (IntCal13) of Reimer *at al.* 2013, covering the British Iron Age (and see Hamilton *et al*., 2015, Fig. 1, 643-44). Where calibrated radiocarbon dates fall into the 'flat' region of the curve, their resultant probability is spread across four centuries. Hamilton *et al. (ibid.)* also note a 'wiggle' in the calibration curve at approximately 400-200 BC has a similar effect on accuracy for this 200 year period. Hence probable blackthorn charcoal retrieved from the pre-burnt mound phase of Hut Group 8 in the north of Skomer during excavations in 2014 returned a very general calibrated date of 751-408 cal. BC, SUERC 54181 at 95% (Barker *et al.* 2014, 3-4).

This new OSL Middle Iron Age date (in west Wales, the MIA is generally agreed to span the years 400-50 BC (Driver 2016, xiii)) shows the precision and power of OSL dating for this period. This is the first evidence for Middle Iron Age farming on the island. The addition of the plough soil deposit 303 to the lynchet (a clayey silt; mid brown and soft with occasional small sub angular stones) raised the height of the existing Middle Bronze Age lynchet of 0.46-0.52m high to 0.64-0.68m high, an addition of 0.16-0.18m of ploughsoil. At this point it the lynchet began to attain a flat summit and steeper southern face, still retained by the 'grounder' stone but becoming a more prominent terrace in the agricultural landscape.

Based on the OSL dates this was the last intervention at this lynchet until the medieval period, a break in cultivation of 800 years. We know from Hut Group 8 in the north of the island that roundhouses and a burnt mound were established in the period 161 cal. BC – 51 cal AD (*ibid.*), presumably in a flourishing and well populated landscape. Perhaps this part of the South Stream settlement was abandoned but it is equally likely that the fields were used for grazing or another activity which did not physically contribute new soil to the lynchet. It would be unusual to consider the south-east part of Skomer to have remained entirely unused in the LIA/Romano-British period, perhaps at the time of the greatest farming population on the island.

Context 302. 870 BP ± 60 years. Centred 1147AD. Medieval farming.

T. Driver, H. James & S. Lloyd

In 1950 Grimes (p. 4) noted; 'There are at the present time no clearly recognisable traces of structures which can be related to the medieval period..' This is a sweeping statement, but it remained largely accurate prior to the confirmation of the 2017 OSL dates for agriculture at South Stream.

In sharp contrast to the prehistoric phases of cultivation described above, a distinct change in the pattern of land management and cultivation of this slope at South Stream is seen with the formation of the upper context 302 (a browny-black, loose, friable silty loam). This plough-derived soil intermixed with a distinctive deposit of cleared field stone 307 (see Figure 11; large angular stones up to 0.4m x 0.25m), more visible in the east section, shows new and efficient medieval plough technology at work. The quantity of soil movement downslope increases dramatically, pushing the foot of the new lynchet out at least a metre beyond the 'grounder' stone (and burying it in the process) and raising the height of the lynchet to 0.92-0.96m. Duller and Roberts (2019) also noted the well bleached nature of this and other contexts which responded well to OSL, making it likely that heated material, potentially manure, domestic waste or ash was incorporated into these contexts.

The date is extremely precise, centred on 1147 AD with an error of 60 years. For the first time we can demonstrate medieval cultivation of part of Skomer Island, rather than postulating the abandonment of the island in the Middle Ages or assuming it was only used intermittently for seasonal rabbit farming, grazing and hunting prior to the establishment of a post medieval farm in the eighteenth century.

The early twelfth century was a period of immense cultural change, particularly in south Pembrokeshire and William of Malmesbury writing in 1125 notes;

> *The Welsh were in constant revolt, and King Henry maintained pressure on them by frequent expeditions until they surrendered; also, in reliance on an admirable plan for reducing their ebullience, he removed into Wales all the Flemings who were living in England. … and so he collected them all together, as though into some great midden, in the*

Welsh province of Rhos, with all their belongings and relatives. (Thomson and Winterbottom 1998, 727)

The Breviate chronicle, written in south Wales, notes the arrival of the Flemings in 1107 and several skirmishes with the Welsh into the thirteenth century (Remfry 2007, 213 and Gough-Cooper 2015, b.1129.1). Skomer lay in the cantref of Rhos where the Flemish settlers were granted an exemption from paying tithes on wool and played an important role in the woollen industry. This fact may provide a plausible context for the restarting of agriculture and improving the old fields.

Skomer was also part of the Bishop of St David's estates and a key figure here in view of the date might be Bernard, the first Norman bishop 1115-1148 who was favoured by Henry I and his queen. On his accession he set about modernising the church at St David's and granting lands to Norman knights which may have led to a new cycle of agricultural improvements (Evans 2002, 272-7) The dramatic growth of the South Stream lynchet, including the great mass of newly-cleared stone thrown down across it from the field above, vividly illustrates the impact of this new agricultural phase in transforming and modernising an island landscape which otherwise appears to have been abandoned since Roman times.

Figure 27. *A four-ox-team plough, redrawn from the* Luttrell Psalter, *an English illuminated manuscript, c. 1330. We can now imagine similar scenes in South Stream, Skomer, in the twelfth century.*

With this new date for medieval farming on south-east Skomer, and the strong possibility that incoming Flemish settlers reoccupied and transformed at least part of the island landscape in the mid twelfth century, we can commence the search for likely remains of medieval domestic structures on the island. The remains of a rectangular building on the The Neck isthmus (NPRN 415679) has long been thought likely to be the footings of a medieval chapel described in early literature. The old range of ruinous farm buildings (NPRN 423442; Figure 28) to the north of the Skomer Island Farm is built at right angles to the slope and may have originated as a medieval longhouse on a platform but has not been recently examined by an archaeologist.

The closest example within the South Stream field system is John Evans' feature 47 described by him as a 'rectangular stone-walled enclosure in the corner of a field defined by similarly

Figure 28. *The old range of farm buildings (foreground) to the north of Skomer Island Farm may have originated as a medieval longhouse built in a sheltered position below the plateau (Crown Copyright RCAHMW, AP_2018_4960).*

constructed walls' (1990, 265; NPRN 424554). This lies only 38m east of the 2017 excavation trench and must now be considered as one of a handful of likely medieval houses on the island (see Figure 29). It may be that other prehistoric houses, particularly 'cleared' examples like Hut 20 in the Wick Stream settlement which is more oval than round, were simply too useful to have been ignored by medieval settlers and were promptly brought back into use with the raising of stone walls and timber or thatched roofing. In 2012 the authors postulated a precursor to the 17th century farm buildings in the centre of the island in the form of two rectangular platforms '…perhaps of medieval date' (Barker *et al.* 2012b, 301).

Future excavation and sampling of an extant long and round house, particularly in the south of Skomer, would be extremely useful to obtain a comparable range of scientific dates and better understand the duration of occupation of settlement structures on the island.

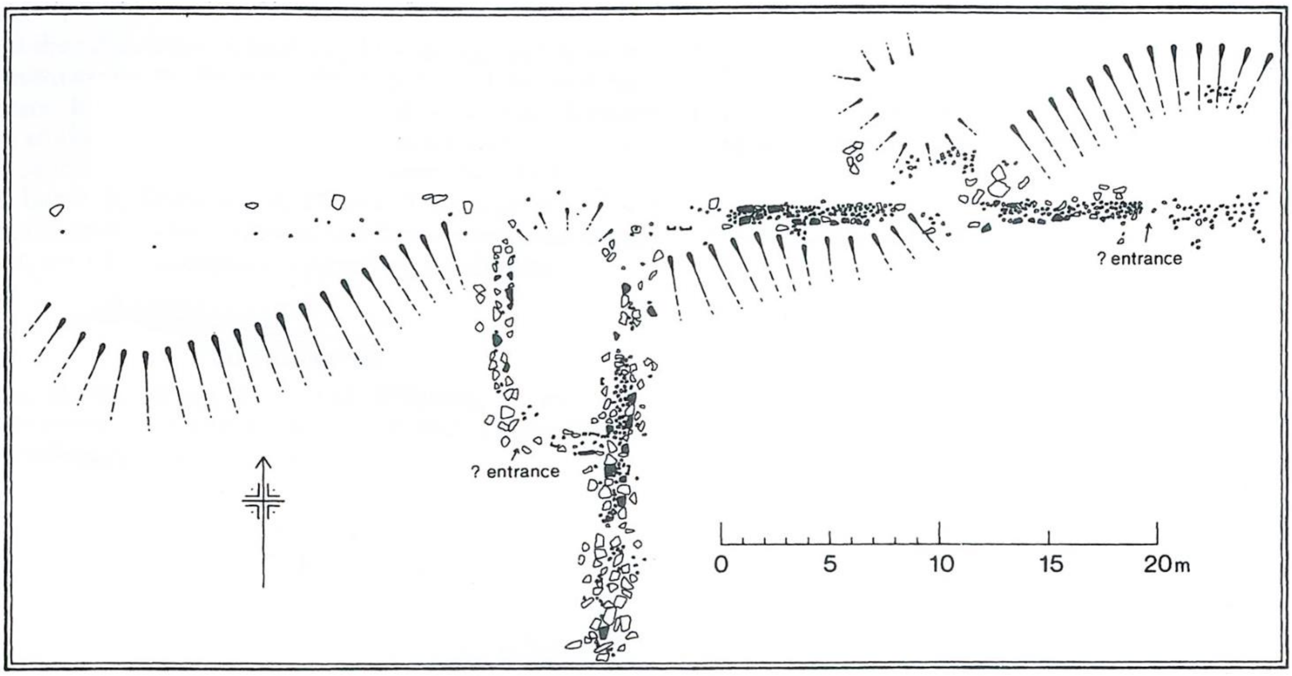


Figure 29. *Plan of Evans' rectangular stone-walled enclosure 47, probably a medieval longhouse, measuring 11m x 6m with a doorway at the south-west angle (Evans 1990, Fig. 18, 265). The structure lies 38m west of the 2017 excavation trench. See* NPRN 424554.

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Figure 30. The excavation team in 2017; L-R: Bob Johnston, Louise Barker, Toby Driver and Oliver Davis (Photograph: Geoff Duller. Crown Copyright RCAHMW, DS2017_001_011).

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12. Appendix

a. Skomer SKM17: context list

CONTEXT NUMBER	TYPE	DESCRIPTION
301	Deposit	Upper turf layer, dark brown, loose, rooted, with occasional small angular and sub angular stones. Bulbs and bracken roots penetrating down to 0.3m
302	Deposit	Brown/black, loose friable silty loam. Context 307 contained within 302 towards the north end of the trench. Contains relatively frequent 5-10cm sub angular stones. Interpreted as a plough-derived soil containing the latest cleared stone (307) <002>
303	Deposit	Lower colluvium below cleared stone layer 307 and ploughsoil layer 302. Clayey silt, mid brown, soft, with very occasional small sub-angular and sub-rounded stones. Appears to bank up against a larger mass of cleared stones at the mid-point of the lynchet. <003>
304	Deposit	Lower colluvium. Greyer-brown, soft clayey silt, contains very occasional sub-angular, sub-rounded stones. Appears to bank up behind cleared stone and then tails off to the tip of the lynchet. 303 and 304 represent hillwash from upslope cultivation, banking up behind the cleared stone of the lynchet face. <004>
305	Deposit	Pale browny-grey, slightly clayey soft silt. Contains very occasional, very small sub-rounded stones up to 0.03m size. Potential soil horizon sealed by upper layers of colluvium 304 and 303. <005>
306	Deposit	Clay layer at base of trench. Soft yellowey-orangey brown, silty clay contains occasional sub-angular and sub-rounded stones up to 0.05m in size. Variation in firmness through the trench. <006>
307	Deposit	Latest cleared stone, capping lynchet within 302, sealed by 301. Large angular stones up to 0.4 x 0.25 x 0.15m and sub angular, generally flat laid in north part of the trench, with evidence for physical clearance on the south face of the lynchet.

b. Skomer 2017 excavation trench; coordinates of trench corners.