

Discovery and Settlement of the Azores: Assumptions Regarding Medieval Viking Presence on the Archipelago

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Abstract

The Azores were officially discovered and colonised by the Portuguese in the mid-15th century. Contemporary sources describe the islands as empty when discovered. However, various types of new evidence have led scholars to doubt the traditional narrative. This paper will examine available sources regarding pre-Portuguese presence in the Azores. The focus will be on possible Viking activity on the archipelago. To examine the research question, various types of source material will be discussed. Archaeological sources on the topic include various types of rock formations (e.g. artificial depressions, megalithic structures, rock carvings, *Maroiços*), but also previously excavated materials. Additionally, recent biological findings (e.g. mouse genetics, palaeoecological surveys), which suggest pre-Portuguese human activity, will be analysed. Since previous research has not yet included available historical sources, this study aims to do so and shed new light on the matter from a historical perspective. Findings suggest that pre-Portuguese activity has likely taken place on various occasions stretching from Antiquity to the Middle Ages. The possibility of knowledge transfer concerning the islands' positions from Antiquity to the High Middle Ages is discussed. Assumptions of Viking presence could only be corroborated concerning the Island of São Miguel.

Keywords

Azores, Vikings, Interdisciplinary Research, Island Colonisation, Settlement

1. Introduction

The Azores are a volcanic archipelago in the northern Atlantic Ocean, which consists of nine larger islands. These are, in turn, separated into three distinct groups:

Grupo Ocidental (Corvo and Flores), *Grupo Central* (Faial, Pico, São Jorge, Terceira and Graciosa) and *Grupo Oriental* (Santa Maria and São Miguel). All of the islands cover a surface area of about 2333 km² and even the island closest to the European mainland—St. Maria—exhibits a substantial distance of about 1400 km (Tian, 2017; Yavuz, 2021; Rodrigues et al., 2015). The archipelago was supposedly discovered around 1439 by Portuguese seafarers under the command of Prince Henry the Navigator. Even though the exact circumstances are unclear, as some sources mention different dates (e.g. initial discovery 1427 or 1431/2) or even different discoverers (e.g. initial discovery by merchant Gonalo Velho, who was blown off course onto St. Maria in 1431 or 1432; initial discovery by royal guide Diego de Silves) (Rabinowitz, 2017; Boxer, 1969; Rodrigues et al., 2015; Yavuz, 2021). One of the few relatively certain things regarding the archipelago’s detection is, that seven of the Azorean isles (*Grupo Central* and *Oriental*) were discovered and settled first, while *Grupo Ocidental* was only discovered in 1452 due to its comparatively large distance to the other two island groups (distance between Faial and Flores: about 250 km, compared to <200 km between Terceira and São Miguel) (Yavuz, 2021). According to most written sources, the islands were found completely empty and pristine. No large mammals could be detected on any of the isles. Only seabirds and insects are documented. Consequently, the islands were quickly substantially colonised and already produced notable amounts of corn, vegetable dyes, wood and fish for the mainland at the time of Prince Henry’s death (1460). This economic boom attracted many immigrants from various places (esp. Northern Africa, mainland Europe, Madeira and the Canaries) (Boxer, 1969; Yavuz, 2021) and their strategic position in the midst of the Atlantic accompanied by advantageous currents ensured the preservation of the archipelago’s economic status especially with the beginning of trans-Atlantic trade routes. It led to them being used as “stepping stones” to the Americas and becoming a significant stop over location for loading new supplies as a result (Dartnell, 2019; Cunliffe, 2017).

Status of Research and Research Objectives

Presently, there are only a few historical sources that treat the discovery of the Azorean archipelago, and only a limited amount of research has been conducted since the 1960s, most of which is solely available in Portuguese. The study of Portuguese history without proficiency in the Portuguese language has traditionally been difficult, as most—especially older—research literature has never been translated (de Sousa, 2005). However, most sources conclude that the islands have likely been spotted by seafarers centuries before their official discovery by the Portuguese. While some theories have been posed regarding Phoenician or Roman mariners, many scholars argue that it is more probable that the first visual contact only took place during the 13th or 14th century. During that time, Italian and Catalan seafarers ventured along the North-Western African coast and (re-)discovered, for example, the Canary Islands, which had been known to Roman geographers,

but were possibly forgotten about during the early and high Middle Ages. Even though there is no definite information available regarding the Azorean and Madeira isles, these circumstances lead most authors to assume that the archipelagos must have at least been sighted by these expedition crews (Nicolle, 2012; Boxer, 1969; Yavuz, 2021; Dartnell, 2019). The initial discovery of the Azores has traditionally been especially disputed. However, only a few high-quality studies have examined the topic appropriately (Dames & Seemann, 1903; Rull, 2023b; Rodrigues et al., 2015). As most historical evidence regarding the settlement of the Azores is inconclusive, increasingly multidisciplinary approaches are being applied. Especially paleoecologic and genetic evidence is progressively being generated, but other scientific fields like archaeology and linguistics are also more frequently implemented (Raposeiro et al., 2021; Rodrigues et al., 2015).

Sadly, mostly unclear and dubious results have accompanied the historical studies, which have been conducted to solve questions related to the archipelago's discovery. One of the most provoking sources for the assumption of pre-Portuguese presence on the Azores are the adjacent findings of 3rd century BCE Carthaginian coins (detected 1749) and yet undated pottery fragments (excavated during the 1980s) on the Island of Corvo (Ribeiro et al., 2011; Ribeiro et al., 2017; Pimenta et al., 2013; Isserlin, 1984; Cunliffe, 2017). These discoveries have inspired parts of the scientific community to question the conventional narrative, but only interdisciplinary approaches were able to gather new corroborating data. A few recent studies (late 2010s-2020s) discuss possibilities and implications of pre-Portuguese presence on the Azores based on genetic and palaeoecological data (Rull et al., 2017; Gabriel et al., 2015; Elias et al., 2022; Raposeiro et al., 2022; Raposeiro et al., 2021; Rull, 2023b; Rodrigues et al., 2018). This has led to a resurgence in interest regarding this centuries-old research question and inspired this re-examination of available materials, while including the often disregarded historical sources. The following chapters will discuss available archaeological, biological and historical sources and evidence regarding the possibility of pre-Portuguese human activity in the Azores, mainly in the form of a literature review. In the course of this process, the quality of available evidence shall be examined and future research possibilities be pointed out. Particular focus shall be laid on the role of Norse/Viking sources and evidence concerning possible settlements on the archipelago during the High Middle Ages as proposed by Raposeiro et al. (2021).

2. Archaeological Sources

The first group of discussed sources will be archaeological ones, as most of them have been known and examined for at least 10 - 20 years. While multiple archaeological discoveries related to pre-Portuguese presence have been made on the Azores Islands, especially Terceira, in recent years, only a few of them have been further pursued—most likely due to financing issues—regardless of their potential in answering questions about early human activity. There are no anthropological studies available, due to the extremely bad bone conservation resulting from the

Azorean climate and soil conditions. Recent research on Terceiran cemeteries could show that rapid bone degradation already takes place only 20 years after inhumation (Rodrigues et al., 2023). This may also be attributed to the lack of archaeological excavations.

Nevertheless, various rock carvings and superficial recesses have been discovered since the late 2000s and have been treated in numerous studies (Rodrigues, 2015; Ribeiro et al., 2015; Azevêdo, 2021; Pimenta et al., 2013; Rodrigues et al., 2015; Ribeiro et al., 2017; Rodrigues et al., 2018). One of the leading researchers regarding this topic is Antonieta Costa, who published her findings in her main research work “The Mound of Stones: Azores megalithic rocks and enigmatic inscriptions rearrange the old Atlantic geography” (Lambert Academic Publishing, 2013). Sadly, this work was unobtainable during the research done for this paper, it may have allowed for deeper insights.

2.1. Rock Carvings and Other Artificial Depressions

Most archaeologically relevant structures have been discovered on the Island of Terceira, but no explanations or explanatory approaches for this have been found. Since about 2010, a significant number of rock carvings have been discovered, which has sparked a lively scientific debate concerning their creation. While some scientists doubted that the respective carvings are actually man-made, recent research has been able to verify this hypothesis. Almost all known markings were made on trachytic and trachyandesitic rock, which is formed by volcanic activity and makes up about 80% of Terceira’s rock landscape. Carvings usually exhibit a length of several centimetres to a few decimetres and vary in depth (<2 cm). According to Azevêdo (2021), it is highly unlikely that the shapes were created by natural causes like water streams, as they are too deep and randomly placed. Further studies could also prove that this type of stone is not very susceptible to selective types of erosion (e.g. chemical, mechanical, thermal), rendering many of the posed counterarguments (e.g. grooves were produced by tree roots, high saline content in the air and wind) meaningless, even though a completely certain exclusion of natural causes cannot be made (Azevêdo, 2021).

Most of the carvings represent straight lines in varying degrees to one another, sometimes overlapping and thus creating figures or similar structures. Such shapes have led i.a. Costa (see above) to view them as pictures of boats, snakes and other symbology (e.g. human-shaped figures). Some researchers have compared the display of these carvings to similar rock carving styles found in various Mediterranean cultures (e.g. Phoenician, Carthaginian), but also Northern European ones (e.g. Scandinavian, British) (Azevêdo, 2021; Ribeiro et al., 2015). Certain carvings have also been compared to Neolithic or Copper Age cultures (e.g. northern Portuguese or British carving styles) (Rodrigues, 2015). By optical comparison, the similarity of especially more simple carvings to the Guanche rock art style—indigenous peoples of the Canary Islands—is striking. Rock inscriptions made by this group have been found on five of the seven Canary Islands; they are

usually very short and have been dated from the 3rd century BCE to the 3rd century CE. Very short and separate rock inscriptions are typical for Northern African rock carvings and are frequently documented for Berber-related peoples (Blench, 2018). However, while the Azorean rock engravings exhibit some similarity to the Guanche style, it is very unlikely that this ethnic group has visited the archipelago as their lack of seafaring technology is well documented. It is instead more likely that peoples of the mainland Berber-culture, possibly of Libyco-Berber origin, have reached the islands (Blench, 2018; Barbaza, 2012). Several of the more complex carvings found on Terceira strongly resemble Libyco-Berber rock art found on mainland Northern Africa, especially shapes like (concentric) circles or human-resembling ones, which are relatively frequently documented (Barbaza, 2012). However, compared to the elaborate motifs and arrangements typically found in mainland Africa, the Azorean carvings appear simplistic and almost primitive. This may be attributed to the more humid climate on the islands resulting in stronger vegetation overgrowth and increased erosion (e.g. plant chemicals, damp wind, washout). It could also be a result of knowledge loss regarding the carving of stone art resulting from the reduced amount of overall knowledge typically found in isolated communities. Many of the shorter, deeper and very simplistic carvings found on the Azores are directly comparable to Guanche/Libyco-Berber inscriptions, which were mostly found to signify ritual or burial spaces (Arnaiz-Villena et al., 2020a). Many carvings on Terceira have indeed been associated with other discovered stone structures like hundreds of man-made basins, cupule-like depressions, hypogea and megalithic structures, which are in part thought to resemble passage tombs (Rodrigues, 2015; Azevêdo, 2021; Ribeiro et al., 2017).

The dating of stone carvings, whether it be mainland Northern African ones or Azorean ones, is most of the time not possible and many authors discourage the use of previously generated low-quality ¹⁴C-data in newer research (Arnaiz-Villena et al., 2020b; Blench, 2018). Recent research has, however, been able to date a single man-made bowl-like structure (about square with rounded edges, ca. 52 × 45 cm) found near *Angra do Heroísmo* (Terceira), which was accompanied by multiple carved channels and an engraved spiral-like shape. Due to the presence of crystallised mosquitoes on the base of the basin, the material could be dated via accelerator mass spectrometry (AMS). The dating process revealed the bowl to have been made after about 950 ± 30 years BP, meaning it was probably created around 1020-1160 CE. This is mostly interpreted as secure proof of pre-Portuguese presence on the archipelago, at least during the 11th century. It remains unclear why these structures were created, who created them and to what extent people stayed on the island (Ribeiro et al., 2017; Rodrigues et al., 2015; Raposeiro et al., 2021).

Another recent attempt has been made to bring light into the stone structures of Terceira. Rodrigues et al. (2018) decided to more closely examine cart ruts on the *Passagem das Bestas* ("Passage of the Beasts", Terceira), which were rediscovered in the 1980s, after being mentioned in multiple sources shortly after the

colonisation of the island. The team analysed shape/size/depth, location and orientation of the ruts as well as historical and biological evidence pointing to possible material being transported, cart-types and draught animals being used; they concluded that the ruts were very likely man-made and used to transport heavy materials in animal-pulled (e.g. oxen) carts. The most interesting point of the study is, however, the dating of the wheel tracks. Since at the time of their rediscovery, they were covered in a slight layer of volcanic ashes, Rodrigues et al. conclude that they must have been created before the 15th century, when the island was officially settled, as the only volcanic eruption since the settlement of Terceira happened in 1761 and did not affect the respective area. They state that the ashes which covered the cart-ruts likely stem from an eruption of *Pico Alto*—the most recent possibility—which renders them at least 1000 years old. Two further geologic dating methods were applied to samples from the ruts, with AMS spectrometry yielding an age of 920 ± 30 years BP (1025–1190 CE at 95% probability), putting them in close chronological proximity to the above mentioned bowl-like structure. The authors did not elaborate on possible cultures or groups, which could have produced these tracks (Rodrigues et al., 2018).

Future research may look at the spatial distribution of rock carvings, artificial depressions and other megalithic structures detected on Terceira, to each other, which may bring light to questions of purpose.

2.2. Hypogea of Monte Brasil

Around 2010, multiple hypogeum-like structures were detected on Terceira, most of them in the area around *Monte Brasil* (south of *Angra do Heroísmo*). Overall six west-oriented structures in various degrees of conservation could be found, all of them containing some sort of interior structure (e.g. basin, seating place or altar, steps leading to a recessed part of the structure). The three main hypogea, which are in close proximity to each other, are the most extensively studied ones. Their entrances are quite high (~2.20 m) and they exhibit a similar layout (almost triangular, with sides between 5.5 and 6 metres). The interiors of the artificial caves definitely indicate human creation, even though the purpose of carved basins and steps remains unclear. Ribeiro et al. (2011, 2015) suggest a cultic use of the hypogea and compare the structure to Phoenician temple complexes, possibly dedicated to the goddess of Tanit as they are frequently located in similar sites: on the western slope of a mountain near a water source. As the goddess of fertility, pleasure, and beauty, Tanit was quite popular in antique Hispania and was frequently represented by her symbol, the trapezium. The authors argue that the layout of the artificial caves represents this symbol. The goddess was also associated with war and defence, which may be why the hypogea are positioned at a strategically sensible place. As the goddess of fertility, places of worship were almost always associated with bodies of water, which may explain the carved basins in structure number 4 (Ribeiro et al., 2015; Pimenta et al., 2013; Ribeiro et al., 2011). Some of the rock carvings of stylised human-shaped figures discovered on Terceira

have also been linked to typical representations of Tanit (Azevêdo, 2021). Because the structures cannot be dated via ^{14}C -method¹ (Pimenta et al., 2013), recently an attempt was made to date them via relative dating based on biogenic stalactites. Under the assumption of linear growth, stalactites from the site were compared with stalactites of identical composition found in a nearby water cistern with a known construction date (17th century). The researchers were able to estimate the structures to be between 2000 and 400 years old. Regardless of the unknown purpose, similarities to Phoenician cultic habitus, broad dating of the hypogea and their appearance on 20th-century maps, where they are marked as non-military structure, suggest that they likely represent an undocumented military or civil structure of post-15th century settlement of the island (Pimenta et al., 2013; Ribeiro et al., 2015).

An important finding which should not be left out when discussing the hypogea of *Monte Brasil* is the discovery of a rounded rock, which resembles the base of a statue and bears a two-rowed inscription. The rock was initially found in *Posto Santo*, a region near *Angra do Heroísmo*, and preserved in a private home. Comparative granulometric analysis yielded a 95% confidence of the stone base having its origin in *Posto Santo*. While not all of the inscription is decipherable due to massive erosion and possibly low-quality mason work, it has been translated as: *Elo 'ōs eōn* (“the lord of the gods”)/*Dacciōs theos* (“god of the Dacciōs”). The language in which it was composed remains unclear; the researchers assume it may be of Indo-European origin (Ribeiro et al., 2015). It has been linked to the Roman-Dacians, but no further evidence or theory regarding creation and purpose of the stone base remains has been detected (Pimenta et al., 2013).

The general possibility of Phoenician presence in the Azores has often been rejected with the reasoning that Phoenician ships have been too fragile for Atlantic travel (Neto, 2020). While this is a viable argument, recent research emphasises the role of specific currents, which could have been used to reach the Azores and subsequently Portuguese mainland coming from the Canary Islands (Neto, 2020; Ribeiro et al., 2011). Another finding complicating the situation was the alleged detection of Carthaginian coins within a black clay pot on Corvo Island in 1749. The coins were analysed by Swedish numismatist Johann Frans Podolyn, who published his findings (Podolyn, 1778) together with drawings of the coins (Ribeiro et al., 2011; Ribeiro et al., 2017; Pimenta et al., 2013). While the authenticity of the coins is frequently doubted—it has been suggested the coins actually stem from a town in mainland Portugal called “Corvo”²—excavations on Corvo Island conducted in the 1980s by Prof. Isserlin yielded, yet undated, ceramic fragments near the alleged site (Ribeiro et al., 2017; Ribeiro et al., 2011; Isserlin, 1984). The

¹An attempt at radiocarbon dating only yielded a result of 0 BP, which has been attributed to ground water contamination due to nuclear bomb tests in the 1950s.

²This information was taken from Bikai, P. M., Pierre, M. (1990). Timelines: A Phoenician Fable. *Nautical Archaeology*. As the original publication could not be obtained, the available citation on Wikipedia has to be trusted (Wikipedia, Carthaginian coins of Corvo.

https://en.wikipedia.org/wiki/Carthaginian_coins_of_Corvo#cite_note-Bikai-2 [last accessed 9.1.2024]).

assumption of Phoenician activity on the Azores is, additionally, not exactly new. The first mention of this presumption can be found in the chronicle of Dom João II. (chapter IX), written by Damião de Góis in 1567 (Neto, 2020; Hennig, 1953).

2.3. Other Structures

Further discoveries of rock-made structures indicate pre-Portuguese presence on the Azores as well. Because most of them were only dated tentatively, if at all, and construction context as well as purpose are mostly very unclear, they shall only be discussed shortly.

The discovered structures can roughly be split into man-made caves or cavities and megalithic constructions. The latter have been found on Terceira and Pico, while cave-like structures were mainly found on Corvo (exception: *Monte Brasil*, Terceira). On Terceira (*Grota do Medo*) Rodrigues (2015) discovered rock structures similar to so-called neolithic passage tombs, which are frequently found in mainland Spain, the British Isles and Northern France. Such constructions are typically fabricated on top of hills to be visible from a significant distance and represent either a ritual or literal burial ground. With an impressive maximum height of about 10 metres, the Azorean structure is clearly identifiable. As no archaeological surveys have yet been performed, nothing can be said about its construction date or purpose (Rodrigues, 2015).

On Pico 118 pyramid-like constructions (*Maroiços*) made from piled-up lava stones can be found. All of the structures are found within six square kilometres and are categorized into three classes according to their height. Similar constructions can be found in Tenerife, Sicily and the Mauritius Islands, all of them built during or after the 19th century. They have, nevertheless, also been compared to Guanche or Berber constructions frequently found on the Canary Islands, which are usually dated to the 16th and 17th centuries. Incidentally, ¹⁴C-dating conducted on charcoal probes found in one of the Azorean structures yielded a construction date between 1450-1600 CE as a result. While this does not mean that they were built by Guanche or Berber peoples, nor does it clearly indicate pre-Portuguese presence, the constructions date significantly earlier than it would be suspected from the structure type alone. Additionally, many of the *Maroiços* contain chamber-like insides. One survey conducted in 2017 examined one of the more easily accessible chambers and found various items (e.g. arrow head, iron hook, iron skewer, ceramic fragments, limpet shells, non-native barnacle remains), which have not yet been dated inside. Analyses regarding the unusual amount and clustering of the structures near Madalena are overdue as well. However, to date, no further surveys have been conducted (Pimenta et al., 2013; Ribeiro et al., 2017), which leaves most questions open.

3. Biological Sources

The following section will discuss the available biological sources regarding pre-Portuguese presence on the Azores. Most of the below described research is fairly

new and was mainly gathered in the last 10 years. These findings mostly complement the archaeologic sources discussed above, while historical evidence is rather opposing. Relatively recent scientific interest in this area of research was sparked by a study examining the genetic profile of house mice on the Madeiran archipelago, which found a significant amount of Northern European (Scandinavian) DNA-markers in Madeiran mice. This led the scientists to the conclusion that Norse or Viking groups may have visited the islands (Förster et al., 2009; Gündüz et al., 2001). As the Madeiran and Azores' discoveries are similarly controversial, a similar approach was tested on the Azorean archipelago and has led to additional studies examining the palaeoecology of the islands to solve questions regarding pre-Portuguese settlements.

3.1. Mouse Genetics

Due to their ability to tolerate various climatic conditions, their smallness and their habitus as hemerophiles, house mice (*Mus musculus*) are one of the most widespread animals in the world. They have been studied frequently regarding the ecological impact on their previously uninhabited environments, as well as human migration, especially in regard to oceanic islands. To assess the dispersal patterns of mice and associated human groups, their genome is frequently examined, especially the analysis of mitochondrial D-loop sequences has been proven useful (Jones et al., 2011; Gabriel et al., 2015).

The main study relevant to this paper was done by Gabriel et al. (2015) and analysed the genome of 239 mice from the Azorean archipelago between 2005 and 2007. The Azorean DNA was compared to mice DNA from mainland Iberia (Portugal and South-Western Spain) as well as Madeira and the Canary Islands to determine haplotypes and clades. Interestingly, haplotypes corresponding to genetic profiles from the Falkland Islands, the Faroe Islands, the British Isles, Ireland, Finland and Iceland could be detected in the Azores. The overall high level of genetic diversity also does not correspond to the typical image found on similar small and remote islands, which was demonstrated in various studies concerning, for example, the Faroes or the Canaries (Jones et al., 2011; Gabriel et al., 2015). It rather corroborates the Azores complex colonisation and vital role in transatlantic travel especially after the 15th century. The historically strong connection to mainland Spain and Portugal as well as Madeira and the Canaries is obvious in the genetic material. However, the Azorean Island of Santa Maria, which is the closest island of the archipelago to the Portuguese shore, exhibits a very unusual genetic profile: Of the five mtDNA clades (B-F) detected in the course of Gabriel et al.'s (2015) study, Santa Marian mice belong almost exclusively to clade F. This genetic group is typically found in North-western Europe (coastal Norway, Ireland, Iceland and NW-Scotland), corresponding the main residence places of Vikings. This is an almost certain sign of Viking presence on St. Maria and Terceira, where also a high proportion of clade F is present. All other Azorean islands exhibit a mixture of mainland, Northern European and Canary/Madeiran DNA. It is very unlikely

that after the initial documented colonisation of the archipelago in the 15th century, mice from Iberia spread on all islands and were consecutively completely replaced, but only on St. Maria by mice coming from Northern European trading ships (Gabriel et al., 2015).

Similar evidence has been found regarding the Island of Madeira, as the island's mice exhibit significant genetic similarities to Northern European mice, which has been interpreted as an indication of pre-Portuguese activity, possibly by (Danish) Vikings which were blown off course near the Iberian Peninsula. Even though historical evidence regarding these speculations is still missing, the hypothesis was recently encouraged by a mouse skull detected on Madeira, which was ¹⁴C-dated to about 1000 years ago. The skull presents a similar genetic profile to Azorean mice, containing lots of Northern European molecular markers (Rando et al., 2014; Gündüz et al., 2001; Förster et al., 2009). In both scenarios, the argument has been posed that Northern European mice could have reached the islands after the initial Portuguese colonisation via trading ships or that Viking mice reached the islands (especially Madeira) with local ships (e.g. Berber) after being transported to Iberia or Northern Africa by the Vikings, implying that they themselves never reached the archipelagos. Both of these possibilities seem genetically unlikely, as they would result in a much more diluted gene profile since Northern European mice would have had the time to procreate with Southern European/Northern African mice. It is also extremely unlikely that Vikings would have stopped at a completely mouse-free harbour where no genetic admixture whatsoever would have taken place. Additionally, no similar linkage between Northern European clades and Southern European ones could be detected anywhere on mainland Iberia or Northern Africa (Gabriel et al., 2015).

3.2. Palaeoecology

The historical impact of human settlements in previously pristine habitats has frequently been analysed by paleoecologic studies, which includes subcategories like palaeozoology or palynology. Commonly, studies examining the pre-colonisation history of the Azores, have mainly focused on pollen records and other analyses regarding palaeovegetation as well as the use of aquatic sediment cores (Connor et al., 2012; Rull et al., 2017; Rull, 2023a; Raposeiro et al., 2021). This is mainly due to the fact that almost no archaeological record is documented and palaeozoology also can be applied only marginally as no animals except birds and insects inhabited the islands (Connor et al., 2012; Gabriel et al., 2015; Raposeiro et al., 2021).

The main scientific paper, which recently sparked great controversy regarding pre-Portuguese settlements on the Azores, was written by Raposeiro et al. (2021). In the article, the authors argue that the archipelago was settled by people of unknown origins in the early Middle Ages (ca. 500-900 CE). Due to their seafaring ability and the parallel beginning of Viking colonisation in the Atlantic, the authors propose a Northern European origin of the settlers. To prove their hypothesis,

³Corvo: Lake Caldeirão, Flores: Lake Funda, Pico: Lake Peixinho, Terceira: Lake Ginjal, S. Miguel: Lake Azul. No probes were taken on S. Maria, S. Jorge, Graciosa and Faial.

sediment cores from five lakes on different Azorean islands³ were analysed regarding markers of significant environmental change. These include fecal biomarkers (5 β -cholestan-3 β -ol, 5 β -stigmastanol), coprophilous fungal spores (*Sporormiella*, *Sordaria* and *Podospira*) and terrestrial proxy-evidence for human activity (variations in pollen, plant macrofossils, charcoal particles and polycyclic aromatic hydrocarbons (PAH))⁴ (Raposeiro et al., 2021; Raposeiro et al., 2022). All gathered sediment cores were dated using a combination of various isotope dating methods (²¹⁰Pb, ¹³⁷Cs, ¹⁴C) yielding age records between ~600 - 3.800 years BP. The results were put into four phases related to human activity on the archipelago: Phase 1) no human activity detected (500-700 CE), 2) appearance of 5 β -stigmastanol (700-1070 CE), 3) appearance of 5 β -cholestan-3 β -ol and fungal spores, increased soil erosion and fire activity (1070-1427/1452), 4) notable changes in all proxy records due to Portuguese settlement (from 1427/1452). Of special interest is the amount and sudden appearance of human-associated proxies around 950 (-60/+50 years) CE together with sudden spikes in pyrolytic PAHs and microcharcoal, which suggest frequent and abrupt fires even though earlier record does not exhibit similar fire-related occurrences. The authors conclude that these findings suggest large-scale landscape modifications probably accompanied by the establishment of permanent settlement structures as well as the introduction of larger mammals (e.g. sheep, cattle, goats). From 1070 CE on the record slightly changes—a strong increase in coprophilous fungi, PAHs, charcoal and 5 β -stigmastanol, accompanied by a drastic drop in arboreal pollen—and is hence interpreted as an increase in human population as well as deforestation (Raposeiro et al., 2021).

Some researchers have criticised the data quality and representation of Raposeiro et al. (2021), which is why the data has not been generally accepted in the respective community (Rull, 2023a; Elias et al., 2022). The authors however have defended their dataset continuously and publicly provided questioned materials (Raposeiro et al., 2022). Other studies examining pollen and plant fossil records could not demonstrate a significant decrease around 1070 CE, but only after proven human impact on the islands in the 15th century. This especially contrasts Raposeiro et al.'s (2021) argument regarding massive amounts of deforestation (van Leeuwen et al., 2005). However, studies focusing not only on the examination

⁴Sterols like Cholesterol are extensively present in mammal feces; certain types (=coprostanols) like 5 β -cholestan-3 β -ol or 5 β -stigmastanol are especially frequently found in omnivorous and therefore human faeces and therefore often used as biomarkers for human presence (compare for example: Bethell, P. H., Goad, L. J., Evershed, R. P., Ottaway, J. (1994). The Study of Molecular Markers of Human Activity: The Use of Coprostanol in the Soil as an Indicator of Human Faecal Material. *Journal of Archaeological Science*, 21, 619-632). It is, however, not clearly distinguishable whether human or other omnivorous traces are present in the probe, which is why additional proxies are used. Coprophilous fungi rely on ingestion and release of their spores by large herbivores (e.g. cattle, sheep), which were introduced to the Azores by humans, rendering their presence a relatively reliable proxy. Other examined factors like pollen and plant macrofossil variation can allow conclusions regarding soil erosion, deforestation and fire disturbance. While most of these conditions can arise without human intervention, the authors argue that their observed findings are distinctly different to ecologic reactions to natural disasters.

of palynologic and palaeovegetational records, but also on the appearance of coprophilous fungi and charcoal in the archipelago's sediments, could demonstrate moderate human impact including small settlements and the introduction of mammals before official Portuguese settlement (13th century) (Rull et al., 2017)⁵. It has been proposed that initial settlement on São Miguel could have been positioned near Lake Azul due to increased amounts of landscape modifications in this location and the strategically valuable position of the Lake. The high quality and coverage data acquired by Raposeiro et al. (2021) for Lake Azul corroborates this assumption, as comparatively high amounts of coprostanol, 5 β -stigmastanol, coprophilous fungi and cereal spores could be detected (Rull et al., 2017; Raposeiro et al., 2021).

One of the most disputed arguments which Raposeiro et al. (2021) point out, is the sudden appearance of rye pollen (*Secale cereale*) on the Azorean islands between 1150 (Pico) - 1550 (Corvo), which they perceive as definite evidence of human activity. This, however, has been doubted by other researchers due to the fact that rye produces significantly more pollen than other types of cereal and strong east wind from the European mainland could have easily resulted in pollen reaching the archipelago without human activity (Elias et al., 2022). This nevertheless does not explain the sudden onset of pollen appearance on the islands especially since rye has been used in Europe since the Neolithic period and the pattern it was discovered. Instead of irregular and relatively widespread long-distance pollen record, Raposeiro et al. (2022) describe subsequent pollen slides indicating local use or production. Other researchers have corroborated Raposeiro et al.'s (2021; 2022) method while adding that an expansion of cereal pollen related evidence would have aided in the validity of the paper. Rull (2023a) could, for example, provide additional data regarding the appearance of wheat pollen (*Triticum aestivum*) on the Azores already since the 13th century.

The main contra-argument posed by the scientific community against Raposeiro et al.'s (2021) claims is however not, that no pre-Portuguese contact whatsoever took place, but rather the extent of landscape modifications described by the research team. It is deemed as very unlikely due to historical sources describing a pristine landscape upon Portuguese arrival on the archipelago. This means that widespread human influence on the Azorean ecosystem as well as settlements before the 15th century, can most likely not be supported by the available data (Elias et al., 2022; Rull, 2023a; van Leeuwen et al., 2005; Connor et al., 2012). Other researchers have instead theorised that not the whole archipelago was colonised by pre-Portuguese people at the same time but rather bit by bit (Rull et al., 2017). Overall, the topic is highly current and disputed (Rull, 2023a).

4. Historical Sources

Even though various scholars have addressed the possibility of pre-Portuguese

⁵This additional data has so far only been gathered for São Miguel Island (Eastern Group) around 1287 $\pm$ 40 years, while Raposeiro et al. (2021) have looked at sediment cores from Corvo, Flores, Terceira, Pico and São Miguel.

human activity on the Azores already in the mid-19th to early 20th century, later researchers have shut their arguments down, arguing that no scientific evidence—apart from certain literary sources and unclear depictions on ancient maps—would corroborate their assumptions (Hennig, 1953; Rodrigues et al., 2018). All but one known written source about the discovery of the Azores, describes the archipelago as uninhabited before Portuguese colonisation (Boxer, 1969; Cunliffe, 2017; Dames & Seemann, 1903). However, the oldest work composed on the Azores by Gaspar Frutuoso (1522-1591), which describes each of the then-known islands in one volume of his six-part series (Corvo and Flores were not yet discovered by the Portuguese) mentions indigenous people living on at least the Island of Terceira. The author describes them as “*demons that threw stones at the first navigators from the beach*”. Allegedly, most of them withdrew to the mountain peaks or were incarcerated at the Castelo de S. Sebastião (“*Castelinho*”, est. 1570), where they were converted to Christianity and integrated into the Portuguese settler community. This, however, has never been proven (Serpa Silva, 2021; Azevêdo, 2021) and it is unlikely to be verified in the foreseeable future, since only human genetics could technically deliver solid evidence. Due to high levels of migration and colonisation present in the archipelago, this is, anyhow, unlikely (Santos et al., 2003).

The discovery of the Azores officially happened in 1439 through an expedition led by Prince Henry the Navigator (Boxer, 1969), although on a map in Nicolle’s (2012: p. 4) book, the date 1427 can be observed. The author does not support this number with any sources or accompanying text (Nicolle, 2012). A similar claim can be found in Yavuz (2021); the author mentions that seven of the nine islands of the archipelago were discovered in 1927 by Portuguese seafarers belonging to Henry the Navigator. Corvo and Flores were only discovered about 25 years later (Yavuz, 2021). Vagueness like this is the main reason why the history of the official discovery of the Azores archipelago is increasingly being questioned (Rodrigues et al., 2015; Dames & Seemann, 1903). The first definite written evidence available on the colonisation of the Azores is, however, from 1439. A royal decree by Infante Dom Pedro enacts that “[...] *sheep are to be released on the seven Azorean islands in preparation for human settlement.*” (Corvo and Flores were still unknown) (Gabriel et al., 2015: p. 139).

The possibility of the archipelago being known before the official discovery is, while low, definitely not zero. The Canary Islands, for example, were already known by Romans and Phoenicians, but awareness of their existence or at least their position was lost during the Middle Ages (Dartnell, 2019). The appearance of the Azorean archipelago on medieval maps centuries before discovery by the Portuguese corroborates this assumption. It is, however, quite speculative work, as very little is known about medieval maps overall and especially regarding the then used sources and dispersion of resulting knowledge. While many researchers stress that the spread of knowledge during medieval times is difficult to evaluate and trace, the quality of information should not be narrowed down based simply on

remoteness (Harvey, 1991). This brings the thread of this paper to the Arabic world.

4.1. Normans, Northern Africa and al-Idrīsī “Kitab al Roger”

Early and high medieval geographic knowledge was highly shaped by Arab traders understanding of European coastlines. Since about the 8th century cartography and geographical research was emphasised and frequently conducted in the Islamic world. This was mainly due to their position in (marine) trade, which led Arab merchants to most of Europe, Northern and Western Africa as well as parts of Asia (e.g. Asia Minor, India, possibly even China) (Wawrik, 1981). Arabs and Normans only got into frequent contact during the 12th century—first touch points via traders were, of course, made centuries earlier—due to the establishment of the Norman kingdom in Sicily during the 11th century. These connections allowed for the exchange of geographical knowledge of their respective terrains and marked the beginning of an Arabic-Norman map making period (late 11th to 12th centuries) (Kliege, 1991). Norman King Roger II. (1095–1154), for example, commissioned the even then renown cartographer *Abū ‘A’bdallah Muhammad al-Idrīsī* (1099–1164) to create a complete map of the then-known world. By a combination of Arab and Norman geographic knowledge as well as information collected by al-Idrīsī himself on his travels to Northern Africa, Eastern Europe and Asia Minor, a grand opus consisting of 70 maps annotated in Latin and Arabic in a separate narrative work, was composed within 15 years (finished between 1154–1157/8) (Hiatt, 2021; Kupcík, 2011; Wawrik, 1981). Al-Idrīsī named his work “*Kitab al Roger*” (Book of Roger)⁶ (Obenaus, 2010; Kupcík, 2011; Wawrik, 1981) and called its main map “*Tabula Rogeriana*”, which pictured all “verified” parts of the world. Various direct sources could be identified until today; associated Arab sources include the works of *Ibn Khurdādhbih*, *al-Ya’qūbī* (11th century), *al-Jaihānī* (10th century), *Ibn Hauqal* and *al-Mas’ūdī* (10th century). Additionally, al-Idrīsī must have also used Greek (mainly Ptolemaic) and Christian (mainly Paulus Orosius) sources (Kupcík, 2011; Wawrik, 1981; Cunliffe, 2017; Hiatt, 2021). More contemporary European sources have, however, remained somewhat unclear up until 2007, when a script fragment from the “*Kitab al Roger*” was found in the archives of the *Capella Palatina* in Palermo. It has been identified as a manuscript produced by al-Idrīsī himself, an older version of the distributed and “published” map collection. It indicates the name of a contemporary middle-European scholar—*Buṭrus al-Fallāḥī al-Ḥaqlī*⁷—whose information was used for the

⁶Its main name, created by Roger II., is *Nuzhat al-muštāq fī ḥtirāq al-āfāq*, which can be roughly translated to “Diversion for the man longing to travel across the horizon”. The shorter name used above was also given to his work by al-Idrīsī himself and shall be used for reasons of readability.

⁷This name can most likely be translated to Peter Feldbauer, a Viennese magister whose information seems to mostly have been used regarding distance measures and tour descriptions for central Europe (e.g. the cities Regensburg, Ulm, Vienna, Augsburg, Passau). He also seems to have composed a text on the Arabic world called “*Mundus islamicus—praematurae imminutionis casus*” (roughly: “The Islamic world—a premature case of Underdevelopment”). Obenaus speculates that this work might be the reason why al-Idrīsī had removed his name from the final version of his cartographic collection.

creation of the book. He is one of the few European scholars who could be identified as sources for al-Idrīsī's work (Obenaus, 2010). While multiple travel accounts of (European) guests at Roger's court exist (e.g. Swedish-speaking Estonian, Slavs, French-speaking shipman, Gascon of Bayonne, pilgrims, monks, merchants of various origins), it is possible, but unclear whether their information was used for the production of the "*Kitab al Roger*" (Hiatt, 2021).

Other sources used by Arab-Norman map makers, which are especially relevant regarding the position and habitation of Atlantic islands off the coast of Africa or the Iberian Peninsula, are the Berber people. Under the Norman rule of Sicily and parts of Northern Africa (mid-12th century), Berber chieftains were frequently deployed by Norman rulers as local support and aid in governance. The exchange of geographic knowledge is not unlikely, and analysis has even shown that contemporaries paid particular attention to Northern African geography due to its importance regarding the logistics of Norman rule (King, 2017). Additionally, some sources mention the collision of North African sailors with Viking fleets near the Iberian Peninsula sometime before the 14th century. The described North African—sadly not more closely specified—fleets supposedly also visited the Canary Islands and knew about Madeira, the Azores and the Cape Verde Islands (Yavuz, 2021; Nicolle, 2012).

There is, however, evidence that the Azores (as well as Madeira and the Canaries) were already mentioned by al-Idrīsī hundreds of years before their initially assumed appearance on late medieval maps during the 14th century. One passage found in al-Idrīsī's geographic descriptions is especially striking regarding possible pre-Portuguese presence on the Azores. The narrative geographic account found in the "*Kitab al Roger*" is split into the different climate zones described by al-Idrīsī. A chain of 14 islands, spread over three (of seven!) climate zones, can be found in the mapped part of the Atlantic Ocean; unfortunately, none of them are named on the map itself. The accompanying text identifies six of them as belonging to today's Canary Islands (one unnamed, "*Masfahan*", "*Laghus*", island of the two brothers (Shirham & Shiram) and "*Sawa*"), one representing Madeira ("*Laqa*") and two are thought to constitute part of the Azores archipelago (Siebold, 2023; Hiatt, 2021). These two islands are called "*Raqa*"⁸ (Isle of the birds) and "*Jazirat al-Ghanam*" (Sheep Island) and most likely refer to the islands of St. Maria and São Miguel. "*Raqa*" is described as inhabited by large birds, whose characterisation has been compared to the goshawk (*açor*) which the archipelago was supposedly named after. "*Jazirat al-Ghanam*" was, in turn, supposedly inhabited by small freely roaming sheep whose flesh tasted bitter and was therefore inedible. The island is described as large and otherwise empty (Siebold, 2023). If this

⁸Another frequently found name for the island of "*Raqa*" is "*Djazirat t-Toyour*", as no translation could be obtained and the two names are used alternately by most authors, it shall at least be mentioned. For the use of the two designations in direct translation compare for example Dozy, R., de Goeje, M. J. (1866). *Description de l'Afrique et de l'Espagne par Edrīsī. Texte Arabe publié pour la première fois d'après les man, de Paris et d'Oxford avec une Traduction, des Notes et un Glossaire*. Brill, 63–64.

description would prove to be true, the above discussed paleoecologic and genetic evidence would suggest that Sheep Island refers to São Miguel as a small settlement together with animal husbandry (most likely cows and/or sheep) could be identified on the island near Lake Azul (Rull, 2023a; Rull, 2023b; Raposeiro et al., 2021; Rull et al., 2017). The rough description of the sheep as small and wild, corresponds to accounts found describing Scandinavian sheep species frequently taken on Viking voyages for meat, wool and milk. During the 12th and 13th centuries, a shift in the use of livestock by Vikings can be noticed, which led to sheep becoming the most frequently used domestic animal (Baldwin, 1978; McGovern et al., 2014). “*Raqā*” would therefore most likely refer to São Miguel’s closest island, which is St. Maria. Here so called “Viking-mice” have been detected genetically (Gabriel et al., 2015), but unfortunately no archaeological or palaeoecological surveys have been conducted.

Al-Idrīsī’s cartographic knowledge seems to have withstood for the next few centuries with later medieval cartographers, especially of Catalan tradition (see below), seemingly having used his information as a source (Wawrik, 1981). The oldest known map, which directly applies information found by al-Idrīsī, is most likely a climatic map from the chronicle of John of Wallingford (13th century). It is, however, only a sketch working over the climatic aspects of al-Idrīsī’s work, not its geographic details (Kliege, 1991). Additional loose evidence for this period suggests the conservation of seafaring and geographic knowledge concerning Atlantic islands described by al-Idrīsī. For example, Henry the Navigator, who represents a major figure during the 15th-century Portuguese discoveries, seems to have had close contact with Arab peoples during his military campaign in Morocco (1415) about his planned explorations along the Western African coast (Wawrik, 1981). During the various expeditions coordinated and conducted by Prince Henry, Madeira and the close-by *Porto Santo* were discovered and subsequently colonised (1418-1420). Additionally, the so-called “*volta do mar*” was perfected during his campaigns, which required extensive knowledge of western Atlantic currents and winds (Dartnell, 2019; Boxer, 1969).

There is, however, still a chronologically long distance (about 200 years) between the notation of Sheep Island and “*Raqā*” by al-Idrīsī and their appearance in Western European geographic knowledge. This can mainly be explained by late medieval patterns of knowledge dissemination. While many scientific Arabic texts of various fields (e.g. medicine, astronomy, mathematics) were translated into Latin between the 12th and 14th centuries, geographical texts show to have been less prevalent. Many 12th-century translators could be found in Andalusian Spain (e.g. Gerard of Cremona, Hermann of Carinthia) and purposefully ignored certain disciplines (e.g. literature, jurisdiction, music), like geography, completely. Most transmission during this period seems to have been accidental, for example, as scientific by-products. When in the 13th and 14th centuries Arabic influence on Latin European geography grew, interestingly, the influence of al-Idrīsī’s “*Kitāb al Roger*” remains strikingly low. While this can partly be attributed to vast cultural

differences surfacing, for example, difficulties in understanding underlying religious or spatial concepts as well as linguistic ones, most of these processes are still unclear (Hiatt, 2021). Furthermore, it will remain uncertain whether information about the Azores travelled via Vikings and Normans or if Berber and Arab peoples initially possessed this awareness. The exact route of this geographical knowledge is difficult, if not impossible, to retrace.

4.2. Navigatio Sancti Brendani Abbatis

Medieval maps and travel accounts frequently extended into the fictional, resulting in a blend of true and constructed events. There are multiple legendary islands pictured in the middle of the Atlantic Ocean found on medieval maps (e.g. Fortunate Isles, Island of St. Brendan). They mostly do not directly correspond to real islands; islands named alike might not always be pictured in the same position or size and some may be mentioned once and never again. A frequently found island, which can be found on multiple medieval maps, is St. Brendan's Island. It was first mentioned in the *Navigatio Sancti Brendani Abbatis* (9th century), a travel report supposedly talking about a voyage of twelve to 14 Irish monks, determined to find Christian paradise (Chapman, 1973; Scafi, 2022). It is therefore not surprising that the isles of St. Brendan can be found on various medieval maps. While the islands are not always put in the same place especially in early medieval maps (e.g. before the coast of Western Africa, in a gulf off the coast of Ireland, island between Greenland and Newfoundland, completely fictional position, Brazilian coast pictured as islands), they have been identified with various Atlantic islands including Madeira, the Canaries, Iceland, the Faroe Islands and seldomly with the Azores (Scafi, 2022). Even though identification of the Azores archipelago is rejected by most scholars, some argue that Brendan and his crew must have stopped there, due to the accurate description of the islands within the Latin text. With the end of the 15th century, depictions of these mythical islands collectively shift to the west and closer to the equator. They are typically approximately positioned between the Azores and Madeira, resulting in an unclear assignation to either archipelago by most researchers (Dunn, 1921). Some of the youngest maps to depict the legendary islands are portolan charts produced by Andrea Bianco (active 1436-1460). His second map (1448) portrays the Azores, Madeira and the Canary Islands and supposedly also the Brazilian coast (reputedly 1500 miles from the western European coast) (Kupcik, 2011). Especially striking is the accuracy with which the island of Terceira is mapped as well as its designation: “*Ya fortunate de sa beati blandan*” (The fortunate island of St. Brendan) (Dunn, 1921). While this might suggest some kind of continuity in the use of these mythical islands as “stand-in” for the Azorean archipelago and possibly some refrained knowledge about their approximate position potentially since the early Middle Ages, it cannot be proven (Scafi, 2022). Some scholars do, however, emphasise the role of literary sources for sea travel in the Middle Ages and early modern era. For example, it is assumed that Christoph Columbus utilised information about foreign islands and

travel routes found in the *Navigatio Sancti Brendani* in preparation for his trans-Atlantic voyage. Further medieval (literary) sources likely used by Columbus include Pierre d'Ailly, Roger Bacon, Norse sagas and unknown Arab informants (Kimble, 1938; Chapman, 1973; Scafi, 2022; Hiatt, 2021).

4.3. Late Medieval and Early Modern Maps

While it is almost impossible to pinpoint one specific scholar or source, who/which kept knowledge about Atlantic islands over centuries, it is easier to roughly trace their appearance in various sources. It has, for example, been speculated that Portuguese (and other southern/middle European) seafarers of the 14th and 15th centuries were only able to perform travels into the Atlantic Ocean due to preserved knowledge from Viking/Norsemen travels. It is quite likely that knowledge about currents, winds and the position of lands (whether there were islands or not) was retained and applied to the performed expeditions. Increasingly evidence is being found that supports the widespread distribution of geographic knowledge in the medieval world. Between the 9th and 11th centuries, for example, awareness of trans-Atlantic lands—mainly Norse colonies on Greenland and Vinland—was spread via travel reports, maps and natives. Certain place names like “*Ilha Verde*” (today Cape Verde) have been interpreted to exhibit linguistic inspiration from certain northern Atlantic places—here “*terra verde*” (today Greenland). This is sometimes perceived as a display of historic public awareness surrounding the presence of islands within the Atlantic Ocean (McGhee, 2003; Enterline, 2002). These assumptions, however, will remain purely speculative. Nevertheless, it cannot be ignored that cartographic evidence regarding knowledge about the Azores archipelago exists before their official discovery by the Portuguese. The islands appear on multiple maps between 1367 and 1410, noticeably before their official discovery between 1427 and 1452. The archipelago—or parts of it—are pictured on the Pizzigani map (1367), the Medici-Laurentian Atlas (1370), the Catalan Atlas (1375), the Pinelli-Walckenaer map (1384) and the Corbitis Atlas (1378-1402) (Raposeiro et al., 2021; Kupcık, 2011; Hiatt, 2021). Additionally, they are listed in the *Libro del Conoscimiento de Todos los reinos* (“The book of knowledge of all kingdoms”, ca. 1380), a narrative description of the then known parts of the world (Marino, 1999). Most of these maps have likely influenced each other and are partly based off each other (e.g. *Libro del conocimiento* used i.a. the Catalan Atlas and al-Idrīsī reports as source) (Drecoll, 2000; Marino, 1999).

Medieval *mappae mundi* and in some instances early modern Portolan charts⁹ typically map not only known parts of the world, but rather extend cartographic

⁹The designation *mappae mundi* describes a collection of several hundred early to high medieval maps. These mostly religiously influenced charts elaborately describe the known world as well as mythical or spiritual characters (e.g. sea monsters, ancient mythical landmarks). Portolan charts are, in turn, late medieval or early modern sea charts, which only depict relevant elements like coastlines, rivers, harbours or coastal settlements. Newly discovered lands were mostly documented on such charts and were typically treated as state secrets, which is why they were not reproduced extensively.

depictions by legendary or religious material (Harvey, 1991; Kupcık, 2011; Kliege, 1991). This especially applies to oceanic islands, as their veracity was hard to test and easily mythologically conveyable. While the appearance of the Azores on maps and charts almost 50 years before their official discovery may hint to preserved bits of knowledge regarding Atlantic islands, it may also be pure coincidence. Many archipelagos within the Atlantic Ocean have been mapped before their official discovery (e.g. Madeira, Cape Verde). However, legendary islands were frequently put into the midst of the Atlantic and could overlap with real ones after their detection. The newly discovered islands were then mostly initially named after the fictitious ones, which had been put in their geographic location before. This circumstance makes a distinction between reality and legend quite complicated and renders the first true-to-scale mapping of the Azores unknown¹⁰ (Harvey, 1991).

5. Discussion and Conclusion

As can be seen from the diverse corpus of evidence discussed, many different indications for pre-Portuguese presence in the Azores exist. They, however, cover various chronological periods, which was initially unexpected. Each of the different phases will subsequently shortly be discussed.

Evidence regarding human activity on the archipelago during antiquity or possibly even earlier can mainly be found in the chapters covering archaeological evidence. As most of it was/could not (be) dated yet, a definite placement is not possible. Nevertheless, do the Hypogea of *Monte Brasil*, megalithic structures and various types of rock carvings as well as artificial depressions corroborate some early human contact. Additional findings like ceramic fragments, Carthaginian coins and the statue base of Terceira further strengthen these arguments. The assumption of Carthaginian/Phoenician presence is furthermore not new and can already be found in sources from 1567 (Hennig, 1953); it can therefore be seen as somewhat secure. Further research regarding the dating of various structures as well as already discovered objects (e.g. ceramic fragments) and possible excavations (e.g. below the so-called passage tombs of *Grota do Medo*) might aid in consolidating these assertions. Other hypotheses regarding chronologically unclassified Berber or Libyco-Berber presence on the archipelago, which has been supposedly corroborated by certain types of rock carvings and the so-called *Maroiços*, is however more insecure and further research, especially concerning rock art and dating of the pyramid-like *Maroiços*, is definitely necessary.

Scientific evidence regarding medieval human activity in the Azores is less straightforward—sometimes even contradictory—correspondingly, much more and complex research will be necessary to substantiate current claims. Medieval sources can be roughly split into two main phases, with some evidence scattered in between, mostly resulting from a lack of exact age determinability (e.g. mouse

¹⁰Al-Idrisi's depiction does not portray coastline or distance between islands and to the mainland shore accurately.

mtDNA). The first phase can be put into the 10th-12th centuries (after about 1020 CE), and the second one into the 13th century (around 1280). Reliable evidence concerning the first phase is limited to a dated bowl-like structure and cart-ruts found on Terceira. Due to the dating methods applied by the researchers, only a somewhat secure result could be archived, indicating that the bowl was made after about 1020 CE and the ruts after about 1025 CE. A definite date of construction and use is therefore not given, but it is assumed to have been within the 11th and 12th centuries.

Due to a lack of further dated structures from that period or any other kind of evidence relating to medieval human activity, these sources have to be treated as standalone. Peer-reviewed evidence concerning the second phase (13th century) is also limited to a single island of the archipelago: São Miguel. While Raposeiro *et al.* (2021) conducted palaeoecological surveys on the islands of Corvo, Flores, Pico, Terceira and São Miguel, further studies could only corroborate the data gathered for Lake Azul (São Miguel). Multiple studies looking at various palaeoecological markers for human activity (e.g. charcoal particles, PAHs, faecal biomarkers, coprophilous fungal spores) were able to determine a relatively secure evidence base concerning small-scale human settlements accompanied by animal husbandry and agriculture near Lake Azul during the 13th century, theorised to have been established by Viking seafarers. Additional acquired evidence regarding Viking presence—Scandinavian house mouse mtDNA from Santa Maria—is unfortunately not clearly dateable and can therefore not be sorted into one medieval phase. Even though a mouse skull from Madeira, with a similar genetic profile to those found on St. Maria, could be dated to about 1000 CE and opens the possibility for Azorean mice exhibiting a comparable chronological origin, it cannot completely confidently be assumed (Rando *et al.*, 2014). Further studies concerning the haplogroup status of Azorean mice will be necessary, as the only present study has been exclusively conducted on the island of Santa Maria, where in turn absolutely no palaeoecological surveys have been carried out so far. Higher quality data coverage, especially for the islands of Santa Maria and São Miguel, would be desirable and will aid in answering questions about Viking activity on the Azores. So far, the only secure evidence gathered can be assigned to Santa Maria, as settlement remnants on São Miguel cannot be categorised as definitely stemming from Viking or Norse activity. Since the map of al-Idrīsī shows two Azorean islands (“*Raqa*” and “Sheep Island”), whose designations might refer to Santa Maria and São Miguel, the possibility for settlement structures on St. Maria is given; further palaeoecological and archaeological surveys on these islands will be necessary. As the man-made bowl from Terceira has also been theorised to correspond to Viking-style techniques (Rodrigues, 2015), it could either be wrongly dated, the timeframe of creation could have been set too closely to the bowl’s minimum age or it might simply be the result of stranded people without associated settlement structures. Substantial human contact around 900-1000 CE is, however, deemed very unlikely by most researchers. The only evidence, which could be interpreted

as hinting at human activity for that timeframe has been detected on Pico. It solely consists of palaeoecological markers signifying fires (e.g. charcoal, deforestation), which are not per se indicative of human presence on the island (Rull, 2023b).

Historical evidence concerning human presence in the Azores is equally complicated to disentangle as no clear indications for medieval (or earlier) human activity were found to date. It is, however, documented that certain peoples have ventured into the Atlantic and have encountered insular populations, if existing (e.g. Canary Islands) (Blench, 2018; Chapman, 1973; Hennig, 1953), and/or discovered yet unknown islands. While it is at times difficult to separate fact and fiction, especially when incorporating religious and literary sources, a certain awareness of lands within the Atlantic Ocean can be traced since antiquity (Dartnell, 2019; Cunliffe, 2017). Concerning the discussed region and timeframe, Northern African and Arabic seafarers are especially relevant and quite likely to have made it to some—if not all—of the Macaronesian archipelagos at some point. During antiquity and possibly even earlier, the Azorean islands might have been visited by Mediterranean (e.g. Phoenicians/Carthaginians) or Northern African (e.g. Berber) cultures, which might have left traces still archaeologically visible today. Following the early Muslim conquests of Northern Africa, knowledge about various Atlantic islands could have spread to Arabic and subsequently to Norse and Viking peoples. The first Viking raids on the Iberian Peninsula are documented during the mid-9th century (around 840/50 CE), leading up to the establishment of the Norman kingdom of Sicily in 1130 (Christys, 2015; Cunliffe, 2017). Here, the combination of Norman—descendants of Norse settlers in today's Normandy—and Arab seafaring knowledge resulted in the creation of al-Idrisi's "*Kitab al Roger*", which was, with the available sources, determined as being the presently oldest known depiction of the Azorean isles (Nicolle, 2012). Subsequently, the information was processed by middle and southern European cartographers and began to appear on 14th-century maps. Pre-Portuguese peoples most likely had various reasons, which may or may not be understandable today, for visiting such remote islands. Possible motivations might have been the plentiful fishing grounds surrounding them as well as whale catching, since the Azores mark a relevant spot in whale migration patterns (Vieira and Brito, 2009). As the Norse are known for their emphasis on whale and dolphin hunting, this might have been a reason to search out these islands (Hennius et al., 2023).

While this is a beautifully traceable and simple outline of the possible dissemination of knowledge accompanying the discovery of the Azores, it is not sufficiently verifiable and will remain theoretical. There are millions of other alternative possibilities, which cannot be or have not yet been discovered. The appearance of mythical, paradisiac islands within the Atlantic, possibly corresponding to Macaronesian archipelagos, in Scandinavian or Northern European folklore might, for example, hint at a different way of knowledge distribution within seafaring peoples. This study correspondingly also sheds light on the unknown ways in which information and knowledge were distributed during the Middle Ages, an often-underestimated process.

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Conflicts of Interest

The author reports that there are no competing interests to declare.

References

- Arnaiz-Villena, A., Medina, M., Ruiz-del-Valle, V., Lopez-Nares, A., Rodriguez-Rodriguez, J., & Suarez-Trujillo, F. (2020a). The Ibero-Guanche (Latin) Rock Inscriptions Found at Mt. Tenezara Volcano (Lanzarote, Canary Islands, Spain): A Saharan Hypothesis for Mediterranean/Atlantic Prehistory. *International Journal of Modern Anthropology*, 2, 140-162. <https://doi.org/10.4314/ijma.v2i13.5>
- Arnaiz-Villena, A., Suárez-Trujillo, F., Ruiz-del-Valle, V., López-Nares, A., & Pais-Pais, F. J. (2020b). The Iberian-Guanche Rock Inscriptions at La Palma Is.: All Seven Canary Islands (Spain) Harbour These Scripts. *International Journal of Modern Anthropology*, 2, 318-336. <https://doi.org/10.4314/ijma.v2i14.5>
- Azevêdo, A. T. M. (2021). Markings on the Stones of Terceira Island, Azores—Rock Art or Natural Causes? *Rock Art Research*, 38, 119-130.
- Baldwin, J. R. (1978). Norse Influences in Sheep Husbandry on Foula, Shetland. *Northern Studies*, 11, 97-127.
- Barbaza, M. (2012). Libyco-Berber Rock Engravings: From One Shore of the Sahara to the Other. *Palethnologie*, 4, 167-191. <https://doi.org/10.4000/palethnologie.6098>
- Blench, R. (2018). *The Peopling of the Canaries: New Data and New Hypotheses*. Circulation Draft Prepared in Conjunction with a Presentation at the 18th African Archaeology Research Day, University of Cambridge.
- Boxer, C. R. (1969). *The Portuguese Seaborne Empire, 1415-1825*. Hutchinson & Co. Ltd.
- Chapman, P. H. (1973). *The Man Who Led Columbus to America*. Judson Press.
- Christys, A. (2015). *Vikings in the South. Voyages to Iberia and the Mediterranean. Studies in Early Medieval History*. Bloomsbury Academic.
- Connor, S. E., van Leeuwen, J. F. N., Rittenour, T. M., van der Knaap, W. O., Ammann, B., & Björck, S. (2012). The Ecological Impact of Oceanic Island Colonization—A Palaeoecological Perspective from the Azores. *Journal of Biogeography*, 39, 1007-1023. <https://doi.org/10.1111/j.1365-2699.2011.02671.x>
- Cunliffe, B. (2017). *On the Ocean: The Mediterranean and the Atlantic from Prehistory to AD 1500*. Oxford University Press.
- Dames, M. L., & Seemann, E. (1903). Folklore of the Azores. *Folklore*, 14, 125-146. <https://doi.org/10.1080/0015587x.1903.9719347>
- Dartnell, L. (2019). *Ursprünge. Wie die Erde uns erschaffen hat*. Hanser.
- de Sousa, J. S. (2005). Portugal and Ireland: Medieval Business Connections in the Atlantic. In M. Avelar (Ed.), *Viagens pela palavra: Homenagem à Professora Maria Laura Bettencourt Pires* (pp. 145-160). Universidade Aberta.
- Drecoll, C. (2000). *Idrisí aus Sizilien. Der Einfluß eines arabischen Wissenschaftlers auf die Entwicklung der europäischen Geographie*. Dr. Hänsel-Hohenhausen.

- Dunn, J. (1921). The Brendan Problem. *The Catholic Historical Review*, 6, 395-477.
- Elias, R. B., Connor, S. E., Góis-Marques, C. A., Schaefer, H., Silva, L., Sequeira, M. M. et al. (2022). Is There Solid Evidence of Widespread Landscape Disturbance in the Azores before the Arrival of the Portuguese? *Proceedings of the National Academy of Sciences*, 119, 1-2. <https://doi.org/10.1073/pnas.2119218119>
- Enterline, J. R. (2002). *Erikson, Eskimos & Columbus: Medieval European Knowledge of America*. John Hopkins University Press.
- Förster, D. W., Gündüz, İ., Nunes, A. C., Gabriel, S., Ramalhinho, M. G., Mathias, M. L. et al. (2009). Molecular Insights into the Colonization and Chromosomal Diversification of Madeiran House Mice. *Molecular Ecology*, 18, 4477-4494. <https://doi.org/10.1111/j.1365-294x.2009.04344.x>
- Gabriel, S. I., Mathias, M. L., & Searle, J. B. (2015). Of Mice and the “Age of Discovery”: The Complex History of Colonization of Theazorean Archipelago by the House Mouse (*Mus musculus*) as Revealed by Mitochondrial DNA Variation. *Journal of Evolutionary Biology*, 28, 130-145. <https://doi.org/10.1111/jeb.12550>
- Gündüz, İ., Auffray, J., Britton-Davidian, J., Catalan, J., Ganem, G., Ramalhinho, M. G. et al. (2001). Molecular Studies on the Colonization of the Madeiran Archipelago by House Mice. *Molecular Ecology*, 10, 2023-2029. <https://doi.org/10.1046/j.0962-1083.2001.01346.x>
- Harvey, P. D. A. (1991). *Medieval Maps*. University of Toronto Press.
- Hennig, R. (1953). Eine nur scheinbare Kenntnis der Azoren im 14. Jahrhundert. In *Terrae Incognitae III, 1200-1415 n. Chr. (Beginn des Entdeckungs-Zeitalters)* (pp. 290-308, 2nd ed.). E. J. Brill.
- Hennius, A., Ljungkvist, J., Ashby, S. P., Hagan, R., Presslee, S., Christensen, T. et al. (2023). Late Iron Age Whaling in Scandinavia. *Journal of Maritime Archaeology*, 18, 1-22. <https://doi.org/10.1007/s11457-022-09349-w>
- Hiatt, A. (2021). *Cartography between Christian Europe and the Arabic-Islamic World, 1100-1500: Divergent Traditions*. Brill. <https://doi.org/10.1163/9789004446038>
- Isserlin, B. (1984). Did Carthaginian Mariners Reach the Island of Corvo (Azores)? *Rivista Di Studi Fenici Sommari*, 12, 31-46.
- Jones, E. P., Jensen, J., Magnussen, E., Gregersen, N., Hansen, H. S., & Searle, J. B. (2011). A Molecular Characterization of the Charismatic Faroe House Mouse. *Biological Journal of the Linnean Society*, 102, 471-482. <https://doi.org/10.1111/j.1095-8312.2010.01597.x>
- Kimble, G. H. T. (1938). *Geography in the Middle Ages*. Methuen & Co. Ltd.
- King, M. (2017). The Norman Kings of Africa? *Haskins Society Journal*, 28, 143-166. <https://doi.org/10.1017/9781787441446>
- Kliege, H. (1991). *Weltbild und Darstellungspraxis hochmittelalterlicher Weltkarten*. No-dus Publikationen.
- Kupcık, I. (2011). *Alte Landkarten. Von der Antike bis zum Ende des 19. Jahrhunderts. Ein Handbuch zur Geschichte der Kartographie*. Franz Steiner Verlag.
- Marino, N. F. (1999). *El Libro del Conoscimiento de Todos los Reinos. The Book of Knowledge of All Kingdoms. Arizona Studies for Medieval and Renaissance Studies*.
- McGhee, R. (2003). Epilogue: Was There Continuity from Norse to Post-Medieval Explorations of the New World? In J. H. Barrett (Ed.), *Contact, Continuity, and Collapse. The Norse Colonization of the North Atlantic* (pp. 239-248). Brepols Publishers. <https://doi.org/10.1484/m.sem-eb.3.3838>
- McGovern, T. H., Harrison, R., & Smiarowski, K. (2014). Sorting Sheep and Goats in

- Medieval Iceland and Greenland: Local Subsistence, Climate Change, or World System Impacts? In R. Harrison, & R. Maher (Eds.), *Human Ecodynamics in the North Atlantic: A Collaborative Model of Humans and Nature through Space and Time* (pp. 153-176). Lexington Books.
- Neto, J. L. (2020). Fernando Rodrigues Ferreira e Conceição Machado: A Propósito da Questão da Ocupação Pré-Portuguesa no Arquipélago dos Açores. *Arqueologia & História*, 13, 329-340.
- Nicolle, D. (2012). *The Portuguese in the Age of Discovery c.1340-1665. Men-at-Arms 484*. Osprey Publishing Ltd.
- Obenaus, A. (2010). Buṭrus al-Fallāhī al-Ḥaqlī-Ein hochmittelalterlicher mucallim aus Wien. Neue Erkenntnisse zu den zeitgenössischen Quellen des al-Idrisī. In A. Schnöller, I. Steffebauer, & B. Hausberger, (Eds.), *Von der Lust an der Grenzüberschreitung und vom Reiz der Verweigerung* (pp. 163-167). Verein Transdisziplinär.
- Pimenta, F., Ribeiro, N., Joaquinito, A., Rodrigues, A. F., Costa, A., & Silva, F. (2013). Land, Sea and Skyscape: Two Case Studies of Man-Made Structures in the Azores Islands. *Culture and Cosmos*, 17, 107-130. <https://doi.org/10.46472/cc.0217.0211>
- Podolyn, J. F. (1778). Some Notes on the Voyages of the Ancients, Based on Several Carthaginian and Cyrenaican Coins Found in 1749 on One of the Azores' Islands. *Göteborgs Wetenskap og Witterhets Samlingar*, 1, 106.
- Rabinowitz, H. (2017). History and Economy of the Azores. In *Azores Field Guide* (pp. 2-5). Columbia University, Department of Earth and Environmental Sciences.
- Rando, J. C., Pieper, H., & Alcover, J. A. (2014). Radiocarbon Evidence for the Presence of Mice on Madeira Island (North Atlantic) One Millennium Ago. *Proceedings of the Royal Society B: Biological Sciences*, 281, Article ID: 20133126. <https://doi.org/10.1098/rspb.2013.3126>
- Raposeiro, P. M., Hernández, A., Pla-Rabes, S., Gonçalves, V., Bao, R., Sáez, A. et al. (2021). Climate Change Facilitated the Early Colonization of the Azores Archipelago during Medieval Times. *Proceedings of the National Academy of Sciences*, 118, e2108236118. <https://doi.org/10.1073/pnas.2108236118>
- Raposeiro, P. M., Hernández, A., Pla-Rabes, S., Gonçalves, V., Bao, R., Sáez, A. et al. (2022). Reply to Elias Et Al.: Multiproxy Evidence of Widespread Landscape Disturbance in Multiple Azorean Lakes before the Portuguese Arrival. *Proceedings of the National Academy of Sciences*, 119, e2120107119. <https://doi.org/10.1073/pnas.2120107119>
- Ribeiro, N., Joaquinito, A., & Pereira, S. (2011). *Phoenicians in the Azores, Myth or Reality?* Unpublished Document of the Portuguese Association for Archaeological Investigation (APIA).
- Ribeiro, N., Joaquinito, A., Fernando, P., Sauren, H., Rodrigues, A. F., Costa, A., Pereira, A. S., Juliano, M. d. F., Fernandes, J., Freitas, R., et al. (2015). Protohistoric and Historical Atlantic Navigation: Archaeological Evidence from the Azores. In F. Pimenta, N. Ribeiro, F. Silva, N. Campion, A. Joaquinito, & L. Tirapicos (Eds.), *SEAC 2011 Stars and Stones: Voyages in Archaeoastronomy and Cultural Astronomy. Proceedings of the SEAC 2011 Conference* (pp. 64-70). BAR International Series 2720, Archaeo-Press.
- Ribeiro, N., Joaquinito, A., Rodrigues, A. F., & Azevêdo, M. T. (2017). Arqueologia e Arte Rupestre na Macronésia, novos contributos. *Techne*, 3, 113-124.
- Rodrigues, A. F. (2015). Megalithic Constructions Discovered in the Azores, Portugal. *Archaeological Discovery*, 3, 51-61. <https://doi.org/10.4236/ad.2015.32006>
- Rodrigues, A. F., Martins, N. O., Ribeiro, N., & Joaquinito, A. (2015). Early Atlantic Navigation: Pre-Portuguese Presence in the Azores Islands. *Archaeological Discovery*, 3, 104-

113. <https://doi.org/10.4236/ad.2015.33010>
- Rodrigues, A. F., Quaresma, C., Madruga, J., Mendes, A., Matos, V., & Ferreira, M. T. (2023). *The Fast Human Bone Degradation in the Azores: The Case of Terceira Island Cemeteries*. Poster for PhD Fellowship at the R&D Unit Research Centre for Anthropology and Health (CIAS).
- Rodrigues, F., Madruga, J., Martins, N., & Cardoso, F. (2018). Dating the Cart-Ruts of Terceira Island, Azores, Portugal. *Archaeological Discovery*, 6, 279-299. <https://doi.org/10.4236/ad.2018.64014>
- Rull, V. (2023a). Settlement and Anthropization of the Azores Islands. *Journal of Biogeography*, 50, 2008-2011. <https://doi.org/10.1111/jbi.14712>
- Rull, V. (2023b). Human Settlement and Landscape Anthropization of Remote Oceanic Islands: A Comparison between Rapa Nui (Pacific Ocean) and the Azores (Atlantic Ocean). *Plants*, 12, Article No. 2089. <https://doi.org/10.3390/plants12112089>
- Rull, V., Lara, A., Rubio-Inglés, M. J., Giralt, S., Gonçalves, V., Raposeiro, P. et al. (2017). Vegetation and Landscape Dynamics under Natural and Anthropogenic Forcing on the Azores Islands: A 700-Year Pollen Record from the São Miguel Island. *Quaternary Science Reviews*, 159, 155-168. <https://doi.org/10.1016/j.quascirev.2017.01.021>
- Santos, C., Lima, M., Montiel, R., Angles, N., Pires, L., Abade, A. et al. (2003). Genetic Structure and Origin of Peopling in the Azores Islands (Portugal): The View from mtDNA. *Annals of Human Genetics*, 67, 433-456. <https://doi.org/10.1046/j.1469-1809.2003.00031.x>
- Scafi, A. (2022). Saint Brendan's Island on European Maps (1300-1500). In J. Bockmann, & Holtzhauser (Eds.), *St. Brendan in Europäischer Perspektive—St. Brendan in European Perspective* (pp. 167-194). V&R Unipress. <https://doi.org/10.14220/9783737014861.167>
- Siebold, J. (2023). *World Maps of Al-Idrisi*. Online via Myoldmaps.com. <https://myoldmaps.com/early-medieval-monographs/219-al-idrisi-world-maps/>
- Silva, S. S. (2021). Angra Do Heroísmo, Azores, Portugal. World Heritage City: An Invitation to Cultural Tourism. *Revista Rosa dos Ventos-Turismo e Hospitalidade*, 13, 434-459. <https://doi.org/10.18226/21789061.v13i2p434>
- Tian, K. (2017). General Tectonics of Azores. In *Azores Field Guide* (pp. 5-13). Columbia University, Department of Earth and Environmental Sciences.
- Van Leeuwen, J. F. N., Schäfer, H., van der Knaap, W. O., Rittenour, T., Björck, S., & Ammann, B. (2005). Native or Introduced? Fossil Pollen and Spores May Say. An Example from the Azores Islands. *Neobiota*, 6, 27-34.
- Vieira, N., & Brito, C. (2009). Past and Recent Sperm Whales Sightings in the Azores Based on Catches and Whale Watching Information. *Journal of the Marine Biological Association of the United Kingdom*, 89, 1067-1070. <https://doi.org/10.1017/s0025315409000873>
- Wawrik, F. (1981). Die islamische Kartographie des Mittelalters. In O. Mazal (Ed.), *Kultur des Islam. Referate einer Vortragsreihe an der Österreichischen Nationalbibliothek, 16-18 Juni 1980* (pp. 135-163). Biblos-Schriften 113. Österreichische Nationalbibliothek.
- Yavuz, A. (2021). *The Portuguese in the First Century of the Age of Discovery (1415-1499)*. Master's Thesis, Yeditepe University.