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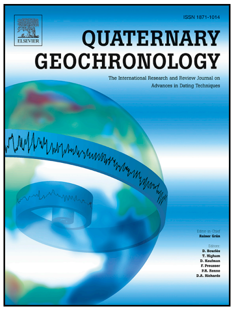

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How ^{14}C dates on wood charcoal increase precision when dating colonization: the examples of Iceland and Polynesia

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Abstract: Archaeological chronologies use many radiocarbon (^{14}C) dates, some of which may be misleading. Strict 'chronometric hygiene protocols', which aim to enhance the overall accuracy and precision of ^{14}C datasets by removing all potentially problematic samples, mean that so few dates remain in some locations that accurate chronologies cannot be established. ^{14}C dates on charcoal can be affected by an 'old-wood' effect, and so they are often removed from analyses, despite > 40,000 being available worldwide, representing > $25 million. We show that when a Bayesian chronological model is used, which incorporates an Outlier Model specific to wood charcoal, the ^{14}C dataset of

Iceland's Viking Age settlement agrees well with ice core-dated tephrochronology and written sources. Greatest accuracy comes from an even temporal distribution of ^{14}C dates and more dates lead to greater precision (< 20 years). This shows how charcoal-based ^{14}C chronologies can pinpoint the transformational human settlement of islands in the Atlantic, Oceania, and elsewhere.

Keywords

Iceland; East Polynesia; Bayesian statistics; tephrochronology; radiocarbon dating; chronometric hygiene

1. Introduction

Our aim is to improve the use of large radiocarbon (^{14}C) datasets to establish the most accurate and precise age ranges for archaeological events. ^{14}C dating is one of the most significant chronometric discoveries of the 20th century, allowing us to use organic material to establish accurate chronologies for the last 50,000 years. However, individual ^{14}C dates are probability distributions that plot around the true age and do not necessarily capture the timing of key events (Wood, 2015). This is a particular problem when trying to recognize and understand rapid changes in human history that occur over a matter of decades or less. Transformative events, where the timing is crucial to our understanding, include human migrations and the colonization of new areas – topics that are often subject to vigorous debate (e.g. Braje et al., 2017; Mellars, 2006).

Our ancestors spread overland across Africa and migrated across Eurasia and into the Americas on foot, but to settle in Australia people had to cross the sea. The development of seafaring has played a key part in human history and finally enabled people to colonize some of the last settled places on Earth, including the islands of the deep oceans. Island communities are globally significant as they have the potential to teach us many things about adaptation, sustainability, how societies are established and how they survive over multi-generational timescales in constrained circumstances with finite resources. Such lessons are timely, as globally our appetites and numbers continue to grow and our collective environmental impacts become significant on a planetary scale. In order to gain the most effective understanding of various 'completed experiments' on islands around the world, we need to have precise regional-scale ^{14}C chronologies to understand as accurately as possible when people arrived and the timing of subsequent cultural, ecological, and demographic changes.

Efforts to construct accurate and precise ^{14}C chronologies from many dates typically rely on 'chronometric hygiene' protocols (after Spriggs, 1989) eliminating dates that are most likely problematic (Bayliss, 2015). Currently, protocols favour organisms with short-life spans, where ^{14}C concentrations are in equilibrium with the atmosphere until death (Bronk Ramsey et al., 2010; Wilmshurst et al., 2011; Rieth et al., 2011). Such strict protocols have both reduced the number of places where dating can be utilized, and shifted individual chronologies by up to 1,000 years (Dye et al., 2015). Significantly, they largely ignore the use of wood charcoal samples. This is despite charcoal samples of indeterminate age being the most frequently dated material (> 40,000 samples) in a global inventory of archaeological ^{14}C dates (Fig. 1, Table 1). In modern values, these samples represent over $25 million of laboratory analysis. Clearly there have been good reasons for discarding this data in certain circumstances, but a greater effective use of it would represent a major advance for many sites around the globe, where wood charcoal is the only significant material class sufficiently well preserved for dating (Dee and Bronk Ramsey, 2014).

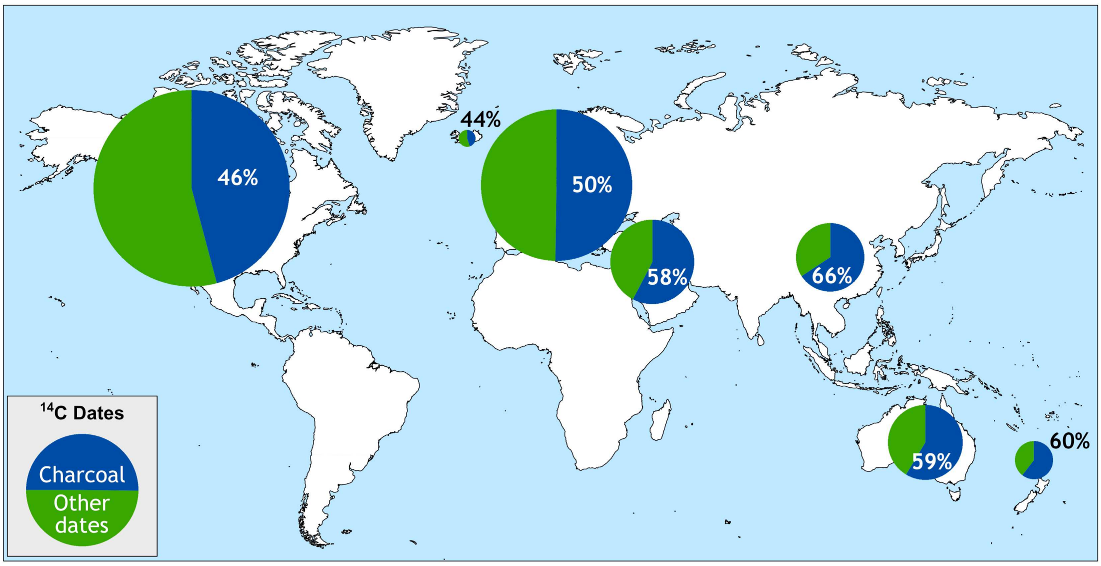


Fig. 1. The distribution of 79,809 (40,254 wood charcoal samples) ^{14}C samples from cultural layers recorded in key databases (CARD, RADON, ^{14}C Paleolithic Europe, CONTEXT, AustArch) around the world (Table 4).

Table 1. Databases and geographic areas summarizing 79,809 ^{14}C samples from cultural layers presented in Fig. 2.

Region	Total number of ^{14}C dates	Total number of wood charcoal dates	References
United States/Alaska	38,119	17,482	Gajewski et al., 2011
Iceland	282	125	This study
Europe	22,760	11,426	Veermeersch, 2015; Hintz et al., 2012
Near East	7036	4,054	Flohr et al., 2015; Böhner and Schyle, 2002-2006
China	4,656	3,063	Wang et at., 2014
Australia	5,522	3,238	Williams et al., 2014
East Polynesia	1,434	867	Wilmshurst et al, 2011
	79,809	**40,255 (> 50%)**	

The need for dating controls independent of the radiocarbon method make alternative approaches a challenge to asses. The wide range of complementary dating methods (^{14}C dates, ice core-dated tephrochronology and medieval texts), which can be employed to date the Viking Age colonization of Iceland (the Landnám), allows us to clarify the long-standing debates about how ^{14}C dataset choices can affect age-model accuracy and precision. These provide a chronological 'Rosetta stone', which enables us to perform novel assessments of alternative approaches. This in turn will help us to better understand other examples of island colonization and other large-scale events for human history that have an abrupt, but complex, manifestation.

With independent dating control, we examine 282 Icelandic ^{14}C dates using Bayesian Outlier analysis (Bronk Ramsey, 2009; Dee and Ramsey, 2014) with OxCal v.4.3 (Bronk Rasmey, 2017). Subsequently, we applied our new insights from Iceland to re-assess 1088 ^{14}C dates for 15 archipelagos in East Polynesia (Wilmshurst et al., 2011). To achieve this in a timely manner we developed a new open access program

('OxCal_parser') to speed data entry and minimize errors, a prerequisite for correct modeling of hundreds of ^{14}C dates.

2. Materials and Method

2.1 Iceland: Archaeological periods and data

Iceland has produced one of the world's richest collections of medieval vernacular literature and these texts pinpoint key historical events that notably include the first settlement of Iceland, which is dated to AD 870-930 according to the chronicle *Íslandingabók* written in AD 1122-33 (Grønlie transl. 2006). Texts also date many of Iceland's frequent explosive volcanic eruptions, which deposit widespread tephra (ash) layers that form spatially extensive marker horizons (isochrons) in key environmental archives such as ice cores, soils and lake sediments (Streeter and Dugmore, 2014; Sigh et al., 2015; Schmid et al., 2017a). Around the time of Iceland's settlement, simultaneous eruptions of the Veiðivötn and Torfajökull volcanic systems spread a distinctive two-coloured visible tephra layer over the entire island apart from the northwest peninsula. Traces of this layer, called the Landnám Tephra Layer, have been found in the Greenland ice cores, and it is precisely dated to AD 877 ± 1 (Grönvold et al., 1995; Zielinski et al., 1997; Schmid et al., 2017a). Three sites have little evidence of anthropogenic activities immediately below this tephra (Jóhannesson and Einarsson, 1988; Roberts et al., 2003; Schmid et al., 2017b). In contrast, the archaeology of 81 settlement sites and 132 related ^{14}C dates are known from stratigraphic contexts above this isochron (Appendix A). This combination of archaeology and ice-core dated tephrochronology places countrywide settlement directly before, but mainly after, AD 877. Similarly, medieval texts place the end of early settlement to AD 930, when the Althing, the world's oldest parliament, was established (*Íslandingabók*: Grønlie transl. 2006). This historical juncture coincides with tephra isochrons including the key layer from Eldgjá dated in the ice cores to AD 939 (Sigl et al. 2015; Schmid et al. 2017a) and a tephra layer from Veiðivötn dated to AD 938 ± 6 (Sigurgeirsson et al., 2013). The widespread Hekla volcanic eruption of AD 1104 provides an effective early 12th century marker horizon for the end of the Viking Age in Iceland (Þórarinsson, 1967).

In total, we have gathered 282 ^{14}C dates that relate to the Viking Age (AD ~800-1100) (Appendix A). We include ^{14}C dates that are from unambiguous stratigraphic contexts below the H-1104 tephra, or are associated with direct evidence of human activity and have a median age before AD 1100. We did not include dates on human bone with possible marine/freshwater reservoir effects due to uncertainties associated with marine and freshwater calibration (e.g. Ascough et al., 2011; Sayle et al. 2016). Significantly, 89% of our newly compiled ^{14}C dataset are from dates stratigraphically associated with tephra isochrons. To begin our assessment we use independently-dated tephra isochrons to divide 282 ^{14}C samples into two well-defined periods of colonization and a general Viking Age group (Appendix A):

1. Landnám (AD 877-939): early widespread settlement (n = 132)
2. Post-Landnám (AD 939-1104): late widespread settlement (n = 90)
3. Viking Age (AD 877-1104) (n = 60).

We then categorize 282 ^{14}C samples according to material types, for which we use two basic categories: short-lived taxa (157 samples: grains/seeds, identified short-lived wood and terrestrial bone) as well as charcoal samples of indeterminate age (125 samples: unidentified charcoal and identified wood with large inbuilt age).

2.2 East Polynesia: Archaeological data

We revisit the dataset for 15 archipelagos in East Polynesia. Wilmshurst et al. (2011) published 1,434 ^{14}C dates that are in direct association with cultural materials from 300–3000 ^{14}C y BP. We exclude 346 bone and shell samples with known marine/freshwater reservoir effects to provide a comparable dataset with Iceland (e.g. Petchey et al., 2013). We categorize 1,088 ^{14}C samples according to material types, for which we use the same categories: short-lived taxa (n = 222) and charcoal samples of indeterminate age (n = 866).

In Oceania, independent dating evidence is limited to the North Island of New Zealand, where environmental impacts and human activities first occur just below the Kaharoa tephra isochron, radiocarbon-dated to cal AD 1314 ± 12 through the use of wiggle matching (Hogg et al., 2002).

2.3 Bayesian Analysis

In this paper we used the Bayesian outlier analysis approach to estimate the most likely time frame for historical events in the OxCal v4.3 software (Bronk Ramsey, 2017). These age ranges (the *posterior* beliefs) depend on the distribution of data (our *prior* beliefs) and the ^{14}C dataset (the *likelihoods*) (Bayliss et al. 2007). The *prior* beliefs include: the stratigraphic relationships of samples, the distribution of samples, the overall distribution of the dataset, and also the likelihood each sample has of being an outlier .

We define accuracy through the reproducibility of *priors* in Bayesian models, and we define precision through the quality and quantity of ^{14}C dates. For accuracy, we used single-phase Outlier models for our data that assume that all dates are uniformly distributed within the bounded time range. Using the *General Outlier Model*, short-lived samples are given a 5% *prior* probability and are individually downweighted with a Student T distribution (Bronk Ramsey, 2009). This has a normal distribution, but with longer tails, that allowing dates to be outliers without affecting the outputs. Using the *Charcoal Outlier Model*, charcoal samples of indeterminate age are given a 100% *prior* probability and are individually downweighted with an exponential distribution that relates to the lifespan and growth habit of trees and the distribution only shifts towards the younger end (Bronk Ramsey, 2009). This model does not eliminate odd erroneous dates, but it shifts the whole sequence in one direction. A recent modification of this model, the *Charcoal Plus Outlier Model*, has allowed a small number of samples to also be younger than the context they represent, such as intrusive material (Dee and Ramsey, 2014)

We used various approaches in order to assess different strategies for evaluating groups of ^{14}C dates, and assess whether they yield a colonization age, which is consistent with independent tephrochronological dating using the Landnám Tephra Layer of AD 877 ± 1 for Iceland and the Kaharoa tephra of AD 1314 ± 12 for New Zealand. In order to be considered different, the Difference probability range does not overlap with zero. The model generates a colonization age range either earlier or later than the tephra layer in question. Uncertainties are presented throughout the Supplementary Materials approximately equivalent to 95% and 68% confidence levels.

2.4 Summing approach

We compare our Bayesian results with current Summing approaches. For the East Polynesian dataset, cumulative and summed probabilities have been used to evaluate large datasets of ^{14}C dates (Rieth et al., 2011; Wilmshurst et al., 2011). When summing, researchers have attempted to improve accuracy by selecting single-entity material and by a small standard error. First, the datasets were subjected to a chronometric hygiene protocol. Only samples from short-lived plant materials and terrestrial bone, where the standard error for the conventional ^{14}C ages is <10% of the age determination, were accepted. These approaches removed 80-95% of the dates. The summing method has been criticized because it is likely to overestimate the age of colonization as statistical scatter is not accounted for (e.g. Bayliss et al., 2007; Culleton, 2008; Chiverell et al., 2011; Bamforth and Grund, 2012; Contretas and Meadows, 2014).

2.5 'OxCal_parser'

OxCal was first released in 1994 and it is a very powerful tool for the analysis of complex stratigraphies of multiple ^{14}C samples (Bronk Ramsey, 2017). We performed more than 300 model runs, each with some tens to hundreds of ^{14}C samples arranged in different stratigraphic phases and sequences. Additionally, we specified different Outlier Models (*General* and *Charcoal Plus*) for ^{14}C samples (*R_Dates*) and assigned specific colors to groups of samples (e.g. green for short-lived materials, grey for long-lived materials and red for calendar dates, such as tephra layers).

To increase the speed and accuracy of data import to OxCal, we developed a program (OxCal_parser), which reads an input spreadsheet file (.xlsl or .csv) and automatically generates a text output (.txt) in *Chronological Query Language2* (CQL2), the latest format used by OxCal. Our program runs instantaneously and the output can be copied in the OxCal text browser to run models without adding any additional information. Our program allows automatic data entry of small to very large datasets with simple and complex stratigraphy in a timely manner, but does not perform any computation. At present OxCal_parser can be used for single- and multiple-phase models (Supplementary Materials, Fig. S1). Since OxCal provides extensive options in data analysis (e.g. the use of different *Boundaries*), we made OxCal_parser available on Bitbucket (https://bitbucket.org/luca_foresta/oxcal_parser). Users can freely download or clone the program and alter it according to individual needs. OxCal_parser is written in Python 2.7, which is an open access programming language. Instructions on how to download and use the code are provided online.

For this work, we provide six examples with datasets from Iceland and New Zealand that are used to demonstrate how OxCal_parser works (Fig. S1, Appendix B). All examples, using complex or simple stratigraphy, have the same structure, with mandatory and optional fields (columns). If optional fields are not used for a specific model, the columns should be empty, as demonstrated in Appendix B. Mandatory fields are presented in Example 1 (Fig. S1A-B), where the input file contains three basic fields (*Sample ID*, *Conventional Radiocarbon Age* and *Error*), together with their *Date Type* ('radiocarbon') and the calibration curve (e.g. 'IntCal13': Reimer et al. 2013). The *Start Boundary Label* can be assigned an optional label; in our examples, we use 'Start occupation' as the age range for the occupation of an archaeological site in question.

Optionally, other information can be included, such as the type of outlier model (*General* or *Charcoal Plus*), the type of outlier for each individual ^{14}C sample, together with its related *P Value* (e.g. p = 0.05 for short-lived material; p = 1 for charcoal samples of indeterminate age), and a *Color* when displaying the model output (Fig. S1C-L).

In scenarios with complex stratigraphy, the user can divide the samples in different *Phases* (unordered group of samples) and/or *Sequences* (ordered group of samples). This is achieved through the 'Stratigraphic Block' field and the 'Block Label' field (*Sequence* or *Phase*) (Appendix B). Each *Sequence* or *Phase* is given a number, where 1 represents the oldest archaeological event. *Boundaries* – implying a uniform distribution of dates – are automatically added by the program. In cases where a ^{14}C or calendar date (*C_Date*) is not part of any *Sequence* or *Phase*, these samples can be placed in an independent stratigraphic block. In Example 4 this primarily accounts for calendar dates, which are tephra isochrons in our examples (Fig. S1G-H).

Furthermore, the user can specify multiple *Sequences*/*Phases* within the same stratigraphic block as shown in Example 5 where one *Sequence* (hearth samples) and one *Phase* (floor samples) are part of the same overall *Phase* (Fig. S1I-J). Our program also supports using the Southern Hemisphere Calibration Curve 'ShCal13' (Hogg et al. 2013) as shown in Example 6 using samples of short lived wood from New Zealand (Fig. S1K-L; https://bitbucket.org/luca_foresta/oxcal_parser).

3. Results and discussion: Accuracy and precision of Bayesian Models

3.1 Iceland

We used the whole dataset, samples from archaeological periods – Landnám (AD 877-939), post-Landnám (AD 939-1104), and Viking Age (AD 877-1104) contexts – as well as individual material classes. The results are summarized in Table 2, Figure 2 and in Supplementary Materials (including both 68% and 95% confidence levels). We excluded three ^{14}C dates of bulk materials, because Bayesian models would not converge if they are included in models (Supplementary Materials).

It is possible to use a range of short-lived samples and charcoal samples of indeterminate age to achieve an age range for the colonization of Iceland (cal AD 866-883 at 68% probability) (Fig. 2A) that is consistent with both medieval literary texts, which date the initial settlement of Iceland to the year AD 870, and ice core-dated tephrochronology of archaeology, which confirms sparse traces of human settlement immediately below, and very extensive countrywide settlement immediately above the crucial Landnám Tephra Layer of AD 877 ± 1 (Appendix A). The important conclusion is that key historical events can be dated with both accuracy and precision using a wide range of ^{14}C dates. We note that the accuracy of this age range is, however, dependent upon a uniform sampling density across the entire period.

Table 2. Accuracy of Bayesian models: sensitivity testing of single-phase models from Iceland.

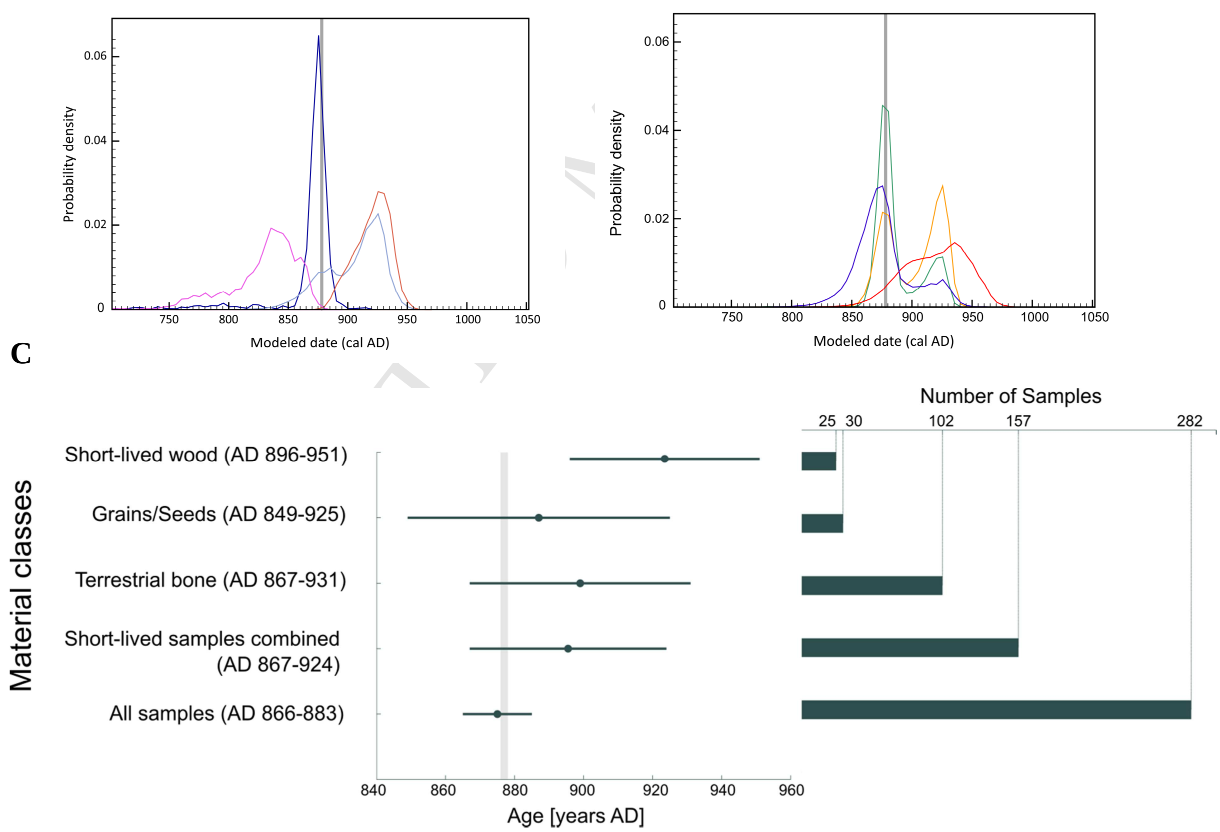
^{14}C DATASETS			AGE RANGES (OUTLIER MODELS)				LTL MODEL DIFFERENCE			
Model	Approach description	No of ^{14}C	Posterior (68%)		Posterior (95%)		from (68%)	to (68%)	from (95%)	to (95%)
1	The whole dataset	279	866	883	748	909	-16	4	-134	28
2	Landnám contexts**†**	135	819	867	759	874	-54	-12	-105	-1
3	post-Landnám contexts*****	90	907	939	888	946	25	59	6	67
4	Viking Age contexts	185	875	935	853	944	-26	4	-56	34
5	Identified short-lived wood*****	25	896	951	865	965	14	70	-18	86
6	Grains and seeds	30	849	925	838	937	-32	4	-62	38
7	Terrestrial bone	102	867	931	860	935	-15	50	-21	55
8	Charcoal samples of indeterminate age combined	126	710	928	633	945	-172	48	-198	64
9	Short-lived taxa combined	156	867	924	862	933	-16	45	-21	53

Key: The models generate a colonization age range that is: accurate (no symbol), or inaccurate. Here, the age range is: earlier than the LTL (†) or later than the LTL (*).

Bayliss et al. (2007) argue that while the accuracy of ^{14}C dates and their stratigraphic relationships may be fundamental for correct synthesis and chronological modelling, uniformly distributed datasets can be flexible, robust and insensitive to these factors as long as individual dates are not too inaccurate. To test this hypothesis we used filtered datasets that are based on archaeological periods and material classes to assess whether they yielded a colonization age that is consistent with the LTL (Supplementary Materials). We find that there are no systematic biases within specific material classes, and all material categories can provide accurate age ranges (Fig. 2B, Table 2). Nevertheless, we find that model accuracy is sensitive to the assumption that a uniform distribution of dates is flexible and robust, because this does have an effect on the synthesized age range. A higher percentage of late or early dates in models results in correspondingly older (up to 54 years) or younger synthesized colonization age ranges (up to 70 years) (Table 2). Indeed, end-member dates dominate the probability distributions and the collective result can underestimate the beginning and duration of initial settlement (Fig. 2A, 2C). As such short-lived wood yielded a slightly younger age range than the LTL (Fig. 2C), because the samples are almost exclusively from late tenth century contexts. As a result care is needed to ensure that the filtering of ^{14}C datasets does not bias the overall distribution of dates.

The precision of models is determined by both the quality and quantity of dates used. For example, using 282 dates from a combination of both short-lived materials and charcoal samples of indeterminate age generates a very narrow age range of 17 years for the onset of colonization (cal AD 866-883). When using short-lived samples only, precision decreases to 76 years, and shifts towards the younger end of the time frame (Fig. 2C-D).

A **B**



D **E**

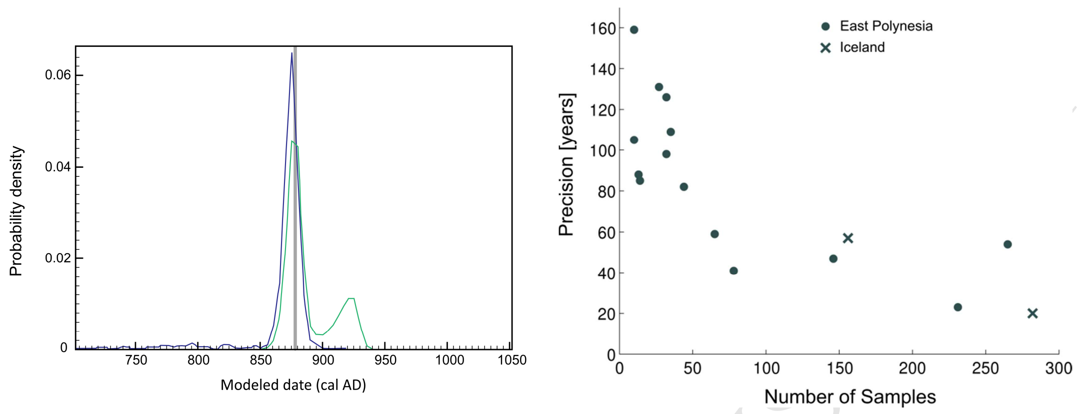


Fig. 2. Accuracy and precision of Bayesian Outlier models. Boundary probability distributions provide a modeled date for initial occupation at 95% probability (A, B, D) and 68% probability (C, E). The grey bar denotes the Landnám Tephra Layer of AD 877 ± 1 (A-D). (**A**) ^{14}C samples and independently dated, tephra defined archaeological periods in Iceland: the whole dataset (blue line) and dates from Viking Age contexts of cal AD 877-1104 (light blue line) show agreement; while dates from early Landnám contexts of cal AD 877-939 (pink line) and late post-Landnám contexts of cal AD 939-1104 (purple line) are inconsistent. (**B**) Material classes of ^{14}C samples in Iceland: grain (blue line), terrestrial bone (yellow line), short-lived wood (red line) and a combination of grain, bone, and short-lived wood (green line) provide accurate age ranges. (**C**) Distribution of ^{14}C samples: Short-lived wood provides an inaccurate age range. (**D**) Precision is enhanced using a combination of short-lived samples and charcoal samples of indeterminate age (blue line) in comparison to short-lived samples only (green line). (**E**) The number of short-lived ^{14}C dates and charcoal samples of indeterminate age from Iceland and East Polynesia in comparison to the precision of age ranges in years. The highest precision is generated using 280 samples (17 years), the lowest using 10 samples (160 years).

3.2 East Polynesia

We use our new approach to re-assess chronologies for first settlement from 15 archipelagos in East Polynesia (Supplementary Materials). We excluded 21 erroneous dates of bulk sediments (from Australs, Marquesas, Hawai´i and Rapa Nui) and 64 charcoal samples of indeterminate age that are too young to represent colonization events (from Hawai´i and Rapa Nui). If included, these ^{14}C dates distort the distribution of Bayesian models, because Outlier models ony allow a small number to be intrusive (Dee and Ramsey 2014). The excluded samples are fully acknowledged in Supplementary Materials.

In Oceania, the accuracy of Bayesian age ranges is generally difficult to assess. One exception is the North Island of New Zealand. Our Bayesian model of 265 radiocarbon dates from archaeological sites generated an age range of cal AD 1260-1314, which is consistent with the stratigraphic distribution of vegetation disturbance just prior to the Kaharoa isochron (cal AD 1314 ± 12) (Furey et al. 2008).

To evaluate precision in the Oceania dataset, we compared models using short-lived materials only (total n = 222) and models including charcoal samples of indeterminate age (total n = 867) (Supplementary Text, Table 3). In Oceania, precision is greater the higher the quality and density of dates used (Fig 2E, Table 3). For example, the precision is 91 years for a combined date produced from 76 short-lived samples from New Zealand (cal AD 1262-1353), but it is enhanced to 54 years if 189 charcoal samples are added to the same dataset (cal AD 1260-1314). Adding charcoal samples of indeterminate age to the dataset, therefore, has the potential to shift the date of initial settlement at least 39 years earlier and just before the deposition of the Kaharoa tephra. We argue that this model is more likely, as the use of short-lived taxa alone may underrepresent early human activities. The influence of the number of ^{14}C samples on precision is further illustrated by a range of 23 years obtained when using 231 dates from Hawai'i (cal AD 1353-1376) and 41 years when using 78 dates from Marquesas (cal AD 1224-1265). Bayesian modeling using multiple charcoal samples not only provides reasonable precision, but also allows reliable chronologies to be established in new areas, for example Norfolk (cal AD 1176-1274), Kermadec (cal AD 1380-1465) and Northern Cook islands (cal AD 1455-1586). Overall, we find that Bayesian Outlier models including charcoal samples of indeterminate age may shift previously accepted chronologies by more than 87 years, and the scale of change depends on the distribution of the dataset (Table 4). Although we can use charcoal samples of indeterminate age in chronological models, we underline the importance of using short-lived material from the same contexts when generating new datasets wherever possible.

Table 3. The timing of colonization from East Polynesian archipelagos using Bayesian Outlier models. Models are tested using short-lived taxa and charcoal samples of indeterminate age.

^{14}C DATASETS			AGE RANGES (OUTLIER MODELS)					
Model	Island	No. of ^{14}C Dates	Posterior 68% (excluding wood charcoal)		Precision in years	Posterior 68% (including wood charcoal)		Precision in years
10	New Zealand*	265	1262	1353	91	1260	1314	54
11	Hawai'i*	231	1331	1371	40	1353	1376	23
12	Rapa Nui*	153	1221	1268	47	1245	1280	35
13	Marquesas*	78	1224	1268	44	1224	1265	41
14	Southern Cooks*	65	1250	1310	60	1231	1290	59
15	Society*	44	1002	1075	73	997	1079	82
16	Gambier*	35	1035	1182	147	1099	1208	109
17	Australs*	32	-	-	-	1391	1517	126
18	Norfolk†	31	-	-	-	1176	1274	98
19	Northern Cooks†	27	-	-	-	1455	1586	131
20	Kermadec†	14	-	-	-	1380	1465	85
21	Line*	13	1316	1414	98	1327	1415	88
22	Auckland island*	10	-	-	-	1195	1300	105
23	Chathams*	10	-	-	-	1451	1610	159

Key: The age ranges are based on: *short-lived taxa and charcoal samples of indeterminate age, †charcoal samples of indeterminate age .

Table 4. Age ranges from East Polynesian archipelagos using Bayesian Outlier models (this study) and summing (Wilmshurst et al., 2011).

East Polynesian island	OUTLIER MODELS (68% probability)*†		SUMMING (68% probability)°	
New Zealand	1260	1314	1230	1280
Hawai'i	1353	1376	1219	1266
Rapa Nui	1221	1268	1200	1253
Marquesas	1224	1265	1200	1277
Southern Cooks	1231	1290	1250	1281
Society	997	1079	1025	1121
Gambier	1099	1208	1108	1275
Australs	1391	1517	/	/
Norfolk	1176	1274	/	/
Northern Cooks	1455	1586	/	/
Kermadec	1380	1465	/	/
Line	1327	1415	1275	1293
Auckland island	1195	1300	1190	1258
Chathams	1451	1610	/	/

Key: The age ranges are based on: *short-lived taxa and charcoal samples of indeterminate age, †charcoal samples of indeterminate age, and °short-lived taxa.

5. Conclusions

This paper demonstrated that accurate and precise age ranges for historical events can be generated using Bayesian Outlier models for small and large datasets that combine ^{14}C dates on short-lived samples and charcoal samples of indeterminate age. These models are sensitive to the distribution of dates, and they will be biased if filtered datasets have dates from early contexts are preferentially removed. Accuracy is greatest where the sampling density is uniform. Precision is greatest (17 years), where the sampling density is high, and 280 ^{14}C samples give the best results. Precise datasets, therefore, could be achieved using far more of the available samples, including more than 50% of around 80,000 ^{14}C samples of cultural layers recorded in a series of key databases around the globe. A more inclusive use of such samples is very important in areas where charcoal is the only material class sufficiently well preserved for dating. Utilizing marginalized charcoal samples of indeterminate age could modify presently accepted chronologies for many important events and processes in human history and may confirm or subtly, but importantly, revise ideas about the timing and impacts of great migrations of people across the planet, not just the Vikings across the North Atlantic, or the Polynesians across the Pacific, but also many other cases as varied as the peopling of the Arctic, the Americas and other oceanic islands.

Enhanced ^{14}C chronologies allow for more nuanced understanding of historical drivers of change, such as long-distance migration (Braje et al., 2017), human-induced landscape modification (Hunt and Lipo, 2006), causes of societal collapse (Middleton, 2017), extinctions (Higham et al., 2014; Holdaway and Jacomb, 2000), and post Ice Age reoccupation (Riede and Borre Petersen, 2018). Developments in Bayesian analyses of ^{14}C datasets, tested here using independent chronological controls that apply to the Viking Age settlement of Iceland, can allow controversial archaeological and anthropological questions to be tackled using a more diverse range of ^{14}C dates.

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Figures

Fig. 1. The distribution of 79,809 (40,255 wood charcoal samples) ^{14}C samples from cultural layers recorded in key databases around the world.

Fig. 2. Accuracy and precision of Bayesian Outlier models.

Tables

Table 1. Databases and geographic areas summarizing 79,809 ^{14}C samples from cultural layers presented in Fig. 2.

Table 2. Accuracy of Bayesian models: sensitivity testing of single-phase models from Iceland.

Table 3. The timing of colonization from East Polynesian archipelagos using Bayesian Outlier models.

Table 4. Age ranges from East Polynesian archipelagos using Bayesian Outlier models (this study) and summing (Wilmshurst et al., 2011).

Supplementary Materials

Supplementary Text

Fig. S1. 'OxCal_parser': Text outputs and modeled calibrated ^{14}C dates from single and multi-phase models in OxCal.

Bayesian OxCal codes: models 1-23

Appendix A. 282 ^{14}C dates from Viking Age contexts in Iceland.

Appendix B. 'OxCal_parser': Input spreadsheet files to automatically import small and large ^{14}C datasets in OxCal.

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How ^{14}C dates on wood charcoal increase precision when dating colonization: the examples of Iceland and Polynesia

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Appendix A. 282 14C dats from Viking Age contexts in Iceland.
Sample category type: Ch-U: Charcoal, unidentified; W-LL: Wood, long-lived; W-SL: Wood, short-lived (twigs, bark); G/S: Grains/Seeds; B-T: Bone-terrestrial

Abbreviations of 14C samples:
To label the 282 accumulated radiocarbon dates we use abbreviations consisting of three letters for each archaeological site, such as HST for Hofstaðir í Mývatnsveit or HRH for Hrísheimar. The abbreviations are used in combination with the Radiocarbon Lab code in the models (e.g. 'HST SUERC-11541').
Abbreviations are also useful for radiocarbon determinations, where the radiocarbon lab code is not published, for instance samples from Geistaðir are labelled GEI 1 and GEI 2.

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Site name	Sample ID	Archaeological feature [number]	Context description	Sample material	Sample species	Outlier Model	P Value	Conventional Radiocarbon Age	Error	Calibration method	δ 13C ‰	δ 15N ‰	Calibrated date A.D. (68.5% probab		Calibrated date A.D. (94% probabil		Associated tephra deposit	Tephra-dated archaeological period	References
Bergþórshvoll	BDH K-580	Byre, below structure	-	W-LL	Betula sp.	Charcoal Plus	1	1010	100	CON	-	-	901	1156	776	1220	-	Viking Age	4
Bessastaðir	BST SFUICE-1	Structure [19]	Floor layer	G/S	Hordeum sp.	General	0.05	1020	30	AMS	-	-	991	1026	909	1147	Between LTL and R-1226	Landnám	31
Bessastaðir	BST SFUICE-2	Structure [19]	Floor layer	G/S	Chickweed, charred	General	0.05	1020	40	AMS	-	-	975	1040	900	1152	Between LTL and R-1226	Landnám	31
Bessastaðir	BST SFUICE-3	Structure [19]	Floor layer	G/S	Chickweed, uncharred	General	0.05	1080	30	AMS	-	-	901	996	894	1018	Between LTL and R-1226	Landnám	31
Brimnes við Dalvík	BVD ARR-5905	Burial [12]	-	B-T	Equus sp.	General	0.05	1080	30	AMS	–21.81	2.7	901	996	894	1018	-	Viking Age	6
Eiríksstaðir	ERS AAR-3963	Hall	Upper midden deposit, south of he	W-LL	Betula sp.	Charcoal Plus	1	1115	37	AMS	-26,7	-	893	975	778	1016	post-LTL	Landnám	32
Eiríksstaðir	ERS AAR-4743a	Hall	Site hearth [H]	W-LL	Betula sp.	Charcoal Plus	1	1150	30	AMS	-	-	778	967	776	971	post-LTL	Landnám	32
Eiríksstaðir	ERS AAR-4743b	Hall	Site hearth [H]	W-LL	Betula sp.	Charcoal Plus	1	1120	30	AMS	-27.1	-	893	970	778	995	post-LTL	Landnám	32
Fossá	FOS Beta-288068	Structure [2]	Floor layer	Ch-U	-	Charcoal Plus	1	1030	40	AMS	-	-	973	1032	896	1150	-	Viking Age	33
Gautlönd	GTL SUERC-2352	Burial [1]	-	B-T	Canis sp.	General	0.05	1170	40	AMS	-20.5	-	776	938	730	972	-	Viking Age	7
Gautlönd	GTL SUERC-2664	Burial [1]	-	B-T	Canis sp.	General	0.05	1175	35	AMS	-20.5	8.3	777	890	730	968	-	Viking Age	7
Geirsstaðir	GEI 1	-	-	Ch-U	-	Charcoal Plus	1	980	60	AMS	-	-	904	1021	892	1028	Between LTL? and Ö-1362	Landnám	1
Geirsstaðir	GEI 2	Midden deposit	East of Structure [1]	Ch-U	-	Charcoal Plus	1	1040	45	AMS	-	-	904	1030	891	1148	Between LTL? and Ö-1362	Landnám	1
Geirsstaðir	GEI 3	Midden deposit	Charcoal pit [2]	Ch-U	-	Charcoal Plus	1	1060	40	AMS	-	-	996	1153	904	1207	Between LTL? and Ö-1362	Landnám	1
Geldingaholt	GDH UCIAMS-49330	Midden deposit	Ash layer	Ch-U	-	Charcoal Plus	1	1045	20	AMS	-	-	991	1016	972	1024	Between LTL and Vj	Landnám	2
Glaumbær	GMB SUERC-2670	Burial [1]	-	B-T	Equus sp.	General	0.05	1115	35	AMS	-21.5	-	893	975	778	1015	-	Viking Age	7, 9
Glaumbær	GMB SUERC-2029	Burial [1]	-	B-T	Equus sp.	General	0.05	1185	35	AMS	-21.3	3.4	777	885	721	964	-	Viking Age	7, 9
Glaumbær, Lower	GMBL AA-46688	-	-	W-LL	Betula sp.	Charcoal Plus	1	990	46	AMS	-28.3	-	993	1149	974	1161	pre-H-1104	Viking Age	21
Glaumbær, Lower	GMBL AA-46689	Structure	Floor layer	B-T	Bos sp.	General	0.05	1017	56	AMS	-21.3	-	970	1148	895	1157	pre-H-1104	Viking Age	21
Glaumbær, Lower	GMBL AA-55489	-	-	B-T	Ovis sp.	General	0.05	969	43	AMS	-21.3	-	1020	1151	993	1161	pre-H-1104	Viking Age	21
Goðatættur (Papey island)	GAT St-3368	-	-	Ch-U	-	Charcoal Plus	1	1440	100	CON	-		434	674	387	775	pre-Ö-1362	Viking Age	4
Goðatættur (Papey island)	GAT St-3604	-	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	980	100	CON	-	-	972	1183	778	1263	pre-Ö-1362	Viking Age	4
Goðatættur (Papey island)	GAT St-4191	-	-	W-LL	Pinus pumila	Charcoal Plus	1	1665	100	CON	-		251	534	133	585	pre-Ö-1362	Viking Age	4
Granastaðir	GRA Kl-3235	Midden deposit	Outside pit house [3]	W-LL	Betula sp.	Charcoal Plus	1	1170	90	CON	-	-	770	970	678	1016	Between LTL/V-Sv? and H-1104	Viking Age	37
Granastaðir	GRA Kl-3236	Animal pen	Lower floor layer	W-LL	Betula sp.	Charcoal Plus	1	1100	50	CON	-	-	890	993	777	1023	Between LTL/V-Sv? and H-1104	Viking Age	37
Granastaðir	GRA Kl-2854	Pit house [3]	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1070	50	CON	-	-	900	1018	778	1116	Between LTL/V-Sv? and H-1104	Viking Age	4, 37
Granastaðir	GRA Kl-2855	Hall [9]	Central hearth	W-LL	Betula sp.	Charcoal Plus	1	1032	80	CON	-	-	895	1149	777	1169	Between LTL/V-Sv? and H-1104	Viking Age	4, 37
Granastaðir	GRA Kl-2856	Hall [9]	Central hearth	W-LL	Betula sp.	Charcoal Plus	1	1110	60	CON	-	-	880	1013	775	1021	Between LTL/V-Sv? and H-1104	Viking Age	4, 37
Grelutóttir	GLT U-2899	Pit house [I]	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1015	70	CON	-	-	905	1151	881	1205	-	Viking Age	4
Grelutóttir	GLT U-2900	Pit house [II]	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1070	65	CON	-	-	894	1022	775	1148	-	Viking Age	4
Grelutóttir	GLT U-299	Pit house [I]	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1190	100	CON	-	-	713	965	662	1016	-	Viking Age	36
Grímsstaðir	GRS SUERC-2019	Burial [1]	-	B-T	Equus sp.	General	0.05	1145	35	AMS	-21	1.7	779	970	776	979	-	Viking Age	9
Grímsstaðir	GRS SUERC-2262	Burial [1]	-	B-T	Equus sp.	General	0.05	1105	35	AMS	-20.7	1.2	895	983	779	1019	-	Viking Age	9
Grófargil	GFG AA-55486	-	-	B-T	Bos sp.	General	0.05	982	45	AMS	-21.7	-	1014	1151	985	1160	Between Vj and H-1104	post-Landnám	3
Hafsteinsstaðir	HSS AA-55485	-	-	B-T	Ovis sp.	General	0.05	1158	44	AMS	-20.77	-	777	950	769	985	Between LTL and mid-tenth century (	Landnám	3
Háls	HLS Beta 34359	Midden deposit	Upper layer in slag heaps	Ch-U	-	Charcoal Plus	1	1190	90	CON	-	-	715	962	665	995	Between LTL and H-1341	Landnám	18
Herjólfsdalur (Vestman island)	HJD U-2529	Structure [I]	Cooking pit 1	Ch-U	-	Charcoal Plus	1	1260	60	CON	-	-	670	860	655	891	post-LTL	Landnám	4, 38
Herjólfsdalur (Vestman island)	HJD U-2533	Structure [III]	Cooking pit 5	Ch-U	-	Charcoal Plus	1	1240	60	CON	-	-	688	865	660	944	post-LTL	Landnám	4, 38
Herjólfsdalur (Vestman island)	HJD U-4403	-	-	W-LL	Larch	Charcoal Plus	1	1070	75	CON	-	-	880	1034	771	1154	post-LTL	Landnám	4, 40
Herjólfsdalur (Vestman island)	HJD U-2531	Hall, early [I]	Cooking pit 1	W-LL	Betula sp.	Charcoal Plus	1	1060	65	CON	-	-	894	1026	777	1152	post-LTL	Landnám	4, 38, 39
Herjólfsdalur (Vestman island)	HJD U-2660	Hall, early [I]	Cooking pit 3	W-LL	Betula sp.	Charcoal Plus	1	1390	60	CON	-		595	681	545	768	post-LTL	Landnám	4, 38, 39
Herjólfsdalur (Vestman island)	HJD U-2661	Hall, early [II]	Cooking pit 4	W-LL	Betula sp.	Charcoal Plus	1	1340	65	CON	-		641	767	576	866	post-LTL	Landnám	4, 38, 39
Herjólfsdalur (Vestman island)	HJD U-2662	Hall, early [II]	Cooking pit 6-7	W-LL	Betula sp.	Charcoal Plus	1	1240	50	CON	-	-	688	864	667	890	post-LTL	Landnám	4, 38, 39
Herjólfsdalur (Vestman island)	HJD U-2663	Structure, late [V] ove	Floor, bench and pit	W-LL	Betula sp.	Charcoal Plus	1	1300	60	CON	-		660	769	641	880	post-LTL	Landnám	4, 38, 39
Herjólfsdalur (Vestman island)	HJD U-4402	Byre/barn, early [VIII	Cooking pit 8	W-LL	Betula sp.	Charcoal Plus	1	1035	65	CON	-	-	897	1118	779	1163	post-LTL	Landnám	4, 38, 39
Hofstaðir 1	HST SUERC-3440	-	-	B-T	Sus sp.	General	0.05	1150	40	AMS	-21.3	0.1	778	968	774	978	Between V-Sv and H-1104	post-Landnám	9
Hofstaðir 1	HST Beta-124004	Midden, early infill	On top of pit house [G]	B-T	Bos sp.	General	0.05	1170	40	AMS	-21.4	-	776	938	730	972	Between V-Sv and H-1104	post-Landnám	11
Hofstaðir 1	HST Beta-149403	Midden, late infill	On top of pit house [G]	B-T	Bos sp.	General	0.05	1120	40	AMS	-21.7	-	889	979	777	1013	Between V-Sv and H-1104	post-Landnám	11
Hofstaðir 1	HST Beta-149405	Midden deposit	Outside hall, Area E	B-T	Bos sp.	General	0.05	1160	50	AMS	-21.6	-	776	949	720	989	Between V-Sv and H-1104	post-Landnám	11
Hofstaðir 1	HST SUERC-6392	Annexe [D1] of hall [/	Turf collapse	B-T	Bos sp.	General	0.05	1065	35	AMS	-20.7	-	904	1019	894	1024	Between V-Sv and H-1104	post-Landnám	11
Hofstaðir 1	HST SUERC-6393	Annexe [D1] of hall [/	Turf collapse	B-T	Bos sp.	General	0.05	1120	35	AMS	-21.1	-	891	973	777	995	Between V-Sv and H-1104	post-Landnám	11
Hofstaðir 1	HST SUERC-6397	Annexe [A2] of hall [/	Turf collapse	B-T	Bos sp.	General	0.05	1110	35	AMS	-21	-	894	980	778	1018	Between V-Sv and H-1104	post-Landnám	11
Hofstaðir 1	HST SUERC-6398	Annexe [A2] of hall [/	Turf collapse	B-T	Bos sp.	General	0.05	1035	35	AMS	-21.2	-	980	1025	896	1118	Between V-Sv and H-1104	post-Landnám	11
Hofstaðir 1	HST SUERC-6399	Annexe [A2] of hall [/	Turf collapse	B-T	Bos sp.	General	0.05	1015	35	AMS	-21.2	-	985	1036	904	1152	Between V-Sv and H-1104	post-Landnám	11
Hofstaðir 1	HST Beta-149404	Pit house [G]	Turf collapse below midden infill	B-T	Bos sp.	General	0.05	1130	40	AMS	-21.5	-	880	981	776	990	Between V-Sv and H-1104	post-Landnám	11, 12
Hofstaðir 1	HST SUERC-11541	Hall [AB]	Pit infill, inside the house	B-T	Bos sp., adult	General	0.05	1030	35	AMS	-21.3	0.4	984	1026	898	1147	Between V-Sv and H-1104	post-Landnám	7, 11
Hofstaðir 1	HST SUERC-11542	Hall [AB]	Lower floor layer	B-T	Ovis sp., adult	General	0.05	1040	35	AMS	-20.8	0.6	977	1024	895	1040	Between V-Sv and H-1104	post-Landnám	7, 11
Hofstaðir 1	HST SUERC-11546	Hall [AB]	Lower floor layer	B-T	Ovis sp., adult	General	0.05	1075	35	AMS	-20.9	1.1	902	1016	893	1020	Between V-Sv and H-1104	post-Landnám	7, 11
Hofstaðir 1	HST SUERC-11547	Annexe [D1]	Hearth	B-T	Bos sp., adult	General	0.05	1160	35	AMS	-21.3	1.8	777	946	773	970	Between V-Sv and H-1104	post-Landnám	7, 11
Hofstaðir 1	HST SUERC-8353	Annexe [A2] of hall [/	Peat and ash dump inside	B-T	Bos sp., adult	General	0.05	990	35	AMS	-21.6	0.7	997	1147	986	1155	Between V-Sv and H-1104	post-Landnám	7, 11
Hofstaðir 1	HST SUERC-8354	Annexe [A2] of hall [/	Backfill of barrel pit inside	B-T	Bos sp., adult	General	0.05	1035	35	AMS	-21.4	1.1	980	1025	896	1118	Between V-Sv and H-1104	post-Landnám	7, 11
Hofstaðir 1	HST SUERC-8356	Annexe [A2] of hall [/	Backfill of barrel pit inside	B-T	Ovis sp., adult	General	0.05	1040	35	AMS	-21.8	0.1	977	1024	895	1040	Between V-Sv and H-1104	post-Landnám	7, 11
Hofstaðir 1	HST SUERC-8360	Annexe [A2] of hall [/	Peat and ash dump inside	B-T	Ovis sp./Capra sp., adul	General	0.05	1050	35	AMS	-21.4	1.3	971	1022	896	1031	Between V-Sv and H-1104	post-Landnám	7, 11
Hofstaðir 1	HST SUERC-3432	Midden, late infill	On top of pit house [G]	B-T	Sus sp.	General	0.05	1040	40	AMS	-21.5	0.5	970	1028	893	1119	Between V-Sv and H-1104	post-Landnám	7, 9, 11

Hofstaðir 1	HST SUERC-3429	Midden, early infill	On top of pit house [G]	B-T	Bos sp., neonatal	General	0.05	1160	35	AMS	-21.2	5.9	777	946	773	970	Between V-Sv and H-1104	post-Landnám	7, 9, 11, 12
Hofstaðir 1	HST SUERC-3430	Midden, early infill	On top of pit house [G]	B-T	Sus sp., adult	General	0.05	1170	40	AMS	-20.8	4.6	776	938	730	972	Between V-Sv and H-1104	post-Landnám	7, 9, 11, 12
Hofstaðir 1	HST SUERC-3433	Midden, late infill	On top of pit house [G]	B-T	Bos sp., adult	General	0.05	1030	35	AMS	-21.1	3.8	984	1026	898	1147	Between V-Sv and H-1104	post-Landnám	7, 9, 11, 12
Hofstaðir 1	HST SUERC-8618	Midden, early infill	On top of pit house [G]	B-T	Bos sp., adult	General	0.05	1110	40	AMS	-21	1.4	893	982	778	1018	Between V-Sv and H-1104	post-Landnám	7, 9, 11, 12
Hofstaðir 1	HST SUERC-8619	Midden, early infill	On top of pit house [G]	B-T	Bos sp., adult	General	0.05	1110	30	AMS	-20.9	2.6	895	976	879	1013	Between V-Sv and H-1104	post-Landnám	7, 9, 11, 12
Hofstaðir 1	HST SUERC-8623	Midden, early infill	On top of pit house [G]	B-T	Bos sp., adult	General	0.05	1130	35	AMS	-21.1	0.1	885	974	777	989	Between V-Sv and H-1104	post-Landnám	7, 9, 11, 12
Hofstaðir 1	HST SUERC-8624	Midden, early infill	On top of pit house [G]	B-T	Bos sp., adult	General	0.05	1080	35	AMS	-21.2	-0.2	900	1011	892	1020	Between V-Sv and H-1104	post-Landnám	7, 9, 11, 12
Hofstaðir 2	HST AA-53125	Church, chapel	-	W-LL	Betula sp.	Charcoal Plus	1	1035	35	AMS	-27.2	-	980	1025	896	1118	Between V-Sv and H-1300	post-Landnám	42
Hofstaðir 2	HST AA-53126	Church, chapel	-	W-LL	Betula sp.	Charcoal Plus	1	1015	45	AMS	-26.5	-	975	1119	899	1155	Between V-Sv and H-1300	post-Landnám	42
Hólmur	HLM Beta-109905	Pit house	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1070	40	AMS	-30.4	-	902	1018	890	1025	post-LTL	Landnám	41
Hólmur	HLM Beta-143634	Pit house	Site hearth	W-LL	Betula sp.	Charcoal Plus	1	1200	60	AMS	-27.6	-	719	936	682	969	post-LTL	Landnám	41
Hólmur	HLM Beta-143635	Pit house	Site hearth	W-LL	Betula sp.	Charcoal Plus	1	1450	70	AMS	-27.4		546	655	426	678	post-LTL	Landnám	41
Hólmur	HLM T 13781	Charcoal layer	Stratigraphically above pit house	W-LL	Betula sp.	Charcoal Plus	1	1245	40	AMS	-28.2	-	685	860	675	881	post-LTL	Landnám	41
Holt	HOT St-5299	Structure	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1040	100	CON	-	-	888	1152	770	1212	Between Eldgjá and H-1104	post-Landnám	17
Holtsmúli	HTM UCIAMS-77365	-	-	G/S	Hordeum, charred	General	0.05	1020	15	AMS	-	-	996	1024	990	1027	Between LTL and Vj	Landnám	3
Höskuldarstaðir í Reykjadal	HKD ARR-1252	-	-	W-LL	Betula sp.	Charcoal Plus	1	1030	75	CON	-26.76	-	897	1148	778	1169	-	Viking Age	40
Höskuldarstaðir í Reykjadal	HKD ARR-1253	-	-	W-LL	Betula sp.	Charcoal Plus	1	1115	60	CON	-29.33	-	780	1011	773	1021	-	Viking Age	40
Hoskulsstaðir	HOSK SUERC-8341	Charcoal layer	Charcoal pit	W-SL	Betula sp./Outer ring an	General	0.05	990	35	AMS	–26.8	-	997	1147	986	1155	-	Viking Age	19
Hoskulsstaðir	HOSK SUERC-8344	Charcoal layer	Charcoal pit	W-SL	Betula sp./Outer ring an	General	0.05	970	35	AMS	–30.1	-	1020	1150	1013	1158	-	Viking Age	19
Hoskulsstaðir	HOSK SUERC-8345	Charcoal layer	Charcoal pit	W-SL	Betula sp./Outer ring an	General	0.05	965	35	AMS	–27.4	-	1022	1151	1015	1160	-	Viking Age	19
Hrísbrú [CK]	HRB-CK Beta 165332	Midden deposit	Under burial 6	W-SL	Twig	General	0.05	1100	40	AMS	-26.4	-	895	987	778	1022	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [CK]	HRB-CK Beta 175675	Midden deposit	-	W-SL	Hay	General	0.05	1070	40	AMS	-23.9	-	902	1018	890	1025	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [CK]	HRB-CK Beta-175676	Church [CK]	Southern chancel wall foundation	W-LL	Pinus sp.	Charcoal Plus	1	1150	40	AMS	-27.8	-	778	968	774	978	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [EH]	HRB-EH OS-35415	Charcoal layer	Base layer	W-SL	Twig	General	0.05	1060	30	AMS	-	-	970	1019	897	1024	-	Viking Age	20
Hrísbrú [EH]	HRB-EH OS-37965	Charcoal layer	Deposit EH-X	W-SL	Twig	General	0.05	1060	30	AMS	-	-	970	1019	897	1024	-	Viking Age	20
Hrísbrú [TUN]	HRB-TUN UCIAMS-64168	Midden deposit	Infill above hall, below layer 34, a	G/S	Hordeum sp.	General	0.05	1040	20	AMS	-	-	993	1017	976	1025	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [TUN]	HRB-TUN UCIAMS-64169	Midden deposit	Infill above hall, above layer 39	G/S	Hordeum sp.	General	0.05	1055	20	AMS	-	-	986	1016	905	1023	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [TUN]	HRB-TUN UCIAMS-64170	Midden deposit	Infill above hall, peat ash	G/S	Hordeum sp.	General	0.05	1085	20	AMS	-	-	901	991	895	1014	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [TUN]	HRB-TUN UCIAMS-64171	Hall	Upper floor layer	G/S	Hordeum sp.	General	0.05	1125	20	AMS	-	-	893	966	885	980	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [TUN]	HRB-TUN UCIAMS-64172	Hall	Floor deposit on northern side aisl	G/S	Hordeum sp.	General	0.05	1140	15	AMS	-	-	886	953	780	973	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [TUN]	HRB-TUN UCIAMS-64173	Hall	Upper floor layer, under turf colla	G/S	Hordeum sp.	General	0.05	1145	20	AMS	-	-	880	964	777	973	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [TUN]	HRB-TUN UCIAMS-64174	Midden deposit	Infill above hall, below deposit 39	G/S	Hordeum sp.	General	0.05	1080	25	AMS	-	-	901	995	895	1018	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísbrú [TUN]	HRB-TUN UCIAMS-64175	Midden deposit	Infill above hall, contemporary wi	G/S	Hordeum sp.	General	0.05	1115	15	AMS	-	-	897	969	891	978	Between K-920/Eldgjá? and H-1500	post-Landnám	10
Hrísheimar	HRH AA-49627	Pit house [H]	Midden, upper fill	B-T	Bos sp.	General	0.05	1150	35	AMS	-20.7	2.3	778	967	775	973	post-V-Sv	post-Landnám	7
Hrísheimar	HRH AA-49628	Pit house [H]	Midden, upper fill	B-T	Bos sp.	General	0.05	1135	45	AMS	-21	-	779	982	774	990	post-V-Sv	post-Landnám	7
Hrísheimar	HRH AA-49629	Pit house [H]	Upper midden fill	B-T	Bos sp.	General	0.05	1135	45	AMS	-20.2	-	880	974	777	986	post-V-Sv	post-Landnám	7
Hrísheimar	HRH SUERC-3439	Pit house [H]	Midden, upper fill	B-T	Sus sp., juvenile	General	0.05	1085	35	AMS	-21.1	2.3	898	995	891	1019	post-V-Sv	post-Landnám	7
Hrísheimar	HRH SUERC-3441	Midden deposit	-	B-T	Bos sp., adult	General	0.05	1095	35	AMS	-21.5	2	896	989	883	1019	Activity post-LTL	Landnám	7
Hrísheimar	HRH SUERC-3442	Midden deposit	-	B-T	Sus sp., juvenile	General	0.05	1120	35	AMS	-20.2	1.3	891	973	777	995	Activity post-LTL	Landnám	7
Hrísheimar	HRH SUERC-3446	Midden deposit	-	B-T	Bos sp., neonatal	General	0.05	1080	35	AMS	-	1	900	1011	892	1020	Activity post-LTL	Landnám	7
Hrísheimar	HRH SUERC-3440	Pit house [H]	Midden, upper fill	B-T	Sus sp., juvenile	General	0.05	1150	40	AMS	-21.4	0.1	778	968	774	978	post-V-Sv	post-Landnám	8
Hrísheimar	HRH SUERC-3445	Deposit [area L]	Midden, upper fill	B-T	Bos sp., neonatal	General	0.05	1090	35	AMS	-20.9	1.5	898	991	888	1018	Activity post-LTL	Landnám	8
Hrísheimar	HRH SUERC-6431	Deposit [area L]	Midden, lower fill	B-T	Bos sp., adult	General	0.05	1220	35	AMS	-21.5	-0.4	724	875	688	889	Between LTL and V-Sv	Landnám	8
Hrísheimar	HRH SUERC-6432	Deposit [area L]	Midden, lower fill	B-T	Bos sp., adult	General	0.05	1200	35	AMS	-21.4	1.5	774	876	694	944	Between LTL and V-Sv	Landnám	8
Hrísheimar	HRH SUERC-6433	Deposit [area L]	Midden, upper fill	B-T	Bos sp., adult	General	0.05	1120	35	AMS	-21.7	0	891	973	777	995	Between V-Sv and H-1104	post-Landnám	8
Hrísheimar	HRH SUERC-6437	Deposit [area L]	Midden, upper fill	B-T	Bos sp., adult	General	0.05	1120	35	AMS	-20.7	1.8	891	973	777	995	Between V-Sv and H-1104	post-Landnám	8
Hvaleyri í Hafnarfirði	HVE Beta-213421	Midden deposit	-	W-LL	Betula sp.	Charcoal Plus	1	1160	40	CON	-28.1	-	777	946	770	980	-	Viking Age	40
Hvaleyri í Hafnarfirði	HVE Beta-213422	Midden deposit	-	W-LL	Betula sp.	Charcoal Plus	1	1140	40	AMS	-26	-	779	975	775	985	-	Viking Age	40
Hvítárholt	HTH K-1243	Structure [III]	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	970	100	CON	-	-	984	1184	780	1267	Between LTL and H-1104	Landnám	4
í Geirlandsheiði	GLH Beta-236719	Hall	-	Ch-U	-	Charcoal Plus	1	980	40	AMS	-26.7	-	1016	1151	992	1156	post-Eldgjá	post-Landnám	35
innan við Faxagil	FXG U-4328	-	-	Ch-U	-	Charcoal Plus	1	1030	65	CON	-	-	899	1147	779	1165	Between LTL and H-1158	Landnám	4, 34
Írskubúðir	IKB Beta-117298	Structure	-	W-LL	Betula sp.	Charcoal Plus	1	1070	60	AMS	-25.1	-	895	1021	776	1147	-	Viking Age	43
Kjartansstaðir	KTS UCIAMS-77360	Midden deposit	-	G/S	Hordeum, charred	General	0.05	1080	15	AMS	-	-	904	993	899	1014	Between V-Sv and Vj	post-Landnám	3
Kópavogsþingstaður	KVS HAR 2155	-	-	W-LL	Betula sp.	Charcoal Plus	1	1180	130	CON	-	-	695	976	615	1151	-	Viking Age	4
Kuða	KUD 1	-	-	Ch-U	-	Charcoal Plus	1	995	30	AMS	-	-	994	1118	986	1153	Between V-Sv and H-1300	post-Landnám	44
Langanes II (CP1)	LNG-CP1 SUERC-2376	Charcoal pit	903 C.4 CS.A	W-SL	Betula sp./bark	General	0.05	1130	35	AMS	–28.1	-	885	974	777	989	Between Eldgjá and H-1341	post-Landnám	19
Langanes II (CP1)	LNG-CP1 SUERC-8217	Charcoal pit	903 C.4 CS.B	W-SL	Betula sp./outer ring an	General	0.05	1135	35	AMS	–29.9	-	880	974	777	986	Between Eldgjá and H-1341	post-Landnám	19
Langanes II (CP1)	LNG-CP1 SUERC-8218	Charcoal pit	903 C.4 CS.C	W-SL	Betula sp./outer ring an	General	0.05	1145	35	AMS	–30.8	-	779	970	776	979	Between Eldgjá and H-1341	post-Landnám	19
Langanes III (CP4)	LNG-CP4 SUERC-8227	Charcoal pit	903 C.2 CS.A	W-SL	Betula sp./outer 5 rings	General	0.05	990	35	AMS	–26.6	-	997	1147	986	1155	Between Eldgjá and H-1341	post-Landnám	19
Langanes III (CP4)	LNG-CP4 SUERC-8228	Charcoal pit	903 C.2 CS.B	W-SL	Betula sp./outer 5 rings	General	0.05	1065	35	AMS	–26.4	-	904	1019	894	1024	Between Eldgjá and H-1341	post-Landnám	19
Langanes III (CP4)	LNG-CP4 SUERC-8229	Charcoal pit	903 C.2 CS.C	W-SL	Betula sp./outer 7 rings	General	0.05	1075	35	AMS	–27.3	-	902	1016	893	1020	Between Eldgjá and H-1341	post-Landnám	19
Langanes IV (AS1)	LNG-AS1 SUERC-8239	Charcoal pit	903 CS.B	W-SL	Betula sp./outer 10 ring	General	0.05	1050	35	AMS	–27.5	-	971	1022	896	1031	Between Eldgjá and H-1341	post-Landnám	19
Langanes IV (AS1)	LNG-AS1 SUERC-8240	Charcoal pit	903 CS.C	W-SL	Betula sp./outer 14 ring	General	0.05	1080	35	AMS	–27.8	-	900	1011	892	1020	Between Eldgjá and H-1341	post-Landnám	19
Langanes V (AS2)	LNG-AS2 SUERC-2381	Charcoal pit	903 CS.A	W-SL	Betula sp./outer 11 ring	General	0.05	1005	35	AMS	–27.6	-	988	1116	972	1154	Between Eldgjá and H-1341	post-Landnám	19
Langanes V (AS2)	LNG-AS2 SUERC-8241	Charcoal pit	903 CS.B	W-SL	Betula sp./outer 15 ring	General	0.05	1110	35	AMS	–27.0	-	894	980	778	1018	Between Eldgjá and H-1341	post-Landnám	19
Langanes V (AS2)	LNG-AS2 SUERC-8242	Charcoal pit	903 CS.C	W-SL	Betula sp./outer 11 ring	General	0.05	1075	35	AMS	–27.8	-	902	1016	893	1020	Between Eldgjá and H-1341	post-Landnám	19
Litla Gröf	LGF 1	Midden deposit	-	G/S	Seed-U	General	0.05	1105	15	AMS	-	-	900	974	894	985	pre-Vj	Viking Age	2
Marbæli 1	MRB UCIAMS-49331	Structure	Collapsed turf layer	G/S	Hordeum, charred	General	0.05	1070	20	AMS	-	-	970	1015	900	1019	Between LTL and mid-tenth century (	Landnám	3
Markarfljót Valley (REU17)	MKF-REU17 SUERC-2373	Charcoal pit	C.1 CS.A	W-SL	Betula sp./bark	General	0.05	1095	35	AMS	–29.6	-	896	989	883	1019	Between Eldgjá and H-1341	post-Landnám	19
Markarfljót Valley (REU17)	MKF-REU17 SUERC-8209	Charcoal pit	C.1 CS.B	W-SL	Betula sp./outer ring an	General	0.05	1115	35	AMS	–29.3	-	893	975	778	1015	Between Eldgjá and H-1341	post-Landnám	19
Markarfljót Valley (REU17)	MKF-REU17 SUERC-8210	Charcoal pit	C.1 CS.C	W-SL	Betula sp./outer ring an	General	0.05	1090	35	AMS	–26.5	-	898	991	888	1018	Between Eldgjá and H-1341	post-Landnám	19
Meðalheimur	MLH 1	-	-	Ch-U	-	Charcoal Plus	1	1145	15	AMS	-	-	894	968	887	981	pre-Vj	Viking Age	2
Meðalheimur	MLH 2	-	-	G/S	Hordeum, charred	General	0.05	1120	20	AMS	-	-	882	951	777	971	pre-Vj	Viking Age	2
Mjóeyri við Reyðarfjörð	MVR Beta-236720	Structure [16]	Hearth	W-LL	Betula sp.	Charcoal Plus	1	1120	40	AMS	-25.6	-	889	979	777	1013	Between LTL and Ö-1362	Landnám	41
Mjóeyri við Reyðarfjörð	MVR Beta-236721	Structure [16]	Hearth	W-LL	Betula sp.	Charcoal Plus	1	1170	40	AMS	-25.7	-	776	938	730	972	Between LTL and Ö-1362	Landnám	41
Naust	NAU Beta-223443	Deposit (Trench 2)	-	W-LL	Betula sp.	Charcoal Plus	1	1060	40	AMS	-25.1	-	904	1021	892	1028	Between V-Sv and H-1104	post-Landnám	45

Oddstaðir	ODO SUERC-27385	Deposit	Midden, above context 144	B-T	Terrestrial mammal	General	0.05	1140	30	AMS	-20.2	-	880	970	777	981	pre-H-1104	Viking Age	22
Oddstaðir	ODO SUERC-27390	Deposit	Midden deposit	B-T	Terrestrial mammal	General	0.05	1005	30	AMS	-21.4	-	990	1039	978	1151	pre-H-1104	Viking Age	22
Pálstóftir	PLT Beta 215979	Structure [II]	-	B-T	Anserini	General	0.05	1000	50	AMS	-21.1	-	986	1150	901	1161	Between V-Sv and H-1104	post-Landnám	13
Pálstóftir	PLT Beta 215983	Structure [III]	-	B-T	Ovis sp.	General	0.05	1080	40	AMS	-20.5	-	900	1012	885	1024	Between V-Sv and H-1104	post-Landnám	13
Pálstóftir	PLT Beta 215984	Structure [II]	-	B-T	Ovis sp.	General	0.05	1060	40	AMS	-21	-	904	1021	892	1028	Between V-Sv and H-1104	post-Landnám	13
Pálstóftir	PLT Beta 216811	Structure [II]	-	B-T	Ovis sp.	General	0.05	1000	40	AMS	-20.8	-	989	1147	975	1155	Between V-Sv and H-1104	post-Landnám	13
Reykholt	RKH RCD-47	Structure	Hearth (89-S36)	W-LL	Betula sp.	Charcoal Plus	1	1160	60	AMS	-	-	776	953	694	994	post-LTL	Landnám	23
Reykholt	RKH SUERC-5119	Structure	Bottom floor layer (87-S1)	W-LL	Betula sp.	Charcoal Plus	1	1130	35	AMS	-28	-	885	974	777	989	post-LTL	Landnám	23
Reykholt	RKH SUERC-5123 a	Midden deposit	Early charcoal pit (02-56)	W-LL	Betula sp./salix	Charcoal Plus	1	990	35	AMS	-27.25	-	997	1147	986	1155	post-LTL	Landnám	23
Reykholt	RKH SUERC-5123 b	Structure	Bottom floor layer (87-S2)	W-LL	Betula sp.	Charcoal Plus	1	1115	35	AMS	–28.3	-	893	975	778	1015	post-LTL	Landnám	23
Reykholt	RKH SUERC-57018	Structure	Church	25-25	W-LL	Betula sp.	Charcoal Plus	1	998	29	AMS	-	-	994	1116	985	1152	post-LTL	Landnám	23
Reykholt	RKH SUERC-8207	Structure	Hearth in earliest layers (89-S25)	G/S	Hordeum sp., charred	General	0.05	975	35	AMS	-23.6	-	1018	1150	997	1155	post-LTL	Landnám	23
Reykholt	RKH SUERC-8890	Structure	Hearth in earliest layers (89-S25)	G/S	Hordeum sp., charred	General	0.05	990	90	AMS	-23.6	-	974	1161	780	1252	post-LTL	Landnám	23
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7610	Hall	Fill of temp. Hearth	G/S	Hordeum sp.	General	0.05	1102	35	AMS	-21.44	-	896	986	780	1019	Between LTL and K-1500	Landnám	46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7618	Hall	Fill of hearth	W-LL	Betula sp.	Charcoal Plus	1	1082	37	AMS	-25.71	-	899	996	890	1020	Between LTL and K-1500	Landnám	46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7611	Hall	Upper fill of longfire	G/S	Hordeum sp.	General	0.05	1092	39	AMS	-25.63	-	896	992	780	1023	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7612	Hall	Lower fill of longfire	G/S	Hordeum sp.	General	0.05	1150	36	AMS	-23.94	-	778	967	775	974	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7613	Hall	Upper lower fill of longfire	G/S	Hordeum sp.	General	0.05	1087	35	AMS	-25	-	898	993	890	1018	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7614	Hall	Bottom fill of longfire	G/S	Hordeum sp.	General	0.05	1218	40	AMS	-25.9	-	724	878	684	893	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7615	Hall	Floor deposit N of longfire	G/S	Hordeum sp.	General	0.05	1153	36	AMS	-25.21	-	778	965	775	971	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7616	Hall	Upper floor deposit, E of longfire	G/S	Hordeum sp.	General	0.05	1129	35	AMS	-24.32	-	885	975	777	990	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7617	Hall	Lower floor deposit, W of longfire	G/S	Hordeum sp.	General	0.05	1152	36	AMS	-23.42	-	778	966	775	972	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7619	Hall	Upper fill of hearth	W-LL	Betula sp.	Charcoal Plus	1	1282	35	AMS	-24.83		679	767	657	858	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7620	Hall	Lower fill of hearth	W-LL	Betula sp.	Charcoal Plus	1	1184	35	AMS	-25.29	-	777	885	721	965	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7621	Hall	Upper lower fill of hearth	W-LL	Betula sp.	Charcoal Plus	1	1210	33	AMS	-26.35	-	771	877	691	893	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7622	Hall	Bottom fill of hearth	W-LL	Betula sp.	Charcoal Plus	1	1262	35	AMS	-26.35		689	770	667	868	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7623	Hall	Floor deposit N of hearth	W-LL	Betula sp.	Charcoal Plus	1	1226	33	AMS	-27.98	-	719	869	689	885	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7624	Hall	Upper floor deposit, E of hearth	W-LL	Betula sp.	Charcoal Plus	1	1192	36	AMS	-25.88	-	776	879	712	962	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST AAR-7625	Hall	Lower floor deposit, W of longfire	W-LL	Betula sp.	Charcoal Plus	1	1236	35	AMS	-27.31	-	692	863	685	881	Between LTL and K-1500	Landnám	12, 46
Reykjavík: Aðalstræti 14-18	RKV-AST K-940	Deposit	Annexe?	W-LL	Betula sp.	Charcoal Plus	1	1340	100	CON	-	-	591	801	434	948	Activity post-LTL	Landnám	4, 26
Reykjavík: Aðalstræti 14-18	RKV-AST U-2530	Deposit	Bottom of the section G-H; under	W-LL	Betula sp.	Charcoal Plus	1	1330	80	CON	-		625	773	570	886	Activity post-LTL	Landnám	4, 26
Reykjavík: Aðalstræti 14-18	RKV-AST U-2592	Deposit	Floor with wood chips; annexe?	W-LL	Betula sp.	Charcoal Plus	1	1140	90	CON	-	-	777	982	675	1030	Activity post-LTL	Landnám	4, 26
Reykjavík: Aðalstræti 14-18	RKV-AST U-2617	Deposit	Under annexe: bottom of section (	W-LL	Betula sp.	Charcoal Plus	1	1280	120	CON	-	-	652	882	548	996	Activity post-LTL	Landnám	4, 26
Reykjavík: Althingisreiturinn	RKV-ADR Beta-346805	Midden deposit [Area	Tra-64	W-LL	Betula sp.	Charcoal Plus	1	1295	25	AMS	-25.4		673	764	664	769	Between LTL and R-1226	Landnám	25
Reykjavík: Althingisreiturinn	RKV-ADR Beta-346806	Midden deposit [Area	Tra-65	W-LL	Betula sp.	Charcoal Plus	1	1565	25	AMS	-19.6		430	538	421	551	Between LTL and R-1226	Landnám	25
Reykjavík: Althingisreiturinn	RKV-ADR ARR-12759	Midden deposit	Pit 38770	W-LL	Betula sp.	Charcoal Plus	1	1210	23	AMS	-26.67	-	772	869	722	887	Between LTL and R-1226	Landnám	24, 25
Reykjavík: Grjótagata	RKV-GTG K-949	-	-	W-LL	Betula sp., mixed	Charcoal Plus	1	1340	100	CON	-	-	591	801	434	948	-	Viking Age	4
Reykjavík: Suðurgata 3-5	RKV-SGT U-2534	Hall, older	Under the NW wall, greasy layer	W-LL	Betula sp.	Charcoal Plus	1	1000	75	CON	-		975	1154	889	1210	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2671	Smithy, older	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1150	55	CON	-	-	778	968	721	1012	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2672	Smithy, older	Charcoal layer in the smithy	W-LL	Betula sp.	Charcoal Plus	1	1345	60	CON	-		641	766	571	860	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2674	Granery, younger	-	G/S	Mixed deposit including	General	0.05	1060	55	CON	-	-	899	1023	778	1150	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2676	Hall, older	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1260	55	CON	-	-	671	857	661	886	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2677	Slabhouse	Posthole at slab, NE wall	W-LL	Betula sp.	Charcoal Plus	1	1250	100	CON	-	-	672	878	621	988	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2678	Smithy, older	Inside the threshold	W-LL	Betula sp./bark mixed d	Charcoal Plus	1	1210	260	CON	-	-	575	1147	258	1282	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2679	Hall, older	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1080	60	CON	-	-	895	1017	774	1115	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2680	Midden deposit, early	Bottom wood-chip layer, under co	W-LL	Betula sp.	Charcoal Plus	1	1375	70	CON	-		596	764	478	861	Activity post-LTL	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2681	Hall, older	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1255	65	CON	-	-	674	862	653	941	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2682	Smithy, older	Treshold, inside the doorway	W-LL	Betula sp.	Charcoal Plus	1	1090	80	CON	-	-	779	1025	719	1152	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2719	Smithy, older	Trunk from the floor	W-LL	Betula sp.	Charcoal Plus	1	1360	60	CON	-		613	764	563	774	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2720	Midden deposit, early	Stake under and at the lower edge	W-LL	Betula sp.	Charcoal Plus	1	1270	90	CON	-	-	663	865	619	969	Activity post-LTL	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2721	Smithy, older	Floor layer	W-LL	Betula sp.	Charcoal Plus	1	1050	85	CON	-	-	886	1147	771	1165	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2739	Midden deposit, early	Charcoal lalyer over wood-chip la	W-LL	Betula sp.	Charcoal Plus	1	1310	70	CON	-		651	771	610	884	Activity post-LTL	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2740	Smithy, younger	Sec. O-P: upper charcoal l.	W-LL	Betula sp.	Charcoal Plus	1	1280	65	CON	-		659	801	645	890	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2741	Midden deposit, early	SE side of the smithy	W-LL	Betula sp.	Charcoal Plus	1	1330	40	CON	-		652	764	643	770	Activity post-LTL	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2742	Smithy, younger	Sec. O-P: lower charcoal l.	W-LL	Betula sp.	Charcoal Plus	1	1150	60	CON	-	-	778	969	717	1015	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2743	Midden deposit, early	Stake under and at the lower edge	W-LL	Betula sp.	Charcoal Plus	1	1140	65	CON	-	-	778	978	714	1020	Activity post-LTL	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2744	Hall, older	Early charcoal layer	W-LL	Betula sp.	Charcoal Plus	1	1245	60	CON	-	-	684	864	659	940	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2745	Hall, older	Under a stone slab in the doorway	W-LL	Betula sp.	Charcoal Plus	1	1275	60	CON	-		662	800	653	885	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2746	Hall, older	Between the two layers of the hea	W-LL	Betula sp.	Charcoal Plus	1	1090	65	CON	-	-	889	1017	770	1118	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2747	Hall, older	Charcoal l., SW wall	W-LL	Betula sp.	Charcoal Plus	1	1245	80	CON	-	-	682	870	652	968	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 3-5	RKV-SGT U-2748	Hall, older	Charcoal l., SW wall	W-LL	Betula sp.	Charcoal Plus	1	1250	65	CON	-	-	678	864	655	944	Between LTL and K-1500	Landnám	4, 26
Reykjavík: Suðurgata 7	RKV-SGT K-4271	-	-	W-LL	Betula sp.	Charcoal Plus	1	1110	75	CON	-	-	779	1017	695	1115	Activity post-LTL	Landnám	4
Reykjavík: Tjarnargata 4	RKV-TRG U-2082	-	-	W-LL	Larch	Charcoal Plus	1	1140	70	CON	-	-	778	979	695	1021	-	Viking Age	4
Reykjavík: Tjarnargata 4	RKV-TRG U-2167	-	-	W-LL	Betula sp.	Charcoal Plus	1	1190	90	CON	-	-	715	962	665	995	-	Viking Age	4
Reynistaður 1	RIS 1	Structure	Small hearth inside structure 9	W-LL	Betula sp.	Charcoal Plus	1	1110	60	AMS	-	-	880	1031	775	1021	pre-Vj	Viking Age	2
Reynistaður 1	RIS 1 UCIAMS-62807	-	-	G/S	Caryophyllaceae, charre	General	0.05	1205	20	AMS	-	-	880	1013	775	1021	Between LTL and mid-tenth century (	Landnám	3
Reynistaður 2 (Langhúshóll)	RIS 2 AA-46687	-	4-063-009	W-LL	Betula sp.	Charcoal Plus	1	1189	32	AMS	-28.8	-	778	880	719	950	Between LTL and Vj	Landnám	3
Reynistaður 2 (Langhúshóll)	RIS 2 RISL Beta-167781	-	4-063-009	W-LL	Betula sp.	Charcoal Plus	1	1160	60	AMS	-28.4	-	776	953	694	994	pre-Vj	Viking Age	21
Sámsstaðir	SMS Ua-1425	Later house	-	W-LL	Betula sp./bark mixed d	Charcoal Plus	1	1150	50	CON	-	-	778	968	726	993	Post-Eldgjá	post-Landnám	4
Selhagi	SLH AA-49631	Deposit	Midden, upper layer	B-T	Bos sp.	General	0.05	995	45	AMS	-20.8	-	991	1148	970	1160	Between LTL and H-1104/H-1158?	Landnám	29
Sílastaðir	SIL ARR-5907	Burial	Vikisl-52	B-T	Equus sp.	General	0.05	1155	43	AMS	–21.92	0.4	778	961	770	985	-	Viking Age	6
Skuggi	SKO SUERC-27379	Deposit	Midden, basal layer, above collaps	B-T	Terrestrial mammal	General	0.05	1025	30	AMS	-20.7	-	990	1024	903	1146	Between LTL and H-1104	Landnám	22
Skuggi	SKO SUERC-27380	Deposit	Midden, basal layer	B-T	Terrestrial mammal	General	0.05	1015	30	AMS	-21	-	990	1030	971	1149	Between LTL and H-1104	Landnám	22
Skútustaðir	SKT SUERC-20218	Deposit [E2]	Midden, basal layer	B-T	Bos sp.	General	0.05	1215	30	AMS	-22.1	5.7	769	874	694	889	Between LTL and V-Sv	Landnám	47
Skútustaðir	SKT SUERC-20219	Deposit [E1]	Midden, basal layer	B-T	Ovis sp.	General	0.05	1040	30	AMS	-21.4	2.6	986	1021	901	1033	Between V-Sv and K-1262	post-Landnám	47
Skútustaðir	SKT SUERC-54611	Deposit [E2]	Midden, basal layer	B-T	Bos sp.	General	0.05	1060	29	AMS	-22.3	-	970	1019	898	1024	Activity post-LTL	Landnám	27, 28

Skútustaðir	SKT SUERC-54613	Deposit [G]	Midden deposit	B-T	Bos sp.	General	0.05	1070	29	AMS	-21.7	-	906	1016	896	1021	post-V-Sv	post-Landnám	27, 28
Skútustaðir	SKT SUERC-54614	Deposit [G]	Midden deposit	B-T	Bos sp.	General	0.05	1082	30	AMS	-21.5	-	900	995	894	1018	post-V-Sv	post-Landnám	27, 28
Skútustaðir	SKT SUERC-54618	Deposit [G]	Midden deposit	B-T	Bos sp.	General	0.05	1137	30	AMS	-21.7	-	883	970	777	984	post-V-Sv	post-Landnám	27, 28
Skútustaðir	SKT SUERC-54619	Deposit [G]	Midden deposit	B-T	Bos sp.	General	0.05	1062	30	AMS	-21.3	-	969	1019	897	1024	post-V-Sv	post-Landnám	27, 28
Skútustaðir	SKT SUERC-54622	Deposit [G]	Midden deposit	B-T	Ovis sp./Capra sp.	General	0.05	1027	30	AMS	-21.4	-	990	1024	902	1119	post-V-Sv	post-Landnám	27, 28
Skútustaðir	SKT SUERC-54623	Deposit [G]	Midden deposit	B-T	Capra sp.	General	0.05	986	29	AMS	-21.1	-	1016	1147	991	1154	post-V-Sv	post-Landnám	27, 28
Skútustaðir	SKT SUERC-54624	Deposit [G]	Midden deposit	B-T	Ovis sp./Capra sp.	General	0.05	1121	31	AMS	-21.1	-	893	970	777	994	post-V-Sv	post-Landnám	27, 28
Skútustaðir	SKT SUERC-59997	Deposit	Midden deposit	B-T	Bos sp.	General	0.05	1000	29	AMS	-21.1	-	993	1115	984	1151	Between V-Sv and H-1104/H-1158	post-Landnám	27, 28
Skútustaðir	SKT SUERC-59998	Deposit	Midden deposit	B-T	Bos sp.	General	0.05	975	29	AMS	-21	-	1020	1147	1014	1155	Between V-Sv and H-1104/H-1158	post-Landnám	27, 28
Skútustaðir	SKT SUERC-60003	Deposit	Midden deposit	B-T	Bos sp.	General	0.05	1058	29	AMS	-21.2	-	971	1019	898	1024	Between V-Sv and H-1104/H-1158	post-Landnám	27, 28
Skútustaðir	SKT SUERC-60004	Deposit	Midden deposit	B-T	Bos sp.	General	0.05	1166	26	AMS	-21.8		778	938	773	961	Between V-Sv and H-1104/H-1158	post-Landnám	27, 28
Skútustaðir	SKT SUERC-60005	Deposit	Midden deposit	B-T	Bos sp.	General	0.05	1086	29	AMS	-21.4	-	900	991	894	1016	Activity post-LTL	Landnám	27, 28
Skútustaðir	SKT SUERC-60006	Deposit	Midden deposit	B-T	Bos sp.	General	0.05	991	26	AMS	-21.5	-	1013	1119	990	1152	Activity post-LTL	Landnám	27, 28
Skútustaðir	SKT SUERC-60279	Deposit	Midden deposit	B-T	Bos sp.	General	0.05	1093	31	AMS	-21.7	-	898	989	890	1015	Activity post-LTL	Landnám	27, 28
Smiðjuskógur	SMI U-2517	-	-	W-LL	Birch sp.	Charcoal Plus	1	970	60	CON	-	-	1017	1154	972	1212	-	Viking Age	17
Sólheimar	SOL Beta-223444	Hall	-	Ch-U	-	Charcoal Plus	1	1040	40	AMS	-27	-	970	1028	893	1119	pre-Eldgjá/post-Eldgjá?	Viking Age	35
Stöng	STG K-5014	-	-	Ch-U	-	Charcoal Plus	1	1220	50	CON	-	-	719	881	673	944	Between Eldgjá and H-1104	post-Landnám	4
Stöng	STG Ua-1427	-	-	W-LL	Betula sp.	Charcoal Plus	1	1120	50	AMS	-	-	782	990	776	1015	Between Eldgjá and H-1104	post-Landnám	4
Stöng	STG Ua-1428	-	-	W-LL	Betula sp.	Charcoal Plus	1	1205	50	AMS	-	-	726	888	683	961	Between Eldgjá and H-1104	post-Landnám	4
Stóra Gröf	SGF UCIAMS-77359	Midden depsoit	Ash layer below midden deposit	W-LL	Hardwood	Charcoal Plus	1	1130	15	AMS	-	-	892	962	886	972	Between LTL and Vj	Landnám	3
Stóra Gröf Ytri	SGFY 1	-	-	W-LL	Hardwood	Charcoal Plus	1	1130	15	AMS	-	-	892	962	886	972	pre-H-1104	Viking Age	2
Stóra Seyla 1 (Lower)	SSL 1	-	-	G/S	Hordeum sp., charred	General	0.05	1125	15	AMS	-	-	894	965	889	971	pre-V-Sv	Viking Age	2
Stóra Seyla 1 (Lower)	SSL 2	-	-	G/S	Caryophyllaceae, uncha	General	0.05	1170	25	AMS	-	-	777	893	772	951	Between V-Sv and Vj	post-Landnám	2
Stóra Seyla 1 (Lower)	SSL AA-55485	-	-	B-T	Ovis sp.	General	0.05	1012	43	AMS	-20.36	-	980	1119	901	1155	pre-H-1104	Viking Age	21
Surtshellir	SURT AAR-7412	Cave deposit	Top layer	B-T	Bos sp.	General	0.05	1214	41	AMS	-20.83	-	727	880	685	939	post-LTL	Landnám	5
Surtshellir	SURT AAR-7413	Cave deposit	Bottom layer	B-T	Bos sp.	General	0.05	1197	36	AMS	-21.92	-	775	877	695	947	post-LTL	Landnám	5
Sveigakot	SVK Beta-134144	Deposit [M]	Upper midden	B-T	Bos sp.	General	0.05	1120	40	AMS	-21	-	889	979	777	1013	post-V-Sv	post-Landnám	12
Sveigakot	SVK Beta-134146	Deposit [M]	Lower midden	B-T	Bos sp.	General	0.05	1100	40	AMS	-21	-	895	987	778	1022	Between LTL and V-Sv	Landnám	12
Sveigakot	SVK Beta-146583	Pit house [T]	Upper fill of pit house	B-T	Bos sp.	General	0.05	1040	40	AMS	-22.7	-	970	1028	893	1119	Activity post-LTL	Landnám	12
Sveigakot	SVK Beta-146584	Pit house [T]	Upper fill of pithouse	B-T	Bos sp.	General	0.05	1010	40	AMS	-21.5	-	983	1118	903	1155	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-27394	Structure [MP3]	Fill of structure	B-T	Sus sp.	General	0.05	1210	30	AMS	-20.1	-	771	875	695	891	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-27395	Structure [MP1]	Floor layer	B-T	Bos sp.	General	0.05	1105	30	AMS	-21	-	897	981	884	1013	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-27399	Pit house [T]	End of house [I]	B-T	Bos sp.	General	0.05	1060	30	AMS	-20.8	-	970	1019	897	1024	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-27400	Hall [S4]	Deposit, southern doorway	B-T	Bos sp.	General	0.05	1075	30	AMS	-21.1	-	902	1015	894	1020	post-V-Sv	post-Landnám	12
Sveigakot	SVK SUERC-27401	Pit house [T]	Start of house [I]	B-T	Ovis sp.	General	0.05	1100	30	AMS	-21.2	-	898	985	887	1013	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-27402	Pit house [T]	Layer outside house [II]	B-T	Bos sp.	General	0.05	1095	30	AMS	-21.1	-	899	987	890	1013	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-27403	Area [M/T]	Wall of house [II]	B-T	Ovis sp.	General	0.05	1015	30	AMS	-20.9	-	990	1030	971	1149	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-27404	Area [M/T]	Levelling layer	B-T	Bos sp.?	General	0.05	1110	30	AMS	-21.2	-	895	976	879	1013	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-28652	Structure [MP3]	Fill of structure	B-T	Bos sp.	General	0.05	1050	35	AMS	-21.8	-	971	1022	896	1031	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-28653	Structure [MP3]	Fill of structure	B-T	Ovis sp.	General	0.05	1090	35	AMS	-21.3	-	898	991	888	1018	Activity post-LTL	Landnám	12
Sveigakot	SVK SUERC-28657	Structure [MP3]	Fill of structure	W-SL	Burnt bark	General	0.05	1105	35	AMS	-27.9	-	895	983	779	1019	Activity post-LTL	Landnám	12
Syðsta Mörk (REU 18)	SMK-REU18 SUERC-2374	Charcoal pit	CS.A	W-SL	Outer 2 rings	General	0.05	1150	40	AMS	–27.2	-	778	968	774	978	Between LTL and H-1341	Landnám	19
Syðsta Mörk (REU 18)	SMK-REU18 SUERC-8211	Charcoal pit	CS.B	W-SL	Outer 10 rings	General	0.05	1205	35	AMS	–27.4	-	773	878	692	941	Between LTL and H-1341	Landnám	19
undir Hellisbjargi (Papey island)	HSB U-4014	-	-	W-LL	Birch/larch	Charcoal Plus	1	1090	80	CON	-	-	779	1025	719	1152	pre-Ö-1362	Viking Age	4
Undir Sandmúla	SDM GU-14456	-	-	B-T	Bos sp., adult	General	0.05	1040	35	AMS	-21.6	0.1	977	1024	895	1040	post-V-Sv	post-Landnám	7
Utskalar	UTS SUERC-60008	-	-	B-T	Bos sp.	General	0.05	999	29	AMS	-21.5	-	993	1115	985	1152	-	Viking Age	30
Vatnsfjörður	VSF 1	Farm mound 2	Western edge	W-LL	Betula sp.	Charcoal Plus	1	1220	35	AMS	-	-	724	875	688	889	pre-H-1693	Viking Age	51
Vatnsfjörður	VSF 2	Farm mound 3	Western edge	W-LL	Betula sp.	Charcoal Plus	1	1035	35	AMS	-	-	980	1025	896	1118	pre-H-1693	Viking Age	51
Vatnsfjörður	VSF SUERC-6741	Structure [1]	Floor layer	B-T	Bos sp.	General	0.05	1060	35	AMS	-21.2	-	906	1020	895	1025	pre-H-1693	Viking Age	51
Víðgelmir	VGM AAR-3962	Cave deposit	Deposit	Ch-U	-	Charcoal Plus	1	1225	30	AMS	-27	-	721	869	690	885	post-LTL	Landnám	48
Víðgelmir	VGM AAR-4249	Cave deposit	Deposit	B-T	Bos sp.	General	0.05	1088	20	AMS	-20.6	-	901	989	894	1013	post-LTL	Landnám	48
Víðgelmir	VGM AAR-4249.1	Cave deposit	Deposit	B-T	Bos sp.	General	0.05	1089	31	AMS	-20.6	-	899	991	893	1015	post-LTL	Landnám	48
Víðgelmir	VGM AAR-4249.2	Cave deposit	Deposit	B-T	Bos sp.	General	0.05	1088	27	AMS	-20.6	-	900	990	893	1015	post-LTL	Landnám	48
Vogur	VOG Beta-302066	-	-	Ch-U	-	Charcoal Plus	1	1030	30	AMS	-27.9	-	989	1023	901	1116	Between LTL and R-1226	Landnám	33
Vogur	VOG Beta-302067	-	-	Ch-U	-	Charcoal Plus	1	1130	30	AMS	-27	-	888	969	777	988	Between LTL and R-1226	Landnám	33
Vogur	VOG Beta-175496	-	-	Ch-U	-	Charcoal Plus	1	1220	40	AMS	-24.9	-	723	877	684	892	Between LTL and R-1226	Landnám	49
Vogur	VOG Beta-330300	Charcoal pit 2	-	W-LL	Betula sp.	Charcoal Plus	1	1080	30	AMS	-25.7	-	901	996	894	1018	Between LTL and R-1226	Landnám	50
Vogur	VOG Beta-330301	Charcoal pit 1	-	W-LL	Betula sp.	Charcoal Plus	1	1120	30	AMS	-25.8	-	893	970	778	995	Between LTL and R-1226	Landnám	50
Ytri-Neslönd	YNL SUERC-2017	Burial	-	B-T	Equus sp.	General	0.05	1175	35	AMS	-21.8	2.7	777	890	730	968	-	Viking Age	6, 7, 8
Ytri-Neslönd	YNL SUERC-2661	Burial	-	B-T	Equus sp.	General	0.05	1200	35	AMS	-21.7	2	774	876	694	944	-	Viking Age	6, 7, 8
Ytri-Þorsteinsstaðir	YDS Lu-2999	Midden deposit	Charcoal/slag deposit	W-LL	Betula sp.	Charcoal Plus	1	1140	50	AMS	-	-	778	977	770	1012	-	Viking Age	4
Ytri-Þorsteinsstaðir	YDS Lu-3000	Midden deposit	Charcoal/slag deposit	W-LL	Betula sp.	Charcoal Plus	1	1150	50	AMS	-	-	778	968	726	993	-	Viking Age	4
Þjótandi við Þjórsá	DVD Beta-236723	Structure [4:5:1]	-	W-LL	Salix sp.	Charcoal Plus	1	1120	40	AMS	-27.5	-	889	979	777	1013	post-LTL	Landnám	15
Þjótandi við Þjórsá	DVD Beta-236724	Structure [4:5:1]	-	W-LL	Betula sp.	Charcoal Plus	1	1130	40	AMS	-27	-	880	981	776	990	post-LTL	Landnám	15
Þjótandi við Þjórsá	DVD Beta-288070	Structure [4:14a]	-	W-SL	Betula sp./Close to bark	General	0.05	980	40	AMS	-25.8	-	1016	1151	992	1156	post-LTL	Landnám	16
Þórarinsstaðir	DOR T-13780	-	-	Ch-U	-	Charcoal Plus	1	1070	40	CON	-	-	902	1018	890	1025	pre-H-1104	Viking Age	14

How ^{14}C dates on wood charcoal increase precision when dating colonization: the examples of Iceland and Polynesia

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Appendix B. 'OxCal_parser': Input spreadsheet files to automatically import small and large 14C datasets in OxCal
Souce data is divided into six examples from Iceland and New Zealand. The data can be replicated using Bitbucket (https://bitbucket.org/luca_foresta/oxcal_parser)

Start Boundary Label	Calibration Curve	Sample ID	Conventional Radiocarbon Age	Error	Date Type	Outlier Model	P Value	Color	Stratigraphic Block	Block Label	Stratigraphic Block 2	Block Label 2
Start occupation	IntCal13	HST Beta-149404	1130	40	radiocarbon							
		HST SUERC-3429	1160	35	radiocarbon							
		HST SUERC-3430	1170	40	radiocarbon							
		HST SUERC-8618	1110	40	radiocarbon							
		HST SUERC-8619	1110	30	radiocarbon							
		HST SUERC-8623	1130	35	radiocarbon							
		HST SUERC-8624	1080	35	radiocarbon							
		HST Beta-124004	1170	40	radiocarbon							
		HST SUERC-3433	1030	35	radiocarbon							
		HST SUERC-3432	1040	40	radiocarbon							
		HST Beta-149403	1120	40	radiocarbon							

Start Boundary Label	Calibration Curve	Sample ID	Conventional Radiocarbon Ag	Error	Date Type	Outlier Model	P Value	Color	Stratigraphic Block	Block Label	Stratigraphic Block 2	Block Label 2
Start occupation	IntCal13	HST Beta-149404	1130	40	radiocarbon	General	0.05					
		HST SUERC-3429	1160	35	radiocarbon	General	0.05					
		HST SUERC-3430	1170	40	radiocarbon	General	0.05					
		HST SUERC-8618	1110	40	radiocarbon	General	0.05					
		HST SUERC-8619	1110	30	radiocarbon	General	0.05					
		HST SUERC-8623	1130	35	radiocarbon	General	0.05					
		HST SUERC-8624	1080	35	radiocarbon	General	0.05					
		HST Beta-124004	1170	40	radiocarbon	General	0.05					
		HST SUERC-3433	1030	35	radiocarbon	General	0.05					
		HST SUERC-3432	1040	40	radiocarbon	General	0.05					
		HST Beta-149403	1120	40	radiocarbon	General	0.05					

Start Boundary Label	Calibration Curve	Sample ID	Conventional Radiocarbon Ag	Error	Date Type	Outlier Model	P Value	Color	Stratigraphic Block	Block Label	Stratigraphic Block 2	Block Label 2
Start occupation	IntCal13	RKV-AST AAR-7622	1262	35	radiocarbon	Charcoal Plus	1	grey				
		RKV-AST AAR-7614	1218	40	radiocarbon	General	0.05	green				
		RKV-AST AAR-7620	1184	35	radiocarbon	Charcoal Plus	1	grey				
		RKV-AST AAR-7612	1150	36	radiocarbon	General	0.05	green				
		RKV-AST AAR-7621	1210	33	radiocarbon	Charcoal Plus	1	grey				
		RKV-AST AAR-7613	1087	35	radiocarbon	General	0.05	green				
		RKV-AST AAR-7619	1282	35	radiocarbon	Charcoal Plus	1	grey				
		RKV-AST AAR-7611	1092	39	radiocarbon	General	0.05	green				
		RKV-AST AAR-7623	1226	33	radiocarbon	Charcoal Plus	1	grey				
		RKV-AST AAR-7624	1192	36	radiocarbon	Charcoal Plus	1	grey				
		RKV-AST AAR-7625	1236	35	radiocarbon	Charcoal Plus	1	grey				
		RKV-AST AAR-7615	1153	36	radiocarbon	General	0.05	green				
		RKV-AST AAR-7616	1129	35	radiocarbon	General	0.05	green				
		RKV-AST AAR-7617	1152	36	radiocarbon	General	0.05	green				

Start Boundary Label	Calibration Curve	Sample ID	Conventional Radiocarbon Ag	Error	Date Type	Outlier Model	P Value	Color	Stratigraphic Block	Block Label	Stratigraphic Block 2	Block Label 2
Start occupation	IntCal13	V-Sv	938	6	calendar			red	1	Sequence		
		HST Beta-149404	1130	40	radiocarbon	General	0.05	green	2	Sequence		
		HST SUERC-3429	1160	35	radiocarbon	General	0.05	green	3	Phase		
		HST SUERC-3430	1170	40	radiocarbon	General	0.05	green	3	Phase		
		HST SUERC-8618	1110	40	radiocarbon	General	0.05	green	4	Phase		
		HST SUERC-8619	1110	30	radiocarbon	General	0.05	green	4	Phase		
		HST SUERC-8623	1130	35	radiocarbon	General	0.05	green	4	Phase		
		HST SUERC-8624	1080	35	radiocarbon	General	0.05	green	4	Phase		
		HST Beta-124004	1170	40	radiocarbon	General	0.05	green	4	Phase		
		HST SUERC-3433	1030	35	radiocarbon	General	0.05	green	5	Sequence		
		HST SUERC-3432	1040	40	radiocarbon	General	0.05	green	5	Sequence		
		HST Beta-149403	1120	40	radiocarbon	General	0.05	green	5	Sequence		
		Hekla	1104	0	calendar			red	6	Sequence		

Start Boundary Label	Calibration Curve	Sample ID	Conventional Radiocarbon Ag	Error	Date Type	Outlier Model	P Value	Color	Stratigraphic Block	Block Label	Stratigraphic Block 2	Block Label 2
Start occupation	IntCal13	LTL	877	1	calendar			red	1	Sequence	1	Sequence
		RKV-AST AAR-7622	1262	35	radiocarbon	Charcoal Plus	1	grey	2	Phase	1	Sequence(Hearth)
		RKV-AST AAR-7614	1218	40	radiocarbon	General	0.05	green	2	Phase	1	Sequence(Hearth)
		RKV-AST AAR-7620	1184	35	radiocarbon	Charcoal Plus	1	grey	2	Phase	1	Sequence(Hearth)
		RKV-AST AAR-7612	1150	36	radiocarbon	General	0.05	green	2	Phase	1	Sequence(Hearth)
		RKV-AST AAR-7621	1210	33	radiocarbon	Charcoal Plus	1	grey	2	Phase	1	Sequence(Hearth)
		RKV-AST AAR-7613	1087	35	radiocarbon	General	0.05	green	2	Phase	1	Sequence(Hearth)
		RKV-AST AAR-7619	1282	35	radiocarbon	Charcoal Plus	1	grey	2	Phase	1	Sequence(Hearth)
		RKV-AST AAR-7611	1092	39	radiocarbon	General	0.05	green	2	Phase	1	Sequence(Hearth)
		RKV-AST AAR-7623	1226	33	radiocarbon	Charcoal Plus	1	grey	2	Phase	2	Phase(Floor)
		RKV-AST AAR-7624	1192	36	radiocarbon	Charcoal Plus	1	grey	2	Phase	2	Phase(Floor)
		RKV-AST AAR-7625	1236	35	radiocarbon	Charcoal Plus	1	grey	2	Phase	2	Phase(Floor)
		RKV-AST AAR-7615	1153	36	radiocarbon	General	0.05	green	2	Phase	2	Phase(Floor)
		RKV-AST AAR-7616	1129	35	radiocarbon	General	0.05	green	2	Phase	2	Phase(Floor)
		RKV-AST AAR-7617	1152	36	radiocarbon	General	0.05	green	2	Phase	2	Phase(Floor)

Start Boundary Label	Calibration Curve	Sample ID	Conventional Radiocarbon Ag	Error	Date Type	Outlier Model	P Value	Color	Stratigraphic Block	Block Label	Stratigraphic Block 2	Block Label 2
Start occupation	ShCal13	NZ0222	823	40	radiocarbon	General	0.05					
		NZ1167	410	86	radiocarbon	General	0.05					
		NZ1644	775	59	radiocarbon	General	0.05					
		NZ1645	777	59	radiocarbon	General	0.05					
		NZ1647	687	58	radiocarbon	General	0.05					
		NZ1648	681	58	radiocarbon	General	0.05					
		NZ7170	490	30	radiocarbon	General	0.05					
		NZ7171	475	30	radiocarbon	General	0.05					
		NZ7780	481	46	radiocarbon	General	0.05					
		NZ7812	1297	33	radiocarbon	General	0.05					
		NZ7813	538	34	radiocarbon	General	0.05					
		NZ7887	556	71	radiocarbon	General	0.05					
		NZ7888	588	72	radiocarbon	General	0.05					
		NZ7889	891	110	radiocarbon	General	0.05					
		NZ7890	556	89	radiocarbon	General	0.05					
		NZ7891	434	65	radiocarbon	General	0.05					
		Wk2706	940	100	radiocarbon	General	0.05					
		WK3721	510	45	radiocarbon	General	0.05					

How ^{14}C dates on charcoal increase precision when dating colonization: the examples of Iceland and Polynesia

Highlights

- Iceland has a remarkable conjuncture of complementary dating methods
- ^{14}C dataset choices can be tested using independently-dated tephra layers
- ^{14}C dates on charcoal can be used to produce accurate and precise chronologies
- Greatest accuracy comes from an even temporal distribution of ^{14}C dates
- A greater number of ^{14}C dates enhances chronological precision