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'Thàine is gun tàine feamainn' – 'Come and come is seaweed': Tides of innovation, continuity, and change in Scotland's seaweed industry, c.1619 – c.1932

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Abstract

Over the past four hundred years, the Scottish seaweed industry's fortunes have ebbed and flowed, mirroring the tides on the shores of those coastal communities that relied on the industry for their livelihoods. The first commodity derived from seaweed was kelp, the calcined ashes of seaweed, which provided essential chemicals like calcium carbonate and potassium nitrate to early industries, including glass, soap, gunpowder, and bleach. In the industry's second phase, kelp and charcoal derived from tangle stipes were sources of iodine and potash until the early 20th century. Despite the industry's significant economic and social impact in Scotland, the limited in-depth research thus far has tended to focus on the main production areas of Orkney and South Uist. This research has typically concentrated on the so-called 'boom years' during the Napoleonic Wars and the subsequent decline following the first phase. As a result, there has been a gap in understanding the industry's broader context. For example, this knowledge gap is illustrated in the misidentification of some kelp processing sites in the National Historic Record of the Environment (NRHE) as prehistoric or Viking 'burial cists'.

To bridge this gap, this thesis focuses on the first two phases of four commercial phases of the industry: the alkali phase, which operated from the early 17th century to the early 20th century, and the iodine and potash phase, which was active from around 1840 to the early 1930s. By exploring the themes of innovation, continuity and change, this thesis sets out to understand how the Scottish industry adapted and reinvented itself to changing markets and economic conditions over the centuries. It does this by analysing the role technological innovations played in driving progress, analysing the archaeological remains in diverse coastal landscapes to understand the scale and methods used to harvest and process the seaweed into the final commodity, and finally, critically examining the social, ecological,

and economic impacts that the seaweed industry had on these coastal communities.

This thesis features three coastal landscapes representing the first two phases: Calbost (Isle of Lewis) and Coigach (Wester Ross), representing the first phase, and the Isle of Tiree, for the second phase. Through an integrated interdisciplinary approach, the analysis uncovers ecological entanglements and connections within a commodity chain analysis framework, shaping a different narrative beyond the dominant themes of exploitation, collapse, clearance, and famine found in previous historical analyses. Furthermore, this thesis emphasises the importance of local knowledge and the lived experience of workers in the industry. It showcases how the Gaelic language and oral histories serve as vital resources to better understand the industry's impacts.

The thesis concludes by comparing and contrasting the three landscapes by reflecting on the merits of the conceptual frameworks used to interpret these areas. By discussing the tides of innovation, continuity and change, the thesis underscores the significant contribution of the seaweed industry to Scotland's cultural identity and economic landscape. It considers the broader implications of this research in light of current challenges in the heritage management of these coastal sites, such as natural erosion and rising sea levels due to climate change.

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Author's note:

Conventions on the use of Gaelic:

Orthography: the placenames and any Gaelic texts or vocabulary will follow the GOC 2009 spelling and orthographic conventions. When citing from Gaelic sources, the Gaelic will be given first, in italics, followed by the English translation in brackets.

Gaelic Placenames: the Gaelic placename appears first, followed by the anglicised name in brackets to indicate the primacy of Gaelic. Where possible, the placenames in the Ordnance Survey Map were also verified with Ainmean-àite na h-Alba, for Lewis: Ainmean Tuineachaidh Leòdhais (Lewis Settlement Names) , for Tiree, www.tireeplacenames.org, and for Coigach, Tobar an Dualchais recordings https://www.tobarandualchais.co.uk/ , tracks 80582, 81495 and 81497.

Names for wider regions, large islands and bodies of water (e.g. the Minch, Tiree, Coigach, Lewis) will use the standard anglicised form as they refer to broadly understood boundaries. The term 'Gàidhealtachd' refers to Gaeldom, that is, the Gaelic-speaking areas, which includes the Highlands and the Islands.

Placenames outwith the Gàidhealtachd: These will use the standard English name, e.g. Glasgow, Edinburgh, Prestonpans, East Lothian

Gaelic personal names: where the patronymic or personal name is known, this will be preferred. Otherwise, anglicised forms referred to in primary sources are used.

Currency:

Before 1707:
Unless stated otherwise, all values are in £ Scots, thereafter £ Sterling.
Merk = 13s 4d (Scots)

Between 1603 and 1707, the exchange rate between £Scots and £ Sterling was standardised at 12:1, that is, £12 (Scots) = £1 (Sterling)

Pre-decimal currency (before 1971):
d= pence, s = shilling
Groat = 4d

Images: Unless otherwise attributed, all photographs are copyrighted by the author.

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A lump of kelp, made at Eilean Mhàrtainn Seaweed Festival, 2021

For my parents, Wayne and Betsey McCoy

Author’s Declaration

I declare that, except where explicit reference is made to the contribution of others, this thesis is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Holley McCoy

15/02/2025

Abbreviations

AAA – Ainmean-àite na h-Alba (Scotland's placenames)

ANT – Actor-Network Theory

AoP – Acts of Parliament

RARFA – Regional Archaeological Research Framework for Argyll

CCA – Commodity chain analysis

GOC = Gaelic Orthographic Conventions, SQA. 2009. Scottish Qualifications Authority, Glasgow

GUARD – Glasgow University Archaeological Research Division

HER – Historic Environment Record

HES – Historic Environment Scotland

HighARF – Highland Archaeological Research Framework

ICA – Inverary Castle Archive

NGR – National Grid Reference

NLS – National Library of Scotland

NOSAS – North of Scotland Archaeological Society

NRHE – National Record of the Historic Environment

NRS – National Records of Scotland

NSA – New Statistical Account

ODNB – Oxford Dictionary of National Biography

OED – Oxford English Dictionary

OS - Ordnance Survey

OSA – Old Statistical Account

RPCS – Records of the Privy Council of Scotland

SCAPE - Scottish Coastal Archaeology and the Problem of Erosion

ScARF – Scottish Archaeological Research Frameworks

SIRFA – Scotland's Islands Research Framework for Archaeology

TAD – Tobar an Dualchais/Kist O' Riches

TGSI – The Gaelic Society of Inverness

Chapter 1 Introduction

Thàine 's gun tàine feamainn,	Come and come is seaweed,
Thàine 's gun tàine brùchd,	Come and come is red sea ware,
Thàine buidheag 's thàine liaghag,	Come is yellow wrack, come is tangle,
Thàine biadh mu 'n iadh an stùc.	Come is food which the wave enwraps.
Thàinig Mìcheal mil na conail,	Come is Michael of fruitage,
Thàinig Brìghde bhìth na ciùin,	Come is womanly Bridgit of gentleness,
Thàinig a' Mhàthair mhìn Mhoire,	Come is the mild Mother Mary,
'S thàinig Connan àigh an iùil.	And come is glorious Connan of guidance.

(translation by Alexander Carmichael)
(Carmichael 1941: 33)

The *ortha* (incantation) above praying for *Foghnadh Feamainn,* an abundance of seaweed, is from *Carmina Gadelica*, a collection of oral traditions collected by Alexander Carmichael in the late 19th century. This *ortha*'s rhythm matches the waves bringing the seaweed onto the shore. It also reflects the importance of seaweed to the way of life of the Gaelic-speaking communities of the Outer Hebrides, even to their survival. In the same way, this ebbing and flowing symbolises how the seaweed industry has been like the tide coming in and pulling back and coming again. The Scottish seaweed industry has followed a 'boom-and-bust' pattern in economic history, often affected by international conflicts such as the Napoleonic Wars and political policy (Bumsted 2005: 124, 134-35; Clow and Clow 1947: 198, 314-16; MacAskill 2006; Rymer 1974). Over the past four centuries, the industry has witnessed tides of change, characterised by emerging new technologies and markets. As one aspect of the industry declines, another rises to take its place. Despite the considerable economic significance of the seaweed industry in Scotland, there remains a notable absence of sustained and systematic archaeological investigation into this topic. This thesis directly addresses this research gap, presenting the most comprehensive and methodical study of the Scottish seaweed industry to date.

What is 'kelp', and what is the kelp industry?

In the context of this study, kelp does not refer to a specific species of seaweed but rather to the residue obtained from the incineration of seaweed, also referred to as 'calcined ashes', which was produced in pits or trenches located close to shorelines. The Oxford Dictionary (2023) suggests that the noun *kelp* is of Middle English origin from *culpe*, and the variant *kelp,* which is now in common use, is apparently a dialectal variation, which can also mean seaweed. The OED also gives the earliest written evidence of the use of *culpe* from John Trevisa's translation into Middle English of Ranulf Higden's *Polychronicon* in 1387: *as culpes of þe see waggeþ wiþ þe water* (as kelps of the sea waggeth with the water).

From the 17th century until the early 19th century, kelp played a significant role in early industries such as glassmaking, soap production, cloth dying, gunpowder and bleaching. Subsequently it became a valuable source of iodine and potash in the latter half of the 19th century until the early 1930s. Throughout its operation spanning two and a half centuries, the kelp industry experienced fluctuations akin to the ebb and flow of tides along the shores where the seaweed thrived.

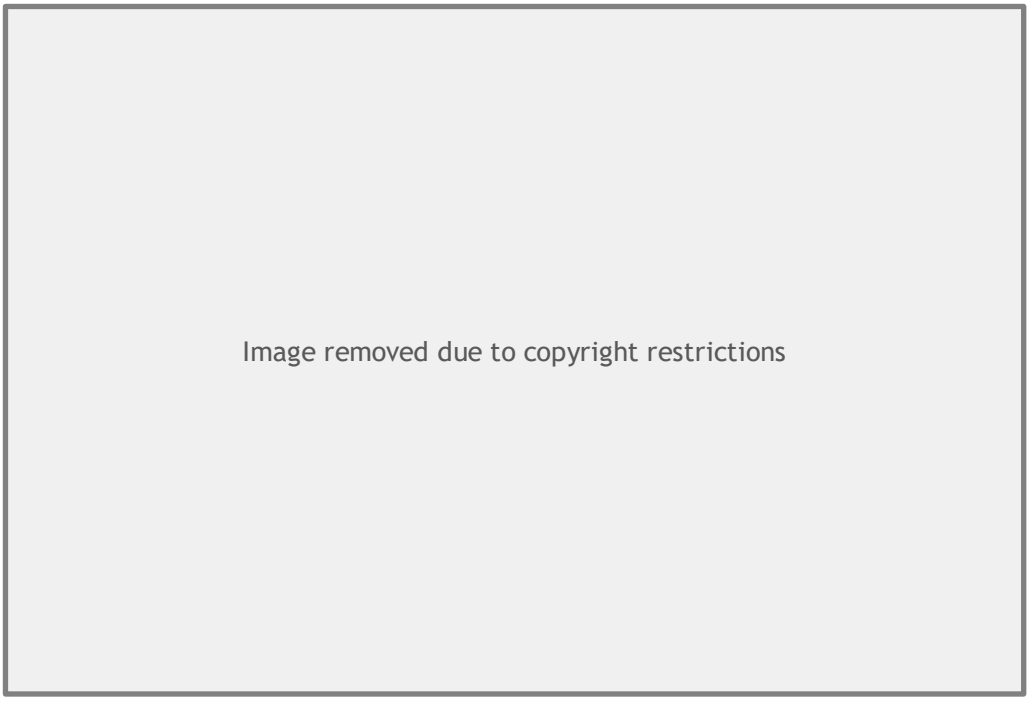


Figure 1-1: Kelp fragments. ©Orkney Islands Council.

1.1 Aims and Objectives

The Scottish seaweed industry, particularly kelp production, has played a significant but understudied role in coastal landscapes, communities, and economies since the 17th century. Notably, there has been little systematic archaeological research into the industry in Scotland. This thesis aims to understand this role the industry played by addressing these specific questions:

1. *How did technological innovations and changing economic conditions shape the development of Scotland's seaweed industry between the 17th and early 20th centuries?*

2. *What can archaeological remains and landscape features reveal about the scale, methods, management and evolution of seaweed harvesting and processing in different regions of Scotland over time? How can these sites be better identified in light of rising sea levels due to climate change?*

3. *What were the economic, social, and environmental impacts of the seaweed industry on Scottish coastal communities, and how did local knowledge and practices influence its development?*

There are potentially hundreds of kelp-processing sites along Scotland's coasts, although less than one hundred and fifty are in the National Record of the Historic Environment (NRHE) (Figure 1-2). In addition, some sites in the NRHE have been misidentified as burial cists (TROVE: 10758 1994; TROVE: 337559 2001). This misidentification is possible because many archaeologists conducting coastal surveys are unfamiliar with the historical practices and economic significance of the kelp industry, largely due to a lack of in-depth archaeological research (Grant, Kevin 2016: 123; McAteer 2020: 13).

One of this research project's objectives is to document and identify the diversity of archaeological remains in the historic environment and potentially transform how these sites are recorded, designated and ultimately managed in the future in the face of rising sea levels due to climate change. Many of these sites are at risk

from natural coastal erosion, and with increasingly frequent and severe storms caused by climate change, they now face significant threats (Hambly 2017: 4). It is unknown how many sites have already been lost to coastal erosion without having been recognised, much less recorded. For instance, an extensive site that was identified by archaeologist Carol Knott as a potential kelp processing site at Gabhsann a Deas (South Galson), Isle of Lewis (TROVE: 337559 2001) (Figure 1-5) is on the island's northwest coast, an area susceptible to the heavy waves and tidal action of the North Atlantic. Some of the kelp kilns are located on an actively eroding section, where part of this site may have already been lost. Issues with this site are discussed in more depth in Section 1.3.1. This thesis also aims to address the issue of erosion exacerbated by rising sea levels by identifying these environmental threats and suggesting ways to mitigate these potential losses in Chapter 7.3.1.1.

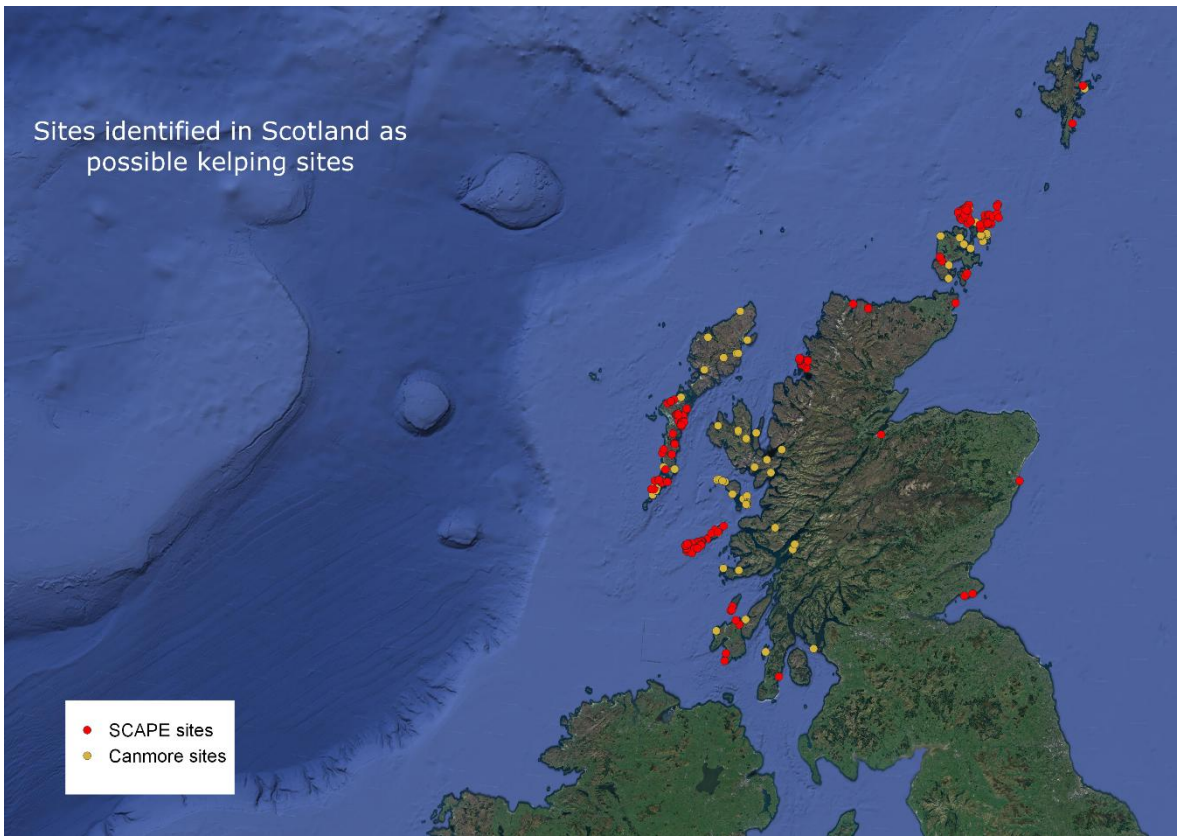


Figure 1-2: The distribution of potential kelp processing sites in Scotland. Data obtained from ©the SCAPE Trust and ©Historic Environment Scotland (www.trove.scot).

The Scottish seaweed industry, particularly kelp production, played a significant but understudied role in shaping coastal landscapes, communities and economies

for three centuries, starting in the 17th century. This thesis aims to provide a deeper understanding of how the industry developed over time and how it impacted different regions of Scotland. It does this by taking an interdisciplinary approach that integrates archaeological, historical and intangible cultural evidence such as oral tradition, knowledge, poetry and song. Three key conceptual frameworks — Commodity, Ecological Entanglements, and Connections—will be utilised to achieve this goal. These conceptual frameworks are informed by various archaeological, landscape, economic, philosophical, and anthropological theories to help interpret the data. They also draw on archival sources, social history, environmental history, oral history and Gaelic resources.

This approach is applied to three coastal landscapes where significant kelp manufacture took place: two from the Hebrides and one from the northwest mainland in Wester Ross. The three primary coastal landscapes effectively illustrate the first two phases of the industry. The first case study focuses on Calbost, located on the Isle of Lewis, and examines kelp production in a tacksman-led township during the boom years of the Napoleonic Wars c.1784-1821 within a major kelp-producing estate. The second case study centres on Coigach, situated on the northwest coast near Ullapool, directly across the Minch from Lewis. Although it addresses the same period, the kelp industry in Coigach, which was part of the Cromartie estate, was controlled by external entrepreneurs instead of the estate. As a result, the documentary evidence is fragmentary but has a significant number of archaeological sites relating to kelping. The third case study explores the Isle of Tiree, investigating the industry's transition to iodine and potash extraction from tangles (Laminaria sp.) from 1863 to the final days of burning tangles in the 1930s.

The beginning of this thesis includes a Gaelic poem, and two of the case studies feature relevant Gaelic poetry. These poems from the oral tradition represent a part of intangible cultural heritage (UNESCO ICH 2024) and help to understand specific tasks, landscapes and human relationships. They strengthen the argument by illustrating social change through poetry, emphasising the connections between people and their environment, whether in harmony or conflict.

1.2 Commercial phases and surviving archaeology: thesis scope and structure

Scotland's seaweed industry experienced four main commercial periods with their approximate dates, each defined by key historical events or changes within the industry (Childs, Peter E 2022; Devéria 2012). The periods are identified through archival sources (Masson, David 1895: 771-772), or these milestones: improvements in iodine extraction by Andrew Ure (1817), the cessation of kelp use by Glasgow soap-boilers around 1845 (Childs, Peter E 2022: 200), the final days of kelping in Orkney for iodine (Thomson 1983: 51) and the operational dates of Cefoil Limited, later Alginate Industries Ltd (L/D271/C/1), and experimentation into new uses since the decline of alginates, albeit at a smaller scale (Kenicer *et al*. 2009: 17-18). The following breakdown provides a clear framework for understanding the evolution of the industry and the changes in technology and use over time.

Phase 1. c.1619 – c.1840s: Extraction of alkali (soda) from kelp for glassmaking, soap, dyes, bleaching, and gunpowder production. Seaweed used in this phase included rock weeds: such as *Ascophyllum nodosum* (knotted wrack, *feamainn-bhuidhe*), *Fucus serratus* (toothed wrack, *feamainn-dhubh*) and *Fucus vesiculosis* (bladder wrack, *feamainn-bhuilgeanach*); drift weeds, referring to *Laminaria* species (often called kelp) washed ashore in spring. Rock weeds and drift weeds were both valued for their chemical properties and availability (Figure 1-3).

Phase 2. c.1814 – c.1937: Extraction of iodine and potash from kelp or seaweed charcoal, primarily using *Laminaria* species.

Phase 3. 1934 – 2009: Extraction of alginic acid from *Laminaria* species and *Ascophyllum nodosum* for applications including wound dressings, food, medicines, drink thickeners, stabilisers, and emulsifiers.

Phase 4. c.1980s – present: Harvesting of various seaweed species for diverse industries such as cosmetic skin treatments, food, nutraceuticals, biodegradable packaging, animal feed, biofuels, and artworks.



Figure 1-3:The seaweeds used in the first two commercial phases, left to right: Ascophyllum nododum, Fucus serratus, Fucus vesiculosis, Laminaria digitata. Ascophyllum image obtained from: https://commons.wikimedia.org/wiki/File:Ascophyllum_nodosum.jpg

Given the time constraints of this four-year project, the broad timespan of the industry and the Scotland's vast and complex coastline, estimated to be 18,743 km including its many islands (marine.gov.scot 2023), this thesis will primarily concentrate on the first two commercial phases of the industry: Phase 1 (alkali/soda) and Phase 2 (iodine/potash), from the early 17th century to the 1930s. The Isle of Lewis and Tiree have been selected as key case studies because of their particularly significant roles in the development and operation of the Scottish seaweed industry, as well as the abundance and diversity of available evidence from these locations. Their selection allows for a focussed and meaningful analysis that is both manageable within the project's scope and representative of broader regional historical dynamics. Moreover, the sheer volume of archival material relating to both Lewis and Tiree means that this thesis is not archivally driven; instead, archival sources are used selectively and strategically to support and inform the *archaeological* narrative.

Archaeological evidence for the first two industrial phases includes kilns, drying walls, seasonal shelters for accommodating itinerant kelpers and maritime infrastructure such as slipways, landing places and boat nausts. Creating a gazetteer of these monument types is not part of this research because this has been accomplished in John McAteer's thesis (2020). His research is discussed in Section 1.3.1 regarding the Scottish archaeological research context. The primary structures associated with kelp sites discussed in this thesis are the kilns for burning seaweed into kelp, along with discussion of drying walls and shelters. Rough stone alignments feature in two of the three coastal landscapes, their morphology tending to be varying lengths of undressed beach cobblestone alignments, or whatever stones were to hand to build or augment depending on the amount of seaweed brought in. Bothies or kelpers shelters also feature in some of the processing sites seen in Chapter 5.3.1. These include roughly built sub-rectangular structures made of stone or more ephemeral materials such as turf, or a combination of both.

The morphology of kilns varies, from circular or oval stone-lined pits dug in close to a shore edge often 3m in diameter and up to 0.5 m to 1m deep (Figure 1-4, Figure 1-6), to long narrow sub-rectangular trenches averaging from 2 -3m in

length by 1m -1.5m wide externally, about .5m- 1m internally, and up to 1m in depth (Figure 1-5). The latter represented an improvement to the circular pit that was first mooted in the late 1780s in Ireland because the elongated shape of the sub-rectangular trenches allowed for more even distribution of heat, which improved the efficiency of the burning process and increased kelp yield compared to circular pits (Beaton 1799: 35; Jameson 1798: 47; Kirwan 1789: 31). Both of these types of kilns could either be dug into the soil or hollowed out beach cobbles in storm beaches, or their sides could be built above ground, averaging about 1m in height. How the morphology of kilns and other structures were adapted or developed over time, and the reasons behind these changes, will be examined in the individual coastal landscape studies in Chapters 4 - 6, then returned to in the reflections and discussions of the findings in Chapter 7. The archaeology of the Scottish seaweed industry has not been well understood in the past, and it is hoped that this study will significantly enhance our understanding of these questions, providing much needed clarity and depth to the subject.



Figure 1-4: Àird Sìthaig, Ceann Shìophort, Isle of Lewis. Example of a circular pit, one of several identified by Christopher Burgess (Northamptonshire Archaeology 2004).



Figure 1-5: Gabhsann a Deas, Isle of Lewis. Example of a trench-type kiln partially dug into the soil.

Image removed due to copyright restrictions

Figure 1-6: A circular kelp kiln typically found in Orkney. (Fenton 1997: 65)

Although Orkney has been identified as the primary kelp producer in Scotland since about 1719, further exploration of this archipelago was not undertaken due to the industry there having been well-researched and documented, including archaeological excavation. Instead, Orcadian sources, such as William Thomson's monograph *Kelp-Making in Orkney* (1983), have been used to inform the other case studies and document the transition in kelp production from the Firth of Forth to Orkney in the early 18th century. Nor has South Uist been explored despite being the largest kelp producer in the Outer Hebrides. South Uist was part of a case study for a PhD thesis (Grant, Kevin 2016), which subsequently led to the development of this research project. As with Orkney, the research conducted at

Loch Aoineart by Grant will be employed to help further contextualise the kelp industry along the west coast of Scotland and in the Hebrides. Both Thomson's book and Grant's research will be reviewed in Section 1.3.1.

The investigation of the early industry of the Firth of Forth showed that examining the historical aspects of the case study was more valuable than an archaeological analysis, because written records offered more detailed and accessible evidence. Two potential archaeological sites identified by SCAPE along the coast at Pittenweem (Chapter 3.1) may date back to the late 18th century. However, the archaeological record in this area is fragmentary and poorly understood, with interest only beginning recently by SCAPE. Active erosion by the North Sea and significant industrial development, land reclamation in particular (Smout, T C and Stewart 2012: 175-200) in the region since the Industrial Revolution, especially between Prestonpans and Leith - have likely subsumed any archaeological remains that may have existed. For example, land reclamation projects such as the infilling of Morison's Haven in the 1950s have altered the coastline significantly, making it difficult to locate any remaining artifacts. In addition, the archaeological record in this area is so fragmentary and poorly understood, that it is not certain that it would be recognised by most archaeologists. Similar challenges have affected other coastal archaeological sites in Scotland where the combination of natural forces and human activities have obscured or destroyed traces of past industries. This contextual analysis highlights the complexities involved in identifying and interpreting archaeological evidence in dynamic coastal environments. As a result, the Firth of Forth functions primarily as an historical analysis rather than using the three conceptual frameworks to analyse archaeological and ethnological data, as seen in the three other case studies. The case of the Firth of Forth explores the origins of commercial kelp use and trade in Scotland. It highlights the factors that contributed to the transition from domestic and agricultural use to commercial burning for the glass industry, and expanding its uses later on for soap, alum, gunpowder and bleach production. This transformation demonstrates the significant evolution of an essential resource into a commodity whose exploitation has been driven by technical innovation and development.

Alginic acid was discovered in 1882 by Edward Cortis Stanford, whose innovative work in Tiree concerning iodine production is discussed in Chapter 6. However, the alginates phase (1934-2009) did not operate on a large industrial scale until after World War II. The complexity and amount of global data required to fully understand the alginates phase is beyond the scope of this thesis. Therefore, this study will not go into an in-depth analysis of this phase, as its significance warrants a separate investigation (see section 7.3 for future recommendations).

Chapter 2 introduces and explains the three conceptual frameworks of Commodity, Ecological Entanglements and Connections that underpin the interpretation of coastal landscapes presented in Chapters 4 - 6. These frameworks are not applied in isolation; rather, they are intricately interwoven to provide a richer and more nuanced narrative. The Commodity production sequence forms the structural backbone, mapping the transformation of seaweed from its raw state through various stages of processing and distribution, highlighting its journey as a tradeable commodity. Within this commodity-centred narrative, Ecological Entanglements are addressed by considering the dynamic interactions between people, seaweed and the wider coastal environment, such as how harvesting practices impacted local ecosystems and how environmental conditions shaped the evolution of kelp processing techniques. The Connections framework is layered into the analysis by tracing the social, economic and cultural linkages that developed between coastal communities, regional markets and broader global networks as a result of the kelp industry. This integrated approach allows for a holistic understanding of each site, revealing the interplay between material processes, environmental factors and social networks. Chapter 3 provides an historical foundation by exploring the early development of the Scottish kelp industry and the technological innovations that transformed kelp into a commercially valuable commodity, setting the stage for the detailed analyses that follow. Chapters 4 - 6 consist of the three main case studies, each systematically investigating the archaeological remains and interpreting them through the three key conceptual frameworks outlined in Chapter 2.

The Discussion chapter integrates the case studies with the conceptual frameworks, highlighting common themes that address the research questions and

their contribution to the overarching argument of the thesis. This section also reflects on the results, evaluating the effectiveness of the approach and its alignment with national, regional, and thematic research frameworks (ScARF), as well as the goals of Historic Environment Scotland (HES) in understanding, designating and managing these sites in line with their stated policies. Finally, Chapter 7.3.1 discusses the research implications and suggestions for potential future research pathways.

1.3 A research context of Scotland's seaweed industry

This section conducts a critical analysis of previous research concerning the Scottish seaweed industry, focusing on the fields of archaeology, history, material culture and oral traditions from the 17th to the early 20th centuries. This analysis aims to identify gaps in the existing research and to evaluate which methodologies would be most beneficial for achieving an in-depth understanding of the industry. Specifically, the discussion will encompass the industry's contextualisation within the relevant landscapes and seasonal cycles, its impact on local communities, its interconnections with other industries across Scotland, and its positioning within the broader framework of the global economy.

The seaweed industry is vast in its historical timeline and diverse applications. It encompasses a range of processes, from historic industrial practices like kelp burning for sodium carbonate, potash or iodine to its modern-day use in food and beauty products and biofuels. This section is categorised into several distinct themes to clarify this extensive subject. These themes are: the archaeology conducted on the seaweed industry in Scotland; the historical research context; the Irish, English, and French contexts, local oral histories and material culture, and legal considerations regarding the ownership of the foreshore. Ultimately, understanding the broad context of the industry will not only identify the knowledge gaps but will also aid in narrowing down appropriate case studies within the wider context of the seaweed industry in Scotland.

1.3.1 Scottish Archaeology on the Seaweed Industry

Aside from Orkney (Fenton 1997; Riekie *et al.* 2006), no systematic archaeological surveys or excavations have targeted the remains of the seaweed industry. Most excavations, such as that at Sanday, Canna (Hunter, John 2016: 96-7) and Allt Chrisal, Barra (Branigan 2005: 33-36) have been accidental, prompted by development or coastal erosion. The few studies that have been conducted, including specific case studies in South Uist (Badcock 2000; Grant, Kevin 2016: 121-152) or the monuments of Scotland's seaweed industry in general (McAteer 2020), involved minimal primary fieldwork and relied on fragmentary previous research such as the coastal zone assessments conducted by HES and SCAPE.

Several archaeological sources are short informal pieces written by or for local archaeology groups or historical societies. One such example, *The Scottish Kelp Industry* by Sue Hothersall (2012) for the Lorn Archaeological and Historical Society's journal *Historic Argyll*, gives a brief outline of the history of the kelp industry with a description of different archaeological remains that can be found in the landscape. Since the article targets a non-academic audience, it does not include a list of sources at the end. However, it does mention a couple of potential sources in the text that warrant further investigation.

A key example is the substantial potential kelping site near Gabhsann a Deas (South Galson), Isle of Lewis (TROVE: 337559 2001). Several of its structures were initially misidentified as burial cists in a 1997 HES coastal erosion assessment (Burgess and Church 1997: 257). When Carol Knott resurveyed the site in 2001, she interpreted it instead as a kelp-processing site. She noted that the eight identifiable trenches, each around 2.4 to 3m long and 0.4 to 0.6m wide internally, were scattered across the site rather than aligned on a consistent axis, as burials normally would be (Figure 1-5). Most were three-sided and open-ended. Knott also interpreted nearby rough stone alignments as seaweed-drying walls, based on their construction and their spatial relationship to the trenches. Together with the remains of a bothy and the site's proximity to the shore, these features led her to suggest large-scale kelp processing. However, a shore-side bothy in Lewis does not, by itself, confirm a kelping site. Such rough stone shelters were also used by

fishermen, given the long history of fishing around Lewis since the sixteenth century (MacCoinnich 2015: 258-289). MacGillivray (1831: 301) notes that kelpers were not only working 'at a distance many miles from his home, or in a remote island… sleeping on the damp floor of a wretched hut.' These aspects are why understanding the wider kelping context is therefore essential for identifying and recording such sites. More definitive confirmation would require environmental archaeological methods, such as soil chemistry or geophysical survey, particularly magnetometry, to detect evidence of burning. These methods are discussed further in 7.3.1.1. Knott's revised interpretation is now recorded on Trove.scot, the searchable online digital resource of the National Record of the Historic Environment (NRHE) in Scotland. Although the site was probably an extensive kelp-processing complex, Hothersall (2012: 36) states that 'these examples of kilns and bothies at Galson NW Lewis were easily spotted by a visiting group,' despite there being 'no local knowledge of them.' This claim appears not to account for the local history and politics of Lewis. It is unclear who was consulted for this 'local knowledge', and whether they lived in or near South Galson. One possible explanation is that North and South Galson were not established as townships until 1924, long after the decline of the Lewis kelp industry in the 1830s (Macdonald, Donald 2004: 171-177). Earlier residents had either been relocated elsewhere on the island or compelled to emigrate. The scale and location of the site are therefore significant, since Barabhas (Barvas) parish, including Gabhsann, appears to have had relatively limited kelping activity compared with other Lewis districts before c. 1830 (GD 46/17/80/59), therefore production was operating in a short, but intense, period of about ten to fifteen years, perhaps not getting underway at a large scale until 1919 when William MacGregor from Gairloch became the tacksman (MacCoinnich 2024: 24). Most production took place in Uig and Lochs, where the more sheltered sea lochs offered better conditions for seaweed growth (see Chapter 4.2). Chris Barrowman (2015: 272) suggests that kelp kilns may not have been identified in neighbouring Ness because production was 'centralised around Barvas, Lochs and Stornoway, with a large travelling population working in these districts, many of them coming from Ness', although he does not cite a source for this claim. MacDonald (2004: 125-126) records that people in Barabhas refused to work at kelping, either because they detested the labour or because

spring agricultural work there continued until July. These contradictions raise questions about the presence of potential kelping sites in the parish, including another substantial possible site on the Barabhas shore (Figure 1-7), and about how kelping in this area related to the wider Lewis estate under the Seaforth MacKenzies. It is also notable that two local specialist sources (MacCoinnich 2024; Rennie 2020) do not address the kelp industry in this area. Even though Hothersall's article was written informally for a local community group, it demonstrates the importance of investigating local historical contexts carefully when interpreting archaeological sites.



Figure 1-7: Potential kelping site at the Barabhas shore featuring several round pits. NGR 34162 50765. This site is known locally in Barabhas as 'kelp kilns' but is not in the NRHE.

One source mentioned in the article is *The Coastal Zone Assessment Surveys (CZAS)*, conducted by the SCAPE Trust (Scottish Coastal Archaeology and the Problem of Erosion) and Historic Environment Scotland (HES) and its predecessor bodies. Many of these surveys began in the late 1990s and are ongoing, with much of Scotland's coasts already surveyed. Some of the surveys have identified potential kelp processing sites, providing a starting point for more detailed

research. These surveys will help identify case studies or assessment the extent of specific phases within the industry. In doing so, they also provide an opportunity to evaluate the reliability of existing data sources. Additionally, they can be evaluated to determine whether their data accurately identifies kelp processing sites, for example when the HES coastal erosion assessment in Gabhsann incorrectly identified a site as burial cists, highlighting the need for careful data evaluation. In another survey, the Lochinver to Ullapool Coastal Zone Asssessment Survey (CZAS) (Long *et al.* 1996) collected information on potential kelp processing locations along the northwest coast, but this data has not previously been analysed within the context of the Scottish seaweed industry. The quality and reliability of the data from the Lochinver to Ullapool CZAS will be considered in Chapter 5. Section 7.2. will further discuss the implications of these findings for archaeologists undertaking future coastal zone assessments. By explicitly tracing the historical evolution of kelp processing methods, they can develop a clearer understanding of how the industry changed over time. This knowledge will enable them to recognise and interpret characteristic features that are specific to different periods of commercial kelp production. As a result, archaeologists will be better equipped to confidently identify kelp processing sites in the landscape, linking physical remains to phases of industrial development and thereby informing more accurate site interpretation.

Staying within the same period, '*Òran an Fheumnaidh – song of the seaweed gatherer: an archaeology of early 19th-century kelping*' (Grant, Kevin 2019) uses a case study of a kelping site at Loch Aoineart, South Uist, to consider the kelping industry in the context of a 19th-century community. The article, which is based on a case study in his PhD thesis (Grant, Kevin 2016: 121-152, 241-272), examines archaeological remains of the kelping industry, including kilns, bothies and roads, along with historical documentation and local Gaelic culture and oral tradition. He presents an innovative narrative approach to landscape archaeology, focusing on the lived experience of the people in that community, from the clan elites who controlled the business to the individual kelper, often a landless cottar. The author takes a unique approach by emphasising the importance of the Gaelic language and culture in their way of life rather than disregarding them. By using the poem *Òran*

an Fheumnaidh, by the well-known Uist bard Dòmhnall Iain MacDhòmhnaill (Dòmhnaill Iain Dhonnchaidh, 1919-1986) of Peighinn nan Aoireann (Peninerine), South Uist, various parts of the poem are tied to the landscape and tasks to evoke the experience of the kelpers, such as the strenuous work of seaweed collection and the collective remembrance of hardship after the decline of kelping. The study also examines various facets of the kelping industry within the landscape. It includes a documented history, movements and infrastructure related to kelping. Additionally, it explores social and economic relationships as evidenced by archaeological remains and provides a detailed description of the kelping process and material culture finds, such as kelping irons for stirring the molten kelp. Regarding the lack of first-hand accounts, Grant states (2019: 75):

> Some insights into the experience of this work can be gleaned from local culture. The first-hand oral tradition of the area is relatively silent on the matter of kelping, although two songs by the 20th-century poet Dòmhnall Iain MacDhòmhnaill refer to the act of collecting seaweed. Aspects of his accounts of kelping probably come in part from personal experience of collecting seaweed for manuring, but perhaps they are also based on local traditions and stories of kelping in the century previous to his birth.

A search of the *Tobar an Dualchais* (TAD) website reveals many interviews collected regarding '*obair na ceilpe*' (kelp work), several of them from South Uist, Dòmhnall Iain Dhonnchaidh among them. MacDhòmhnaill states in his interview when asked if he ever heard about kelping: '... *bha mi fhìn ann, chunna mi fhìn a' dèanamh na ceilpe. Bha m' athair tric a' dèanamh na ceilpe*' (I was there myself, I saw the kelp being made myself. My father was very often making kelp.) (MacDhòmhnaill 1983).

It is possible that Grant did not have the means or time to translate at the time of writing, and, therefore, lacked access or awareness of these resources, as these recordings are not listed in his bibliography. Archaeological research in the islands often faces challenges because most projects have not been led by Gaelic speakers, which poses a limitation, especially concerning the post-medieval period, where there are recorded oral histories in many instances. Grant acknowledges this limitation in the conclusion of his thesis (Grant, Kevin 2016: 298) and argues that the thesis aimed to show that 'there is a significant amount of translated material available and a corpus of literature in English which allows for

a basic critical understanding of the tradition to be acquired'. Nonetheless, this paper presents a comprehensive approach to landscape archaeology by effectively addressing case studies, referencing both Gaelic and Scots sources, and stating further research directions on the industry, with this thesis being one of the outcomes of his recommendations.

The first dedicated archaeological research into the broader Scottish context of the kelping industry is John McAteer's (2020) MSc dissertation *Monuments of a Proto-industry in a Maritime Landscape: The Archaeology of the Scottish Kelp Industry: early 18th to mid-19th Century*. McAteer connects the documented history, the archaeological evidence for the origins and development of the industry, and its economic and social impact. He states that while the industry's history has been well-documented, little systematic studies have been done in archaeology. Using the historical record, mainly gleaned from online databases such as the Old and New Statistical Accounts (Gordon 1845; Sinclair, Sir John 1794), he has highlighted where there are gaps in the archaeological record that could identify where fieldwork may uncover kelping sites, particularly in areas not considered before, such as the Solway Firth. He suggests this area would make 'an ideal candidate for a community-based archaeology project' (2020: 93). He also uses archaeological research into the Irish kelp industry (Forsythe 2006; McErlean 2007) as an analogue to understand the Scottish context. The main thrust of this dissertation is that to be able to identify the different types of monuments correctly, one must understand 'the process of kelp manufacture, an awareness of the relationship to the physical environment and an understanding of the range of monuments one would expect to find.' In addition to naming and describing various types of monuments and outlining potential areas of research, such as seasonal migration within and between islands, giving voice to marginalised historical perspectives, and analysing the impact of airborne arsenic on health and soil, McAteer has included various tables in the appendices to help organise the data and identify potential areas for further study (2020:92). These appendices contain extracts from the Old Statistical Accounts (OSA) and the New Statistical Accounts (NSA) that outline areas suitable for making kelp or where seaweed appropriate for kelping can be found. It features a comprehensive list of identified kelping sites available on the Trove.scot website and local Historic Environment Records (HER).

Additionally, it references placenames, maps and paintings related to kelping. This dissertation serves as a gazetteer for understanding the kelp production process and identifying structures of potential kelping sites in Scotland. However, given that it is a Master's thesis, much of it is more of a summary rather than in-depth research. For example, he asserts that the shape of kilns had possibly more to do more with culture and where the influence came from, e.g. round kilns in Orkney coming from the north-east of England and the long narrow trenches from Ireland. The validity of this generalisation will be explored through the individual case studies and discussed in section 7.2.

In *From Clan to Clearance: History and Archaeology on the Isle of Barra c. 850-1850AD* (Branigan 2005), some archaeological work (both survey and excavation) on kelping sites and a 'soda factory' was presented. This book also contains a chapter by J.M. Bumsted on the history of the kelp industry in the Western Isles; this chapter will be discussed in the next section on the historical research context. This book is not a dedicated study of the archaeology of the kelp industry in Barra but is multi-period research into the island's history and archaeology since the Viking era. For example, survey and excavation was conducted at Allt Chrisal (p.33), a multi-period site where two sub-rectangular kelp 'ovens' were excavated. In addition, MacNeil's soda factory in North Bay was surveyed and described (pp.34-36). The soda factory was built in 1832 to produce soda directly from kelp made elsewhere, such as in South Uist. This operation did not last long. General MacNeil, Barra's proprietor, was close to bankruptcy due to long-standing debts. At the same time, the kelp industry was in decline. The collapse in prices followed the repeal of the Salt Tax in 1824, and chemical factories in Liverpool and Glasgow began producing 'soda ash' from sodium chloride at a lower price than kelp. While this book is not a systematic archaeological study of the kelping industry, it does include one of the few excavations of kelp kilns. Such excavations are valuable for identifying kelp sites, not just through surveys but also through soil analysis and the study of structural features. For example, it was noted that grass growing within the infill of kilns is often a deeper green due to the presence of kelp or unburnt material, which acts as a soil nutrient (potash). This green tint helps identify kelp kilns, the round kilns in particular, whose subtle, ephemeral shapes blend into the landscape, appearing as low humps and bumps that may be

mistaken for natural mounds. Unlike more obvious structures, kelp kilns require careful observation of both colour and contour for detection.

1.3.2 The historical research context

Highland historians, geologists and industrial chemists have published numerous academic articles and book chapters on the history of the kelp industry (Bumsted 2005; Childs, Peter E 2022; Clow and Clow 1947; Grant, I. F. 1995; Gray 1951; MacDonnell 2014; Rymer 1974). These works primarily focus on the alkaline and iodine phases, with some attention given to the alginates industry in the later 20th century. However, as with archaeology, there has been little in-depth research, in the form of longer theses or monographs devoted specifically to the industry. These shorter historical studies draw on primary archival sources from the main west-coast and Hebridean kelping estate archives, such as the Argyll Papers at Inverary Castle, the Clanranald Papers (GD201) (South Uist and Benbecula), the MacDonald of Sleat Papers (NRAS3273) (Skye and North Uist) and the Seaforth Muniments (GD46) (Isle of Lewis and Kintail). These collections contain kelp business accounts, daily management records, year-end financial statements and correspondence with mainland kelp agents. Early foundational research provides valuable insight into the economic and logistical aspects of the kelp industry, drawing heavily on estate records. Specifically, Clow and Clow (1947), focus on the industry's chemical and economic history, while Gray (1951) examines its broader economic development. Expanding on these works, Rymer (1974) covers the early industry while offering the most in-depth treatise on the iodine phase.

A persistent gap in the historiography of the Scottish kelp industry lies in the absence of a comprehensive synthesis that bridges diverse methodological approaches and addresses overlooked aspects of industrial history. In addition to the foundational articles specifically focusing on the industry, most Highland historians have tended to treat the industry as an element within wider regional histories, often under broader themes such as military recruitment, agrarian change, Improvement or the processes associated with the Highland Clearances.

The wider historical context for this study has, however, already been substantially addressed in recent archaeological and interdisciplinary research. In particular, the theses of Bratt (2023), Grant (2016) and Adamson (2014) provide important syntheses of the social, economic and environmental transformations affecting the Highlands and Islands, drawing in turn on major Highland historians such as James Hunter (1976/2010), Eric Richards (1982), T. M. Devine (1994), Allan MacInnes (1996) and Andrew MacKillop (2000). Rather than rehearse those broader accounts in full, this section identifies the historiographical positions most relevant to the study of the Scottish seaweed industry.

These historians do not represent a single interpretive school. Instead, they offer different perspectives on the incorporation of Highland society into wider political, economic and social frameworks. Hunter's emphasis in *The Making of the Crofting Community* (1976/2010: 84-113) foregrounds the formation, persistence and agency of crofting communities. Hunter highlights the harsh working and living conditions, quoting contemporary observers who compared their plight unfavourably even to that of southern factory workers and enslaved people (pg. 86). Hunter also documents kelpers' agency, shown in widespread resistance and resentment through petitions, refusals to relocate and plans for mass emigration, as communities recognised the damaging effects of these changes on their livelihoods and social cohesion (pg. 94). Hunter's position is important because it demonstrates that kelp-producing communities were not passive victims of estate policy or market forces. Instead, their responses reveal forms of local agency that support this thesis' wider argument; that the Scottish seaweed industry must be understood through lived experience, community action and response, alongside economic, technological and archaeological evidence.

Richards' brief discussion of the kelp industry in the first volume of two of his work *A History of the Highland Clearances* (1982: 132-33) is chiefly economic and structural. It emphasises landlords' control over shoreline resources, labour and markets, the uneven distribution of profits, and the limited reinvestment of kelp revenues in local communities. He presents kelp as an extractive and economically fragile industry that increased coastal dependency without creating a sustainable basis for regional development. His emphasis is therefore on economic structures,

landlord power and regional development rather than on the lived experiences or agency of kelp-producing communities

A useful comparative perspective may also be found in Allan MacInnes's approach in *Clanship, Commerce and the House of Stuart* (1996: 295-297, 303). Writing from what may be described as an internal Gaelic perspective, MacInnes is especially attentive to the cultural world of the Gàidhealtachd and frequently draws upon Gaelic poetry as historical evidence. He utilises native literature to reveal a highly literate, politically conscious and nuanced critique of the kelp industry and estates management operating within the Gaelic-speaking communities. MacInnes asserts that creating small coastal crofts for kelping and fishing was not just an economic change: it was a profound and existential breach of *dùthchas*, the sacred contract between the *ceann-cinnidh* (clan chief) and the clan.

MacKillop's (2000) work on military recruitment over the one hundred years between 1715 and 1815 is especially useful in showing how Highland communities were connected to the state and to imperial systems through processes that affected labour availability (pg.213), household economies and mobility (pg.360,337). MacKillop notes an important aspect affecting part-time militia mobilisation was that 'as sporadic tasks such as kelping and peat-cutting, which formed a central feature of estate economies in the region, were completed, training or mobilisation were often temporarily delayed or rescheduled'. This shows the direct relevance to kelp-making, since both recruitment and kelping depended on the mobilisation of rural populations whose labour was subject to shifting economic and political demands (pg.206).

Taken together, these positions provide a framework for interpreting kelp without reducing it to any single narrative of recruitment, commercialisation, clearance or crofting formation. They show that kelp production was simultaneously an economic activity and a social practice, embedded in estates undergoing reorganisation, dependent on household labour also required for other tasks, and oriented towards markets extending far beyond the communities where seaweed was harvested and processed. The recent theses noted above are valuable precisely because they have already brought many of these historical debates into dialogue with archaeological evidence. Their contribution makes it unnecessary to

reproduce a full account of Highland historiography here, but returning directly to MacKillop, Devine, Richards, Hunter and MacInnes remains necessary because their arguments provide the principal historical positions against which the evidence for the kelp industry can be assessed.

These broader historiographical positions provide the necessary context for assessing the more specific literature on the Scottish seaweed industry. They show that kelp cannot be understood only as an economic commodity or as an adjunct to clearance, but must also be considered through labour, landscape, environmental knowledge and community experience. The following studies therefore narrow the focus from general Highland and Island historical discussions to works that address kelp and seaweed production more directly. While these accounts have established the importance of kelp to particular estates, regions and markets, they also reveal the continuing need for an approach that examines the material organisation of production, the ecological knowledge on which it depended, and the lived experiences of the workers who harvested, dried, burned and transported seaweed.

Isabel F. Grant (1961/1995: 54-55), ethnographer and folklore collector, likewise offers only a short discussion, focusing on the impact of the industry on population size and the division of farms into crofts. She provides a brief account of the burning process, stating that 'the sea-ware had to be gathered at low tide in the summer and brought to the shore to be calcined between layers of burning peat in trenches dug into the ground.' However, she does not cite the source of this description, and it may misrepresent the procedure by implying the use of substantial quantities of peat as fuel. Most accounts instead indicate that only small amounts of dry material such as peat, driftwood, dried seaweed or heather were used as kindling at the base of the kiln, after which dried seaweed was layered and replenished as needed, as outlined by Thomson (1983: 34) and Morrison (1983: 54). This process is discussed in greater detail in Chapters 4-6.

Robert Dodgshon (2015: 203-205) as a geographer, takes an environmental history point of view by examining the impact that kelping had on agriculture, such as the change in the use of seaweed as a fertiliser to the use of animal manure from

overwintering livestock indoors, or the increased use of the *cas-chrom* (foot plough) and *cas-dhìreach* (straight foot plough) in potato cultivation. These newer practices were partly due to demands from the kelp industry, often because kelping estates forbade the cutting of seaweed from their kelp shores in their lease agreements. He also outlines how settlement patterns were affected by the kelp industry, though again, only in general thematic terms as the section on the kelp industry is brief.

Branigan's volume on Barra (2005) contains a chapter on 'The Rise and Fall of the Kelping Industry in the Western Isles' by J M Bumsted (2005). This serves as a general economic historical survey of the main kelping estates in the Outer Hebrides, drawing primarily on the archives of Clanranald, MacDonald of Sleat and the Seaforth MacKenzies, three prominent landholding families in the region. The author also references the earlier historical articles on the kelp industry by the Clows and Malcolm Gray, as other researchers have done (both in archaeology and history). Bumsted's chapter discusses key figures, such as Frederick Humberston MacKenzie, Lord Seaforth, the proprietor of Lewis, to whom Bumsted erroneously referred as 'the Earl of Seaforth'. It also should be noted that Lord Seaforth's son-in-law, James Stewart-MacKenzie, is referred to as 'Lord Seaforth' in the text, although he did not hold that title. These misattributions are significant because they can lead to misunderstandings about the lineage and authority of the individuals involved, affecting interpretations of historical events. Chapter 4.2 details the lineage of the Seaforth MacKenzie proprietors during the period of 1760-1830 to clarify who these individuals were. The chapter discusses the organisation and decline of the industry, attempts at scientific improvement in South Uist, and Colonel MacNeil’s short-lived soda factory at North Bay, Barra, in the mid-1830s. This factory attempted to produce soda directly from kelp but could not compete with the more efficient and cheaper LeBlanc process, and it ceased production within two years. These examples help explain why local initiatives struggled against industrial and market change. Bumsted also briefly notes the resurgence of kelping for iodine and mentions North Uist shores rented to the British Seaweed Company, but he does not identify Edward Cortis Stanford or his factory at Loch Euphort, the sister plant to that at Tiree. Stanford’s

operations in North Uist and Tiree demonstrate the continuing importance of the Hebrides during the iodine phase. Chapter 6 examines Stanford's new 'char process' for iodine production and his establishment of his first factory in Tiree as well as the factors that led to its eventual closure.

Continuing with the iodine phase of the seaweed industry, general works on Highland and Islands geography as discussed by O' Dell and Walton (1962), and Scottish industrial archaeology as surveyed by Butt (1967), Hume (1976) and Knox (1999) have tended to neglect the iodine industry. O' Dell and Walton (pp.194-5) provide only a brief overview of kelping in Orkney, the Outer Hebrides and Tiree, with a short note of a 'slight recovery' in the 1830s when seaweed was used as a source of iodine. Later, they mention post-war survey work and processing units from 1956 (p. 228). Butt, Hume and Knox also largely omit the Glasgow chemical industry as well as Hebridean iodine production. Neither Butt nor Hume includes the Whitecrook Chemical works at Clydebank or the Tiree factory in their gazetteers. This omission is striking given the significance of the iodine to Glasgow's chemical sector and to the development of industrial chemistry more broadly.

More detailed treatment has instead come from the history of chemistry. Dr. Peter Childs, emeritus senior lecturer in Chemistry at the University of Limerick (2022) and Jaime Wisniak (2001), a chemical engineer, offer detailed accounts of the Glasgow iodine industry, the iodine distillation process, including Stanford's process, and its impact on the United Kingdom's iodine industry, which was centred in Glasgow. Their research, alongside articles by Ernest Booth (1911-1986), who was also a research chemist, on Stanford and the iodine industry (1963, 1978, 1979), a brief mention by Warren (1980: 19-20) and Leslie Rymer's (1974: 148-49) earlier observations, reveals the significance of Stanford's innovation and the centrality of the Tiree factory, yet these developments remain absent from general historical treatments. The failure to acknowledge Stanford's contribution not only obscures critical technological advancements but also perpetuates an incomplete narrative of industrial transformation. By explicitly integrating these sources and establishing Stanford's pivotal role, this thesis aims to break new ground, offering an original and essential corrective to the historiographical record

and enhancing our understanding of the role of seaweed in Scotland's chemical industrial heritage.

There is only one dedicated monograph on kelp-making and a booklet and a small body of Gaelic writing on the industry, which underlines the limited scale of sustained scholarship. These include: *Ceilp: mar a thug an fheamainn cruadal is tomhais de shoirbheas dha muinntir na Gàidhealtachd* (Kelp: how seaweed brought hardship and a measure of success to the people of the Highlands) by Richard Devéria (2012), Tormod E. Dòmhnallach(1998) *Obair na Feamad* and *Kelp-making in Orkney* by William P. Thomson (1983).

Devéria's *Ceilp* (Kelp) is a booklet written in Gaelic, which forms a part of the series *Sgrùdaidhean ann an Eachdraidh Gnìomhachais* (Studies in Business History). In a brief overview of the industry, Devéria discusses its origins in Prestonpans, East Lothian and outlines the various phases of the industry down to its current presence in the Western Isles with the Hebridean Seaweed Company in Lewis. This work is one of the few published articles or books on this subject in Gaelic: which is not unusual given the lack of publications on historical subjects in Gaelic as most of the literature written about the history of the Highlands and Islands to date has been in English.

This booklet provides an overview of the history of the different phases of development, valuable references, and a new technical or chemical vocabulary in Gaelic, including terms like *mear-shalann* (nitre) and *searbhag pronnsaig* (sulphuric acid). It features excerpts of interviews with former seaweed workers from Baile Ailein (Lewis) and Beàrnaraigh (Harris), who describe their experiences working in the alginates industry. One aspect outlined is the difficulties that the alginate factories experienced, which are the same as current seaweed businesses in the Outer Hebrides continue to experience maintaining a business remote from trading centres: international competition and trade policy, labour costs, unpredictable weather and cost of transport. For instance, international competition led to declining profits for both alginate factories in the twentieth century and kelp producers in the nineteenth century, highlighting a persistent challenge across generations. Some of these same issues also affected the earlier phases of the kelp

industry in the Western Isles, as documented in historical records from the nineteenth century (Bumsted 2005: 134-37).

One noteworthy piece of information is that the earliest recorded date for kelp manufacturing in Scotland appears to be 1661. This date was noted by the English travel writer and botanist John Ray, who mentioned observing glassmaking along the coast between Berwick and Dunbar, where locally sourced sand and kelp were used in its production. Devéria presumed the location was in Prestonpans. But Prestonpans is not between Berwick and Dunbar, although Ray does not specify. One of Scotland's first glassmakers was located at Morison's Haven in Prestongrange (Derham 1760), which will be covered in Chapter 3.

Devéria's booklet is organised chronologically, with each phase of the industry clearly marked by year. This structure enables the creation of a timeline, which serves as a visual aid for readers by allowing them to easily track major shifts in production and development. The timeline enhances understanding by illustrating the 'ebb and flow' of the seaweed industry's evolution, helping readers to identify significant turning points and transitions between phases. Although the booklet is not an in-depth study, its overview is particularly valuable because it provides a concise summary that highlights key milestones and patterns. This approach makes the industry's history accessible to those seeking a succinct informed grasp of it, distinguishing the booklet from more exhaustive academic works because of its clarity and ease of reference.

Tormod E. Dòmhnallach's Gaelic article *Obair na Feamad* (Dòmhnallach 1998), provides a brief history of the agricultural and domestic uses of seaweed, with particular attention to its use in *feannagan* (cultivation rigs). It also sketches the history of the kelp industry, concentrating mainly on the Uists and providing figures for the declining annual North Uist tonnage between 1860 and 1934, covering the time that the British Chemical Company was active there (see Chapter 6.2 regarding Tiree and E.C.C. Stanford). From 1883 onwards, the article shifts its attention to the alginates industry in the Uists. Writing in 1998, Dòmhnallach describes an industry already in serious decline, with Kelco considering cutbacks in response to unstable market and rising freight costs.

Although Dòmhnallach's article is not an in-depth academic study, it is useful because it preserves a Gaelic-language account of seaweed work in the Uists and identifies continuities across agricultural, kelping and alginates contexts. Its brief treatments of declining North Uist tonnage and the later difficulties faced by Kelco offers a valuable indication of how island seaweed industries remained vulnerable to external markets, transport costs and industrial restructuring. In this respect, the article supports this thesis' wider argument that the Scottish seaweed industry should be understood as a long, uneven sequence of adaptations rather than as a single boom-and-bust episode.

Kelp-making in Orkney (Thomson 1983) is a comprehensive survey of the history, life, and environment of the kelp-making industry in Orkney. Orkney became the primary producer of kelp in the early 18th century when industrial-scale production began. Thomson describes the kelping process as carried out in Orkney. This process includes an examination of the perspectives of the merchant lairds and kelp agents, and the lived experiences of the workers involved in the Orcadian industry. Thomson pays attention to the Orcadian dialect for tools, kelpers' lived experience and specific parts of the process. In his description of burning the kelp, for example, he not only details how it was made but also evokes the experience of the kelpers:

> Because it was rough and caustic, it was ‘coorse wark’ loading and carting kelp; tempers were often frayed, but once it was in the store house, the kelp-maker was 'clear' (p. 36).

A key aspect of the book is Thomson's detailed analysis of how environmental factors, such as wind and seabed composition, interacted with the biological requirements of different seaweed species to determine which areas of Orkney were best suited for kelping in the various commercial phases. Each of the first six chapters illustrates a different phase of production, beginning with the natural resource and moving through gathering, burning, marketing, and manufacturing. The Appendices are particularly detailed, presenting tables that outline kelp production, prices, output by islands and parishes, and snapshots from John Balfour's accounts as a merchant laird in 1803, alongside diary entries from James Flett, factor for Hoy Estate in 1828–29. These resources provide valuable context,

allowing readers to appreciate the economic and logistical realities of the industry. For example, the inclusion of John Balfour's accounts and James Flett's diary entries offers a vivid glimpse into the daily challenges and financial conditions faced by those involved in kelping. Notably, the chapter on the Kelp Riots in 1741-2 details early resistance by the tenantry to kelping, some of it driven by perceived detrimental environmental impacts on agriculture and fishing from smoke from the kelp fires. Thomson draws on extensive archival materials, historical literature, and ethnological data, including informal interviews with local kelpers, to enrich our understanding of the kelping industry in Orkney. While these resources provide valuable context, the lack of a clearly defined chronological structure sometimes makes it challenging to fully appreciate the evolution of kelping practices over time. For instance, on pages 39 and 40 Thompson discusses 18th century production and prices and then abruptly shifts to 19th and 20th century iodine production, and then to comparing Orkney to the Western Isles and Shetland in the late 18th century without clear transitions, which can disrupt the reader's understanding of the industry's development. Integrating clearer chronological markers or transitional sections would help readers follow the progression of the industry more easily. He notes that Orkney used circular pit kilns until the 1930s, unlike Shetland's trench-style kilns, but does not explain why Orkney did not adopt the improved kiln design popular elsewhere since the early 1790s. Moreover, since this monograph was published in 1983, it precedes numerous archaeological surveys and excavation reports that have been carried out after the late 1990s (Mitchell *et al.* 2024; Moore and Wilson 1997; 1998, 1999; Riekie *et al.* 2006), making it outdated in some respects. Nevertheless, this work remains fundamental. It provides both a model of the kelp manufacturing process and a framework for understanding the landscape archaeology of kelping in other parts of Scotland.

1.3.3 Oral traditions and histories

An important aspect missing from many historical accounts of the Scottish seaweed industry, particularly kelping, is the voice of those who have worked in it. Including first-hand accounts of those who worked in kelping provides unique insights into daily life, working conditions and community impacts that are often

missing from official records. The absence of these perspectives means that much of the lived experience, social context and cultural significance of kelping remains underrepresented in the historical narrative. Intangible cultural heritage, such as oral history, offers a valuable means to capture personal stories, memories and local knowledge, enriching our understanding of how the industry shaped communities, influenced local economies and affected family life (Cregeen, Eric 1998; Grant, Kevin James 2013). Cregeen, whose main focus in his work was in the Isle of Tiree where he recorded about three hundred hours of material, argues that oral tradition is a distinctive and complementary historical source that often preserves information not visible in official documents. He concludes (pp.34– 35) that neither written nor oral sources can provide a complete history on its own. While written records supply the chronological and institutional framework to understand economic and social change, whereas oral traditions preserve the 'inside' history of a community: family connections, local knowledge, personal experiences, cultural practices, emotional responses and community values. Building on this, Grant (pp.30–31) treats Gaelic oral tradition as evidence within an archaeological approach to interpreting post-medieval Gaelic cultural landscapes. He contends that not only can oral tradition recover the 'inside' history as Cregeen stated, but also it can recover agency of ordinary Gaelic-speaking people who are largely absent from the written records and material evidence. As discussed in Section 1.3.1, Grant used this approach in his PhD thesis when examining the South Uist kelping landscape case study. Together, these perspectives demonstrate why oral history must be treated not as supplementary background, but as a core body of evidence through which the gaps identified above can be addressed; the following section therefore considers the main Gaelic oral tradition resources that make such an approach possible.

Though there is now no one living with a memory of kelping, there are some resources where oral histories can be accessed, namely *Tobar an Dualchais/Kist O' Riches*, the website *Hebridean Connections*, and the evidence taken by the Napier Commission (1884a, 1884b, 1884c, 1884d). *Tobar an Dualchais* (TAD) is the online platform housing many recordings collected by the School of Scottish Studies, Radio nan Gàidheal and the National Trust for Scotland's Canna Collection. TAD is

an ongoing project with at least 50,000 recordings of stories, songs, interviews, history, folklore and traditions collected by renowned collectors such as Calum I. MacLean, John Lorne Campbell, Eric Cregeen and John MacInnes. The database is easily searchable, and as stated previously, if a search using the English word 'kelp' is made, 82 results will appear, mostly from Tiree and South Uist. To obtain further results, searches using different grammatical forms of the Gaelic word for seaweed need to be used, such as *feamainn, feamad,* and *fheamainn*. The results also indicate domestic and agricultural uses, as well as kelping and the alginates industry. The only Scots recordings in the database to date that are related to kelping are from Shetland rather than Orkney. There are recordings regarding kelping from Orkney, but they are not in the TAD database but kept in an archive in Orkney. Most of the memories in the recordings, wherever they were recorded, come from elderly residents, some of whom were involved in the final iodine phase of kelping, either directly or through recalling their parents' experiences.

To date, there are only three songs or poems about working in the seaweed industry in the TAD collection. The first is from South Uist: *Marbhrann to dh'Aonghas Òg Àirigh a' Mhuilinn* (Elegy to Young Angus of Milton), (Morrison, Angus 1953) which commemorates Captain Angus MacDonald, who drowned in 1809 while ferrying kelp in Loch Aoineart. The second, from Tiree, is *Tha mise an seo gun chroit gun sgoth* (Here I am without a croft and a boat) (Kennedy 1977b), a piece describing the hardships and low wages of gathering tangle for the seaweed factory in winter during the iodine phase. The third is a satire work from Laxay, Isle of Lewis: *Suas an Fheamainn* (Up the Seaweed) (MacDonald, George 1966) to celebrate the opening of the Alginates factory in Keose and the perceived benefits of working there. These three pieces happen to be representative examples from different islands and periods, thus creating a vivid and informative picture of the evolving nature of the seaweed industry.

With only summaries available for recordings in Gaelic or English, listening is required to extract details. Audio quality can be poor due to wax cylinder technology or interviewees speaking distinct dialects. As not all recordings from the School of Scottish Studies and Canna are digitised—often because of copyright issues—regular site checks are needed for newly uploaded or transcribed material.

Hebridean Connections (2024b) is a website that provides information on genealogy, croft histories, local archaeology, history, oral traditions, and the material culture of the Western Isles. *Comainn Eachdraidh* (local historical societies) and heritage organisations in the Western Isles have contributed information to its database. The database has been integrated within the Heritage Service of Comhairle nan Eilean Siar (CnES). It is maintained by volunteers at Ravenspoint, Kershader, a community centre in the Pàirc district on the Isle of Lewis, which also houses the Angus MacLeod Archive and Comunn Eachdraidh na Pàirce's museum. While not all *comainn eachdraidh* in the Western Isles have participated yet, it offers a valuable searchable database for most districts. This resource enables residents and researchers to trace family histories, learn about local industries such as seaweed harvesting, and preserve oral traditions for future generations. To date, twelve *comainn eachdraidh* have uploaded information on the seaweed industry. However, data from North and South Uist, Barra, Benbecula, Eriskay, Back, Point, Stornoway and mainland Harris are currently missing. Some groups are newly established, such as Comann Eachdraidh Ceann a Deas na Hearadh (South Harris Historical Society), founded in January 2020. Others have been unable to participate due to reliance on volunteers, or a lack of equipment or training. COVID-19 restrictions from March 2020 to March 2022 further delayed contributions, as many smaller heritage centres closed or had restricted access and are now only beginning to catch up.

Three kelping sites named on *Hebridean Connections* have not yet been recognised in the NHRE: two now uninhabited islands in *Loch Ròg an Ear* (East Loch Roag) in the Uig district, and Calbost in Lochs. Uig and Lochs parishes were Lewis' primary kelping areas from the early 1760s, which will be explored in Chapter 4 as part of the Lewis historical context and its impact at Calbost. The site at Calbost is not registered as a site either in the NHRE or the Western Isles HER. However, it is mentioned in the article from the Pairc Historical Society's *Kelping in Calbost,* where Angus MacLeod notes his belief that it is at Eilean a' Ghòdh that the ruins of Robert Weir's kelping kilns are located (Pairc Historical Society n.d.). On the right side of the webpage, there are links to related pages, one of which includes the names of kelper/fishermen and the tacksman Robert Weir from Calbost in the early 19th century. These online records served as a starting point for gathering

local background information and assisted in identifying potential sites for a local case study in Lewis.

Numerous articles discussing the history of kelping reference the Napier Commission documents, officially known as the *Royal Commission of Inquiry into the Condition of Crofters and Cottars in the Highlands and Islands* (1884a, 1884b, 1884c, 1884d), to demonstrate how the industry's decline, the potato famine and subsequent clearances affected tenants, small or sub-tenants, and cottars both socially and economically. These documents illustrate the widespread nature of the industry and provide insight into the human experience during the time of the inquiry. First-hand testimonies ranged from representatives of crofting townships to landowners and their managers. An example of a first-hand testimony from the landowner class is from Captain Allan MacDonald, proprietor of Waternish in Skye, who reported a lack of singing in Waternish, blaming it on the local Free Church ministers: 'I must say I like to hear them sing a song. I remember when they used to manufacture kelp, it was pretty in the evening to hear them crossing in their boats and singing songs as they rowed along' (Napier Commission 1884d: 617). MacDonald's testimony presents kelping in almost nostalgic terms, suggesting the work was accompanied by song and therefore perhaps experienced as enjoyable. Yet this interpretation reflects the perspective of a landowner and risks obscuring the physical hardship of the labour itself. The singing he remembers may equally have functioned as a way for tenants to endure repetitive, demanding and unpleasant work. Even so, the testimony is valuable because it is a reminder that kelping was not conducted in silence, with workers quietly getting on with their tasks. It points to the social and sonic dimensions of kelp-making, where song formed part of the labouring experience and shaped the collective soundscape of work. Further testimonial evidence from Volume 3 (Napier Commission 1884c) will be considered in Chapter 6 where accounts from tangle gatherers, the factory manager, the managing director of the British Seaweed Company and the Duke of Argyll are used to explore how the Glassary seaweed factory in Tiree affected islanders' lives.

Despite the availability of oral tradition and local history resources, there has been no research where the Gaelic-language oral histories have been collated into a

single academic article or monograph to provide a more comprehensive account of the seaweed industry in the islands. The *Tobar an Dualchais* (TAD) database is an online repository for oral history recordings, primarily managed by the School of Scottish Studies at the University of Edinburgh; it houses a vast collection of stories, songs, and interviews, making it a key resource for researchers. However, Scots language resources differ in their archival practices. For example, recorded oral histories were used in the monograph *Kelp-making in Orkney*. These recordings, locally produced and not part of the School of Scottish Studies fieldwork, are kept in the Orkney Museum archives, which explains the absence of Orkney from the TAD database. Meanwhile, several recordings in the Shetland dialect of Scots about kelping during the final years of the iodine industry can be found on TAD. This comparison between Gaelic and Scots language resources underscores significant differences in accessibility, which in turn affect the preservation and interpretation of oral histories. The language of the recordings can shape the narratives and influence how community memory is maintained and understood, highlighting the importance of both linguistic and archival contexts in historical research.

1.3.4 English, French and Irish contexts

Kelp was not only produced in Scotland but was also exploited along the North Atlantic rim of Europe, from the north coast of France to Norway. Three crucial areas of the early industry were Ireland, England, and France, all whose industries were contemporary with Scotland's. Examining other countries producing kelp concurrently with Scotland is essential, as their methods and market trends may have directly influenced the Scottish industry. As innovations emerged in these countries, these developments gradually spread to various kelp-producing regions in Scotland - and vice versa.

England

Though kelping in England for the glass industry seems to have been operating from the mid-17th century, contemporary with Scotland and France, there seems to have been relatively little written about activities there compared to Scotland, Ireland and France. In England, circular pits for burning kelp can still be found in

the Scilly Isles, similar in morphology to those found in Orkney, Lewis (Chapter 4), and Coigach (Chapter 5). According to the HER entry for a kelp kiln in Scilly (Historic England 1996), 'soda production by this method was introduced to south-west England from France in the early 1680s. Initially centred at Falmouth, Cornwall, the production moved in 1684 to the Isles of Scilly where the national distribution of its recorded remains is confined.' The handful of kelp pit sites in the Scilly Isles are the only sites listed on Historic England's HER for the whole of England. In the case of Staithes and Whitby, the evidence for the shape of the kelp pits there comes from anecdotal reports from travel diaries, such as the botanist John Ray, when he visited Whitby earlier in the 1660s, and Reinhold Rücker Angerstein, the eighteenth-century Swedish industrial spy who travelled throughout Europe. Angerstein describes and illustrates the kelp-burning process at Staithes in his travel diary:

> A great deal of kelp is burnt at Staithes. This is used in precipitation of alum brine. Kelp is burnt from a plant which grows on rocks by the sea, underwater at high tide but easily accessible when the tide is low. The leaves of the plant are thick, bulbous and very large, and the plant is firmly attached to the rock. It is cut, laid on the beach to dry and burnt in a small oven built of loose stones in a circle. The best time to burn kelp is from 15th April to the end of August (Berg T and Berg P (trans) 2001. p 35, as cited in:Cornwall Council 2007).

While it seems the use of kelp as an alkali in glassmaking in England was introduced in the 1660s (Dungworth 2009), its use in the alum industry is said to have begun in England as early as 1604. Alum, is a compound made by combining aluminium sulphate or hydrated ferrous sulphate with potash (potassium carbonate) to make a mordant for dying cloth (Jecock 2009: 55-56). The West Yorkshire Archives catalogue contains records of receipts for kelp sales that date back to 12 November 1619 at Whitby (WYL100/PO/8/IV/26 1619). There is also a letter dated March 1620 (WYL100/PO/8/VII/22 1620) giving details of the price sold for kelp for the purpose of alum-making, indicating there was substantial early commercial production of kelp in the northeast of England. Whitby was the main producer in England of alum, the main production sites being along the north-east coast. Despite these early records and their significance, research into the English kelp industry remains limited, with Dungworth's (2009)recent analysis of alkali in glass production standing as one of the few detailed studies in this field.

Ireland

While archaeological research into the kelp industry on the British mainland has been limited, Ireland has seen more substantial investigation. Notably, McAteer's (2020) MSc dissertation employs two Irish archaeological case studies as analogues for the Scottish kelp industry, providing a comparative framework for identifying monuments and understanding production methods (Forsythe 2006; McErlean 2007). This comparative approach enriches the discussion, allowing for a nuanced evaluation of regional similarities and differences.

Focusing specifically on the environmental and ecological dimensions, McErlean's later paper examines the Strangford Lough area, highlighting how the geology and environmental conditions supported the growth of bladderwrack, which played a pivotal role in the early phase of kelping. In his conclusion, McErlean explores the consequences of intensive seaweed harvesting on the intertidal zone's ecology, noting that as early as the eighteenth century, the removal of seaweed was linked to declining herring shoals due to the loss of spawning habitat (Harris, (1774) as cited in McErlean 2007: 92). He observes that the majority of identified kelp kilns along the Strangford Lough were circular or oval, mirroring those found in Orkney.

In contrast, Forsythe's study of the northern islands off the coast of Donegal adopts a broader historical perspective, considering developments from the seventeenth through to the early twentieth centuries. Forsythe's analysis extends beyond the physical remains to address the economic impact of the kelp industry on local island communities. He discusses estate management practices along the shore and describes the range of monument types, including kelp grids, kelp stores and trench-type kilns, the latter being sub-rectangular in form.

Both McErlean and Forsythe reference Scottish Highlands and Islands sources mentioned in section 1.3.2 (Clow and Clow 1947; Fenton 1997; Gray 1951; MacKenzie, W C 1903; Rymer 1974; The Highland Society of Scotland 1824; Thomson 1983), recognising that the Scottish industry is often better documented and thus offers valuable insights into the Irish sphere. The integration and exchange of knowledge between Scotland and Ireland underscore how closely their kelp industries were linked (McErlean 2007: 78). This comparative methodology reveals many parallels in production methods, environmental impacts and

monument types. However, it also highlights important differences in historical developments. Such cross-regional analysis deepens our understanding of the kelp industry and emphasises the need to consider both local context and broader trends.

In addition to these two main articles, one article surveys and records numbered meering stones on Island Eddy in Galway Bay. These stones remain a fascinating part of Galway Bay's maritime history, having been initially used to mark seaweed rights along the shore for the kelp industry to control the cutting of seaweed. Later, these rights were auctioned annually by the landlord until 1912 (Sheehy-Skeffington *et al.* 2013). In addition to documenting meering stones, Peter Childs has contributed invaluable insights into the Irish iodine industry derived from seaweed through several local history articles, including a study of Galway, only two of which are available online (2021a; 2021b). The two articles not available online, which focus on the history of iodine production in Co. Clare and Co. Donegal, are published in local historical society journals. These articles are particularly significant as they delve into the emergence of iodine factories, such as the British Seaweed Company's factory in Freagh, Co. Clare, and explore their influence on local economic and social conditions. The author referenced articles by McErlean (2002, 2007), Forsythe (2006) and Ernest Booth (1978, 1979) because these works provide foundational insights into the development of the kelp industry and its continued impact on local communities through to the early 20th century. This use of established scholarship enriches his discussion by grounding it in well-evidenced historical and archaeological perspectives, thereby offering a more comprehensive understanding of the regional and international kelp and iodine industries.

France

The French kelp industry, located in the north in Normandy and Brittany, also appears to have begun in the mid-17th century. By 1687, it had become a well-regulated industry when the glass-making sector transitioned from wood ash to seaweed ash, mainly due to extensive deforestation in Europe (Mesnildrey *et al.* 2012). The report on the NetAlgae project regarding the French Seaweed Industry highlights a comprehensive monograph titled *Les Goémoniers* (Arzel 1987). This

comprehensive study examines the seaweed industry in Brittany from its inception in the 17th century to the present, addressing topics such as the coastal lifestyle, historical development, and industrial processing techniques. It further explores aspects of material culture, including specialised tools, garments, modes of transportation (such as horses, carts, and stretchers), the construction of seaweed boats, and related artifacts. Additionally, the work highlights works of art and monuments associated with each production phase, including kilns, factories, quays, and accommodation for migrant labourers, with relevant terminology provided in Breton. Additionally, it examines the evolution of alginates production and collection through the 20th century. The book, while written in French and requiring translation for in-depth understanding, is well illustrated with large photographs and detailed drawings that explain each topic. It is an excellent example of what a comprehensive survey of the Scottish seaweed industry, with a strong focus on material culture, could look like. However, a similar exploration would be beyond the scope of this thesis.



Figure 1-8: Profile drawing showing the construction of a Breton kiln (Arzel 1987: 207).

1.3.5 Legal aspects regarding ownership of the foreshore

The issue of who owns the foreshore—and, by extension, the seaweed—played a crucial role in both the industry and the traditional access to shores for coastal communities, whether on islands or the mainland of Scotland. The implications of the kelp proprietors' claim to ownership of the foreshore can be seen in its impact on the agricultural calendar, disputes among the kelp proprietors, and even among the kelpers. In the example of Coigach, the parish minister wrote to the Board of Commissioners of the Annexed Estates on behalf of the small tenants, airing their

concerns about rights to seaweed for their crops should kelp production take place in Coigach (E746/176/2 1769–1771). The impact of this petition will be discussed in Chapter 5, which examines the Coigach kelping landscape.

Records of disputes between individual kelp workers can be found in local archives such as Sherriff Court records, which at times were violent, that occurred among local kelpers gathering washed-up seaweed for their own agricultural use due to the Lewis estate prohibiting the cutting of seaweed from designated kelp shores (Comann Eachdraidh Sgire a' Bhac 1990: 7). Additionally, historical society documents detail specific disputes, such as the Grianam dispute concerning the ownership of islands in the Sound of Harris, which involved Lord MacDonald and the MacLeods of Harris (Hebridean Connections: 127; Morrison, Alick 1983). The Grianam case is one of the most notable as it lasted for over a century, to include 'nasty confrontations' between those in North Uist and Berneray, Harris. Samuel Johnson (1775: 127), criticising the exploitation of landowners in raising rents from the kelp industry, noted this dispute between landowners: 'This new trade has excited a long and eager litigation between MacDonald and MacLeod, for a ledge of rocks, which, till the value of kelp was known, neither of them desired the reputation of possessing'. This dispute eventually culminated in a court case in 1770. By 1781, a decision was made in the House of Lords, dismissing Sir James MacDonald's final appeal and finding in favour of Berneray (1983: 46-47). This later impacted the kelp industry in Berneray. The whole of the island then transformed into what could be described as an 'industrialised landscape' as a result of the large-scale kelping on the island (1983: 53-54).

In John MacAskill's PhD thesis, '*A Silver fringe?:* the Crown, private proprietors and the Scottish kelp shores and the Scottish foreshore generally c1800-c1940' (2003), he examines in detail the dispute between the Crown and private kelp proprietors over the ownership of the Scottish foreshore, mainly focusing on the kelp shores from the mid-19th century to the mid-20th century. MacAskill has published a book based on his thesis and several articles on the subject. He argues that this aspect of the historiography of the Highlands and Islands, as well as Scottish legal history, has not received adequate attention. His study of the foreshore dispute adds depth to the story of the Scottish kelp industry.

In his work, MacAskill conducts a detailed legal and historical analysis that acknowledges the role of crofters and cottars in determining the Crown's ownership of the foreshore through their gathering of seaweed. This determination continues to have implications for the current seaweed industry in Scotland (Crown Estate Scotland 2021, 2024).

MacAskill notes that the Crown did not assert ownership of the foreshore in Scotland until the latter part of the nineteenth century because, while in England the foreshore belonged to the Crown, it was assumed that the law was different in Scotland.

> The position, however, in Scotland, was not understood to be the same, and it had been the custom of the Board of Trade and the Office of Woods to regard seaware as belonging to the *ex adverso* proprietor whether he had a grant of title to the foreshore or not and irrespective of any prescriptive possession. (2020: 180)

Various legal frameworks complicate the situation regarding ownership of seaweed growing in the intertidal zone. In Orkney and Shetland, Udal tenure, originating from Norse tradition, grants local landowners proprietary rights and title over the foreshore, which stands in contrast to most other parts of Scotland where the Crown generally retains ownership. Udal Law's significance lies in its approach to land and foreshore rights, reflecting the islands' historical connections to Norse legal customs (MacAskill 2003: 299). As a result, not all foreshore areas in Scotland are owned by the Crown Estate, which can complicate the bureaucratic process of determining ownership (Crown Estate Scotland 2021). In addition to Udal Law in Orkney and Shetland, Gaelic-speaking coastal communities elsewhere in Scotland observed a communal right to gathering seaware, echoing similar practices found in Ireland's coastal communities who were influenced by Brehon law. Brehon law, the ancient legal system of Ireland, emphasised community access and collective management of natural resources, allowing members of the community to harvest seaweed for common benefit and was 'later reflected, in Scotland, in how the land was worked on the old run rig system' (MacAskill 2003: 11-12). This is not to suggest that the Scottish foreshore was governed by Brehon law; rather, the point is that customary practices surrounding communal access to seaweed in Gaelic-speaking Scotland appear to have had parallels with those found in Irish coastal

communities. The communal right to harvest seaweed for agricultural use often conflicted with the interests of the kelp industry, as discussed previously regarding the conflict in the Back district (see p. 37). Many kelp proprietors claimed ownership of the foreshore, the area between high and low tide, by including a provision in their tenants' leases that prohibited the cutting of seaweed from their designated kelp shores, referring to specific coastal areas used for kelp harvesting. This practice was notably adopted by the Seaforth estate in the 1760s when kelping activities commenced there (GD 427/35/1 1766). In some estates, their ownership was asserted when they granted leases of their kelp shores to external entrepreneurs. An example of tenants asserting their customary rights as well as the estate leasing their kelp shores in Coigach is discussed in Chapter 5. The estate proprietor's claim to the foreshore in Tiree is evident in Chapter 6, where the Duke of Argyll leased the shores to the British Seaweed Company.

1.3.6 Conclusion

The historiography of the Scottish seaweed industry has, to date, been shaped primarily by studies that focus on its economic and social significance during the late eighteenth and early nineteenth centuries as part of wider narratives within Highland history. Notable works by Hunter, MacKillop, and Devine have illuminated the role of kelp production in Highland and Island economies, examining its impact on rural societies and its integration into broader patterns of industrialisation and capitalist transformation. These authors have provided substantial archival and documentary insights, especially regarding landownership, economic change, and the decline of kelp as a commodity. However, the prevailing scholarship has largely concentrated on the boom period of kelp production and has been limited in its engagement with the material culture, landscape context and the lived experiences of kelp workers. Furthermore, the work of Bumsted, particularly in Barra, has offered valuable local perspectives but remains largely rooted in textual sources and does not fully address spatial and archaeological dimensions.

Despite the historical importance of the industry, current scholarship often fails to capture the perspectives and agency of kelp workers themselves, as well as the industry's long-term effects on coastal landscapes and ecosystems. There is a

marked absence of interdisciplinary research combining landscape archaeology, oral tradition, Gaelic-language sources, and ecological analysis. Material evidence, such as structures, infrastructure, and artefacts, has been underexplored, and the relationship between kelping sites, settlements, and the wider coastal environment remains insufficiently contextualised. In addition, legal disputes over foreshore ownership and seaweed rights, which have shaped the trajectories of coastal communities, have not received comprehensive analysis regarding their enduring consequences. Comparative studies with analogous industries in Ireland, England, and France are also lacking, limiting the scope for understanding the distinctiveness of Scotland's development.

This study seeks to overcome the absence of a systemic archaeological effort aimed at understanding the extent of these remains. It will rely not only on all previously identified sites and case studies but will also use an interdisciplinary approach that includes targeted archaeological research as well as historical records, intangible cultural heritage and Gaelic sources. The research aims to reconstruct the material, social and ecological background of the seaweed industry, with a particular emphasis on the daily experiences of kelp workers and the legal and socio-political influences of foreshore ownership on coastal communities and landscapes. While not archivally driven, primary sources are incorporated as appropriate to support the analysis. The conceptual frameworks and methodology underpinning this approach are outlined in Chapter 2.

This interdisciplinary perspective moves beyond the limitations of previous documentary and archival studies, prioritising archaeological evidence and intangible cultural heritage. The integration of oral tradition, landscape archaeology, and comparative analysis reveals overlooked aspects of kelp workers' experiences and the transformation of coastal landscapes. While this approach may not capture every historical detail, it offers significant benefits by reconstructing physical landscapes and incorporating diverse sources. The interdisciplinary methods employed provide a broader understanding of the Scottish seaweed industry's impact on coastal communities and environments.

Chapter 2 Conceptual framework approaches and methodology: Commodity, Ecological Entanglements and Connections

2.1 Conceptual Frameworks: Introduction and Overview

This thesis, set against the rich historical context of post-medieval Scotland, seeks to integrate post-medieval industrial and landscape archaeology, documented history, ethnology, and material culture. This study aims to examine the impact of Scotland's seaweed industry on the economy, the environment, and society from the 17th to the early 20th centuries. This period marked Scotland's transition from a mercantile economy to a capitalist one, characterised by increasing industrialisation. This shift is significant as the kelp industry was one of several industries that drove the transition from a subsistence economy to one reliant on commerce (Devine 1994: 10, 32; 2003: 30-31, 65,331). Additionally, it aims to explore the sociological effects of the industry on the people involved and their positions within the growing British Empire and the Industrial Revolution. Therefore, this study requires a framework able to connect material production, coastal ecologies and social relations across multiple scales.

What is needed is a synthesis of mutually constitutive conceptual frameworks expressed as Commodity, Ecological Entanglements and Connections. This multi-dimensional approach allows seaweed to be approached as a material resource, a socially mediated product and a participant in wider landscapes of movement, labour and environmental change. The Scottish seaweed industry was never simply a local coastal practice where the seaweed was waiting to be collected. It was made valuable through historically specific relations between shore ecologies, landlord control, labour mobilisation, transport routes, craft knowledge and wider commodity markets. In addition, it linked shore ecologies to agrarian regimes, domestic labour to industrial chemistry and Highland and Island communities to imperial and global markets. Landscapes are not merely cultural projections onto inert land, but fields of agency in which nature, culture and practice are mutually implicated (Plumwood 2006: 115,125). For Scotland's seaweed industry, this means

the littoral zone, tides, weather, drying grounds, paths, piers and burning sites were all active components of production.

Theories based on economic systems include the influence of ideas of the 18th Scottish Enlightenment philosopher Adam Smith's *The Wealth of Nations* and Karl Marx's *Capital* on Hopkins and Wallerstein's World Systems theory (1977), from which comes the commodity chain analysis model that will be used investigate the stages of production through to consumption. Theoretical models that examine the landscape archaeology of the coastal landscapes involved in the kelp industry include influences from Ivan Illich's (1973) concepts of Conviviality, Gregory Bateson's (1972, 1975, 1979) notions of mind and ecology, actor-network theory, environmental history, kinship theory, and the material culture of mobility or movement. These diverse concepts are considered under the three conceptual frameworks of Commodity, Ecological Entanglements and Connections. By integrating these diverse concepts, a comprehensive analysis of Scotland's seaweed industry will be conducted, considering economic, environmental, social, cultural and technological dimensions. This interdisciplinary approach will enhance understanding of the industry's significance and its impact on Scottish society and cultural legacy, as illustrated in the following four chapters which analyse the coastal landscapes where the seaweed extraction operated at an industrial scale.

2.1.1 Commodity: chains of value

The calcined ashes of seaweed, or kelp, was an important commodity that provided essential chemicals, most notably alkali, for several early industries: glass, soap, gunpowder, potash, bleach, and then later in the 19th century, iodine for the pharmaceutical and fledgling photographic industries. A commodity, as defined by Karl Marx (1887: 27) is 'an object outside us, a thing that by its properties satisfies human wants of some sort or another. The nature of such wants, whether, for instance, they spring from the stomach or fancy, makes no difference.' Appadurai (2013) asserts provisionally that a commodity can be defined as an 'object of economic value'. This 'economic object', he says, 'does not have an absolute value as a result of the demand for it, but the demand, as the basis of a real or imagined exchange, endows the object with value.' (Appadurai

2013: 4). Adam Smith explained in *The Wealth of Nations* that two meanings can be ascribed to value;-the value in use and the value in exchange (Butler 2011: 14).

The linked set of processes that takes a consumable item from the extraction of the raw material and the labour involved to the final consumable product is known as a 'commodity chain'. The concept of the commodity chain was first conceived by Hopkins and Wallerstein in 1977, in their paper *Patterns of Development of the Modern World System* (p.128):

> ...take an ultimate consumer item and trace back the set of inputs that culminated in this item – the prior transformations, the raw materials, the transportation mechanisms, the labor input into each of the material processes we call a commodity chain.

Commodity chain analysis (CCA) traces the stages that created the product, including the labour and energy involved, transport during the process, and markets to the consumption of the final item, linking the actors and activities in space and time. Taking the case of a block of Lewis kelp arriving at a glass-makers in Liverpool, this would include not only investigating the techniques in harvesting seaweed and the process it takes to burn and extract the finished kelp, but also the trade routes to get it to market and the markets involved in the industry, and the various actors involved in each stage of the process to get it there, both humans and non-humans. This could include kelpers and their tools, coastal-going boats, ships, ships' crews, ground officers, overseers, merchants, kelp agents, sea routes, cranes and quayside personnel. The next section aims to use this economic theory to understand not only the process of production but also the circuits of exchange in which kelp moved, how it was integrated into more extensive economic networks, and how it impacted local communities and global markets, connecting the microscale of the individual or household to the macroscale of global markets.

CCA has not often been used as a way to interpret material culture in archaeology, but it has been shown to be a valuable method for analysing where trade networks and material culture intersect (Earle 2010; Millhauser and Overholtzer 2020). Specifically, applying CCA, commodity networks and circuits as an archaeological approach is a way to understand the processes and multi-directional flows involved

in production, exchange, and circulation across broad geographic areas (Earle 2010; Millhauser and Overholtzer 2020). CCA differs from *chaîne opératoire* in that it focuses not only on the changing relationships and interactions during an object's life but also on movement and exchange. While both methodologies analyse the production sequence of a specific object in archaeology, CCA encompasses a broader scope of these dynamics. *Chaîne opératoire* is often used to analyse the production sequence of prehistoric lithics, from the extraction and transformation of the raw material to make the object, its maintenance and then finally its discarding to understand the society in which it was made (Joy 2009; Sellet 1993). CCA not only looks at the production sequences of an object but also involves the complexities of economies, trade, and specialisation. For example, when using CCA as an archaeological approach to understanding cotton cloth production in ancient Aztec society, Milhauser and Overholtzer (2020: 129) contend that:

> Commodity chain analysis offers one way to deconstruct traditional models of production, circulation, and consumption as discrete, sequential, and unilinear stages while maintaining theoretical flexibility and allowing investigators to address the oversights mentioned above. In so doing, it complements approaches to the nature of power in ancient societies that recognise power as multicentric, that account for collective forms of political organisation, and that account for the influence of non-state actors such as households, merchants, and markets in the creation of value, the distribution of goods, and the control of resources.

The utilisation of CCA focuses on the placement of kelp production and its incorporation into global markets within the context of the transition to a capitalist system. While an economic history approach has dominated previous studies of the kelp industry, drawing largely from estate accounts, and political and economic policy (Bumsted 2005; Clow and Clow 1947; Gray 1951; Rymer 1974), CCA offers multi-dimensional understanding into the social, economic, technological and environmental dimensions of kelp production from initial harvest to trade of the final product, highlighting the transformations brought about by capitalist growth. By contextualising kelp within its changing historical backdrop, CCA offers a framework through which the process of its commodification and impact on societies and ecosystems during this dynamic period can be understood.

Issues with and limitations of commodity chain analysis

When applying CCA to study the seaweed industry, particularly kelp production before 1830, several challenges and limitations may arise, including disarticulations and uneven geographies. The next section aims to understand these issues and proposes ways to mitigate them when constructing commodity chain analyses.

Disarticulation in CCA refers to the fragmentation or breaking apart of the stages, processes, or connections within a commodity chain. Disarticulation can occur at various points along the chain, disrupting the flow of goods, information or resources and complicating the understanding of the entire chain (Bair and Werner 2011: 989-996). Disarticulations can appear when the chain is fragmented or when there are incomplete historical records. In terms of the seaweed industry before 1830, incomplete or fragmented archive records can make it challenging to accurately trace kelp production processes. Archives may lack detailed records or overlook certain aspects of the industry, such as gender and class, leading to gaps in the understanding of the entire chain. Those in control of the industry, such as tacksmen, estate factors, or independent entrepreneurs, may not have retained any records from the earlier phases of the industry. The kelp industry may have involved multiple actors and processes linking and unlinking within the chain, but historical records may not fully capture the interactions between these elements. This can lead to difficulties in reconstructing the full complexity of the commodity chain, resulting in an incomplete understanding of the industry's dynamics.

Uneven geographies, within the context of CCA, refer to the unequal distribution of resources, power dynamics, economic development and socio-cultural aspects across different geographical areas within a commodity chain (Bair and Werner 2011). This concept acknowledges that various regions involved in the production, distribution, and consumption of commodities may experience disparities and asymmetries in terms of their roles, contributions and benefits within the chain (Bair *et al.* 2013; Bair and Werner 2011; Sheppard 2016). CCA assumes a consistent flow of goods across locations due to its focus on the interconnected, globalised nature of production, distribution and consumption systems (Bair 2009: 7). However, regional variations in production techniques, market access or

resource availability may have occurred along the various coasts and estates that participated in kelp production. Within regional variations, local contexts can make it challenging to generalise findings across diverse geographical areas due to local factors such as environmental conditions, cultural practices and socio-economic structures, which may have significantly impacted the kelp industry in any given year. Regarding the kelp industry in Scotland, regional variations can be seen in kelp processing season length, variations in access to raw materials, infrastructure, technological advances, market opportunities, labour skills or government policies. For instance, some coastal regions such as Orkney had better access to suitable seaweed resources than some Scottish mainland coasts because of the natural environment that gave rise to an abundance of the resource (Thomson 1983); in areas that began using rectilinear-type kilns, the kelpers had a more efficient processing technique due to the technological advancement adopted (Beaton 1799; Parkes 1817; The Highland Society of Scotland 1824). Different areas or regions may have also had varying levels of participation in the commodity chain. Some areas may have focused primarily on resource extraction, for example harvesting bladderwracks off tidal rocks in sheltered sea lochs. In contrast, others may have specialised in processing, trade or transportation, such as iodine extraction at the seaweed factory in Tiree during the 19th century (Chapter 6.4). This differential participation could lead to unequal contributions and dependencies within the chain.

Uneven geographies can influence the economic, social, and cultural dynamics of regions involved in the commodity chain (Bair *et al.* 2013; Bair and Werner 2011). Regions, such as archipelagos like the Outer Hebrides, may have had limited access to markets due to distance and unpredictable weather conditions, and thus may have experienced marginalisation or remained underdeveloped compared to areas with more extensive integration into the chain. This unevenness could have affected livelihoods, wealth distribution, and community well-being. In addition, regarding spatial hierarchies and power relations between regions within a commodity chain, some areas might have held more dominant positions due to their control over resources, market connections or political influences, such as kelp merchants working in Edinburgh. In contrast, others might have occupied

subordinate or marginalised positions, such as subtenants on the coastal fringes of island communities.

In summary, uneven geographies in the Scottish seaweed industry could manifest themselves in coastal regions with varying access to suitable seaweed resources, differing technological advances in processing techniques, disparities in market access and differential integration into broader economic networks. Recognising these uneven geographies is crucial for understanding the industry's complexities, regional inequality, and the diverse impacts experienced by different areas within the commodity chain, as we shall see when comparing and contrasting the case studies of Coigach and Calbost in Chapter 7.2 and reflections on the impact of the factory in Tiree in Chapter 7.2.2.

Constructing the Production Sequence Diagram

Constructing a production sequence diagram is the first step toward understanding the flow of processes involved in a commodity chain. This type of diagram aids in visualising the complexities of a commodity chain by distilling enterprises into a clear set of relationships from raw materials to final products (Millhauser and Overholtzer 2020: 192). This involves mapping the various stages involved in producing, processing, distributing and consuming any given commodity. The operation stages are termed *nodes*. Nodes are multiple points or locations within the chain where production, distribution or value-addition activities occur. Each node represents a crucial link in the chain, contributing to the overall production and movement of a commodity (Hopkins and Wallerstein 1986).

In analysing a finished kelp block, a basic diagram (see Fig. 2-1) starts with identifying each 'node' of production, from harvesting to final consumption. From this, a flowchart is created illustrating the sequential stages of production from harvesting to markets by using labelled boxes (for example, 'Harvesting', 'Drying', 'Burning', 'Transportation', etc.). Arrows are then used to connect the stages to show the flow of kelp and the movement of materials or goods between different actors or locations. The key actors involved (kelpers, landowners, tacksmen, merchants) and the resources utilised (for example, seaweed resources, processing tools and structures, transportation vessels) are included within each node. The

roles and interactions of these actors and resources are explained in brief annotations within each stage, with symbols such as '£' or a lightning bolt to indicate economic inequalities and external dis/articulations respectively. Different shapes with colour coding can indicate various practices or changes in production methods over time. By applying relevant data from historical accounts, archival documents and archaeological remains in the environment of a particular case study, insights into the dynamics and processes as to how a small processing site fits into the more extensive geography of the industry can be further expanded upon in the corresponding narrative. In considering chronological factors such as technological developments and shifts in markets, a separate commodity chain and corresponding production sequence diagram to illustrate these developments can be created, as will be seen in Chapter 6.4.1 and 6.4.2 for the iodine phase of the industry in Tiree.

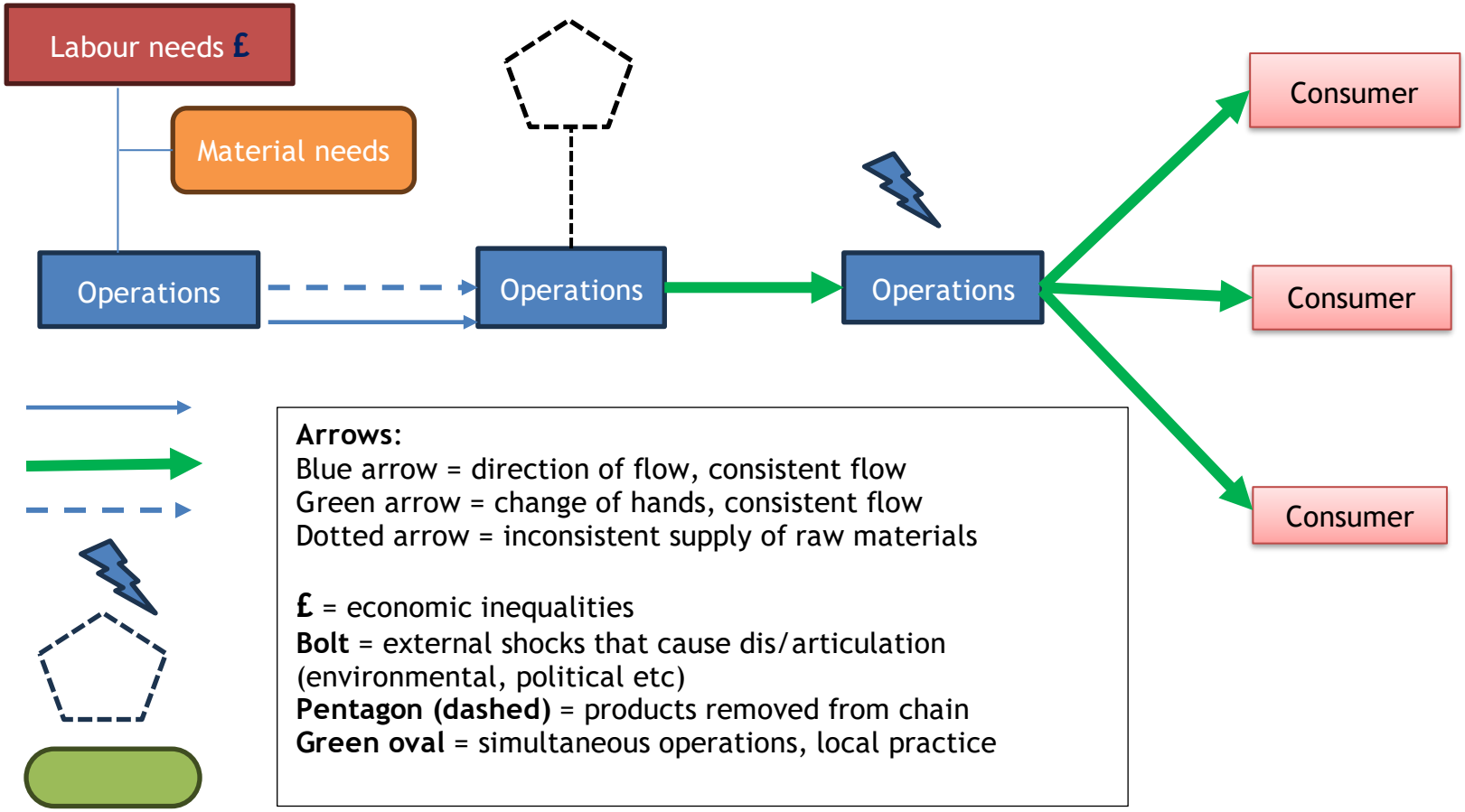


Figure 2-1: A basic form of a commodity chain diagram, with symbols to indicate where uneven geographies or dis/articulations may occur in the chain.

2.1.2 Ecological Entanglements: exploring the interweaving of humans, networks, and the environment in a maritime landscape

If Commodity explains how seaweed acquired value, Ecological Entanglements clarify why it cannot be reduced to value alone. Seaweed is not a passive raw material awaiting human appropriation. As environmental history and recent ecological thinking show, humans and environments are co-constitutive; nature is neither a stable background nor merely a cultural projection (Brüggemeier 2001: 4623; Given 2013: 6). Seaweed exists within littoral ecologies shaped by tides, storms, seasonal rhythms, species variation, rock formations and human intervention. Its availability, quality and uses were contingent on these dynamic relationships. The foreshore and tidal zone should be understood not as a background but as a lively assemblage of relations (Given 2017: 127-130).

Seaweed is conditioned by tidal rhythms, species variation, storm-cast deposition, shoreline geology and seasonal cycles. This means that production locales were chosen not only for social convenience but also for ecological affordances: access to wracks growing on intertidal rocks, drying winds, routes to arable land or proximity to safe landing points. FitzPatrick's study of Aughris in Co.Sligo, Ireland, (2007: 11-12, 28-30) demonstrates exactly this point: apparently simple enclosures were reinterpreted as wrack stands through a combination of excavation, aerial evidence, estate records and local memory, showing the close articulation of seaweed work, micro-topography and seasonal practice. The lesson for Scotland is methodological as much as theoretical: seaweed industry archaeology must read littoral features as ecological and productive simultaneously.

Exploring historical coastal maritime landscapes, specifically kelp processing sites, reveals a multi-dimensional tapestry woven from intricate social, ecological and cultural threads. This study adopts an interdisciplinary methodology, integrating advanced concepts such as Ivan Illich's theory of Conviviality, which highlights the significance of tools and systems that promote both human autonomy and community interdependence. It also draws on Gregory Bateson's holistic systems perspectives, as outlined in *Steps to an Ecology of Mind* (1972) and *Mind and*

Nature: A Necessary Unity (1979), which encourage understanding systems as integrated wholes rather than isolated parts. In order to build a robust framework for interpreting these coastal landscapes, Actor-network theory (ANT) and environmental history are employed to bridge the gap between these two abstract concepts and material reality. ANT considers both human and non-human actors as parts of interconnected networks, highlighting how relationships and influences shape social and material realities. Drawing evidence from environmental history, the analysis explores the complex social, ecological and cultural complexities and interconnectedness present in these maritime spaces. This approach transcends conventional approaches, such as empirical archaeological data (McAteer 2020) or specific historical economic analyses (Bumsted 2005; Gray 1951), exploring the dynamic interactions between human societies and the coastal environments where kelp processing occurred. By interweaving these diverse concepts, this thesis aims to illuminate the nuanced relationships, entangled networks and profound influence of these sites on landscapes, communities and ecosystems during the 250-year period in which the kelp industry operated.

2.1.2.1 Interweaving Conviviality and ecological insights

This section endeavours to unravel the historical narrative by entwining the visionary perspectives of Ivan Illich's *Tools for Conviviality* (1973) and Gregory Bateson's *Steps to an Ecology of Mind* (1972) as an archaeological lens to understand the coastal environments in which the seaweed industry operated (Given 2017, 2018; Ingold 2000: 17).

By scrutinising material remains, communal practices, shared knowledge, and social interactions within these landscapes, Conviviality is a way to explore the environmental and social impact on the communities in which the kelp industry operated. Complementing Illich's perspective, Bateson's *Ecology of Mind* and *Mind and Nature* imbues this exploration with a deeper ecological understanding. Applying Bateson's relational systems approach to the archaeological landscape, this study strives to untangle the interdependencies between human activities and the coastal environment within the context of the seaweed industry. This ecological conceptual framework elucidates the industry's environmental impact,

resource exploitation and adaptive responses within coastal ecosystems, thus enhancing the interpretation of archaeological traces left by the industry as well as informing future exploitation of the intertidal zone.

Applying Illich and Bateson's theories to archaeology helps reveal hidden aspects of landscapes. Analysing kelp kilns, processing sites, and related structures with this framework clarifies material culture, technological change, labour practices, and ecological impacts. This method also highlights heritage preservation challenges from climate change, the value of cultural landscapes, and the interplay between human activity and archaeological evidence.

By combining Illich's Conviviality, Bateson's ecology of mind, and actor-network theory, the study builds a holistic account of Scotland's seaweed industry. This multidisciplinary approach deepens our understanding of connections among communities, coastal ecosystems, and industrial sites, offering a holistic view of the industry's socio-cultural, ecological, and archaeological context.

Conviviality and communities

The ability of individuals to interact creatively and autonomously with others and their environment to satisfy their own needs, or *Conviviality*, is a concept that was coined by the philosopher and social critic Ivan Illich (1926-2002) in his book *Tools for Conviviality* (1973: 26-7) as an ideal to 'combat the degrading effects of capitalism' (Hussain and Stobiecka 2024: 59). Ivan Illich's concept of Conviviality emphasises social structures that foster equitable participation, collaboration, and flourishing communal interaction. Conviviality in this context is *not* the dictionary definition meaning the quality of being friendly and lively, a happy togetherness but is related to its Latin root – *con-vivere*, living together - con- (with, together) and vivere (to live) (Berntsen *et al*. 2014: 6), a co-existence which includes 'negotiation, friction and sometimes conflict' (Wise and Noble 2016: 425). Applying this to communities where the kelp industry operated allows exploration of how communities interacted with these sites, potentially revealing communal practices, local knowledge systems and social relations related to kelp processing. However, when wielded inappropriately, the precariousness of conviviality can

change into what Illich termed an 'unconvivial tool' —a construct lacking its intended essence and resulting in unintended consequences:

> Tools work best for the greatest number of people if the tool is controlled by and for the benefit of the user, rather than the tool taking over, using its own logic and sheer power to drive its workers for the perpetuation of its own momentum (Illich 1973: 34).

One aspect that can transform a convivial tool into an unconvivial one is defining a tool's limits and where breaching these limits tips the balance. In more current terminology, these 'tipping points' signify critical thresholds within systems, where small changes can lead to abrupt, significant alterations. While conviviality inherently seeks to nurture harmonious and balanced social structures, misinterpreting or misapplication of this principle can lead to tipping points within communities or systems. When external pressures, cultural shifts or disruptive interventions disturb the delicate balance of conviviality, it may lead to the breakdown of communal autonomy, erode self-sufficiency or foster discord instead of collective well-being. Conviviality embodies the ideals of communal autonomy, creativity and self-sufficiency within social structures (Illich 1973: 59-100).

An unconvivial use of tools often emerges when rigid ideologies or unrealistic expectations are imposed upon communities or societal systems without accounting for their inherent complexities or tipping points. For instance, enforcing a monopolised legal and political system without considering cultural diversity, local contexts, or socio-environmental dynamics can inadvertently trigger tipping points, destabilising rather than nurturing convivial environments. The imposition of top-down frameworks devoid of community agency and adaptability can create friction, accentuate inequalities, or amplify societal dissonance — deviating from the essence of conviviality's inclusive and empowering nature (Given 2018). In the late 18th century, many coastal and island communities in Scotland witnessed an interplay of conviviality, the precarious tipping into unconvivial realms, and the impact of intensive kelp burning. This process became integral to the local economy yet was marked by its complexities and consequences.

Kelp burning, a crucial process in producing soda ash used in various industries, illustrates this transition. Initially, using seaweed for domestic and agricultural purposes was part of a convivial process - coastal communities engaged in communal harvesting of seaweed, most often as manure for crops, fostering a sense of shared endeavour. However, as demand for kelp escalated in the late 18th century, the intensification of kelp burning led to environmental concerns, depletion of seaweed resources, and altered socio-economic dynamics (Hunter, James 2010: 86-87). The increased focus on maximising production, coupled with restricted access to seaweed rights for manuring crops, pushed this practice beyond its convivial roots. In various coastal townships, disputes arose between neighbours over shares of storm-tossed seaweed on beaches (2017.7.1 1913; Comann Eachdraidh Sgire a' Bhac 1990: 7-8). These conflicts were exacerbated by lease provisions that denied residents the right to cut seaweed on 'kelp shores', with landlords even threatening eviction. This intensification of production and resultant estate policies were also reflected in the shift from communal practices to that of the crofting township, which represented the individualistic ethos where run-rig shares were divided into individual crofts. The consequences of this transformation can still be seen in today's crofting townships.

The impact of kelp burning on the coastal landscapes, economy, and social fabric was profound (Hunter, James 2010: 86-7). While it provided economic opportunities for their landlords and was a source of income for local communities, the unbridled expansion of this industry began straining the delicate balance between human activities and ecological resilience. Tipping into unconvivial territory meant potential overexploitation of humans and natural resources, tensions over land use and disruptions to customary convivial practices, ultimately challenging coastal and island communities' precarious sustainability and equilibrium, as will be explored in Chapters 5, 6 and 7.

Understanding this historical interplay between conviviality, tipping points and the consequences of kelp burning in Scotland's island and coastal communities presents a compelling narrative, which will be explored and developed, particularly in the coastal landscapes of Calbost (4.8) and Tiree (6.4). It highlights the intricate relationships between socio-economic practices, environmental impacts and the

delicate balance between convivial and unconvivial outcomes — a tale resonant with lessons in navigating the complexities of human-environment interactions for contemporary societies grappling with similar challenges.

Limits to Conviviality

While exploring Conviviality to interpret a cultural landscape, various issues became apparent as to why using Illich's ideas was not sufficient as a primary framework and why other concepts were needed to fill in gaps. While Illich's Conviviality helps frame tools, labour and autonomy, it was not developed as an environmental theory and therefore has limits for understanding environmental processes.

While Illich's concept of conviviality provides a powerful framework for exploring the dynamics of social interaction and communal autonomy within cultural landscapes, its limitations become evident when attempting to interpret environmental systems in depth. Conviviality, as articulated by Illich, does not explicitly address ecological processes, biophysical feedback, or the material agency of non-human actors. For example, factors such as the regenerative capacities of coastal ecosystems, the effects of industrial intensification on biodiversity, or the role of seaweed as both a resource and ecological agent are largely absent from a convivial analysis. Crucially, conviviality often describes co-presence without adequately confronting the communicative fragmentation, structural inequality and exclusion that shape social life (Georgiou 2016: 2-3, 23-27). In other words, conviviality can name coexistence, but it does not necessarily explain domination. It can suggest that people and environments were mutually involved, but it struggles to reveal who controlled access to shore rights, who profited from kelp markets, who absorbed economic risk and whose labour remained invisible. This makes it necessary to test Illich's emphasis on autonomy and convivial tools against the harsher realities of kelp work, where labour was often structured by unequal power relations, estate control and economic necessity, rather than freely chosen participation.

A significant risk in relying solely on Illich's conviviality is the tendency to romanticise cultural harmony and overlook the complexities and contestations

inherent in community life. Co-existence is not a static or idyllic state; rather, it is fraught with negotiation, friction, and sometimes conflict (Given 2013: 19). For instance, when interpreting the run-rig system of land management, there is a danger of misrepresenting pre-industrial practices as inherently egalitarian or harmonious from a post-industrial perspective. In reality, run-rig arrangements often involved intricate negotiations over land division, access to resources, and the management of communal labour, with disputes arising over storm-tossed seaweed or rights to harvest kelp. Such misinterpretations can obscure the historical realities of power imbalances, exclusionary estate policies, and the transition from communal to individualistic land tenure, which had lasting consequences for both social relations and environmental sustainability in crofting communities. Any theoretical model that privileges conviviality with political economy risks reproducing a pastoralised image of coastal life. Conviviality may therefore be retained as a secondary interpretive register, useful for understanding lived practical relations, but it cannot substitute for commodity analysis or for explicit attention to ecological and social asymmetry. Conviviality can illuminate how production was enacted, but not fully why benefits and burdens were distributed as they were.

An ecology of mind: patterns, relationships, and feedback loops

> "What do you mean, ecology of mind?" Approximately what I mean is the various kinds of stuff that goes on in one's head and in one's behavior [sic] and in dealing with other people, and walking up and down mountains, and getting sick, and getting well. All that stuff interlocks, and, in fact, constitutes a network. ...At the root, it is the notion that ideas are interdependent, interacting, that ideas live and die. The ideas that die do so because they don't fit with the others. You've got the sort of complicated, living, struggling, cooperating tangle like what you'll find on any mountainside with the trees, various plants and animals that live there-in fact, an ecology (Bateson 1975: 24).

Gregory Bateson (1904-1980), a prominent anthropologist, social scientist, and cyberneticist, contributed significantly to various fields, integrating diverse concepts and ideas from anthropology and cybernetics, systems theory, ecology and epistemology. His main emphasis was on understanding relationships, patterns and processes within ecosystems and societies. This section explores how Bateson's concepts of patterns of interaction and relationship, context, and feedback loops

can be applied to interpret the archaeological remains, social interactions, and environmental entanglements pertinent to each case study and how this can complement a conviviality approach. Bateson's emphasis on relationships and patterns of interaction within systems (1972: 106,1 49-50, 177, 377, 380-81) aligns with the archaeological quest to decipher the interconnectedness of elements within the seaweed industry's landscape. Examining archaeological sites, artefacts and features through Bateson's cybernetics lens allows the decoding of dynamic relationships between human activities, technological practices and the coastal environment. This approach aids in reconstructing the industry's functioning, societal interactions and embeddedness within ecological systems.

Bateson's ecological approach underscores the importance of *contex*t and *feedback loops* within systems (1972: 278-79). Bateson's understanding of context was not just the immediate surroundings but also the broader patterns and structures shaping how individuals interpret and respond to information. Context is essential for comprehending the meaning of a message or behaviour because it provides the background against which specific actions or statements gain significance. His holistic approach to understanding communication and behaviour highlighted the interdependence of elements within a system, where context plays a crucial role in shaping the dynamics of relationships and the interpretation of information (1972: 292-396). According to Bateson, the concept of feedback loops (1972:278-279) was fundamental in understanding communication, learning and system dynamics, including social and ecological systems. He introduced two types of feedback loops: positive and negative. A positive feedback loop amplifies or reinforces a process, the output of which enhances or intensifies the input, leading to a self-reinforcing cycle. This can lead to rapid and dramatic changes that may result in the instability of specific patterns. Conversely, negative feedback functions to stabilise or regulate a system. The output counteracts or diminishes the input, maintaining a balance or *homeostasis*.

Applying Bateson's core concepts of mind and nature to the archaeology of the seaweed industry enables exploration of how human interventions, such as seaweed harvesting and burning practices, influenced coastal ecosystems. Examining archaeological traces through this lens unveils the feedback loops

between human actions and environmental changes, shedding light on the industry's ecological impacts and the adaptive responses of communities to environmental shifts. This scrutiny could highlight how convivial (or unconvivial) practices within the seaweed industry had feedback effects on the environment. These loops would illuminate the industry's sustainability, its impacts on coastal ecosystems, and communities' responses to environmental changes caused by industry practices, as discussed in Chapter 7.1.2.

Bateson's holistic approach prompts viewing the seaweed industry as a socio-ecological system, encompassing human societies and their interactions with coastal environments. Integrating this perspective transcends traditional disciplinary boundaries, amalgamating social, ecological and archaeological interpretations. Embracing the interdependence of cultural practices, ecological dynamics and material remains, Bateson's framework facilitates a deeper understanding of the seaweed industry's historical significance and its implications for socio-ecological landscapes. By incorporating this holistic approach, convivial practices can be explored in terms of how these were embedded within broader ecological contexts. This will involve examining the industry's interactions with coastal ecosystems, the impact of intensive seaweed harvesting on marine biodiversity and the coastal communities' adaptation to ecological changes over time.

The application of Gregory Bateson's 'Ecology of Mind' in interpreting the archaeological landscape of Scotland's seaweed industry enriches the understanding of the industry's socio-ecological complexities. By unveiling relationships, contextualising human-environment interactions, deciphering communication and embracing a holistic perspective, this approach offers an in-depth analysis and specific examples of how this historical phenomenon has influenced social dynamics, environmental changes and cultural perceptions over the period it operated.

Limitations with Bateson's concepts

While Bateson's 'pattern which connects' has clear appeal for coastal archaeology, where tidal ecologies, labour routines and material traces are deeply relational, it

does have limitations for archaeological analysis of commodity production. His thinking can be too abstract, privileging pattern and cybernetic relation over historical specificity. Additionally, while excellent at identifying feedback, adaptation and learning, Bateson's ideas are less adept at explaining political economy, conflict and exploitation. Critics have noted in relation to ecological intelligence that his framework sometimes encourages a harmonising emphasis on balance and relational awareness that sits uneasily with histories of extraction and coercion (Saniotis 2011: 459-463). Bateson can help us see shore ecologies and labour as patterned interactions, but his framework does not explain why seaweed became a commodity at certain moments, how its value was appropriated along the chain, why certain communities bore disproportionate labour burdens or how coastal production related to wider imperial and capitalist transformations. Thus, Bateson is invaluable for understanding relational cognition and ecological pattern, but insufficient for analysing commodity chains and historical power.

2.1.2.2 Environmental history and ecosystem dynamics

The historical context in studying Scotland's seaweed industry is crucial for understanding the industry's impact on society, the landscape and the economy. By examining this history through the additional lens of environmental history, the complex interactions between humans and their environment can be revealed. J. Donald Hughes (2009: 5) states that 'environmental history is derived in part from a recognition of the implications of ecological science for the understanding of the history of the human species'. In the past, the conventional historical narrative has tended to emphasise technological and cultural advances as a way for humans to gain mastery over other beings and the natural environment and has been more concerned with human political activities. Environmental history considers that humans biologically depend on natural factors and are subject to ecological factors. Environmental history investigates the dynamic interactions between human societies and their surroundings over time. This discipline unravels the complex interplay between human agency and ecological processes by analysing past environmental changes and their impacts on human communities. By integrating environmental history into this conceptual framework, a deeper understanding emerges regarding the long-term effects of human-environment

relationships, the repercussions of resource exploitation and the cultural transformations induced by environmental shifts (Cevasco *et al.* 2015; Hughes 2009; Macdonald, Patricia and Macdonald 2009; Worster 1994).

Understanding the environmental context is a crucial aspect of understanding the impact of the seaweed industry in Scotland. Using environmental history can show how kelp processing affected coastal ecosystems and marine resources. This perspective can highlight changes in the coastal landscapes due to human interventions and technological adaptations. Due to the limited scope of this research project, much of the environmental history will be examined by using historical and archival documents to trace the development of the seaweed industry, paying particular attention to legal and economic aspects such as politics, regulations, taxation and trade networks, and its role in industry, agriculture or medicine. Oral histories that were collected from local communities, such as recordings collected by fieldworkers for the School of Scottish Studies, now available on the *Tobar an Dualchais* website (www.tobarandualchais.co.uk), can also reveal local knowledge relating to customary use of seaweed, industrial practices and changes over time. Comparing these findings with those of other regions and periods will contextualise the development of Scotland's seaweed industry with broader historical and environmental trends that may have influenced the industry, such as the volcanic eruptions in Iceland that not only had an impact in the 1780s on agriculture in Scotland (Dodgshon, R. A. *et al.* 2000), but also on the capacity to dry the gathered seaweed sufficiently to process it into kelp.

A narrative that encompasses not only the ecology of those environments but also the relationship of those in those environments to their ecology can emerge by exploring both documented historical records, oral histories and the realm of environmental history. In challenging the conventional European ideology of human dominance over nature since 1500 (Pattberg 2007), environmental history can provide a crucial lens for deciphering the complexities of the seaweed industry's impact on coastal ecosystems. Examining legal and economic dimensions, trade networks, the industry's role in agriculture and medicine, the burgeoning growth in consumer goods and personal experiences from oral histories can add depth to this

understanding. By contextualising the development of Scotland's seaweed industry within broader historical and environmental trends, this research contributes to unravelling the intricate web of human-environment relationships and the lasting repercussions of resource exploitation.

2.1.2.3 Actor-network entanglements

Actor-network theory (ANT) offers a unique perspective that can complement and fill gaps in other conceptual frameworks used when interpreting the cultural landscape of the seaweed industry. By considering the various elements involved in this process as interconnected actors, ANT allows for a comprehensive analysis of the social, cultural and ecological aspects at play. At the same time, ANT has issues and limitations in interpreting archaeological landscapes, such as power relations, temporality, scale and scope (Millhauser and Overholtzer 2020; Preucel 2012). The following section will outline how ANT is an integral component within each conceptual framework in this chapter.

As elaborated on previously, commodity chain analysis can tend to focus on the linear flow of goods and resources from production to consumption. While this approach provides valuable insights into economic systems, it may overlook the intricate network of human and non-human actors involved in the taskscape of the kelp production process. Tim Ingold (1993: 158) describes the term taskscape 'just as the landscape is an array of related features so -by analogy - the taskscape is an array of related activities. …taskscape is to labour what land is to landscape'. Conversely, ANT emphasises the agency of both human and non-human actors, considering them as equal participants shaping the network and the taskscape (Millhauser and Overholtzer, 2020:196-198).

Conviviality explores the notion of social relationships and interactions that promote community as practice. ANT can build upon this concept by highlighting the diverse actors involved in kelp production. It can examine how these actors, including local communities, seaweed harvesters, kelp burners, the tide cycles and even the seaweed itself, interacted and influenced the conviviality of the process (Given 2013, 2017, 2018; Whatmore and Hinchliffe 2010).

Gregory Bateson's notions of the ecology of mind share some conceptual similarities with ANT's emphasis on relationality, interconnectedness and the agency of human and non-human elements. Bateson's systems theory posits that phenomena are best understood in terms of their relationships within larger systems rather than in isolation. He emphasises the interconnectedness and interdependence of elements within systems, arguing that changes in one part of the system can have ripple effects throughout (Bateson 1972, 1975, 1979). Actor-network theory can fill in the gaps of Bateson's Ecology of Mind when interpreting an archaeological landscape by emphasising the relational dynamics between human and non-human actors. In this approach, the archaeological landscape is not solely seen as a product of human agency but as a network of interconnected human and non-human elements that actively shape each other's behaviours and meanings. Thus, instead of focusing solely on human actions and intentions, actor-network theory highlights the agency of non-human actors, such as artefacts, technologies and environmental features, in the construction and transformation of the landscape. This perspective offers a more nuanced interpretation of past societies and their material worlds by recognising that non-human elements, such as tools, buildings and natural features, played significant roles in shaping human experiences and social structures (Knappett 2011; Van Oyen 2015).

Actor-network theory provides a robust foundation for conceptual frameworks, some of which may be highly abstract, allowing for a thorough understanding of archaeological and historical landscapes. ANT emphasizes the agency of both human and non-human actors, engaging with complex interrelations such as conviviality, ecology of mind, kinship theory, and material culture related to movement, topics which will be elaborated upon in the following section. This approach enables detailed analysis that incorporates the multifaceted interactions shaping historical practices.

2.1.3 Connections: linking places and people

The third strand, Connections, places the industry within systems of movement, communication and relatedness. Given et al.(2019: 83-85) argue that landscapes are best understood through their connections across space and time, from local

paths to regional routes and long term continuities. The 'connected landscape' is not metaphorical only; it is materially constituted through tracks, landing places, routes and nodal sites. Snead, Erickson and Darling (2009: 1-4) similarly stress that paths and roads are essential structures of human landscapes, binding people, places and practices into meaningful spatial order. This has direct relevance to the seaweed industry. Seaweed had to *move*: from shore to drying walls, from drying walls to kilns, from kiln to pier. These connections were not incidental but integral to production. The archaeology of routes, temporary working spaces and storage features becomes central evidence for reconstructing the commodity process. For the seaweed industry, mobility worked through shifting movements and relays that connected ecological cycles, household economies and wider commodity circuits. In coastal seaweed economies, labour often moved along paths of household, tenancy and neighbourhood relations, so that work was coordinated through recurring passages between shore, home, field and market. Such relatedness structured who worked, who claimed access, how knowledge circulated and how burdens were accumulated and were redistributed. Rather than an abstract effect of community, the social relations of production were therefore assembled through these practical connections and circulations of relatedness, in which persons, materials and places were mutually implicated (Carsten 2000: 1; Latour 2005: 1-17; Sheller and Urry 2006: 207-208).

2.1.3.1 The material culture of mobility: linking places

> *Is farsaing an rathad mòr agus faodar fhalbh* (Nicolson 1996: 263)
> (The highway is wide and may be trod.)

The earth is not a static thing but is in perpetual movement. Likewise, the land, sea and creatures, including *Homo sapiens*, are moving through their habitats, sometimes leaving traces of these movements in the way of paths. Mobility and movement are at the centre of human evolution and the eventual dispersal of our species globally (Kuhn *et al.* 2016). Humans, ever developing their modes of transport from well-worn tracks, began constructing infrastructure, such as roads, to ease or accelerate travel. The material culture of mobility or movement refers to the tangible objects, artefacts and infrastructure associated with the movement and transportation of goods, people and ideas. It encompasses a wide range of

physical items-such as tools, vehicles, infrastructure, pathways and technologies-that have played a crucial role in shaping human mobility throughout history. It engages with the material culture and landscape of movement or mobility (Cheape 2021: 44-53; Llobera *et al.* 2011). Understanding the material culture of mobility is particularly important when examining the maritime aspects of the seaweed industry. For example, during the kelp boom years of the 1790s, the transportation of kelp relied heavily on maritime networks and infrastructures rather than roads. Exploring the material culture of mobility allows an unravelling of the intricate connections between the various industries that used kelp in their products, maritime trade, paths or roads between processing sites and quays, vehicles such as horses, carts and boats, and the physical artefacts involved in this process, such as willow creels carried on horse or human backs for transporting seaweed.

Using Actor-network theory alongside the Material culture of mobility

ANT can extend understanding of the material culture of mobility by examining how the movement of people, idea and resources shaped the kelp production network. Shelly and Urry (2006: 214), in drawing out frameworks for discerning a 'mobilities paradigm', contend that as places are dynamic:

> …they are like ships, moving around and not necessarily staying in one location. In the new mobilities paradigm, places are seen as travelling, slow or fast, greater or shorter distances, within networks of human and non-human agents. In the context of the mobilities paradigm, places are no longer seen as static entities but rather as entities that travel varying distances within networks of human and non-human agents.

Actor-network theory, focusing on the relationships and interactions between human and non-human actors, can help understand how these networks operate and how places are constantly being shaped and transformed through these movements. It provides a framework for discerning the complex dynamics of these networks and the role of different actors in shaping the material culture of movement. By considering places as mobile entities, ANT allows for a more thorough understanding of the processes and forces that contribute to the formation and transformation of material culture. It helps to fill gaps by highlighting the agency of non-human actors and their role in shaping the movement of and between places. In this way, ANT complements the approach to

the material culture of movement by highlighting the intricate relationships between people, objects and environments. It allows an examination of the ways in which these elements interact and shape each other, and of the complex dynamics involved.

2.1.3.2 Kinship theory: linking individuals and communities

> *Cha nigh na tha dh'uisge sa mhuir ar càirdeas.* (Nicolson 1996: 134)
> (All of the water in the sea won't wash away our kinship.)

The notion of kinship or *càirdeas* is deep-seated in Gaelic society, underpinning a view of the importance of relationships, where biological connections form the basis of other relationships. *Càirdeas* translates as kinship, friendship, or relationship. Dwelly, in his *Faclair Gàidhlig* (1902: 151), further translates *càirdeas* as:
1. Relationship. 2. Friendship 3. Kindness 4. Fellowship, friendliness 5. Benevolence, goodwill 6. Alliance, as of states.

Càirdeas is also bound up with the equally complex and emotive concepts of *dùthchas* and *buntanas*. *Dùthchas* encompasses heritage, kinship ties, native or ancestral land, birthright, inheritance, familial/ancestral duty, and a sense of belonging. Murphy (2013: 807) suggests that '…that *dùthchas* is being-in-place (in a cultural sense rather than in an existential one); it captures the way that land, people and community, past and present, are connected – connections which are maintained by practices, language and other means.' Similarly, Frank Rennie (2018: 1) has taken this notion of *dùthchas* deeper by putting forward the concept of *buntanas*, which 'expresses sense of belonging, not simply in the present, but the concept of a person or community of people belonging to a certain area of land, a communal sense of embeddedness, and rootedness through family lineage and history of a community who belong to a certain place.'

Dùthchas, càirdeas and *buntanas* are at the heart of the Gael's worldview, expressed in how their society was structured from individual households to clanship. Clan, which comes from the Gaelic word *clann,* meaning 'children', with a secondary meaning of 'kindred', is one of several words used to denote various

types of kin groups in Gaelic. Michael Newton (2019: 203) asserts, 'like many other non-industrial societies, clans were conceptualised as extended families, with familial terms used to describe social structures and relationships'. However, kinship was only one of several bonds holding a clan together, with the clan being a particular manifestation of kinship. As a result, individuals, families, and kin groups changed their allegiances, home territories, and surnames more often than the static portraits of clan life usually suggest, thus illustrating that kinship outlived the clan. Even though the organised political side of clanship had been declining since the 17th century, and more rapidly so after the final Jacobite uprising ended at Culloden on 16 April 1746, the concepts of '*càirdeas*' , '*dùthchas*' and '*buntanas*' have endured within the psyche of Gaels. Since the communities on which the case studies in this thesis are based were Gaelic-speaking, kinship theory serves as a crucial framework for understanding how the rise of capitalism and industrialisation influenced Gaelic consciousness. It can also shed light on the changes in kinship practices that occurred because of the complex web of events that took place during the 250-year period associated with the kelp industry. According to Ensor, three forces of change can alter kinship practices: depopulation, proletarianisation and imposed social changes (Ensor 2011: 206). These changes in terms of Gaelic society can be reflected in land tenure systems, the organisation of communities, settlement patterns, inheritance patterns, gender and labour arrangements.

The anthropologist Peter Peregrine (2001: 34) describes the importance of understanding kinship dynamics to understanding any given society:

> Kinship in all non-state societies structures social relations. It defines who a person is, who their leaders are, what resources they have access to, whom they may marry, where they may live, what occupations are available to them, and what spiritual practices they will follow. Kinship influences, bounds, and shapes all aspects of life.

Kinship theory, developed in the 19th century by the American anthropologist Lewis Henry Morgan (1818-1881), focuses on the relationships and connections between individuals within a community or society. While it has been conventionally applied to studying familial relationships, it can also be a helpful tool for understanding the social dynamics of any community when interpreting a

cultural landscape. Stella Souvatzi (2017: 172), in her article discussing kinship and social archaeology, states, 'Kinship is about much more than just blood ties. It is a domain of social relations; a framework of action, rules, and rights; a powerful means to stretch identities across space and time; and a mode of structuring time, history, and memory'. In this way, kinship theory recognises biogenetic relationships and social and symbolic connections. In interpreting a cultural landscape, these extended notions of kinship can help identify and understand the diverse relationships within and between communities. This broader perspective allows for a more inclusive interpretation of the cultural landscape, considering familial and non-familial bonds. Kinship theory emphasises the interconnectedness of individuals within social networks. When applied to the cultural landscape, it helps uncover the web of relationships that shape how communities interact with their surroundings, particularly regarding settlement patterns. Understanding these social networks is crucial for appreciating the significance of various cultural elements and practices within the landscape and the impacts that estate policies had. For example, there were notable impacts on community relationships due to the transition from communal run-rig land management practices to individual tenure or croft tenure. This shift began when landlords gained direct control over profits from kelping (Ensor 2011; 2013: 18). This shift to commercialism is further discussed in

Dùthchas, as explained above, encompasses various concepts, notably that of a shared identity and a sense of belonging. Kinship theory also asserts these very same concepts. Applying this concept to a cultural landscape allows for exploring how communities derive a sense of identity from their surroundings. It helps interpret the landscape as a repository of shared memories, customs, and symbols contributing to a collective sense of belonging. Kinship involves the transmission of cultural practices and values from one generation to another. In the context of a cultural landscape, this transmission is reflected in the tangible, such as how a particular task is done; and intangible elements, such as how beliefs, songs and stories are passed down through the generations in a community. Understanding kinship dynamics aids in tracing the continuity of cultural heritage within the landscape and how it evolves (Souvatzi 2017: 187-89). Recordings from Tobar an

Dualchais (TAD) and oral histories and traditions collected by *Comainn Eachdraidh* and local archives that relate to the seaweed industry can indicate this sense of *càirdeas*, *dùthchas and buntanas* that has continued through generations, as well as note the impacts of wider societal and economic change on these notions that are at the core of their worldview.

Kinship and Actor-network theory

In applying a kinship theory approach – social, familial, and symbolic relationships within and between individuals and communities are the primary focus, whereas ANT looks at both the human and non-human as equal 'actants' within a network of relations (Latour 2005: 76). Sahlins (2011: :2) defines kinship as a 'mutuality of being'. Regarding actors within a network, this 'mutuality of being' can be thought of as how humans and non-humans interact and relate. Non-human actors can be organisations, food, elements within the local environment, concepts such as ownership and hierarchies, shared rituals, objects, animals –*anything* that shapes and is shaped by kinship. By considering the diverse networks of relations that constitute kinship systems, incorporating an ANT approach underscores kinship arrangements' complexity, fluidity and contingency. By considering the complex web of relationships and associations, we can gain a deeper insight into kinship as a dynamic and constantly changing social construct.

In summary, kinship theory provides a valuable concept for interpreting cultural landscapes by highlighting the intricate web of relationships that shape a community's connection to its surroundings. This approach fosters a holistic understanding of cultural landscapes, encouraging the recognition of shared histories, identities, inter-community dynamics and the impact of changes over time on kinship practices.

2.1.4 Conclusion

The focus of this chapter has been to explore conceptual frameworks that can effectively analyse the Scottish seaweed industry's impact on the economy, the environment and society between the 17th and early 20th centuries. To achieve this, we need conceptual frameworks that are at once material, relational and historical. Theoretical concepts were synthesised into three broad conceptual framework themes that capture the complexity of this impact across economic, environmental and socio-cultural aspects: Commodity, Ecological Entanglements, and Connections. These frameworks clarify how seaweed moved from littoral ecology into social and economic life, and how that movement was mediated through labour, landscape and relatedness.

The Commodity framework using economic history and commodity chain analysis provides value, labour and exchange. The ecological entanglements framework influenced by concepts from Ivan Illich and Gregory Bateson, reveal the active role of tidal and littoral environments, fostering a deeper understanding of the environmental consequences and adaptations associated with seaweed harvesting and kelp manufacture. Connections, enhanced by kinship theory and the material culture of mobility, examines the industry's role in linking coastal communities to global networks and shaping social structures and cultural practices, thereby elucidating the broader societal implications of the seaweed trade. Together, they overcome the weaknesses of any one approach taken in isolation. Thus, understanding the impact of Scotland's seaweed industry should be approached not as a residue of a quaint coastal custom, nor as a purely ecological adaptation, but as materially grounded, socially mediated and historically shifting process of commodity production within connected coastal ecologies.

A final point follows from this broader synthesis. If the Scottish seaweed industry is approached through Commodity, Ecological Entanglements and Connections together, then archaeological interpretation can move beyond treating surviving sites as isolated industrial residues. Kelp shores, paths, kilns, piers and township reorganisation are better understood as the material traces of relations that were simultaneously economic, environmental and social, shaped by unequal access, negotiated belonging, and the practical movement of people and goods. Such a framework is especially valuable in the Highlands and Islands, where the apparent marginality of coastal communities often concealed dense forms of participation in regional, imperial and global processes. This thesis therefore adopts synthesis not as a rhetorical conclusion but as an operational method. By tracing how value was made, how littoral ecologies conditioned action, and how kinship, mobility and local attachment structured labour and obligation, it becomes possible to read the seaweed industry as a historically shifting socio-ecological system rather than a singular extractive episode. The chapters that follow test this integrated framework through the selected coastal landscapes, showing how this interdisciplinary study can recover the differentiated experiences, landscapes and networks through Scotland's seaweed industry was lived.

2.2 Methodological approaches

This next section discusses the methodological approaches used to address the research questions put forward in Chapter 1.1. Each of the following sections outlines a specific research method, explains how it addresses a particular research question, and sets out its connection to a conceptual framework theme. The practical application of each method is described in detail. In addition, each section considers the impact of the COVID-19 pandemic (2020–2022) and the subsequent cost of living crisis (post-2022) on the selection of coastal landscapes, fieldwork, and access to archives. Each section highlights how methodological choices were shaped by both theoretical considerations and real-world constraints arising from recent global events. This approach aims to provide a clear roadmap, demonstrating how each method relates to both the conceptual framework themes and the evolving research context.

2.2.1 Method: Identifying the coastal landscapes

Given the broad scope of this thesis and the limited timeframe, it was necessary to narrow the study to four case studies. This approach allows for an examination of different areas of Scotland and how the industry impacted each region. The rationale for selecting each coastal landscape is discussed in detail in Chapters 3 to 6, but this section outlines the general process of their selection. To begin, I familiarised myself with the Scottish seaweed industry as a whole (including, but not limited to, the kelp industry) through a review of literature and by searching online databases such as Tobar an Dualchas (TAD), Hebridean Connections, the Napier Commission inquiry reports and Trove (previously known as Canmore). I used search terms such as 'kelp', 'seaweed', and the various grammatical forms of the Gaelic word for seaweed: *feamainn, feamad, an fheamainn*, to see what results would emerge. For example, Hebridean Connections provided in-depth information on Calbost and its landscape, particularly in comparison to other townships and districts in Lewis. The Napier Commission reports, when I searched for 'kelp', returned 384 results. A Trove.scot search for 'kelp kiln' identified 139 places, with the distribution data shown in Figure 1-2.

The selection criteria for each coastal landscape were shaped by practical and theoretical considerations. For example, Calbost was selected because it met several criteria: it was accessible during COVID-19 restrictions, provided detailed historical and ethnological data, and represented an island context within a large kelping estate. The other landscapes were chosen to ensure geographical diversity, include both mainland and island contexts, avoid focusing solely on the most profitable period of 1790–1815, and represent the first two phases of commercial production.

Due to COVID-19 restrictions at the start of this research in October 2020, the work was initially limited to online research. This was further complicated by living in Lewis, rather than in Glasgow, as all university staff were working from home during the pandemic. These adaptations not only shaped my methodology but also deepened my understanding of the importance of accessible local archives and digital resources during times of restricted mobility.

Despite the challenges posed by the pandemic and sharply rising costs, the chosen coastal landscapes offered strong examples of different management styles within the industry. Each landscape, in its own way, illustrated the main themes of innovation, continuity, and change that are central to this thesis.

2.2.2 Method: Fieldwork

This research employs a multi-faceted methodological framework to investigate the historical development, mobility patterns, and landscape interactions of the Scottish seaweed industry. The principal approaches include fieldwork techniques (notably site visits and walkover surveys), documentary source analysis (drawing on Coastal Zone Assessment Survey (CZAS) reports, Historic Environment Record (HER) data, cartographic materials, and analytical methods such as aerial, satellite, and drone imagery interpretation. Collectively, these methods are designed to provide robust evidence for reconstructing patterns of past mobility, situating sites within their environmental and socio-economic contexts, and elucidating the spatial organisation of the industry.

The primary form of archaeological fieldwork undertaken in this study is non-excavation-based, centring on systematic site visits and walkover surveys. Each site visit involved recording National Grid Reference (NGR) data, aspect, orientation, size, and site name, accompanied by rough sketches to facilitate later interpretation. Detailed notebooks were maintained to capture observations and measurements, while photographs documented both the sites themselves and their broader landscape contexts. Tape and offset survey methods were applied at selected locations, such as Calbost (Figure 4-26) and Garvie Bay (Figure 5-16), to obtain precise measurements. It should be noted that West Hynish was not resurveyed, as a comprehensive survey had previously been conducted by Dr John Holliday and the local heritage group in Tiree; their data are included in Appendix C. These fieldwork techniques are essential for physically situating sites within the maritime and foreshore environment, establishing connections to infrastructure, routes, and settlements, and interpreting the spatial relationships among monuments within each site. Fieldwork was, however, subject to logistical constraints, including COVID-19 disruption, adverse weather, and the ephemeral nature of many sites, all of which occasionally hindered effective interpretation.

In addition to fieldwork, this research draws extensively on documentary sources. The Coastal Zone Assessment Survey (CZAS), undertaken by organisations such as the Scottish Coastal Archaeology and the Problem of Erosion (SCAPE) Trust and Historic Environment Scotland (HES), provides detailed professional reports, gazetteers, and site descriptions, supporting a deeper understanding of site function, context and chronology. Part of that deeper understanding of the context and function is an example found in the 1996 CZAS (Long *et al.* 1996), where some features in Coigach identified as ‘kelp storage pits’ may be better interpreted as temporary storage pits for seaweed de-salination before use as in cultivation rigs as manure, especially where they occur near dwellings or cultivated ground. This distinction highlights the need for archaeologists carrying out field surveys to understand and use the precise terminology in areas where kelp processing and the agricultural use of seaweed took place: ‘kelp’ should refer to the processed industrial product, while ‘seaweed’ should be used for material gathered as manure, rather than as a general term for seaweed species.

The Historic Environment Record (HER), both national (CANMORE/TROVE) and regional, was systematically searched for the term 'kelp', yielding approximately 150 sites, many of which underpin the dataset for this research. Furthermore, additional documentary sources include cartographic sources such as the National Library of Scotland (NLS) maps, archive photographs, and aerial photography, all contributing to the historical reconstruction of industry landscapes. These resources are instrumental in corroborating field observations, identifying unrecorded sites, and contextualising the spatial extent of kelp-related activities. Another key source of evidence is the analysis of historical and modern imagery, including cartographic data, aerial photographs, satellite images and drone surveys. These analytical approaches allow for the identification of historical pathways, roads, and other infrastructure, as well as the detection of landscape changes over time. In particular, aerial photography assists in mapping movement corridors and tracing the evolution of sites, thereby illuminating patterns of mobility related to the seaweed industry. Such imagery not only reveals physical traces of past activity but also helps situate individual sites within the broader context of coastal and inland connectivity, supporting inferences about the movement of people and materials.

2.2.3 Method: Archival Research

The historical research for this thesis was formulated to address central questions concerning the development and transformation of coastal landscapes in Scotland. This approach integrated both online and onsite archival investigations, adapting as necessary to constraints imposed by COVID-19 lockdowns. The following section outlines a transparent methodology, directly linking each resource to specific research objectives for added clarity.

Online Archival Resources

Angus MacLeod Archive, Cearsiadar, Isle of Lewis: This archive offered comprehensive information on local agricultural practices, traditions, and place names. Its digital accessibility enabled a detailed analysis of community-level transformations, significantly informing *Research Question 3* regarding the evolution of kelp-related activities at the local level.

An Iodhlann Heritage Centre, Scarinis, Tiree: Featuring a rich collection of digitised documents and photographs with catalogue references, this resource facilitated targeted inquiries during the subsequent onsite visit. It proved instrumental in identifying materials relevant to the kelp industry, supporting *Research Questions 1–3* with respect to historical processes, socio-economic impacts, and trading networks.

Argyll Papers, Inverary Castle: The archive offered digitised materials including lease agreements, insurance details, and correspondence between the Duke of Argyll and Stanford. However, important documents about Tiree's seaweed production were not available digitised, as the archive is still working on digitising these records. An Iodhlann holds photocopies of other select Argyll papers, including estate correspondence relevant to the seaweed factory, providing valuable supplementary material.

OSA & NSA Parish Records: The Old and New Statistical Accounts provided parish-specific narratives, frequently authored by parish ministers. These records were essential in contextualising societal attitudes and economic transformations occurring during the kelp boom, directly addressing *Research Question 1* concerning socio-economic impacts.

British Newspaper Archive: This archive addressed critical gaps present in estate archives for the Coigach study area by offering contemporary reports and advertisements. It was vital for *Research Question 2*, revealing trends in market demand, local responses, and changes in industry management.

Napier Commission Reports: Containing first-hand accounts from the late nineteenth century, including perspectives from managers and directors of Tiree's seaweed factory, these reports enriched understanding of industry evolution and supported both *Research Questions 1* and *2* by providing direct evidence on industrial practice and community dynamics.

Parliamentary Papers: Encompassing pre-1707 Scottish legislation and documents relating to the Salt Tax and its repeal, these papers clarified regulatory frameworks and illuminated reasons why kelp shipments often do not appear in

customs records, contributing substantially to *Research Question 2* on economic and legislative influences.

Onsite Archival Research

Physical visits to Scottish archives remained indispensable for accessing undigitised material, particularly regarding the origins and management of the kelp industry (*Research Question 1*). In addition to onsite visits to An Iodhlann in Tiree and the Angus MacLeod Archive, larger institution archives were also consulted. Online catalogues of estate papers in the National Records of Scotland (NRS) guided strategic document selection, maximising productivity within restricted circumstances. Key institutions visited included the Glasgow City Archives, (Mitchell Library) for the Stanford Papers, the National Library of Scotland for early seventeenth-century documents and the Highland Archives Centre (Inverness) for possible information on Isle Martin shipments.

NRS Visits: Onsite research was limited initially during COVID-19 restrictions to six items per visit, with no access to estate maps or photocopying permitted. Despite these limitations, a focused review of the *Gillanders of Highfield Papers* and *Seaforth Muniments* produced valuable information on estate management, lease and kelp industry management addressing *Research Question 1* on kelp trading and estate operations. In addition, the Annexed Estates papers provided information on the early attempts at a kelp industry in Coigach. Once COVID-19 restrictions had been lifted in the NRS archives, it was possible to scrutinise digitised early Port Books from East Lothian to provide evidence of early international kelp trade at the end of the 17th century (Section 3.3).

Document Selection: The absence of a dedicated 'kelp accounts' category in later Seaforth Papers (post-1815) required a judicious use of personal papers, such as those pertaining to Lady Mary Stewart-MacKenzie, to uncover relevant leases and transactions. Careful document selection ensured the research maintained both focus and thoroughness despite the challenges associated with restricted access. Regarding records associated with Tiree, the volume of data collected exceeded the scope of this case study; therefore, only pertinent documents were included.

Challenges During Lockdown

COVID-19 Restrictions: The research commenced amid the October 2020 lockdown, necessitating a reliance on remote work and digital archives. Residing in the Isle of Lewis in the Western Isles – a considerable distance from Glasgow complicated by higher travel costs, further constrained onsite opportunities as university staff operated remotely.

Adaptive Strategies: The methodology was refined to prioritise accessible online resources alongside judicious onsite visits, ensuring effective use of available materials. These adaptations not only shaped the research process but also underscored the significant role of digital archives during periods of limited mobility.

Scope Management: In light of the substantial volume of archival data, a cut-off point was introduced to ensure the research remained focused and achievable, balancing comprehensive data collection against practical limitations.

2.2.4 Methodological Synthesis

By integrating extensive online and onsite archival research, including consulting digital archives where available, onsite visits to regional historical societies, and systematic analysis of estate records, this methodology yielded robust evidence for reconstructing the history and spatial organisation of the Scottish seaweed industry. While lockdowns and the continuing COVID-19 restrictions posed notable challenges, the adopted strategies, such as prioritising accessible digital resources and targeted onsite visits, ensured that each resource contributed meaningfully to the study's objectives, maintaining analytical rigour and transparency throughout. Instances of deferred research due to time and budget constraints include comprehensive archival research into the industry in the Isle of Lewis, which may merit a monograph. This topic and additional further research will be addressed in Chapter 7.3.1.2.

2.3 Conclusion: Integrating Frameworks, Methods and Evidence

This chapter has established an integrated conceptual and methodological foundation for the thesis by arguing that Scotland's seaweed industry can only be understood through a framework that brings together economy, ecology, landscape, labour and social relations across multiple scales. The three linked approaches of Commodity, Ecological Entanglements and Connection were adopted because no single model could adequately explain how seaweed became a historically contingent commodity embedded within wider systems of exchange, power and belonging. Commodity chain analysis provides a strong means of tracing value, labour circulation and exchange, while also accommodating fragmentation, uneven geographies and gaps in the archival record. Ecological Entanglements extends this analysis by showing that tides, weather, species variation, shoreline geology and seasonal rhythms were active participants in production rather than passive background conditions. Meanwhile, Connections highlights the importance of movement, infrastructure, kinship and Gaelic concepts such as *càirdeas, dùthchas* and *buntanas*, demonstrating that seaweed production was shaped not only by logistics but also by social obligation, identity and belonging within connected coastal landscapes.

The methodology translated these conceptual commitments into an interdisciplinary and reflexive research design that combined case studies, walkover survey, non-invasive fieldwork, archival and cartographic research, oral history, landscape observation and the interpretation of aerial, satellite and drone imagery. This mixed approach was particularly necessary in a field where documentary evidence is partial, archaeological traces are often ephemeral and local knowledge preserves insights absent from formal archives. Although the research was constrained by COVID-19 restrictions, limited mobility, rising travel costs, weather and uneven archival access, these limitations prompted adaptation rather than methodological weakness, leading to greater reliance on digital resources, strategic case-study selection and targeted site visits. The chapter therefore concludes that the methods employed are appropriate, robust and sufficient to the research aims because they allow evidence to be triangulated

critically across material, documentary, oral and spatial sources. In doing so, this chapter lays the groundwork for the case studies that follow, showing that the Scottish seaweed industry must be examined as differentiated socio-ecological process shaped by value-making, environmental conditions, labour, movement and relatedness across Scotland's coastal regions.

Chapter 3 The Firth of Forth-Beginnings of the Scottish seaweed industry

3.1 A walk along the shore at Pittenweem, Fife

In October 2022, a walk was undertaken along the Fife Coastal Path from St Monans to Pittenweem with Joanna Hambly of the SCAPE Trust to learn about coastal heritage that is vulnerable to erosion. Joanna had taken the same walk (Hambly 2020), noting several sites that had previously not been recorded in the Historic Environment Record (HER). Among these unrecorded sites were two sub-circular pits shown in profile on an eroding face of the coastal edge, 2-3m across and 1m deep with heat-scorched sides with clinker fragments (Figure 3-3and Figure 3-4). These were in the same vicinity as a contender for the site of 16th-century saltpans at Pittenweem. Joanna stated that much of the site had been eroded by about 15m since the 25in OS map of 1893 and that all that was left was fuel slag and the remains of a wall in the eroding shore edge (The SCAPE Trust 2020–2024b). Could these pits be associated with the saltpans, or might they be actual kelp pits? If they do indeed prove to be kelp pits, then these, along with a trackway cut through a tidal rock platform running parallel to the coastal edge close to these pits (Figure 3-2), could potentially be the only surviving remains of the kelp industry along the Firth of Forth. These pits may also potentially point to the industry's beginnings in Scotland, said to have begun along this coast, and therefore, how burning seaweed became a valuable commodity.

Devéria (2012) and the Clows (Clow and Clow 1947) stated in their treatises on the kelp industry that its origins can be traced back to the Firth of Forth in the 17th century. One of the earliest known records of kelp production along the Fife coast dates back to 1694, when an Englishman sought permission from Anstruther Council to harvest seaweed and produce kelp from it for one year at the price of £4 (Clow and Clow 1947: 298; Forrester 1792: 78-79). In a notable example of early regulations regarding the burning of seaweed, the baillies in Anstruther Wester also restricted this same Englishman from burning kelp, except ‘on the western edge of the burgh and when the wind was blowing from the east’ (Smout, T C and Stewart 2012: 21). But is this the earliest documented mention of kelping in

Scotland? This chapter aims to discover where the origins of the industry lie and what were the factors that drove the early industry forward.

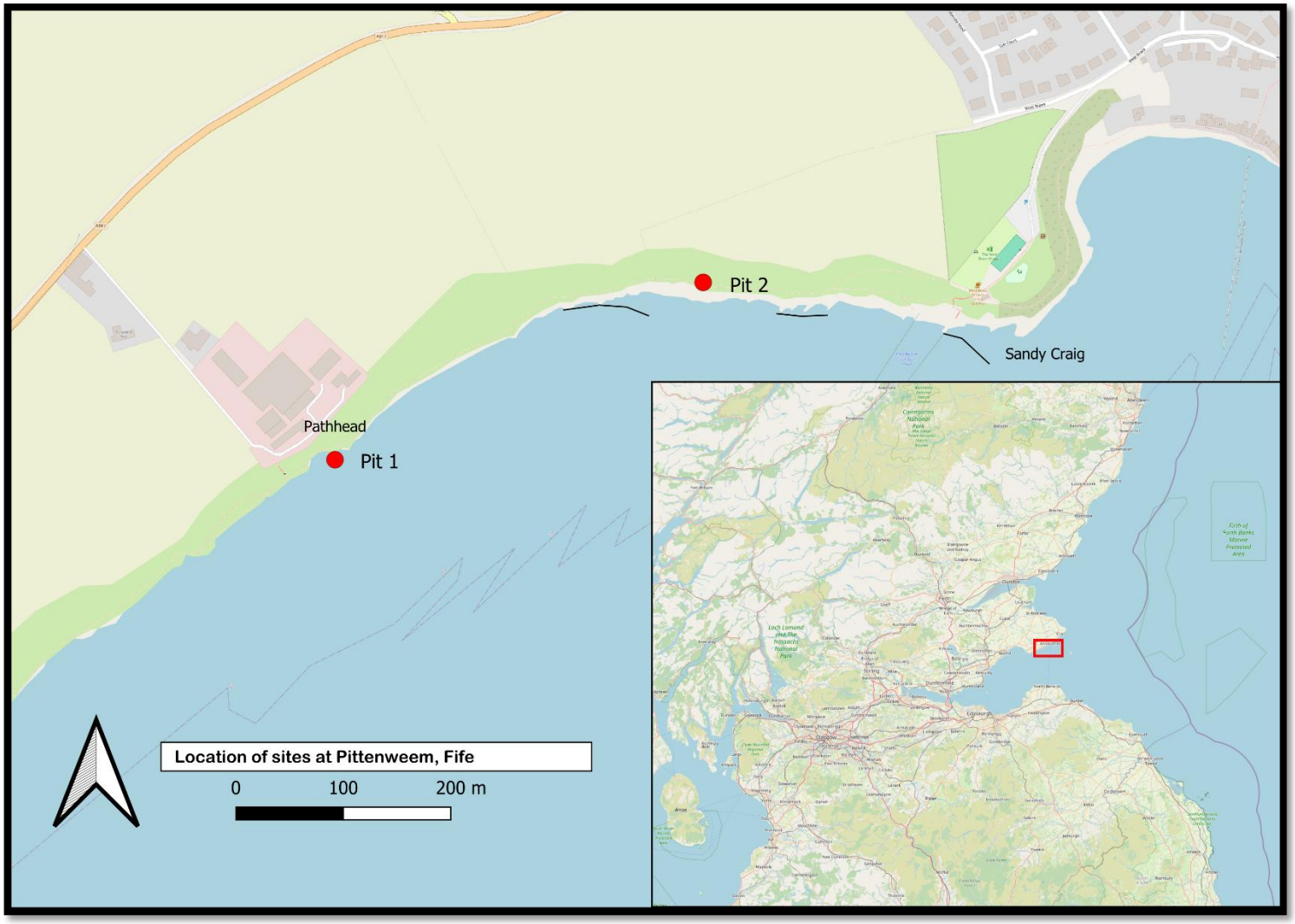


Figure 3-1: Location of PIttenweem sites. The rock cut track (black line) runs parallel to the coastal edge intermittently for 400m between the two pit sites (red circles) and beyond to Sandy Craig. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023, site data from: ©the SCAPE Trust.

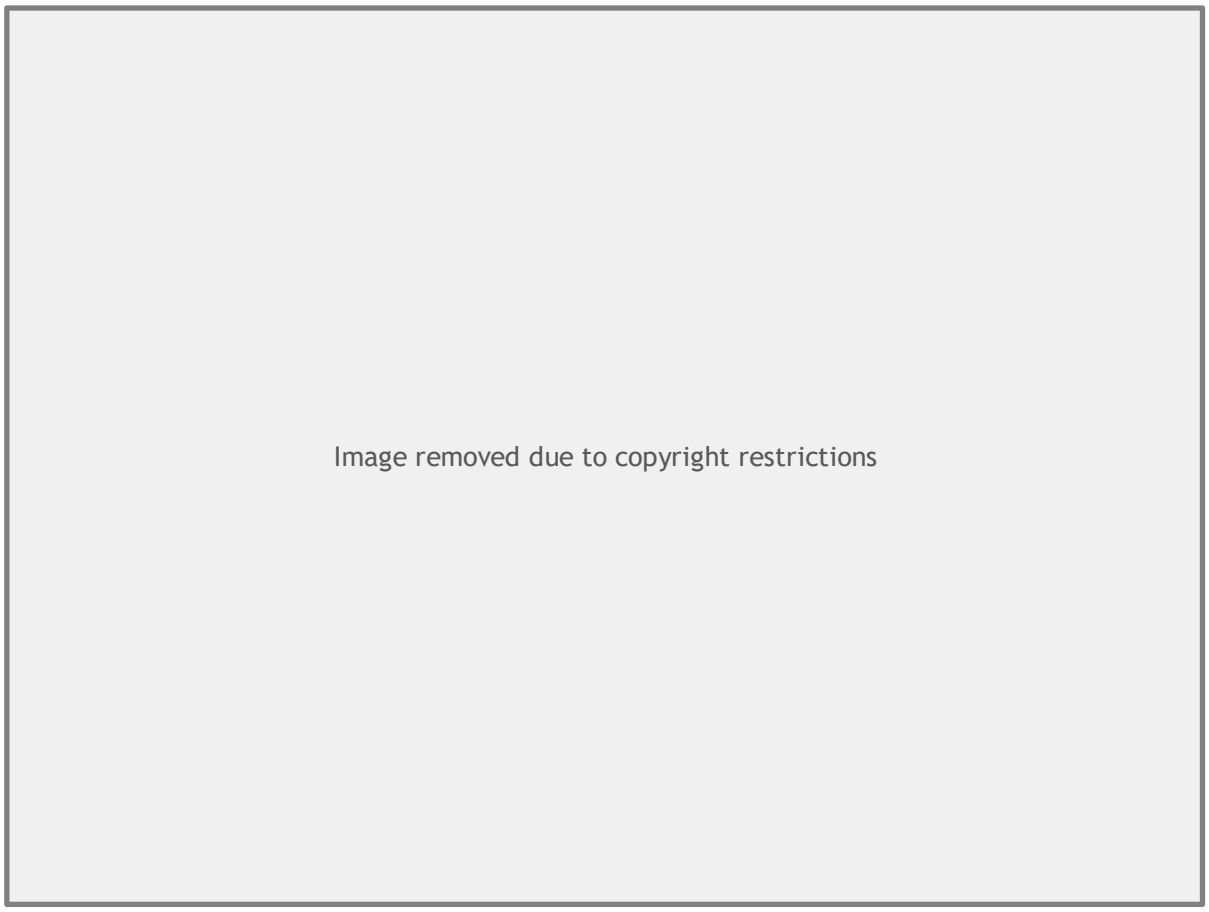


Figure 3-2: Section of trackway cut through an intertidal rock platform that runs parallel to the coastal edge between Pathhead and Sandy Craig to the west of Pittenweem. Note the abundance of bladderwrack (*Fucus vesiculosus*) on the rocks. Fucus species have a high alkali content compared to other seaweeds. Photo: ©Joanna Hambly, 08/05/2022, obtained from https://scapetrust.org/sites-at-risk/site/1314



Figure 3-3: an early pit for making kelp? One of two pits on an actively eroding face at West Braes near Pittenweem. NGR: NO 5379 0213.



Figure 3-4: the second pit, located about 370m to the north-east from the first pit. NGR: NO 5413 0227.

3.2 The Scottish glass industry 1621-c. 1646: innovation in glass furnaces leads to a new product - kelp.

> Righte trustie and wellbeloved cosens and counsellouris, and richt trustie and wellbeloved cousellouris, we greate you weill. – We received your letter from Mr James Orde concerning the glassworkes; whereby we perecave your care in that perticular as importing a generall benefite, besides a credite to that whole kingdome; for whiche your care we give you most hairtie thanks, requiring you to continue the same in anie lyke occasioun of encouraging our subjects to bring policie and settle industrie in this our realme. For our pairte, we sall give such order in that matter concerning the glasseworkis as shall schortlie procure a free commerce. And whereas the said Mr James has bein ane humble suiter for the sole burning and preparing of kelpe in that our kingdome, we have thoucht good to remit his said request to your consideratioun, willing you, if ye shall find it convenient, to expeid ane signature thairof in suche forme as ye shall think most fitt. And, nothing doubting of your care herein, we bide you fairwell. – Given at our Manor of Theobaldis the 1 of January 1621 (Masson, David 1895: 771-772)

The above extract is a letter from King James VI & I and is the earliest known documented mention of kelp-making in Scotland – just over a century before the introduction of large-scale commercial kelp-making in Orkney (Rymer 1974; Thomson 1983) and 40 years before its recorded use in English glass manufacture (Dungworth 2009). James Ord (sometimes spelt Orde) was applying for the sole rights in Scotland to burn and prepare kelp for his glassworks. Ord was, in addition to being a 'dealer in glass', an assignee, or licensee, under Sir George Hay's patent to manufacture glass for a period of twenty-one years from 1619 (Turnbull 2001: 76-77).

Sir George Hay of Netherliff, later 1st Earl of Kinnoull (1571-1634), was a gentleman of the Bedchamber to James VI, the clerk-register of Scotland, and in 1622, appointed Lord Chancellor of Scotland. Between 1598 and 1609, he was also one of the 'Gentlemen Adventurers of Fife', granted a crown charter by James VI to establish a plantation on the Isle of Lewis which ended unsuccessfully in 1609 (Goodare 2004; Hebridean Connections 2024a; MacCoinnich 2015; MacKenzie, W C 1903: 247-248). As a result, he made a deal with MacKenzie of Kintail for not only the deeds to Lewis but also a lease of the woods at Poolewe for the establishment of an ironworks at Loch Maree which was the site of the first blast furnace in

Scotland (MacCoinnich 2006: 139). At the same time, there was also a focus on experimentation in glass furnace technology in England and Wales. Innovations in furnaces began due to a royal proclamation issued by James VI and I on 23 May 1615 prohibiting the use of wood in glass furnaces due to forests being depleted. The ashes from the wood furnaces were a type of alkali used as a flux in the glassmaking process. Once coal furnaces began to be used, this meant other types of alkali needed to be brought in: either shipped in, in the case of pearlash, or locally produced, such as by burning seaweed or bracken.

It is not certain exactly where the site of Ord's glassworks was, but according to Jill Turnbull (2001: 93-96), it is thought that it was located at Morison's Haven near Prestonpans. Morison's Haven was an ideal site for a glassworks – it had a port for bringing in the various kinds of ash needed for glass-making and exporting the finished products, an expert Venetian workforce, plenty of capital from the Prestongrange estate landowners who also controlled the local coal and salt industries, and plenty of raw material available locally for making glass such as sand, salt, coal and seaweed (Anderson 2000: 22; Cressey *et al.* 2013; Smout, T C 1963b: 69; Turnbull 2017).

From 2004 to 2010, the Prestongrange Community Archaeology Project (PCAP) undertook to investigate the industrial remains on the site of the Prestongrange Industrial Heritage Museum (Cressey *et al.* 2013). Two areas became the focus of the project: the site of Morison's Haven (now infilled) and the site of the glassworks and pottery (see Figure 3-5). At the site of the later pottery, a glassworks flue interpreted as belonging to the early 18th century was found. Could this site have also been the original vessel-glassworks run by Ord from 1619, or some three years later by the Venetian glassmaker Leonardo Michellini? The building remains and glass assemblage could not confirm if there was an earlier use of this site. David Dungworth (2009) conducted strontium isotope analysis on mixed alkali glass produced at Silkstone, England from the 1660s. It was found that glass with a high concentration of strontium oxide indicates the use of kelp. He goes on to state that no other samples of mixed alkali glass earlier than the Silkstone samples from the 1660s with high concentrations of strontium have been identified to date. It is unclear from his article if any Scottish samples have been

analysed. This chemical analysis method has been used to confirm the use of kelp as an alkali in window glass in Scotland as early as 1680 by Helen Spencer in her PhD thesis (2020: 90, 281, 284), although other kinds of glass pre-1660, such as that used for vessels, have yet to be confirmed.

The first site established by James Ord may never be found as there have been several periods of industrial development since the 17th century, with some modern buildings still in use. However, the satellite image (Figure 3-5) shows how close the site is to Morison's Haven to access all the raw materials needed to make glass: either brought into the harbour from around the Firth of Forth or gathered and burnt nearby along the shore.



Figure 3-5: Location of Morison's Haven and the glassworks and pottery site. Morison's Haven was infilled in the 1960s. Basemap: Google Satellite Hybrid.



Figure 3-6: George Hay, 1st Earl of Kinnoull, Lord Chancellor of Scotland holding his purse of office in his left hand. Before he was a politician, he was an entrepreneur, establishing the Scottish glass industry. Picture: By Adam de Colone-Government Art Collection, Public Domain, https://commons.wikimedia.org/w/index.php?curid=3835012

3.3 '*A true commodatie furth of the sea'*: Prestonpans: unveiling the origins of early kelp trade from c.1660 – 1729

> By the way, we also saw *Glasses* made of *Kelp* and Sand mixed together and calcined in an oven. The crucibles which contained the melted glass, they told us, were made of tobacco-pipe clay. (Derham 1760: 194)

The above extract is from John Ray, an English botanist and naturalist, who was travelling in the early 1660s with naturalist Francis Willughby on an expedition through the east of England and Scotland to catalogue native flora and fauna. While travelling along the southern Firth of Forth coast between the Bass Rock and Leith on August 19, 1661, he stated that he saw glass being made from kelp and sand. Although Arnold Fleming asserted in his book *Scottish and Jacobite Glass* (1938: 101) that this glassworks was at Prestonpans, Jill Turner contradicts his assertion by stating that Fleming was given to embellishing information from original sources. This is possibly the source Devéria (2012: 6) used as a reference to say that it was at Prestonpans where Ray had seen glass being made. However, according to Jill Turnbull's (2001: 111) analysis of documented evidence showing a bond between Visitella, 'a glass maker at Westpans', and John Bayne, a wright, it was more likely to be Westpans where Ray observed glassmaking. There had also been a hiatus at Morison's Haven in glassmaking since c.1646, with Leith Citadel the only continuously operating glassworks at the time (Turnbull 2001: 284).

Earlier when he was travelling north along the English east coast, Ray had seen kelp being made in pits at Whitby and briefly described the process:

> We saw here all along the Shores the People making of *Kelp*, which they do, by laying the *Alga & fucus marinus* on Heaps, and when it is dry, burning it; while it is burning, they stir it to and fro with an iron Rake, and so it condenses and cakes together, in the manner we see *Kelp*; whereas, should they not stir it, it would go to Ashes, as other Plants burned used to do.(Derham: 174)

About the same time, Christopher Merret also described kelp being used in glassmaking in his translation of Antonio Neri's *The Art of* Glass (originally published in Italian c. 1612):

> Kelp so named from Kali, and pot ashes are used for Chyrstalline metal. Kelp is principally made of that Sea-plant we call Sea-thongs or Laces, And from its use by Joan, Bauh. lib, 39. c. 2. de Hist. plant. *Alga angustifolia vitrariorum* , which being kept moist a little after gathering, will shew afterwards , though long kept, its white salt on the surface of its leaves. Math, in Diosc. calls *it Algam vulgarem Venetorum* the common Sea-wrack of the Venetians, not onely for the reason before, but also because the Venetians wrapt up their Glasses therein, which they sent to forein parts. This wrack when the Sea is tempestuous, *scopulis illisa resunditur Alga*, as Virg, is thrown and scattered upon the Rocks, in great abundance, and also on the shoar, which the country people in the summer rake together, and dry it as they do hay, by exposing it to the Sun and Wind, and so turning it as occasion serves till 'tis fit to burn, and make these ashes call'd Kelp, used as well to make Alume as Glass. Nor is this particular wrack alone used, though very much abounding in all our Seas, but also all other *Algas, fucus & qucrcus marina*, and other Sea-plants, all which abound in Salt.(Neri 1662: 263-4)

In France, kelp (*varech* in French) was also being manufactured in this period – mostly along the Normandy coast for crown glass manufacture (Dungworth 2009). By 1681, an ordinance was passed to regulate the harvesting of seaweed and the manufacture of kelp (Arzel 1987: 33-36).

By this time, there had been various operators of glassworks since the establishment of glass manufacture from c1619 at Morison's Haven, with varying degrees of failure and success. When Ray was travelling along the East Lothian coast, there had been a measure of prosperity in the Prestonpans area since 1650, which included not only Morison's Haven but also Westpans, Port Seton, and Cockenzie. This was due in large part to the coal and salt trade, led by gentlemen merchants such as the Earl of Winton, the Earl of Weymss, the Duke of Hamilton and Sir James Hope, all of whom promoted overseas trade (Turnbull 2017). Much of the data as to what was imported and exported along the Firth of Forth comes from the Customs and Excise books of the Scottish Exchequer, sometimes known as Port Books. The East Lothian precinct was divided into two administrative areas: Prestonpans and Dunbar. The Prestonpans administrative area included all the ports between Fisherrow near Musselburgh and Aberlady (Figure 3-7), and not just Morison's Haven, the closest harbour to Prestonpans itself (Smout, T C 1963b: 67).

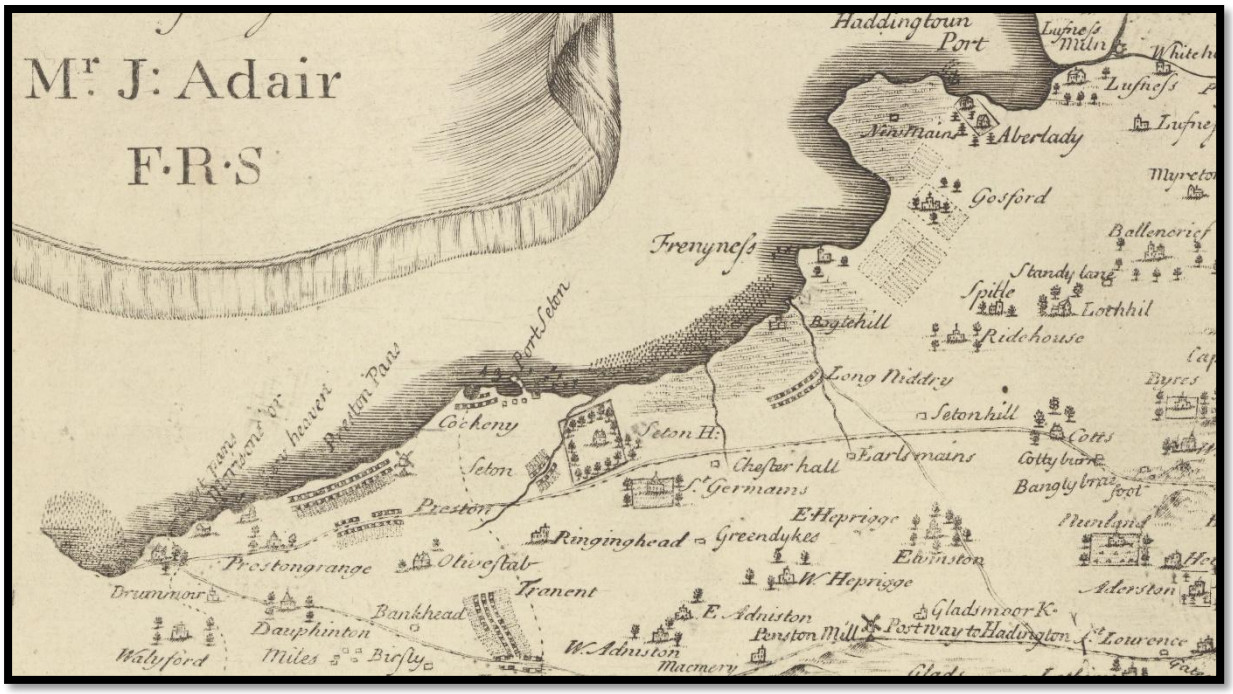


Figure 3-7: Section of East Lothian map showing the Prestonpans district in 1682, contemporary with the Prestonpans customs book which noted an export of kelp to Rotterdam. Adair surveyed this map in 1682 but it was not published until 1735. Map obtained from: Adair, John, ca. 1650-1722, A map of East Lothian-Maps by John Adair https://maps.nls.uk/view/216547755#zoom=5&lat=5267&lon=3272&layers=BT

Based on the model of Cromwellian reforms from 1656, the Customs and Excise Books (sometimes referred to as Port Books or County Customs Books) were records of dues paid to the Crown in Scotland. They are a source of the history of trade in Scotland rather than a mirror of commercial trends or value of goods (Smout, T C 1963a) due to inconsistencies, sometimes from corruption or smuggling. Prestonpans, in particular, had a notorious reputation for this issue (Smout, T C 1963b: 76). For consignments exported, the date, ship name and captain, destination, goods exported and price paid were recorded. It is in these Port Books that the first trade in kelp is recorded, mostly to England from ports such as Leith, Montrose, Fife and Prestonpans. According to Smout (1963a: 224), kelp was already being exported from the Forth 'in quantities up to 70 tons a year'. Interestingly, there is an entry from the Prestonpans June 1681 customs book (E72/21/1/46), showing a consignment of 15 tons of kelp being exported to Rotterdam in the Netherlands to the value of £13.10.00 (Scots). This export highlights a compelling progression in the production of kelp. Previously, kelp was solely manufactured within the Firth of Forth for supplying local glassworks, perhaps by workmen hired directly by the glassworks. However, this scale of

production indicates that an organised, industrial-scale operation was beginning to evolve that was capable of international trade, although perhaps not to the scale seen in Orkney, which later became established as the main kelp-producing area in Britain through to the final gasp of the industry in the 1930s.

3.4 Towards an industrial scale of production: moving from the Firth of Forth to Orkney and beyond

The period from 1690 to 1729 in the Firth of Forth was marked by significant social and economic changes, which were influenced by complex broader national and international contexts: the aftermath of the 'Glorious Revolution' in 1688-89 when James VII and II was deposed, including Jacobite uprisings, the failed Darien scheme, the seven years of famine during the late 1690s and economic stagnation, the establishment of the Bank of Scotland and of the Act of Union in 1707 and the issues and impacts that arose as a result of the Union (Adams and Goodare 2014; McDiarmid 2024). Within this complex backdrop, the process of industrialisation of the Firth of Forth that began with coal, salt and glass was starting to expand to other introduced industries, though at a much smaller scale, such as soap boiling and sugar. Soap-making was another industry that used alkali, either from wood ash or kelp, in its production process. Leith, which was fast becoming a major manufacturing centre in Scotland, was one of the early soap works sites, with Glasgow being the main producer (Dingwall 1989: 304; Smout, T. C. 1961). Amidst the backdrop of an expanding industry along the Forth, kelp production also increased due to rising demand, which would ultimately influence the seaweed industry for the next three centuries, the impacts of which will be examined in the following three chapters.

This expansion of industry was due in part by an Act of the Scottish Parliament in 1681 (Charles II: viii.348 c. 78) that encouraged trade and manufactories. Another piece of legislation that influenced Scottish glass production in the late 1690s, despite the economic stagnation, was the imposition of excise duty in England on goods such glass, ceramics, coal and culm (coal slack) in 1695 to pay for the war with France (Turnbull 2001: 177; 2017). This excise duty on glass put financial stress on English glassworks, whose employees then began going elsewhere, such as

to Holland and Scotland, to search for alternative employment. This could explain why William Morison (owner of the Prestongrange estate) and David Weymss the 3rd Earl of Weymss (a coal owner) were keen to take advantage of this situation by establishing two more glassworks in the late 1790s in the Firth of Forth at Morison's Haven and Weymss. Although at a much smaller scale than the coal and salt industries at the time, the expansion of glass and soapworks could have meant there was increased demand for kelp. I could not find any further evidence in the Port books regarding exports of kelp abroad after the 1680s to either England or Europe due to time constraints in the National Records of Scotland (NRS). But it could be that any other evidence regarding kelp exports to mainland Europe was affected like other trading at this time by tariffs, and England's wars with France or Holland. Both France and Holland had been long-standing trading partners with Scottish merchants (Devine 2003; Whatley 2000: 36).

After the 1707 Act of Union, the glassworks at Morison's Haven were still operating through the 1710s, although faltering due to mismanagement. In addition to Morison's Haven, Leith and Weymss glassworks, there were new works being established in the Forth, at Kirkcaldy and Port Seton/Cockenzie. Records of the time used Port Seton and Cockenzie interchangeably as both harbours were less than a mile away from each other.

There is a notable entry in the accounts of William Henderson, the estate factor of Prestongrange, regarding the transportation of kelp into Morison's Haven. In 1716, kelp appears in the 'charge' and 'discharge', or as it is known in current accountancy practice the 'credit' and debit' columns, indicating that kelp was bought and sold. Another entry from 1717 shows that they were *selling* kelp – this time sent to Cockenzie, a total of two carts at 12s a cart (Turnbull 2001: 219). It is not clear whether this kelp sold was using Cockenzie Harbour to transport kelp to a customer elsewhere (for example, Newcastle) or if this indicates when glassmaking began in the Port Seton area. There were issues at the time with the harbour at Morison's Haven either being in poor condition or not big enough to handle larger ships. It appears that sometimes different harbours, such as Leith, would be used to bring in raw materials, which were then transported by cart overland to Morison's Haven (Turnbull 2001). A later entry from 1721 shows a

payment to four workmen 'who burnt 3 tun kelp' at £48 12s 0d. This indicates that labourers were possibly employed directly by the estate to make kelp for the glasswork.

About this time, the kelp industry began to pivot away from the Firth of Forth to Orkney, which became the major kelp producer in Scotland for the next 250 years. In either 1719 or 1722, James Fea of Whitehall in Stronsay first made kelp in Orkney (Thomson 1983: 13). James Fea was the owner and master of a ship and one of the Orkney 'merchant lairds' who had trading connections with mainland Europe. Fea brought in a man from Fraserburgh named Meldrum to supervise the making of kelp. Fea accompanied the first cargo to Newcastle to negotiate with the glassworks there. Thus began the tradition of Orkney merchant lairds marketing their own manufactured kelp without going through a middleman or kelp agent (Thomson 1983: 13-14, 40). Later in the 1720s, in a bid to corner the Scottish kelp market to ensure supplies for the Port Seton glassworks, Hew Dalrymple, Lord Drummore, one of the Port Seton glass manufactory co-partners, began to establish contacts with kelp suppliers to deprive the rival Newcastle glassworks of this commodity, or to force them to find supplies at a greater distance - that is, Orkney and Caithness. David Traill of Orkney was one of these kelp suppliers contacted, with a view to leasing his kelp shores for nine years (Thomson 1983: 40; Turnbull 2001: 253). A letter dated 20 March 1729 from David Anderson, who perhaps was employed by Lord Drummore, to David Traill (Marwick 1939: 142), outlines their proposal:

> Sir, A Society of Gentlemen have entered into a Co-partnery for carrying on a manufacture of all sorts of glass at Port Seton in this firth, where they designe chiefly to use the produce of our own country, and to serve the whole nation with glass, whereby a very great sum will be saved that is yearly sent abroad to purchase glass. I observe all the gentlemen of the country incline to favour the undertaking as a national benefite, particularly such as have estates on the coast where ware fit for being burnt into kelp may be gott. Most of the gentlemen of Caithness have entered into contract with this co-partnery, by which they have given the priviledge of all their ware on their several estates for nine years, upon their paying forty shillings Scots for each tunn of kelp they shall burn there.

> As it is the interest and I hope the inclination of every Scotsman to promote what tends to be the common good of the Kingdome, and the saving our money being carry'd out, I know you will likewise concur in it, and allow these gentlemen the priviledge of your shores on the same conditions as they have from others, and give them whatever assistance you can. Or if you should choose rather to employ your own servants and labourers to burn the ware and make the kelp, for every tunn of 2000 weight of good and sufficient kelp, well burnt and free of stones or sand they're willing to pay you 35 shillings Sterl. Receivable at a good port in Orkney, or 45 shill. per tunn as above deliverable at their works at Port Seton where ther's a good and safe harbour. I might add that hereby you have the opportunity of doeing a pleasure to the Lord Drummore and several other gentlemen of that partner, which I know will be very agreeable to you.

Thus, the conditions were being set for Orkney to become the main producer of kelp, in spite of its distance from its markets of the Firth of Forth and Newcastle: it had an enormous quantity of seaweed, a large tenant population and a merchant-laird class that had trading connections with ports in northern Europe. This same merchant-laird class also had the ability to exert pressure on their tenants to make the kelp, which was also to become the norm in other kelping estates in the latter half of the 18th century and early 19th century (Thomson 1983).

3.5 Conclusion

Research into the origins of the Scottish kelp industry started with an examination of several sub-circular features on an eroding shoreface in Fife. The Scottish kelp industry is known to have originated in the Firth of Forth, with the earliest records of kelp production along the Fife coast dating back to 1694. Exploring the history of Scottish glassmaking, notably that of Jill Turnbull's monograph on the subject, has revealed that the possible introduction of kelp in Scottish glassmaking in the early 17th century predates that of its generally understood introduction to England and France in the 1660s, as suggested by Dungworth in his article regarding innovations in 17th-century glassmaking. Further investigation and analysis are needed to confirm the nature of these pits and their connection to the kelp industry.

The establishment of glassworks in the Firth of Forth, particularly in the Prestonpans area, further supports the presence of an early kelp industry. The

glassworks required alkali, either sodium or potassium carbonate (the essential chemical compounds in kelp), as a flux in the glassmaking process. The expansion of industry in the Firth of Forth during the 17th and 18th centuries, including the establishment of soap works, suggests an increased demand for kelp in the Firth of Forth.

The discovery of a glassmaking site in Morison's Haven, as well as the accounts of kelp transportation and sales, provide valuable insights into the economic and industrial landscape of the time. These findings highlight the interconnectedness of various industries in the Firth of Forth and the role that kelp played in supporting these industries.

The exploration of fragmentary evidence in historical documents, such as the Port Books, the Records of the Privy Council for Scotland (RCPS) and accounts of early travellers like John Ray, give glimpses into the early history of the kelp industry. These sources provide valuable information about the early use of kelp in glassmaking and the origins of trade in kelp both locally and internationally. The exploration of the origins of the kelp industry underscores the pivotal role of early industry dynamics in Scotland and the strategic motivations behind the shift to Orkney, setting the stage for a deeper exploration into the impacts of this change in the following chapters.

Chapter 4 The impact of the kelp industry at Calbost, Isle of Lewis 1784-1821: Robert Weir, 'the most progressive tacksman'

Calbost, a small crofting township in the northern *Pàirc* (Park) peninsula in Lewis, was resettled in the late 18th century by Calbost's last tacksman, Robert Weir. He came with settlers from places on the west side such as *Càrlabhagh* (Carloway) and *Siabost* (Shawbost) townships, which were then part of Lochs Parish, to Calbost to work in kelping, agriculture and fishing from about 1784 (Lawson 2011: 167-68; MacLeod, Angus n.d.–e). This chapter looks not only at the impact of Robert Weir's business activities, but the way in which his activities in Calbost reflected the wider improvement policy in the Seaforth MacKenzie's Lewis estate.

Calbost's coastal landscape has been chosen as a case study within the Seaforth MacKenzie's Lewis estate because although it was not a large processing site compared to the main kelp manufacturing places such as in the Ùig Parish along the shores of Loch Ròg (Loch Roag) on the west coast, it provides extensive evidence of the impact of the kelping and fish-salting industries, and the way of life of those living within a small Lewis community during the boom era of kelping. This includes archaeological findings and oral traditions from the late 18th and early 19th centuries. Until the late 20th century, the township maintained a continuous population for two centuries after its establishment. Due to the dwindling population since the beginning of the 20th century and a lack of infrastructure development compared to other townships involved in kelping, many archaeological features, such as the tacksman's house and its initial nucleated settlement, are still prominent within Calbost's landscape.

In the approximately thirty years of Robert Weir's management, kelp-making, agriculture, fishing and fish-curing made up the seasonal work calendar in Calbost. The landscape of Calbost features numerous remnants of these past activities and the people who once lived there. Among these remnants are a head dyke that encircles the township, the ruins of Robert Weir's house and garden, black house ruins, various enclosures, a horizontal mill, remains of grain kilns and remnants of what are thought to be kelp kilns to the rear of a boat shed built on the original foundations of a salting house in the tombolo of *Eilean*

a' Ghòdh. Additionally, at *Eilean a' Ghòdh* and its adjoining shingle beach, *Mol a' Ghòdh*, there is a rusting winch that was installed in 1958 which was used for hauling boats ashore onto the shingle beach (MacLeod, Angus n.d.-d). Other late 20th century fishing equipment, now abandoned, can be seen scattered throughout the site, such as prawn creels and plastic floats (Figure 4-22). These remnants of a way of life tell a compelling story of a coastal township whose origins may have been lost if not for the efforts of one of its former inhabitants.

Some of the descendants of the first Calbost settlers, who came from other districts in Lewis, in the main from Siabost, Càrlabhagh and southern Pàirc, were still in residence in Calbost until the early 1970s. The late Angus 'Ease' MacLeod MBE (1916-2002) was one of these descendants (Figure 4-1). Calbost is one of several townships located in the northern area of the Pàirc peninsula that avoided the clearances in the early 19th century, unlike the many townships in southern Pàirc that were cleared for a large sheep farm. After 1802, Calbost saw an influx of displaced families, which increased the population to a level that became difficult to sustain (Lawson 2011: 167-169; MacLeod, Angus n.d.-e). By the early 20th century, the once-crowded township slowly lost its residents, who either moved to Stornoway or the mainland for better job opportunities or passed away. By 1980 Calbost had become a 'ghost village', with houses only occupied during holidays when family members would return. Due to the decline in population in Calbost, Angus MacLeod, who also left Calbost for Stornoway, started collecting and documenting his own family and community memories of Calbost, many of which were handed down from the 18th century through the generations. He also began researching the documented history of the township and the broader area of Pàirc (Lawson 2011: 168-69). The oral histories related to this case study is sourced from his archive, located at Ravenspoint Centre in *Cearsiadar* (Kershader).

Although the site at *Eilean a' Ghòdh* is remembered in oral history (MacLeod, Angus n.d.-d; Pairc Historical Society n.d.), it is not recorded in the local or National Record of the Historic Environment (NRHE). Section 4.7 analyses and surveys Eilean a' Ghòdh where MacLeod thought the remains of kelp kilns were located.

Section 4.8 analyses the story of kelp industry at Calbost through Commodity, Ecological Entanglements, and Connection paradigms by integrating oral

narratives collected by Angus Ease with archaeological findings, such as structures associated with kelping, landing sites and contextualising the township within the Lewis estate dynamics of the time using archival evidence, where available and as appropriate. Oral histories or traditions carry their own issues as they rely on memory of individuals, where definitive facts such as dates tend to be forgotten, are unclear or are embellished (Cregeen, Eric 1998: 29-31). Amateur local historians such as MacLeod and Bill Lawson (Lawson 2008, 2011; Lawson and Comann Eachdraidh na Pàirce 2007, 2022), while they have done in-depth personal research, are or were not academics and therefore their publications will very often lack archival referencing and academic rigour. Considering this caveat, where MacLeod asserts a particular event happened on a particular date, these details will be backed up with factual evidence, if available. The community memories are part of the material culture and intangible heritage of Calbost. Material culture and intangible heritage such as oral histories, poetry, song and stories foreground memory, knowledge and meaning rather than hard facts and figures. They have a value in that they can shed light on experiences of everyday communal practices, some of which continued into the early 20th century, such as the use of boats at high tide to tow seaweed rafts ashore.

This holistic approach allows for a deeper exploration of how the community interacted with its environment, the evolution of the kelp industry in Lewis, how Calbost reflected the broader social and economic changes in the region, and how local identity and relationships were shaped. Ultimately, this integration enriches our understanding of Calbost and highlights the interconnectedness of history, culture, environment and place.

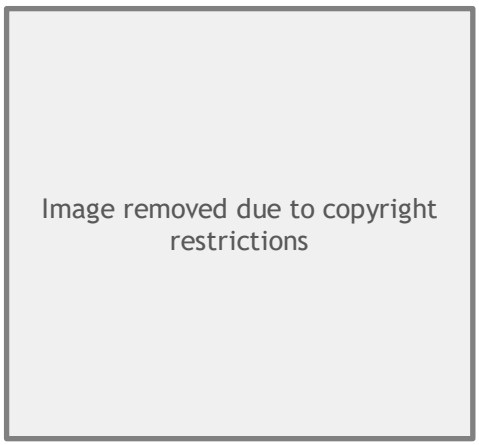


Figure 4-1: Angus 'Ease' MacLeod MBE. ©Angus MacLeod Archive. Image obtained from https://hebrideanconnections.com/images/PaircData/PaircPublishable/Calbost/P_ca_01_001.jpg

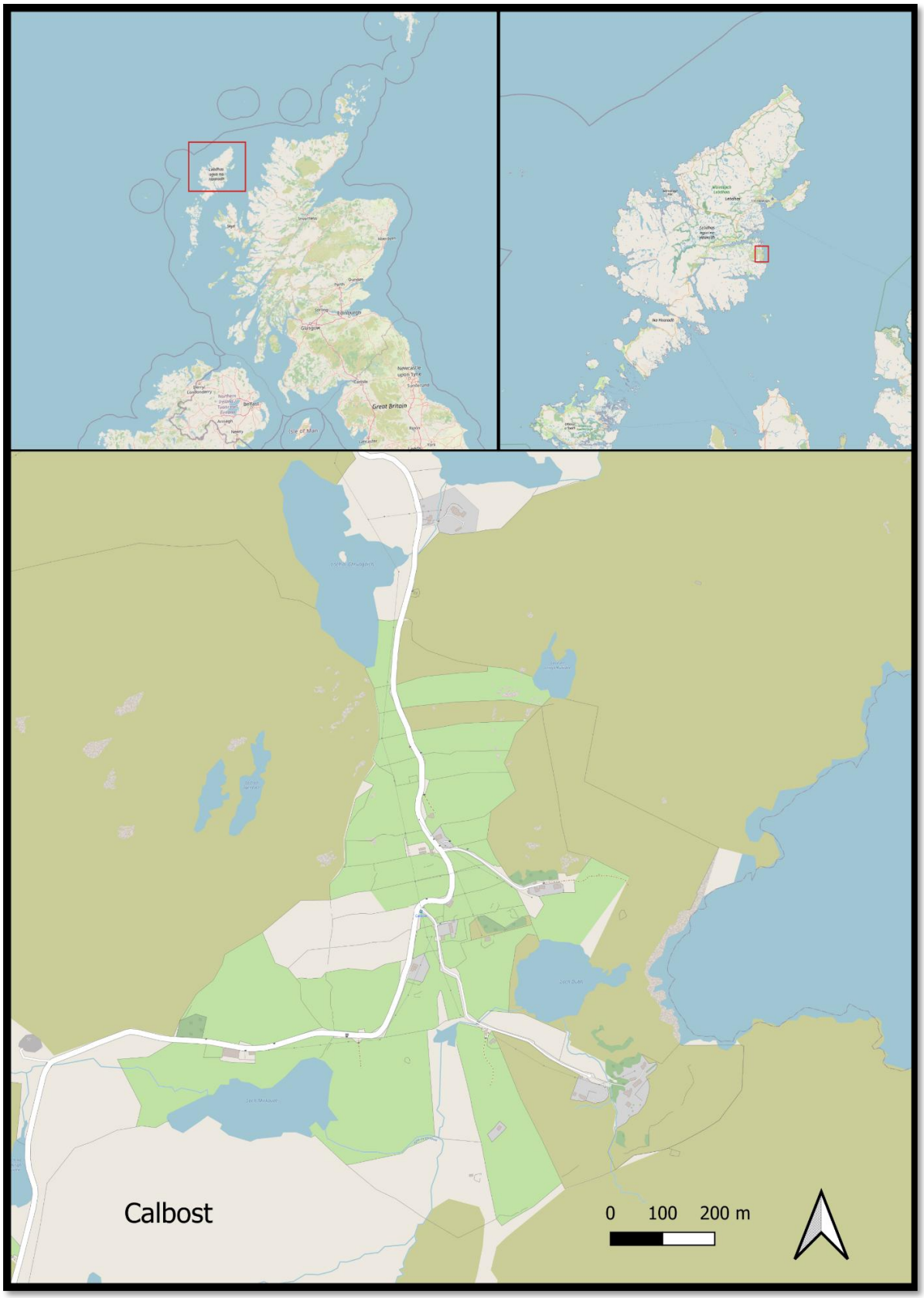


Figure 4-2: Location map of Calbost. Contains OpenStreetMap data (2024). Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023

4.1 Connected by sea: the geography of Calbost

Calbost is a crofting township located on the east coast of Lewis in the Western Isles, about nine miles south of Stornoway by sea. The Western Isles, sometimes called the Outer Hebrides, is an archipelago about 150 miles long, lying 40 miles off the northwest coast of Scotland. Lewis is the northern part of Lewis and Harris, the largest island of the Western Isles archipelago. The landscape of Lewis and Harris is dominated by rugged hills of exposed Lewisian gneiss in the southern half of the island, with the island's interior dominated by vast tracts of peatland interspersed with myriad fresh-water lochs. Shell sand beaches with *machair*, or low-lying grassy plains, are on the western and northeastern shores of the island. On the east coast facing towards the mainland of Scotland, the shore is indented by sea lochs, shingle beaches and rocky bays. It is this coastline that provides ideal growing conditions for the type of seaweed that was used for kelp manufacture in the 18th and 19th centuries, such as the wracks that grow on rocks in the intertidal zone of the shore: the bladder wracks (*Fucus vesiculosus, Ascophyllum nodosum*) and serrated wracks (*Fucus serratus*).

Lewis has been historically divided into four main parishes: *Steòrnabhagh* (Stornoway), *Na Lochan* (Lochs), *Barbhas* (Barvas), and *Ùig* (Uig). Lochs, the parish where Calbost is located, extends from the southern outskirts of Stornoway to the Harris border in the south along Loch Shìophort (Loch Seaforth). The modern Lochs district is further divided into three main areas: *Ceann a Tuath nan Loch* (North Lochs), just outside Stornoway which includes *Griomsiadar* (Grimshader), *Ràmais* (Ranish), and *Crosbost* (Crossbost), *Liùrbost* (Leurbost) and *Achadh Mòr* (Achmore); *Ceann an Loch* (Kinloch), which includes *Baile Ailein* (Balallan), Ceòs (Keose), Lacasaigh (Laxay), *Ceann Shìophort* (Seaforth Head) and *Àirigh a' Bhruaich* (Arivruach) and *Pàirc* which includes both the north and south areas of the Pàirc peninsula. Calbost itself is in northern Pàirc, which extends from the southern shores of *Loch Èireasort* (Loch Erisort) from the north at *Cabharstaigh* (Cavarsta), *Crò mòr* (Cromore) *Crò beag* (Crobeg) and *Marbhig* (Marvig) and south to *Gràbhair* (Gravir), down along the northern shore of Loch Odhairn. Calbost is on the eastern Minch coast, approximately midway between the townships of Marbhig to the north and Gràbhair to the south (Figure 4-4). The townships of *Eisgein* (Eiskein), *Orosaigh*

(Orinsay) and *Leumrabhagh* (Lemreway) along the north shore of Loch Shealg, are the most southerly townships of the northern section, with the southern part of the peninsula is now uninhabited due to clearances which began from the 1820s for a sheep farm (Robson 2011: 103-117).

The landscape of Lochs is that of small rocky hills interspersed with numerous fresh-water lochs and lochans, peat bogs, rocky bays, shingle beaches and sea lochs. Calbost's landscape is typical of this area. However, it has a large amount of arable land in comparison with other places in Lochs (MacLeod, Finlay 1989: 55). The township's centre lies in a verdant bowl-shaped valley, encircling a fresh-water loch called *Loch Dubh*, which empties into the bay *Camas Chalboist*. Small rocky hills dotted with glacial erratic boulders surround the village and bay. To the north of *Camas Chalboist* lies *Mol a' Ghòdh*, a small shingle beach at the bottom of a slope, with the arrow-shaped tied island *Eilean a' Ghòdh* defining the southern edge of the shore. The Calbost boundary extends well beyond the immediate township and its enclosing head dyke (Figure 4-3). Although the march described below is not delineated in the OS Names Book for Lochs Parish (OS 1/27/113 1848–1852), its landmarks are named and described individually.

> Commencing at Loch Odhairn at Clach Uilleim, from thence to Loch na Bà Ruidhe, from thence to Thom Ghruagaich, from thence by Druim nam Bacan to Loch Dubh Steinnol from thence to Loch nan Uidhean and from thence to Loch a' Ghruagaich and from thence to Loch Buaile Duibhe and from thence to the sea at Mol nam Bràithrean, also half the island of Torray. (The Angus MacLeod Archive n.d.)

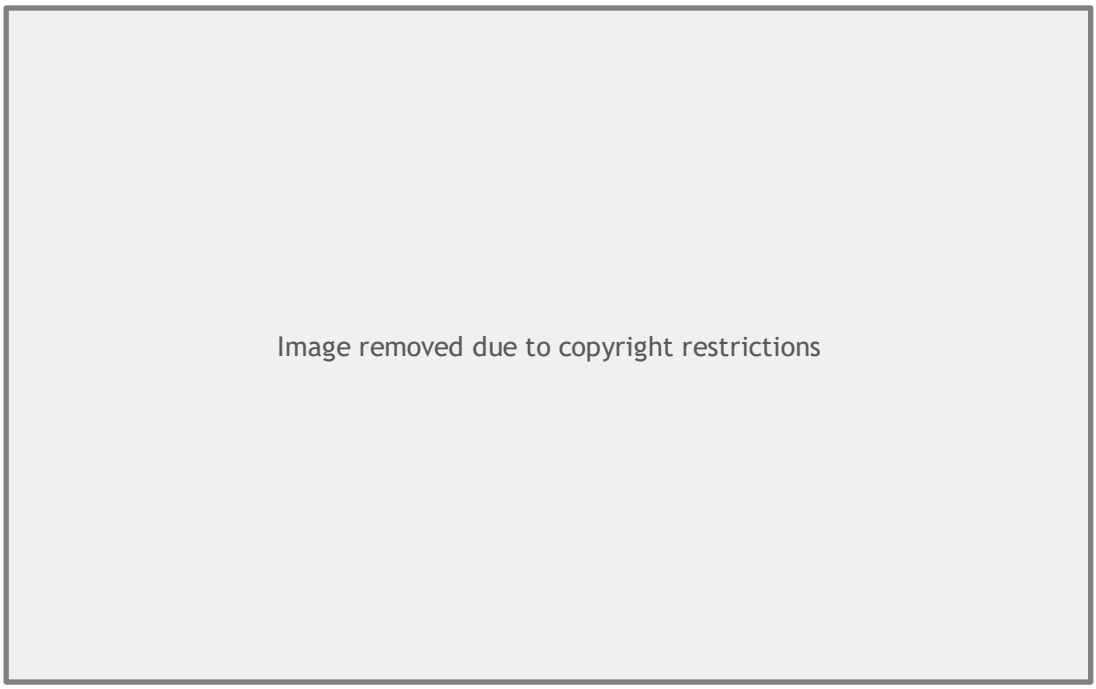


Figure 4-3: Calbost March outlining the boundaries. This undated document collected by Angus MacLeod, also shows the total acreage, including bodies of water. Image obtained from the Angus MacLeod Archive https://angusmacleodarchive.org.uk/

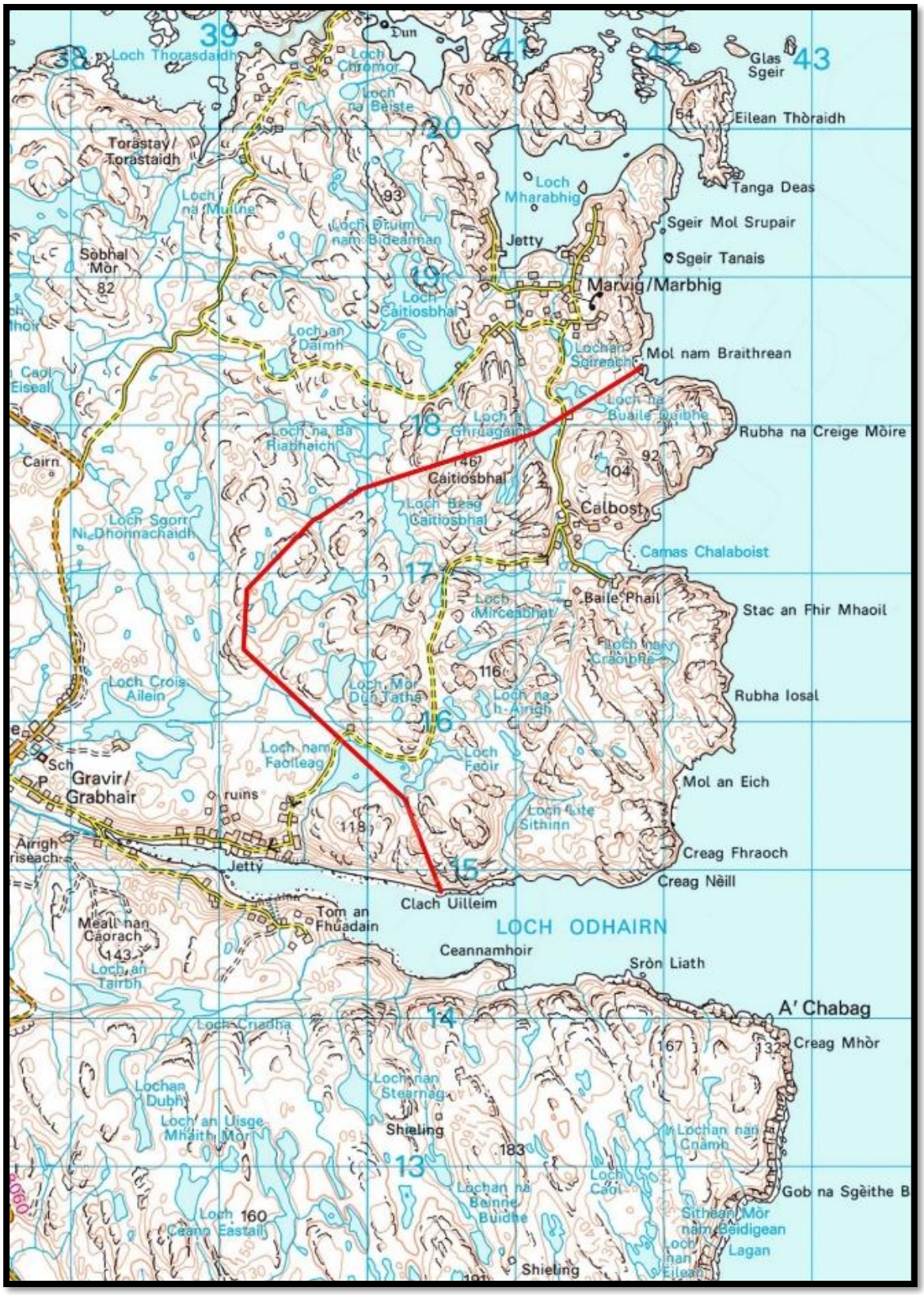


Figure 4-4: Map showing the Calbost march or boundary, which also includes half of Eilean Thòraidh to the northeast of Marbhig. Contains OS data ©Ordnance Survey 2022 Map obtained from https://Digimap.edina.ac.uk

4.2 The Seaforths, the Gillanders and Tacksmen: The kelp industry in Lewis 1763-1830

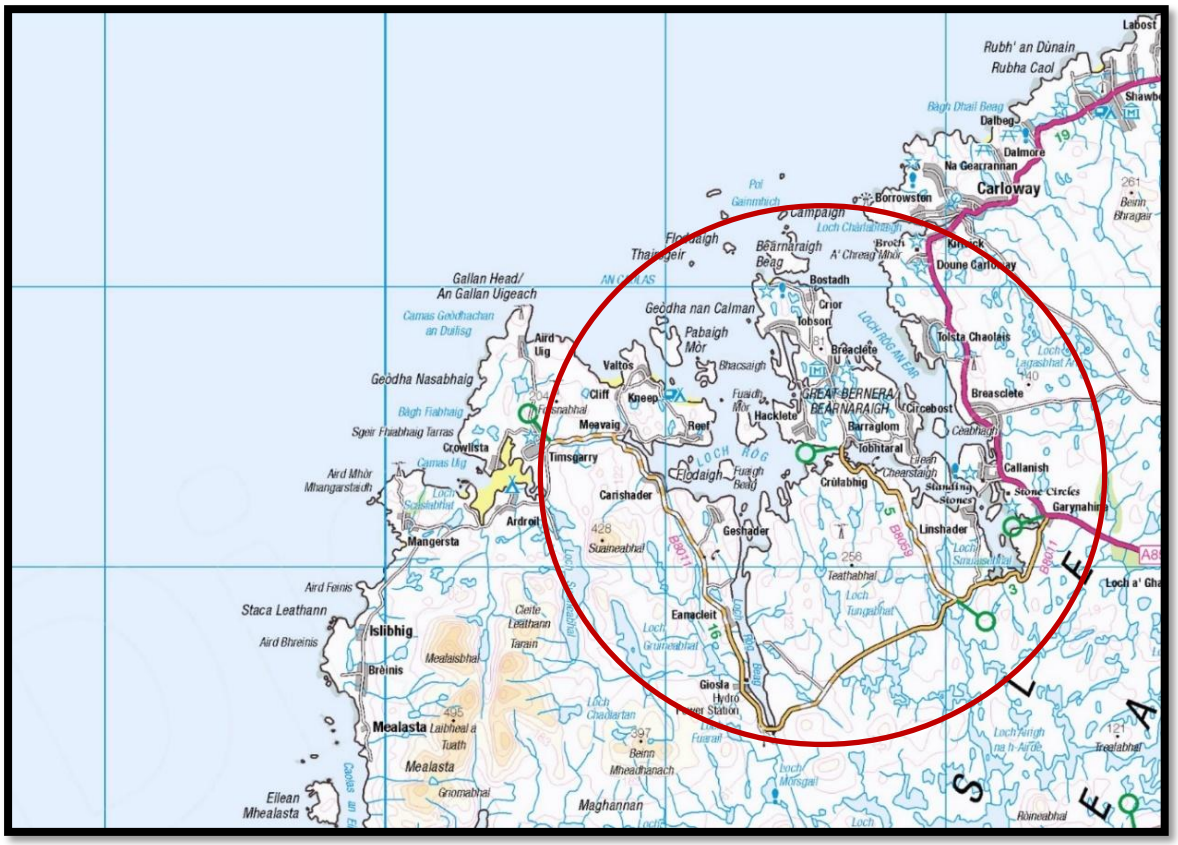


Figure 4-5: Map of Loch Ròg area of Uig parish. Map obtained from https://Digimap.ac.uk contains OS data. ©Crown copyright 2022

The Isle of Lewis in the mid-18th century had been in the control of the MacKenzies of Kintail since the early 17th century, and since this time they were known as the MacKenzies of Seaforth. They had bought the title of Lewis on 20th July, 1610 by 'Charter under the Great Seal' thus buying out Hay and Spens (see page 89) after their third failed attempt to colonise Lewis, which the MacKenzies then proceeded to conquer in 1610 (MacKenzie, W C 1903: 247-248). Martin Martin (1716: 342-3), when travelling through the Western Isles in the 1690s, remarked about the abundance of seaweed in the islands, 'The coast of each isle affords many thousand load of sea-ware, which if preserv'd, might be successfully us'd for making glass, and likewise, Kelp for soap.'. Thus, he showed an awareness of the kelp industry earlier than the purported experiments in making kelp in North Uist c.1735 by an Irishman, Rory MacDonald, as asserted by the Rev. MacQueen in the OSA (Clow and Clow 1947: 299; MacQueen 1794: 305). The Seaforth Estate in Lewis

was a relative latecomer to the industry compared to the rest of the Outer Hebrides, not getting underway to any degree until the 1760s (GD 427/105 1765–1766; McKichan 2018: 52; Scotland 2020: 24; Walker, John R. and McKay 1980).

Kelping in Lewis began along the shores of *Loch Ròg* (Loch Roag)(Figure 4-5) in the Uig parish on the west coast and *Loch Shìophort* (Loch Seaforth) on the south-east Minch coast at the border with Harris as early as 1763 when the then Viscount Fortrose, Kenneth MacKenzie, or rather as he was under 21 at the time – his trustees, had control of the island. *Loch Ròg* is a sheltered sea loch located on the west coast of Lewis. It is dominated by the island *Beàrnaraigh Mòr* (Great Bernera), with numerous uninhabited islets dotted about. It becomes a brackish estuary in its most sheltered areas, such as the shore at Calanais (Callanish). This sheltered estuary creates ideal conditions for the growth of rock weeds such as knotted wrack *ascopyphyllum nodosum* (*feamainn-bhuidhe*), serrated wrack *fucus serrata* (*feamainn-dhubh*), and bladder wrack *fucus vesiculosus* (*feamainn-bhuilgeach*). These seaweeds grow abundantly and are easily accessible for harvest during low tide. There are similar conditions at the head of *Loch Shìophort* (Figure 4-6), mainly north of *Eilean Shìophort* (Seaforth Island). Through the 1770s, kelp manufacturing became more widespread in the Lochs parish, including *Lochs Èireasort* (Erisort), *Sealg* (Shell), and *Liùrbost* (Leurbost) (MacKenzie, 1894:329). By the 1790s, during the peak of profitability, kelping had expanded to other districts in Lewis, particularly Stornoway Parish in the districts of *an Rubha* (Point) and *am Bac* (Back), and thus the Lewis estate had thus became a significant centre of kelp manufacture in the Western Isles (Bumsted 2005; Macdonald, Donald 2004: 124; McKichan 2007: 61; 2018: 57).

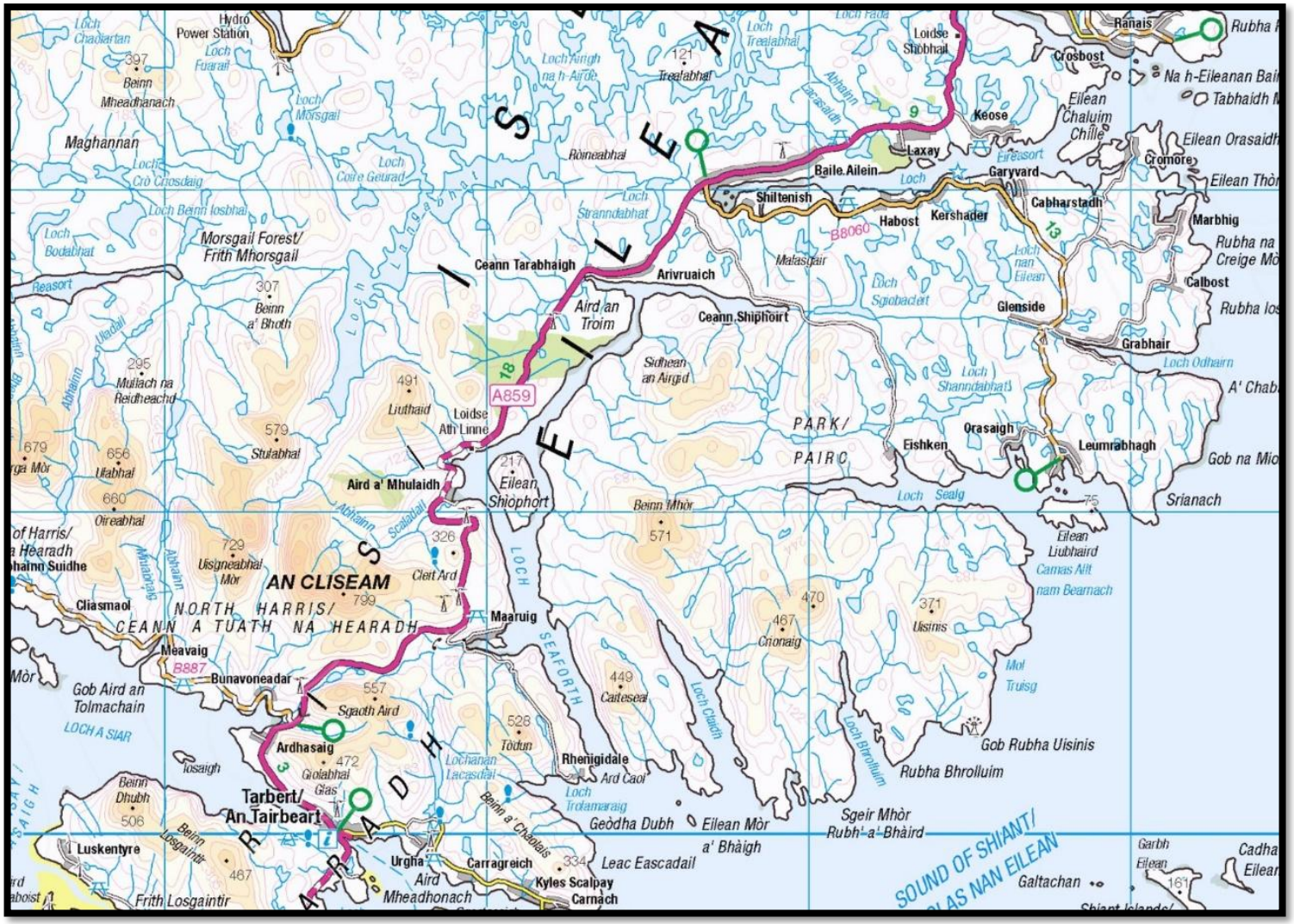


Figure 4-6:Map of the Loch Shìophort area and the Pàirc peninsula. Map obtained from Digimap.ac.uk: contains OS data. ©Ordnance Survey 2022

The Proprietors: The Seaforth MacKenzies – Debts and *dùthchas*

The Mackenzies of Kintail had long been well-connected within the Scottish political establishment and assimilated into Scottish landed society before they came to possess Lewis in 1610, adding to their extensive lands in mainland Ross-shire (MacCoinnich 2015: 3; Macinnes 1996: 256). At this time, they were major landowners in Ross-shire, setting up their seat at Brahan, near Dingwall. Throughout the 17th century, the Seaforth estates were involved in commercial enterprises such as fisheries, ironworks and cattle droving (MacCoinnich 2015: 257, 344-45). After 1741, economic pressures from servicing debts from borrowing to buy back the Seaforth estate due to their involvement in the 1715 Jacobite rebellion and their increasingly extravagant lifestyles socialising with the Edinburgh and London elite accelerated this trend of moving away from the concept of *dùthchas* in terms of the clan elites' perceived obligations towards the members of their clan or tenantry to that of commercial landlords valuing profit over their people (McKichan 2014: 19-21).

In 1771, Kenneth MacKenzie (1744-1781), sometimes known as 'the Little Lord' or in Gaelic as *Coinneach Òg,* was created the 1st Earl of Seaforth in the Irish Peerage to avoid legal troubles in the Scottish peerage. This was a newly created peerage as the Act of Attainder of 1716 attainted the original title because of his grandfather William, the 5th Earl of Seaforth's participation in the 1715 Jacobite uprisings (Macdonald, Donald 2004: 49; MacKenzie, Alexander 1894: 297). The Earl of Seaforth spent most of his time in London and abroad on the Grand Tour as a 'cultured expatriate', from his childhood through to his death. However, McKichan (2018: 52) states that Coinneach Òg, 'prior to selling the estates in 1780, inaugurated two industries in Lewis which appeared to have clear prospects. These were fishing and kelp'. This assertion regarding fishing and who inaugurated kelping is not correct. His father, Kenneth MacKenzie, Lord Fortrose (a courtesy title), died in 1761, the same year when George Gillanders became factor for the Seaforth Estate. The Rev Walker (1980) gives statistics of Lewis kelp as early as 1763/64. Coinneach Òg as of 1764 was still in his minority at that time and was in southern Italy from 1763. Therefore it is more likely that the seven trustees the elder Lord Fortrose appointed to administer the residue of the estate were

overseeing financial decisions within the Seaforth estates (Scotland 2020: 27, 30). The Lewis fishing industry was 'inaugurated' in 1628 when the Dutch were brought in by the 1st Earl of Seaforth, Cailean MacKenzie, to help further develop the fishery (MacCoinnich 2015: 259). George Gillanders, Coinneach Òg's estate factor, managed these industries, as well as the cattle and grain businesses in Lewis on the estate's behalf from about 1761 when he obtained the lease as factor. His son Alexander took over as the Lewis factor in 1775 as a result of threatened mass emigrations, forcing his father to 'retire' to his estate at Highfield near Dingwall (McKichan 2018: 28; Scotland 2020: 91-94). In 1779 the Earl sold his estates to his second cousin, Col. Thomas Frederick MacKenzie Humberston (1753-1783), for £100,000 to pay off his debts incurred from drinking, gambling and art collecting. In 1781 Coinneach Òg died of scurvy while enroute to India with his regiment, the 78th Ross-shire Regiment of Highlanders. When the Earl of Seaforth died, his cousin, Col. Thomas Frederick MacKenzie Humberston, inherited the chieftainship but not the title of Earl, as Seaforth had no legitimate male heirs. The Colonel was born MacKenzie but later assumed his mother’s maiden name, Humberston, when he came of age in order to inherit her family's estate in England. Thomas MacKenzie Humberston died in 1783 in Geriah, India, from wounds sustained during a pirate attack (Chichester and Bryant 2020). Both of these MacKenzie chieftains were 'absentee', entrusting the estate management to the Lewis estate factor George Gillanders and his son Alexander (McKichan 2018: 28), but as will be discussed, this absenteeism was not the case with Col. Humberston's younger brother Frederick, later to become Lord Seaforth.

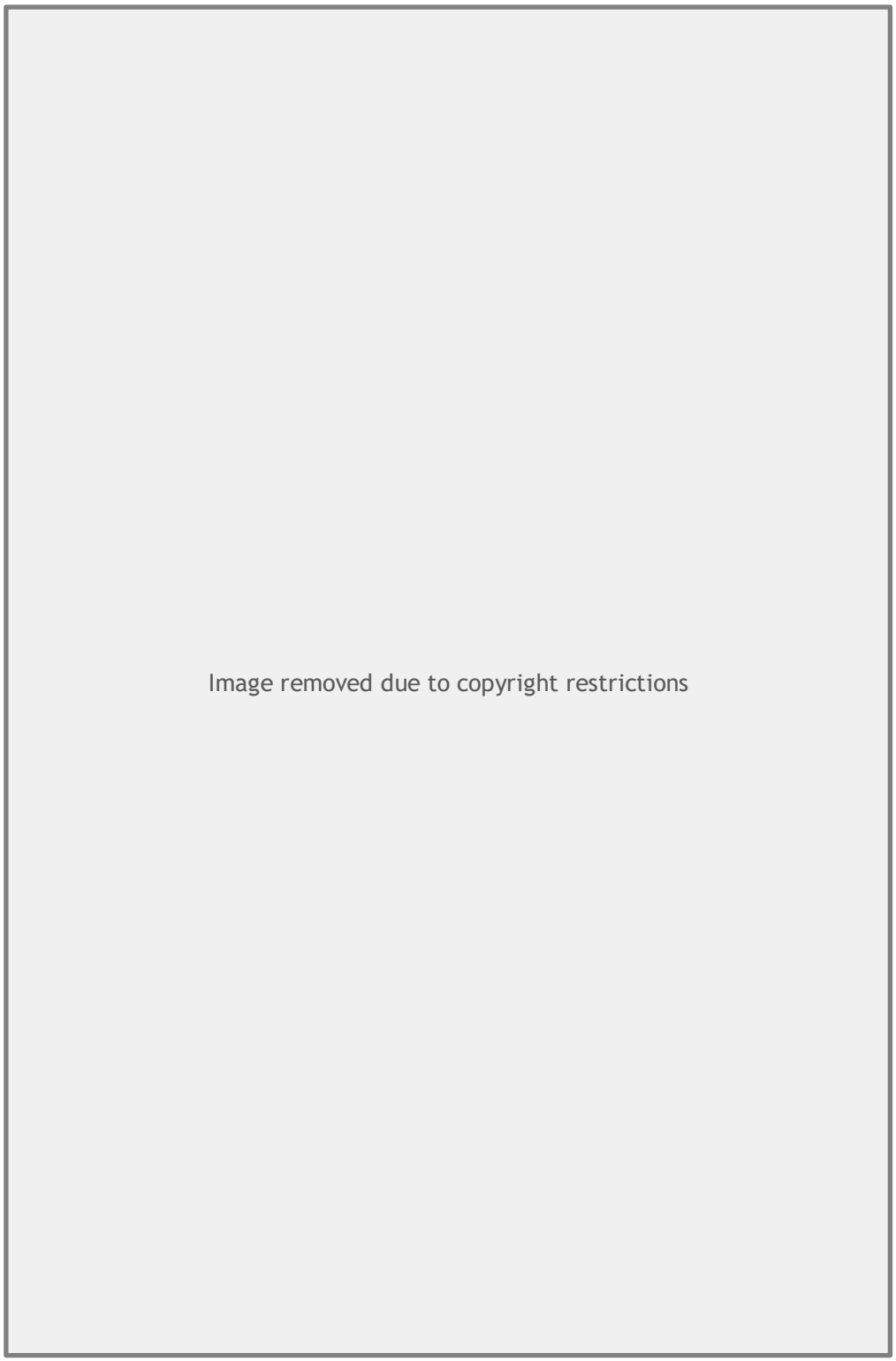


Figure 4-7: Brahan Castle, near Dingwall, c1900, the stronghold and the centre of power of the Seaforth MacKenzies. Image obtained from Am Baile https://www.ambaile.org.uk/asset/38335/

Thomas Humberston's younger brother, Francis Humberston MacKenzie (1754-1815), succeeded to the Seaforth estates and chieftainship. He was known in Gaelic as *MacCoinnich Bodhar* (Deaf MacKenzie), his deafness due to having caught scarlet fever at the age of 16 (Chichester and Spain 2006; MacKenzie, Alexander 1894: :334-345). It was Francis H MacKenzie and his wife Mary who were to take a more personal interest in the improvement of the Lewis estate, dividing their time between Brahan Castle near Dingwall and Seaforth Lodge in Stornoway before he took up the Governorship of Barbados in November 1800. Unlike his two predecessors, who had a more distant relationship with their tenants, Francis was said to have had a strong patriarchal sense of *dùthchas*, even though he was born and raised in England. *Dùthchas,* from the viewpoint of a clan chief, is the chief's sense of responsibility and obligation to his people and the land. McKichan (2018: :19-29) argued in his book on Lord Seaforth that F H MacKenzie often struggled with the concept of *dùthchas.* He faced the complex challenge of securing sufficient income to maintain his lifestyle and meet political obligations, while also honouring his responsibilities toward his tenants. This tension influenced his decisions on estate and financial management. Unlike many other Highland landowners of the period, he was reluctant to implement large-scale sheep farming in Kintail and Lewis, despite recommendations from his Chamberlains, as such measures would have necessitated the eviction of his tenantry. By refusing to convert land to sheep farming, a practice that brought higher profits elsewhere, he limited his estate's income, which exacerbated existing financial pressures. Despite this, like his predecessors, he was dependent on the management of his estates under oppressive estate factors such as the Gillanders and James Chapman (McKichan 2007: 52; Robson 2011: 74).

Francis MacKenzie was later created Lord Seaforth, 1st Baron MacKenzie of Kintail, in 1797. At this time, the kelp industry was experiencing its highest production and prices. When he returned from Barbados in 1806, he was under immense financial pressure due to increasing debts from extravagant expenditures and interest payments. He was saved from bankruptcy because of the continued high price of kelp, going as high as £17 per ton in 1809 (McKichan 2007: 61).

When Lord Seaforth died in 1815, his daughter Mary Elizabeth Frederica MacKenzie, Lady Hood (1783-1862), inherited his estates and the chieftainship (Henderson, T. F. and Reynolds 2016; MacKenzie, W C 1903: 491-2). She did not inherit the title because it had become extinct; her four brothers had predeceased her father. In 1817, she married her second husband, James Alexander Stewart of Glasserton, who assumed the additional surname of MacKenzie (Macdonald, 2004:51). Her husband purchased the Lewis estate, apart from Stornoway parish, in 1824 in a public sale in the Parliament House in Edinburgh brought by their creditors, driving them further into debt. In 1843 her husband died, and in 1844, she sold Lewis to Sir James Matheson, an East Indies merchant from Lairg who made his fortune from opium in China. During the tenure of James Stewart MacKenzie and Lady Hood, the kelp industry in Lewis, like all the other kelping estates in Scotland, underwent the most significant decline. Key developments included the fall of kelp prices following the repeal of the Salt Tax in 1822 and the industrial production of the LeBlanc method for extracting soda. Additionally, tacksmen and their leases were gradually eliminated, which allowed for direct control over the kelp and fishing industries by the estate. This led to the division of townships into smaller individual lots, or early crofts, which began in the last five years of Lord Seaforth's life but continued after his death under Lady Hood's tenure. The elimination of the tacksmen was part of a wider trend in the Gàidhealtachd, begun earlier in 1737 by the Duke of Argyll (Cregeen, Eric R 1969: 92). This marked the end of the run-rig (*roinn-ruithe* in Gaelic) system of land management under the control of tacksmen, and of conjoint tenancies to that of crofting, the impact of which can still be seen in the division of crofts today in Lewis.

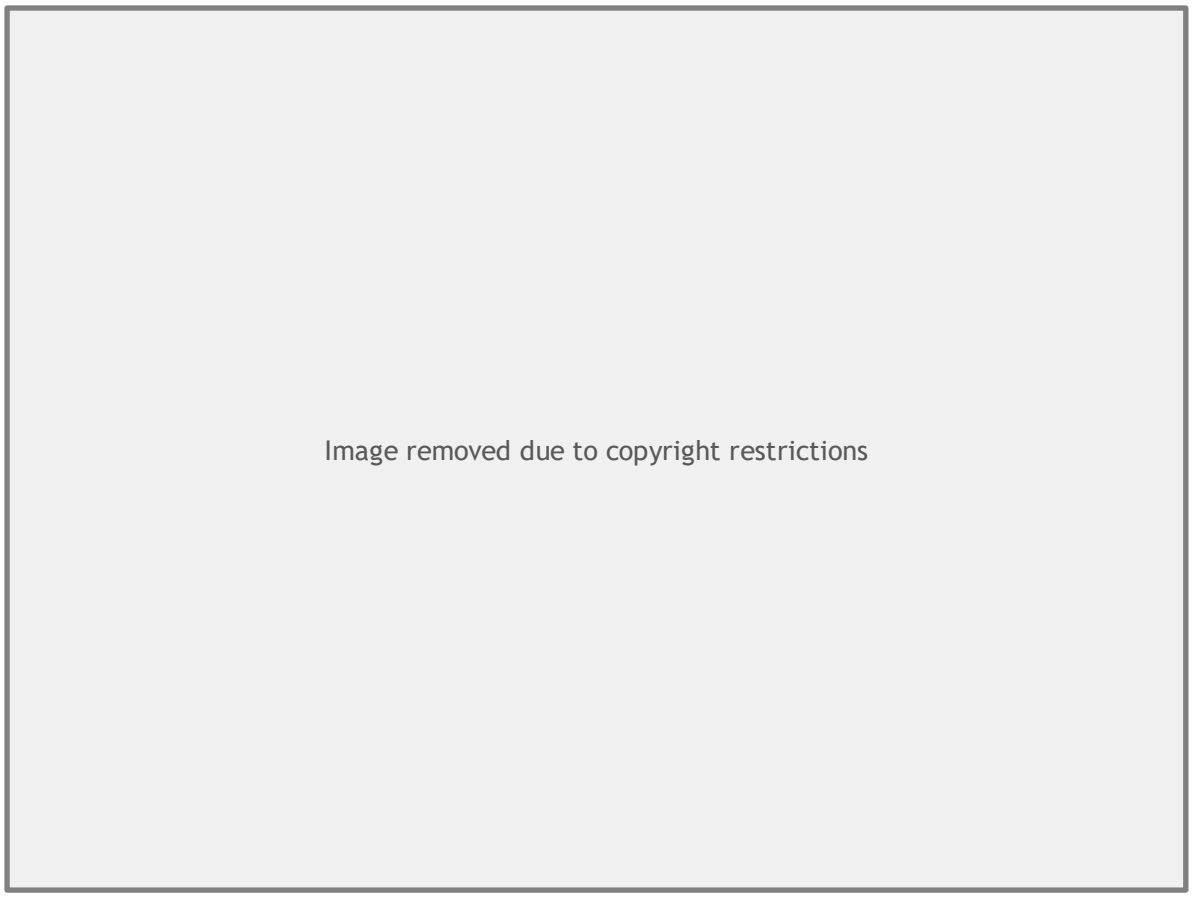


Figure 4-8: Stornoway c1813 with Seaforth Lodge in the foreground, by William Daniell. When the Gillanders were on Lewis, this was their centre of control. Only one wall remains of Seaforth Lodge, now incorporated within Lews Castle. Obtained from The Royal Collection Trust-https://www.rct.uk/collection/1124456/a-voyage-round-great-britain-undertaken-in-the-summer-of-1813-and-commencing-from © Royal Collection Enterprises Limited 2024 | Royal Collection Trust

4.3 Seaforth Lodge: the Gillanders of Highfield, Factors and Baron Baillies of the Lewis Estate

From 1761 until 1794, George Gillanders (1730-1801) and his son Alexander (1751-1794) were appointed as Factors for the Lewis Seaforth Estate and held several large tacks, or leased farms, in different parishes in Lewis themselves. George Gillanders, originally from Little Sauchen in Aberdeenshire, split his time between Seaforth Lodge in Stornoway, Brahan Castle near Dingwall, and his residence at Highfield House near Brahan. The Gillanders managed the estate during the tenures of three successive Seaforth chiefs: Kenneth MacKenzie, Viscount Fortose and 1st Earl of Seaforth; his cousin Thomas Frederick MacKenzie Humberston; and Thomas' brother Francis Humberston MacKenzie, Lord Seaforth (Tasglann nan Eilean Siar 1988). George Gillanders particularly had a reputation for managing the

estate oppressively. He extorted high rents, profited from the estate's tenants, and compelled them to join the military or work in the kelping industry, often threatening eviction if they refused, reflecting a broader trend in the Highlands and Islands region due to increasing commercialisation (Devine 1994: 44; Hunter, James 2010: 13) . The Gillanders became wealthy through their control of fishing, kelp production, black cattle, meal, grain and illicit whisky distilling, which allowed them to become more prosperous than many landowners in the Highlands, which was not uncommon in the kelping estates. Eric Richards (1982: 63) asserted that 'some of the tacksmen had grown so large on the profits of kelp, that they were the social equals of the lairds.' Consequently, they purchased their estate at Highfield, near Dingwall, in 1779 (Macdonald, Donald 2004: 125).

In 1772, following the failure of the oat crop, resulting in famine, the Lewis tenantry lodged so many complaints about George Gillanders that they threatened to move to the American colonies en-masse. Roughly 800 of them followed through. In 1774, Lord Fortrose came to Stornoway from London to address the complaints and demands of the people to prevent more individuals from leaving. The people specifically requested the immediate dismissal of George Gillanders as the factor, a rebate on their rent for the past three years and a return to the original rental rate. George Gillanders ceased being the factor for Lewis, but his son Alexander took over the lease in 1775 until it expired in 1794, the year of Alexander's death. George continued to manage the mainland Seaforth estates until his retirement in 1796. (Macdonald, Donald 2004: 237; MacKenzie, W C 1903: 480-481; Scotland 2020: 91-93).

Alexander Gillanders continued to manage the Lewis estate and the kelp industry for Lord Seaforth when he inherited Lewis. However, both the tacksmen and *maor* (ground officers), who were below the factor in the estate hierarchy, supervised the daily kelp production. During the 17th and 18th centuries, tacksmen, who were often related to the clan chieftain, held leases to farms and then sublet the land to others (Cregeen, Eric R 1969: 94; MacLeod, Roderick C. 1921: 39; Richards, E. 1982: 60-61). From the mid-18th century, the nature of the tacksmen’s position changed from being the military recruiters for the chieftain to that of entrepreneurial middle managers, sometimes having no hereditary or ethnic

connection with the chieftain or his people. This general commercialisation of tacksmen in the Gàidhealtachd was another reflection of market pressures from industrialisation in the Lowlands and England (Devine 1994: 31, 34). In this way, the Lewis tacksmen were no different to their mainland counterparts, particularly as the kelp industry in Lewis began to expand in the second half of the 18th century.

The kelp industry in Lewis appears to have started in 1763 in the Uig Parish and along the shores of Loch Shìophort after George Gillanders had taken over as the Lewis factor. The first mention comes from figures provided by Rev. Dr John Walker for 1764, indicating that 50 tons were produced in Lewis in 1763 for the price of £3 5s (Rackwitz 2004: 508; Walker, John R. and McKay 1980: 126). The kelp account records in the Gillanders of Highfield papers begin in 1765 when George MacAulay, tacksman for Linsiadar, Uig and overall kelp overseer for Lewis, was receipted for £2 2s for 2 tons of kelp made by Valtos con-joint tenants in Uig at Loch Seaforth (GD 427/105 1765–1766). Many of the tacksmen in Lochs were merchants from Stornoway, some of them MacKenzies or from the Lowlands, such as Aberdeenshire in the case of the Gillanders (Geddes 1948: 56). In the parishes farther away from Stornoway, former elite lineages deriving from the old Lewis clans still held tacks, such as the Nicolsons and the MacAulays in Uig. The MacAulay tacksmen were said to be descended from their celebrated chieftain, Dòmhnall Cam MacAmhlaigh (MacAulay), who lived at the turn of the 17th century (Bernera Historical Society 2022; Comann Eachdraidh Ùig 2008; Lawson 2008: 172-73). Some tacksmen in Lochs were merchants from Stornoway. This shift occurred after several hereditary tacksmen left for Carolina in the American colonies during the 'emigration fever' of the 1770s, which followed the famine and rising rents at that time. This pattern mirrored the broader trend in the north-west Highlands (Richards, E. 1982: 142-145). As a result, leases were offered to the highest bidders, primarily to these aforesaid Stornoway merchants (Macdonald, Donald 2004: 97).

The production of kelp in the Lochs parish also began in the 1760s, mainly along the shores of Loch Shìophort on the southeast coast of Lewis. The aforementioned George MacAulay, who leased tacks in Uig and at Loch Shìophort, supervised kelp

production across the whole of Lewis. He became wealthy from the profits of the kelp industry and owned a house in Stornoway, known as *Taigh Sheòrais Chalanais*, which overlooked the inner harbour on the site where the Crown Inn is now located on Point Street (Bernera Historical Society 2022). At first, many kelp makers from Uig, a significant number of whom were from conjoined townships in Great Bernera and Valtos, travelled east to Loch Shìophort to work for the season, just as those in South Uist did to access Loch Aoineart (Grant, Kevin 2019: 69-71). Conjoined townships were settlements where several small tenants shared the tenancy directly from the landowner (Geddes 1948: 55; Macdonald, Donald 2004: 97). Some of the inhabitants of Great Bernera had also kept summer shielings at Àiridh Dhòmhnaill Chaim in the Kinloch area near Loch Shìophort at the border with Harris (Comunn Eachdraidh Cheann an Loch n.d.). The kelpers from Uig were so renowned for their kelp-burning skills that they were in demand not only in Lochs but also in the Uists and Harris, where there was a greater need due to the larger production in those islands. The kelpers in Uig became reluctant to travel each season across Lewis to gather kelp along the shores of Loch Shìophort by the 1790s, seemingly as a form of resistance against compulsion to make kelp. MacDonald (2004: 125) states that in 1794 they went to Lochs 'but not until they were absolutely beat and forced by Mr Gillanders, the factor, who happened to be on his recruiting jaunt at the time.'

Several small communities were already established along the southeast coast of Pàirc along Lochs Shealg, Bhrolluim and Chlaidh. It was the people in these communities who were forced to work in the kelp industry when the Uig kelpers stopped travelling to Loch Shìophort, burning kelp along the shores where their smallholdings were situated (Lawson and Comann Eachdraidh na Pàirce 2007; Macdonald, Donald 2004: 125; McKichan 2018: 70). In contrast to the estates of Lord MacDonald in North Uist and Clan Ranald in South Uist and Benbecula, very few new communities were established on the east coast specifically for kelp manufacture as a deliberate policy (McKichan 2018: 69). The establishment of townships like Calbost, Marbhig and Grabhair was an exception, but even then, it was not just for the purpose of manufacturing kelp. These townships were also engaged in agriculture and year-round fishing. It has been suggested that the

volcanic eruptions in Iceland during the 1770s and early 1780s caused climatic changes, resulting in cold summers and poor harvests, resulting in famines. These changes also led to colder waters, forcing herring from Iceland to warmer waters further south, such as the Minch off the east coast of Lewis. As a result, there was a permanent migration from the west to the east rather than seasonal, with people moving from areas like Nis (Ness) to Tolstadh (Tolsta), west Harris to the Bays, and Càrlabhadh and Siabost to Calbost and Grabhair to take advantage of the year-round fishing (Lawson 2011: 168; Lawson and Comann Eachdraidh na Pàirce 2022: 122).

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Figure 4-9: Robert Weir's house, in the 1970s, with Angus MacLeod standing in front (left) and in 2023 (right). Remnants of Weir's garden wall (gàradh lios-mòr Rob Weir) can be seen in the foreground of both images. The image on left ©Angus MacLeod Archive: https://angusmacleodarchive.org.uk. Image on the right: ©Holley McCoy 2023

4.4 The last tacksman of Calbost: Robert Weir

Who was Robert Weir, the last tacksman of Calbost? Not much is known about him beyond what has been passed down through oral tradition, much of which remains unverified, as well as notes from Angus MacLeod. Both Donald MacDonald (2004: 136) and Angus MacLeod (MacLeod, Angus n.d.-e) identified Robert Weir as one of 'the most progressive tacksmen-curers' at the end of the 18th century. This next section will explore Robert Weir's significance, what being 'progressive' potentially entailed, and how this relates to kelping in Calbost.

Kelp manufacturing in Calbost is thought to have begun as early as the early 1780s, when Robert Weir, said to have come from Aberdeenshire, possibly obtained the lease for the tack of Grabhair and Calbost. Angus MacLeod opined that perhaps he had arrived in Calbost as early as 1776 (MacLeod, Angus n.d.-e), but he also said this fact could not be confirmed. However, it is possible he was not in Calbost in the 1770s but doing business in Stornoway. In an endorsement for a lease of a house in Stornoway, he is referred to as a 'Stornoway merchant' along with two other merchants (GD 427/32). This places Robert Weir in Stornoway from as late as 1780. In 1784, Robert Weir was possibly in Calbost as a sub-tenant to Alexander Gillanders with a verbal lease, as documentation has not been found in either the Gillanders of Highfield Papers or the Seaforth Muniments indicating that he held a lease at that time. On May 11th of that year, he and several other tacksmen from Lochs wrote a letter to the Lewis Presbytery confirming his residence in Calbost. In this letter, they expressed their agreement, as 'parishioners of Lochs,' to the translation of the parish minister from Lochs to the mainland (CH2/473/1 1742-1816: 230).

Who was the tacksman of Calbost if Weir was the sub-tacksman? When going deeper into the Gillanders Papers, there was a clue about who this was. Before 1780, Calbost and Grabhair were part of two different tacks. Calbost itself was part of a more extensive tack of 'Marvick, Soy, Calibost, Croimore, Crobeg, Rhuhasnish and Garihoy [sic]' previously held by William Crichton, a Stornoway shipowner and fish merchant, and subsequently, by his son Colin until 1779. The lease for this tack seems to have reverted to the estate and was not renewed by

Colin Crichton in 1780 after a long court dispute starting in 1773 between the Crichtons and Alexander Gillanders, the Estate Chamberlain who held the tack for Eilean Chaluim Chille (GD 427/262/1-44; Lawson and Comann Eachdraidh na Pàirce 2022; Robson 2011: 32-45). At that time, Grabhair was part of the Eilean Chaluim Chille tack. This suggests that Robert Weir probably did not acquire the subtenancy for Calbost before 1780.

Putting these pieces together, it seems Weir was probably managing Grabhair on behalf of Alexander Gillanders first before acquiring the subtenancy for Calbost c.1780-84. In the Seaforth Muniments, there is a list of the names of the tacksmen in 1781 after the leases were renewed in 1780 (GD46/1/212), and Robert Weir is not named, indicating that he was a sub-tacksman, or officially, a sub-tenant, with perhaps a verbal lease agreement with Alexander Gillanders at that point. There were other instances in Lochs where the tacksmen of the large tacks sublet *bailtean* (townships) of their tacks to men like Weir to manage these bailtean on their behalf; for example, Donald MacNeill, the tacksman of Pàirc, originally from Gigha, *(MacNèill an Eilein)* sub-let Cearsiadar (Kershader) to Donald MacRitchie *(Dòmhnall Mac Ciortaidh)* in 1773 for an annual rent of £4 Stirling (MacLeod, Angus n.d.–g). Bill Lawson (Lawson and Comann Eachdraidh na Pàirce 2022: 121) has cited information from the Stuart & Stuart, Cairns & Co. Papers (GD 274/19 1632–1814) on Weir's leases: the rental charged to Alexander Gillanders in 1780 was at the yearly rent of £45, running out in 1787. At this time, several parts of the tack were leased separately as smaller tacks, but Gillanders had retained the combination of Pabail Uarach (Upper Bayble), Calbost, Eilean Thòraidh, Crò Beag and Marbhig for £49 per year for another seven-year period until 1794. By 1807, Eilean Thòraidh, Grabhair and Calbost were leased to Weir at £56 per year. Seven years later in 1814, he was paying £110, a substantial rise in rent to just under double. There is a later document that names Weir as tacksman of Calbost: a petition by Robert Weir's brother-in-law Alexander MacKenzie, vintner of Stornoway, to the Seaforth Estate from February 1821 where he is named 'Robert Weir, the late tacksman of Calbost', asking that his possessions be sold in a public roup or auction so that his funeral costs and debts could be met (GD 46/17/59) (see Appendix A, pg. 383).

Despite the lack of documentation about Robert Weir's life, he appears to have been an astute entrepreneur who was pivotal in Calbost's economic development. Weir actively managed enterprises in kelp production, fishing and fish-curing both at Calbost and Grabhair. Additionally, he was involved in agriculture and animal husbandry. He is believed to have operated the horizontal mill himself, situated along the southern shore of Loch Dubh (MacLeod, Angus n.d.-e). Angus MacLeod noted that the residents of Calbost were 'better off' than those in other southern Pàirc townships during this time, a difference that may be attributed in part to Weir's diversified business activities and his working directly with the Calbost subtenants. John Munro Mackenzie (1994: 111), the Chamberlain for Sir James Matheson in the early 1850s, observed that 'the tenants of Cromore, Gravir, Marivig, Kershader & Calbost, all fishing villages and were good payers of rent tho' occupying the worst land in the Lews'. In 1850, ten tenants in Calbost each paid £3 per year, with the combined rental for Calbost and Grabhair recorded at £116. The continuing ability of residents to pay these rents decades after Weir's death demonstrates a degree of sustained benefit deriving from his business practices. Weir's direct involvement and varied business interests represented a notable deviation from James MacDonald's (1811: 73-77) characterisation of Hebridean tacksmen as typically unprogressive in agricultural matters and uninterested in the 'improvement of the country'. However, Weir's personal involvement in his initiatives in Calbost had a lasting effect, with the fish-curing and milling carrying on well past his death in 1821, supporting the community during a period when the Seaforth estate was reorganising land into crofts and displacing people elsewhere in Lewis. Weir's legacy, whatever his character or relationship with the Calbost sub-tenants, gave Calbost a measure of economic resilience, helping to shield its residents from the socio-economic upheavals that affected much of the island after 1830.

The list of personal effects in the public roup held after his death (see Appendix A), and the construction of his house indicate the lifestyle of Robert Weir and his modest business success. The house, although thatched, was made of dressed stone rendered with clay, similar to the 'white houses' of the later 19th and early 20th centuries to be found in Lewis and other areas of the Highlands and Islands (Figure 4-9). The location of his house was ideal, situated in the centre of the

township with easy access to, and therefore control of, the sites of his various business interests and his sub-tenants. These sites included Eilean a' Ghòdh, the arable fields and the horizontal mill along the stream that feeds into Loch Dubh (Figure **4-10** and Figure 4-11).



Figure 4-10: Close-up of Calbost, showing a single building, presumably signifying the tenant's (or tacksman's) house. Extracted from Chapman, James / Gibbs, Alexander, Plan of [the] Island of Lewis, the Property of the Rt. Hon[oura]ble Lady Hood Mackenzie of Seaforth, copied and reduced by Alexander Gibbs from a Plan and Survey made by James Chapman in the Years 1807, 8 and 9, Copied 1817. Map obtained from https://maps.nls.uk/projects/stornoway/index-en.html#layer=2

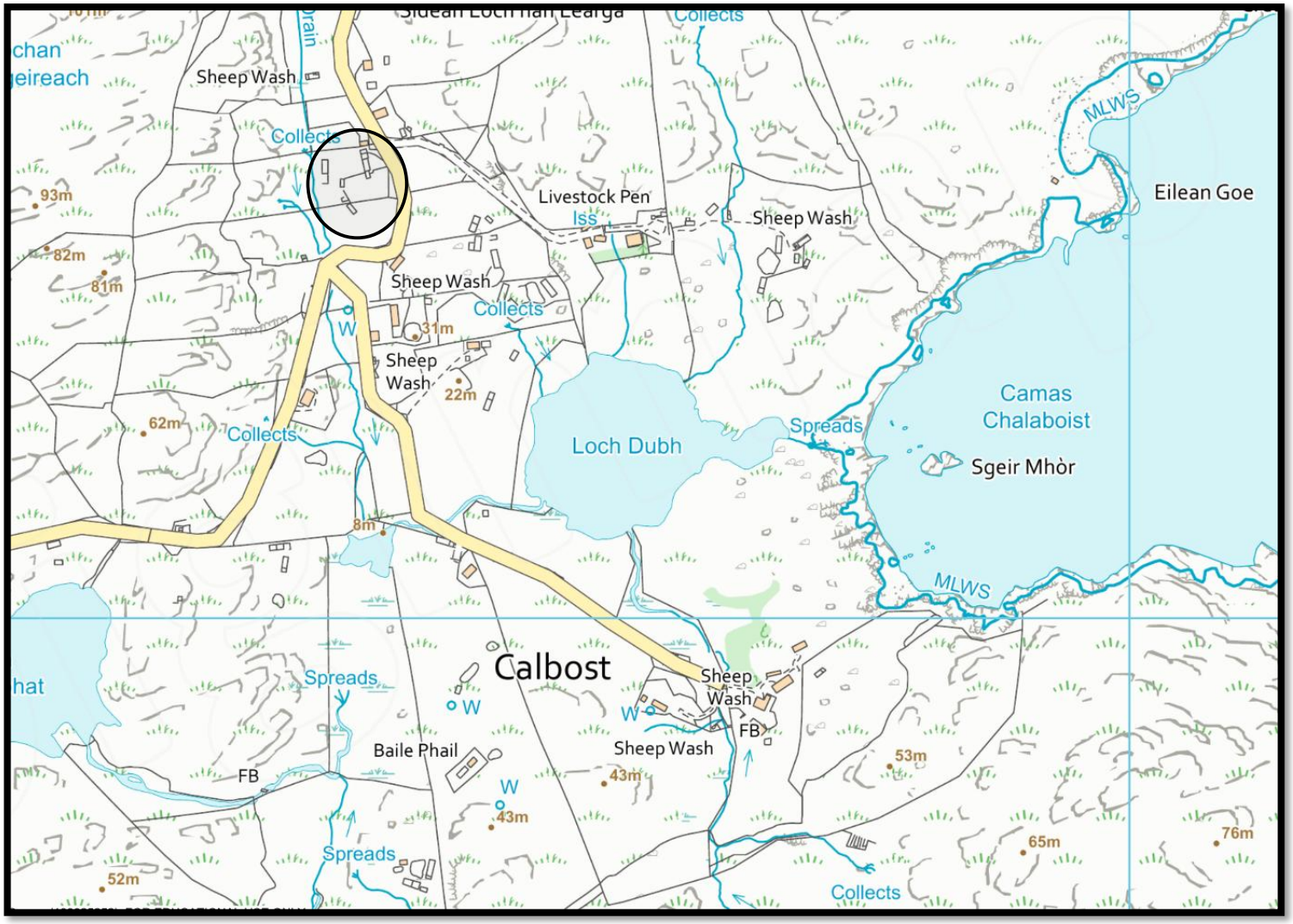


Figure 4-11: Location of Robert Weir's house and garden in Calbost. The outlines of his garden enclosure can still be seen in this modern OS map. ©2022 Ordnance Survey. Contains OS data. Map obtained from Digimap: digimap.edina.ac.uk

4.5 The new settlers of Calbost

Robert Weir could not have accomplished his varied business interests without people agreeing to work with and for him. He attracted his employees and/or sub-tenants from within the Lochs parish, which at that time also included the areas along the eastern shores of Loch Ròg from Tolstadh Chaolais and Càrlabhagh (Carloway) to the west side at Siabost (Shawbost). Although areas like Siabost and Càrlabhagh were more suitable for agriculture, these first and subsequent settlers came to Calbost for year-round fishing opportunities and the chance to earn an income from kelping, as well as to have some land of their own (Lawson and Comann Eachdraidh na Pàirce 2022: 122; MacLeod, Angus n.d.-e).

It is unknown who the sub-tenants that lived in Calbost were when Robert Weir took on the management on behalf of Alexander Gillanders in the 1780s, as the names of sub-tenants were not recorded by the estate at that time. It is unclear if Robert Weir maintained personal records of his tenants or accounts, as any such documentation may have been disposed of following his death. Between 1814 and 1818, the Seaforth estate began abolishing the old order of the tacksman system by not renewing leases and dividing up the smallholdings in each township into crofts directly under tenure to the estate. This was done to gain direct control of profits from the kelp and fishing industries as well as the rentals. By 1818, the six subtenants and their families, who had initially been hired as kelper-fishermen, became the first crofters in Calbost (and Grabhair), with Robert Weir's status as tacksman having been removed; that is, his lease was not renewed (Lawson and Comann Eachdraidh na Pàirce 2022: 121-22). Kenneth MacLean was said to have come with Weir in the 1780s from Siabost. His name is among seven kelper-fishermen from 1818 when Calbost was first lotted into crofts. Norman 'Tormod Buidhe' MacKenzie from Càrlabhagh, Weir's 'right-hand man', is said to have arrived in Calbost in the 1790s (Lawson and Comann Eachdraidh na Pàirce 2022: 121; Pairc Historical Society n.d.).

Initially under runrig management and then subsequently at the first lotting into crofts in 1818, Calbost was divided into named 'areas' (Figure 4-12): *Cnoc an Runnsan* (Hill of the [kelpie's] Tail), *Càrn an Leathair* (the Leather [dump] Cairn),

Cnoc a' Bhuanna (Hill of the Idler or Bodyguard), *Cnoc na Ceàrdaich* (Hill of the Smiddy), *Leòb an Loch* (The [cultivated] Field of the Loch), *Creag a' Choin Duibh* (The Rock of the Black Dog), *Glaic na Sìomain* (The Rope Hollow), *An t-Allt Dubh* (the Black Burn), *Baile [mhic]Phàil* (MacPhail's Village), *An t-Allt Ruadh* (the Brown Burn) and *A' Bhuaile Ghlas (the Green Cattle fold)*. Out of all these named areas, only Baile Phàil has appeared on the OS maps and in the original OS Name Books since the 1st Edition in 1849-1853. This may be because Baile Phàil was possibly a shieling (summer pasture) before William Crichton leased Calbost in 1774. Michael Robson's book about Pàirc (2011) provides valuable insights into the history of Pàirc and its settlements. In the book, there is an undated map (Illustration 19) of the northern Pàirc tack boundaries. This map may have been drawn up for the court during the boundary disputes between Alexander Gillanders and William Crichton in the 1770s. On this map, Calbost is annotated as 'Airidh Mhic Phail and Cala bost'.

The placenames in the other areas reflect a variety of origins: some describe landscape features, others refer to specific tasks or occupation, and some are derived from folklore. For example, 'Cnoc an Runnsan' draws from folklore, 'Cnoc na Ceàrdaich refers to an occupation, and 'An t-Allt Ruadh' is a landscape feature.

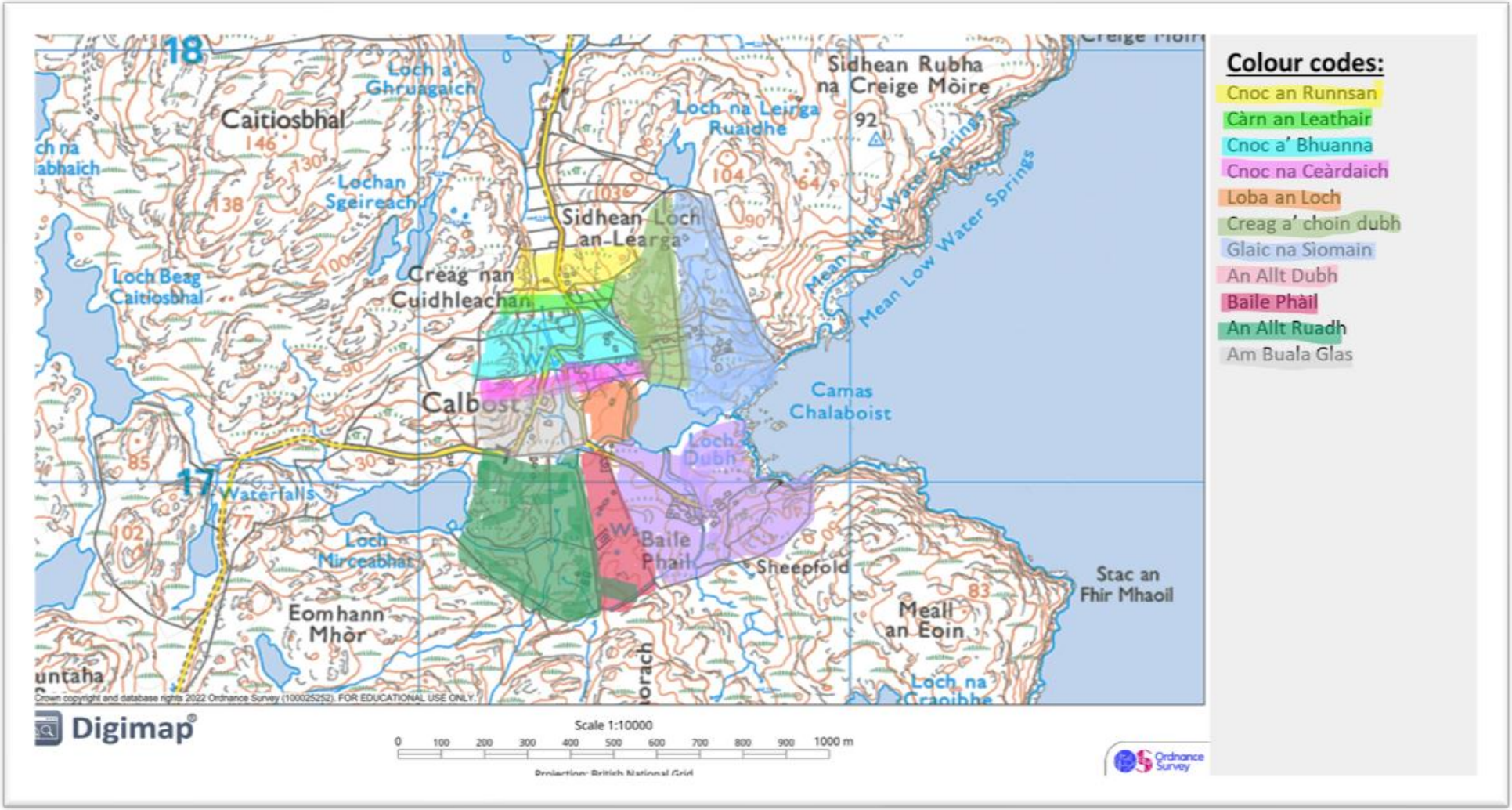


Figure 4-12: The approximate location of the various 'districts' of Calbost, following the modern croft boundaries. Contains OS data. ©Ordnance Survey 2022. Map obtained from https://digimap.edina.ac.uk/

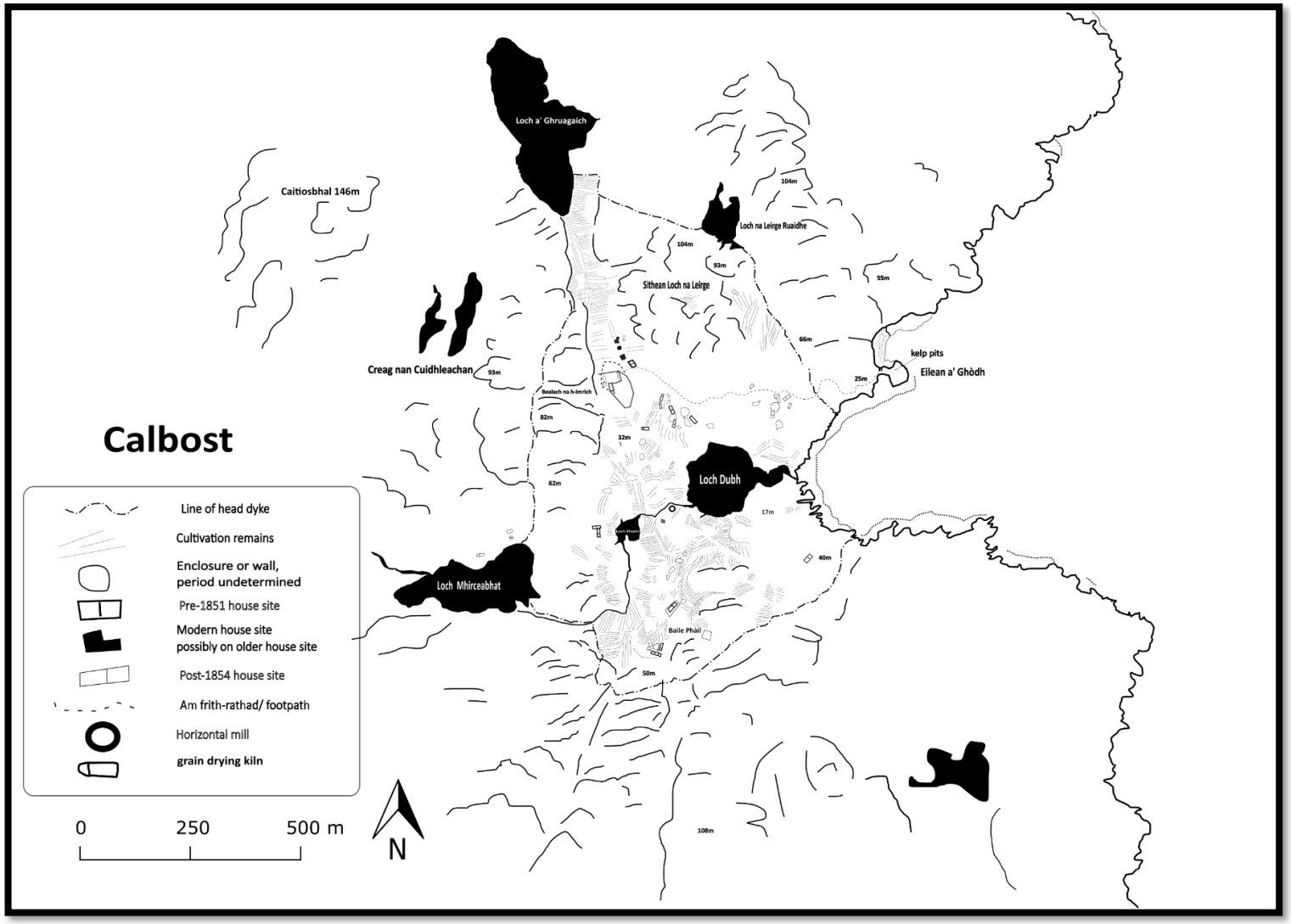


Figure 4-13: Calbost, showing the organisation of the township around Robert Weir's house and garden enclosure. Base Map: Google Earth satellite image.

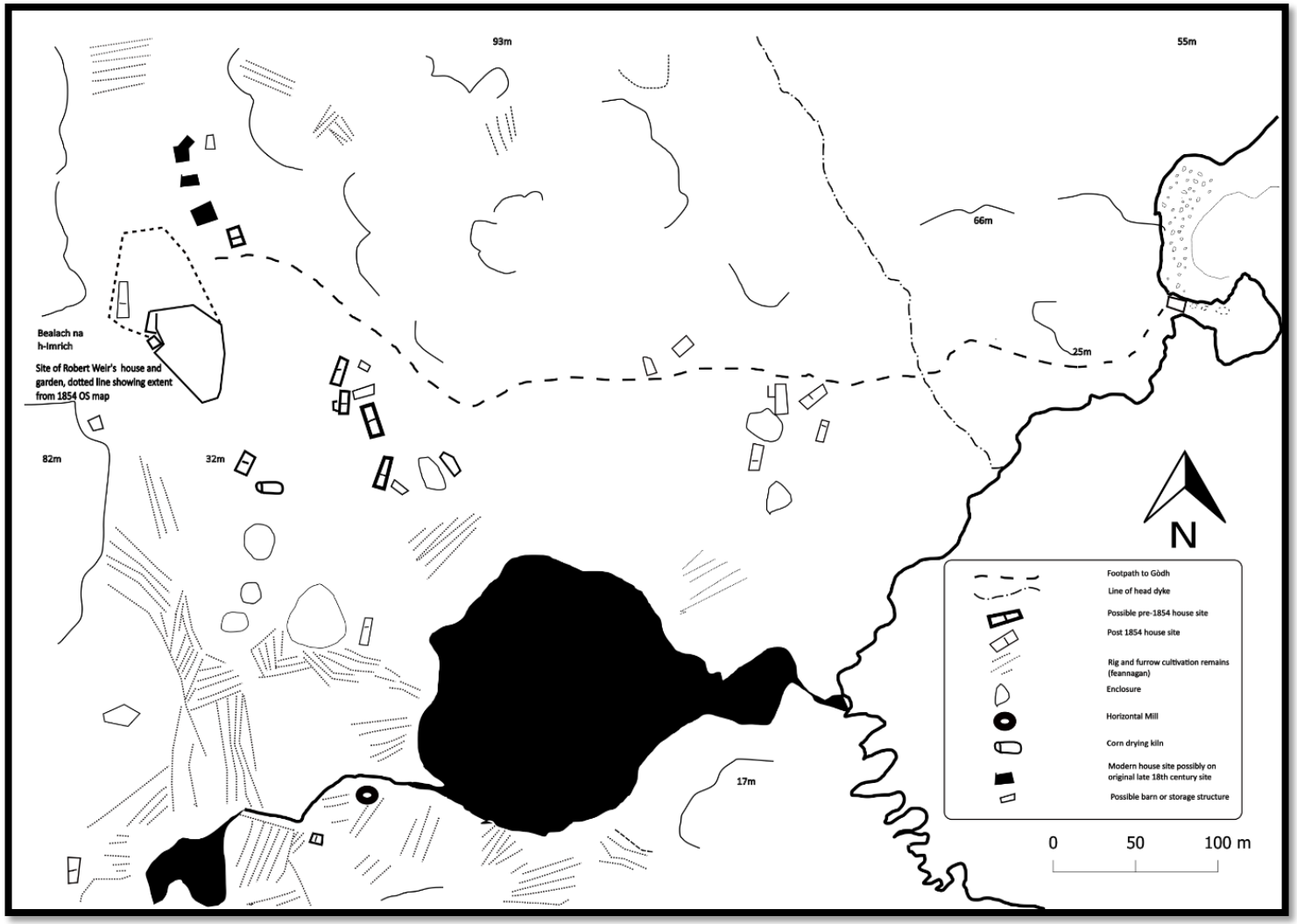


Figure 4-14: Close up of Figure 4-13, showing the access between the nucleus of the township and Eilean a' Ghòdh. The cluster of houses nearest Eilean a' Ghòdh reflects the second lotting of Calbost after 1850. The bipartite structure between Robert Weir's house and Bealach na h-Imrich is that of Norman 'Tormod Buidhe' MacKenzie, Weir's 'right-hand man'. Base map: Google Earth satellite image.

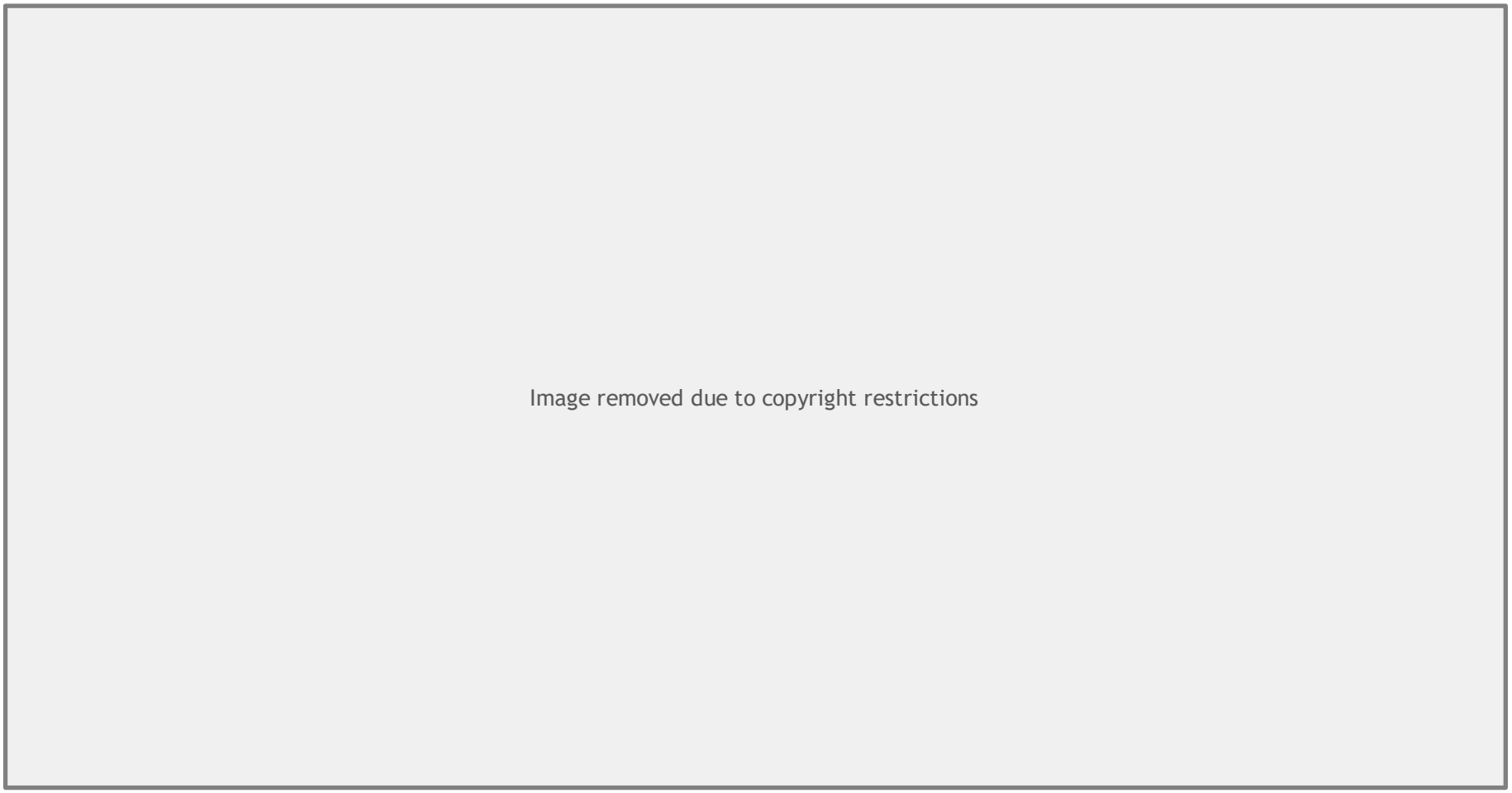


Figure 4-15: Photograph of oldest inhabited part of Calbost, 1958, annotated by Angus MacLeod. Current crofts are numbered 1-4 . A: Ruins of Robert Weir's house. B: Robert Weir's barn. C: Norman 'Tormod Buidhe' MacKenzie's dwelling. The wall of Weir's 'lios mòr' can be seen encircling both crofts 3 and 4. Photo obtained from the Angus MacLeod archive, (MacLeod, Angus n.d.–a)

4.6 The landscape organisation of Calbost

The organisation of the landscape in and around Calbost is what Chris Dalglish (2001: 13) has termed a 'nucleated township of a pre-improvement landscape' within the head-dyke or *baile*. The Calbost map (Figure 4-13) shows that most of the original houses clustered around Robert Weir's house and garden, which formed the nucleus of the settlement. A more dispersed group lay on the far side of Loch Dubh, where two houses that may pre-date the 1780s formed Baile Phàil. The presence of both settlement types at Calbost supports Campbell's (2009: 327) assertion that 'post-medieval settlement on Lewis had no defining characteristic, it consisted of both dispersed and nucleated elements and could comprise both clear indicators of communal endeavours and markers of individual undertaking'. At the time of the First Edition Ordnance Survey map (1854), the tacksman's house was still occupied with the garden walls marked (see Figure 4-16). Analysing the landscape organisation of Calbost will demonstrate how kelping was not a separate activity far removed from the township; rather, it was integrated into Calbost's seasonal work calendar, the work calendar being driven both by the natural seasons as well as the commercial policy of the estate, particularly in regard to the commercial fishing and kelping.



Figure 4-16: Closeup of the centre of Calbost, OS Map, Sheet 38, 1854. The red circle shows the location of Robert Weir's house and garden. Map obtained from https://maps.nls.uk/

The houses of the sub-tenants were thatched individual family bipartite single-story byre-dwellings with rounded ends, which tracked the topography of the land; with the living quarters situated at the higher end of any declivity (*an ceann shuas*) and the byre at the lower (*an ceann shìos*) so that the animal waste would flow away from the house. The walls or *tobhtaichean*, were double lined with stones for the exterior skins, and wool, rubble and soil filling the cavity for insulation and then topped with turf. Instead of chimneys in these houses, there would be a *cagailt* or hearthstone in the middle of the main room floor. Because trees were scarce in the Outer Hebrides, roof rafters were often made from driftwood or timber salvaged from shipwrecks. These houses were built from locally available material to withstand the frequent Atlantic gales and the damp climate (Mackie 2006: 65-68; MacLeod, Angus n.d.-b: 3; Nesbitt *et al.* 2013).



Figure 4-17: Some of the Calbost blackhouse remains, some of which could date back to the early 19th century.

Robert Weir's house, in contrast, was very different, indicating his status and lifestyle. Although thought to be thatched, it was made of dressed stone and clay, two stories high with windows, and two chimneyed gable ends (MacLeod, Angus n.d.-f), with the barn being a separate building. The site of his barn now has ruins of a later 19th-century blackhouse over it. The thatching was also different to that of the *taighean-tughaidh* or 'blackhouses' of the sub-tenants. Instead of the rafters and thatch resting on the inside of the *tobhta* (the double-skinned wall), Robert Weir's rafters rested on the outer wall, with the thatch hanging over the eaves, with wood for the rafters having been brought in from the mainland. At the time of the New Statistical Account, the Rev. Robert Finlayson, minister of Lochs Parish, stated that there were three stone and clay houses in Lochs Parish. It is possible that Robert Weir's house was one of these three houses the Rev. Finlayson referred to:

> There are three dwelling houses in the Parish built of stone and clay which are occupied by farmers, of which only one has a slate roof, which is the farmhouse/Inn at Loch Shell. (1833: 164)

The location of the tacksman's complex, which includes the garden, house, and outbuildings, highlights the central role he played in the life of the township (Figure 4-14). From his elevated position, he had views not only of the southern part of Loch Dubh and the mill but also of the starting point of the footpath (*am frith-rathad*) which led to Eilean a' Ghòdh right from his front door (Figure 4-18). At his back door lay *Bealach na h-Imrich* (Gap of the Flitting), the route used by the residents of Calbost to access the summer shielings, primarily located in the Caitiosbhal area behind *Creag nan Cuidhleachan* (Crag of the Wheels) (MacLeod, Angus n.d.–f). He had a clear view of the surrounding area, which allowed him to easily collaborate with his sub-tenants whose homes were clustered nearby. The ground surface in his garden showed no signs of rig and furrow cultivation, indicating that the site was well-drained – perhaps also indicating that he reserved the best patch of arable land for himself. According to an oral tradition from Calbost, the soil in his garden was enriched by ballast, purportedly 'Irish' soil, from cargo ships that anchored in Camas Chalboist to collect shipments of fish or kelp, the weight of which replaced the ballast. A similar tale is also found in Coigach where Irish soil was also said to have been dumped at Pàirc Eireannaich (Park of the Irish) on Tannara Mòr (Richards, Eric and Clough 1989: 444). This soil was then carried by the sub-tenants from the ships to his garden (MacLeod, Angus n.d.–e). The soil in and around his *gàrradh mòr* complex shows signs of enrichment, as the grass remains green compared to the rest of the township. Whether this enrichment was due to the addition of soil from ballast or from enrichment from dung and old thatch, cannot be determined without a soil analysis.



Figure 4-18: The view over Calbost from Robert Weir's house. The deep green of the grass surrounding his house indicates enrichment over time. The lack of *feannagan* indicates natural drainage and therefore this was probably the best arable land in Calbost.

Access to the various working areas, including the shielings and peat-cutting zones, is usually no more than 500m. Most of the shielings were located near Caitiosbhal Hill, within just a few minutes' walking distance from the township's centre. Much of the peat cutting was conducted in the moorland above Mol a' Ghòdh. The remains of *feannagan* (rig and furrow cultivation) within the boundaries of the head dyke indicate how extensive the cultivation was, primarily involving black oats, barley, and potatoes. There is also a collection of small rocky hillocks just below Loch Dubh, near the horizontal mill, called *Creagan a' Choirce* (the Crags of Oat), which suggests what was grown in that section of the township. (MacLeod, Angus n.d.–f). It is difficult to discern which cultivation and enclosures, apart from the post-1854 structures indicated, date back to the late 18th/early 19th century as the *feannagan* continued to be used and extended until the early 20th century.

4.7 Eilean a’ Ghòdh: a small industrial site



Figure 4-19: The tied island Eilean a’ Ghòdh. The kelp processing site is in the isthmus or tombolo.

Eilean a’ Ghòdh (NGR: NB 419 173) is an arrow-shaped tied island next to the shingle beach *Mol a’ Ghòdh*. It forms part of the north edge of *Camas Chalboist* (Calbost Bay). It rises from a bed of Lewisian gneiss from about 1.5m to 4m at its highest point on the eastern tip. The remains of what are thought to be kelp kilns are on the tombolo, or neck, of the island (MacLeod, Angus n.d.–d). According to Angus 'Ease', kelping activities were carried out alongside whitefish salting in the late 18th and early 19th centuries when Robert Weir held the tack at Calbost and Grabhair (Pairc Historical Society n.d.).



Figure 4-20: *Am frith-rathad* following the edge of the headland, looking towards Calbost, cutting through the township's head dyke. Eilean a' Ghòdh lies outside the head dyke.

Access to *Eilean a' Ghòdh* from Calbost is by *am frith-rathad* (the footpath) (Figure 4-20) across the edge of the headland to *Clach Mhòr a' Ghòdh* (The Big Rock of Goe). This rock is a large, rectangular, pillar-shaped, erratic boulder on top of the slope above Eilean a' Ghòdh. From this vantage point, a defined path down is not as clear; a steep, grassy descent leads to the island and beach. The equipment from the 20th-century fishing industry is scattered around the site: there is an old wooden boat shed with a concrete foundation built on the original site of an 18th-century salting house. Additionally, two rusting winches from the-20th century used for hauling small boats onto *Mol a' Ghòdh* are present. One was funded by the Congested District Board sometime between 1897-1911(when the Board was active), and the second was installed in 1960 by Angus MacLeod himself and was part-funded by the Lewis District Council (MacLeod, Angus 1998). There are also some orange floats and their associated prawn or lobster creels; and a series of iron eyelets embedded into boulders on the easternmost edge of *Eilean a' Ghòdh*.

These eyelets, relating to the winches, were used to thread winch chains to pull boats ashore onto the shingle. Boats were beached at Gòdh because the depth of Camas Chalboist was not suitable for mooring boats.



Figure 4-21: Clach Mhòr a' Ghòdh (Big Rock of Goe) overlooking Eilean a' Ghòdh.



Figure 4-22: View looking down the tombolo of Eilean a' Ghòdh towards the late 20th-century boatshed, which sits on the original whitefish salting house site. One of the winches lies to the right of the shed. Two kelp pits (in red) can be seen in the foreground, with the southern edge of the shingle beach *Mol a' Ghòdh* to the right. The footpath leading up to Clach Mhòr a' Ghòdh and back to the village goes behind the shed and up to the left.

The tombolo provides an ideal location for processing kelp due to its relatively flat terrain, dark loam soil, and distance from the township. The sides of the tombolo, particularly that surrounding the salting-house site and the two pits nearest, appear to have been augmented. The distance from the township offers protection from pollution caused by kelp smoke. The boulders and grassy area at the top of the island and the shingle beach provide an ideal *sgaoilteach* (spreading) or drying green to dry the seaweed without the need to construct drying walls. *An taigh-sailleadh* (the salting house) (Figure 4-22, Feature 1, Figure 4-26), originally established by Robert Weir, was used for salting whitefish during winter (MacLeod, Angus n.d.-d). The 1854 Ordnance Survey map (Figure 4-19) displays two structures at the location of the current wooden boat shed. It is unclear whether there were originally two buildings in the late eighteenth century or if the second building was added before or around the time of the first survey. The entry for Eilean a' Ghòdh in the OS Name Books states (pp. 38, 142): A low point of shore projecting into Camus Chalaboist around which the tide nearly meets at high tide, where there are two fish houses. The field notes for a later entry in the book (pg. 142) suggest that the artificial augmentation of boulders to the neck of Eilean a' Ghòdh (Figure 4-22) took place before 1849, with the surveyor observing that it 'likely has been an island before now'. Because Calbost began to be surveyed in 1848, and the Name Book makes no mention of the inhabitants engaging in kelp manufacture, instead noting that they lived 'chiefly by fishing', it is likely that kelping had been abandoned by 1840, if not much earlier (pg. 40). Chapman's 1807 map (Figure 4-10) is less detailed than the 1st edition OS map as it was intended not as a topographical survey, but as a tool of Improvement. Its purpose was to map the tacks, pasture, arable land and moorland, particularly to facilitate the division of townships into individual crofts, a process Chapman had already undertaken in Great Bernera by 1807. The Lewis map is therefore generalised and often inaccurate, including the shape and position of some freshwater lochs. Its shoreline is also schematic and therefore does not show minute details, such as Eilean a' Ghòdh (MacLeod, Finlay 1989: 51-55).

The salting station (*an taigh sailleadh)* continued operations long after Robert Weir died in 1821 until the turn of the 20th century. Kenneth Nicolson, 11 Calbost,

was the last to run the salting station and the grinding mill until 1902, when he moved to Stornoway to seek better employment (MacLeod, Angus n.d.-i), showing a continuity of use long after Robert Weir died.



Figure 4-23: Eilean a' Ghòdh in 1854 OS Map shows two salting-house structures. Obtained from National Library of Scotland: https://maps.nls.uk/view/228780487



Figure 4-24: Mòl a' Ghòdh shingle beach (left) and Camas Chalaboist (right). Views from the tombolo at low tide show a lack of growth in bladderwrack (*Fucus* species) compared to estuarine areas of sea lochs. The presence of laminaria at the shore edge indicates a sharp drop in depth. Boats were hauled up through a narrow cleared channel onto Mol a' Ghòdh as the deep bay of Camas Chalboist is unsuitable for mooring small boats.

To provide a sense of the scale of seaweed harvested to produce kelp, it typically took about 40 creels of wet seaweed to yield 112 pounds (one hundredweight) of kelp. To make one ton of kelp, 15 to 20 tons of seaweed was required (Devine 1994: :42; MacLeod, Angus n.d.–c; Rymer 1974: 149). In addition, it would also have been essential to rotate harvesting sites every two to three years to allow for re-growth (Macdonald, Donald 2004: 126; Walker, Dr. 1799: 25)(Figure 4-24).

Considering the limited growth of *fucus* species on the inter-tidal rocks between the tombolo of *Eilean a' Ghodh* and *Mol a' Ghòdh*, it would have been necessary to sail north up the coast to Lochs Marbhig, Liùrbost or Èireasort to gather sufficient supply. Angus Ease hints at this possibility in his description of the coastal place names for *Leac nam Buthaidean* (sloping rock of the puffins) (MacLeod, Angus n.d.–h):

> This rock was also used as a landing place by the inhabitants of the village for various things, notably for boatloads of seaweed that was used as fertiliser on their crofts. The practice of going for a boatload of seaweed to the island of 'Torray' or some other place where seaweed grew plentifully, ceased in Calbost in the 1920s, presumably because the people began to use commercial factory manufactured fertiliser more.

He further describes the seaweed they collected as 'bubbly seaweed,' specifically bladderwrack. Tòraidh is an island located just east of Marbhig and north of Calbost (see Figure 4-4). The island's western shore, along with Loch Mharbhig to its west, creates sheltered conditions that promote the growth of fucus species. This island may have served as one of the locations where seaweed was gathered and transported back to Eilean a' Ghòdh for processing into kelp.

On the tombolo, two circular features and one oval feature are interpreted as kelp kilns (see Features 1 – 3, Figure 4-26). Their shapes resemble confirmed kelp pits found in other locations, such as Isle of Mull (TROVE ID: 312309), Orkney (TROVE: 10758) and Coigach (TROVE:114620). Angus MacLeod also suggested that these pits might be the remnants of Robert Weir's kelping kilns (Pairc Historical Society n.d.). Feature 1 is a sub-oval pit with stones aligned on the outside of the feature, truncated on both sides and filled in, 3.5 m in length on the feature's interior by 1.5m in width. Feature 2 is a sub-circular ephemeral pit, heavily truncated on two

sides with a 3 – 3.5m diameter. Feature 3 is also a sub-circular pit located on the narrowest part of the peninsula; next to Feature 4 is a cobbled surface with stone alignments along the edge of the cobbles at the eastern end of the boat storage shed. This cobbled surface may be part of the footing to the original 18th-century salting house or houses.

These types of rough circular pits are typical of the earlier phase of kelp manufacture for soda or alkali extraction (pre-1790), more commonly seen in Orkney (Ballin Smith 2018: 62; Thomson 1983: 34; TROVE ID: 3496; TROVE ID: 306614; TROVE ID: 312309; TROVE ID: 318578). Although the pits are now overgrown with grass and filled in, they would have originally been deeper, with stones lining the sides and bottom. The oval pit's (Figure 4-25) internal dimensions roughly conform to the narrow trench-style kiln seen in other Hebridean islands (TROVE: 10758 1994; TROVE: 312309 2011; TROVE: 337559 2001). The truncated sides of the kilns may have resulted from breaking through the pits to extract the finished kelp or adding turf to the sides to create a windbreak during the initial burning process. The side on which the turf was placed depended on the direction of the wind (Beaton 1799: 36; Fenton 1997: 66; Thomson 1983: 34-36).



Figure 4-25: Feature 1 (Figure 4-26), Oval kiln showing revetted sides with stones defining its shape still in situ.

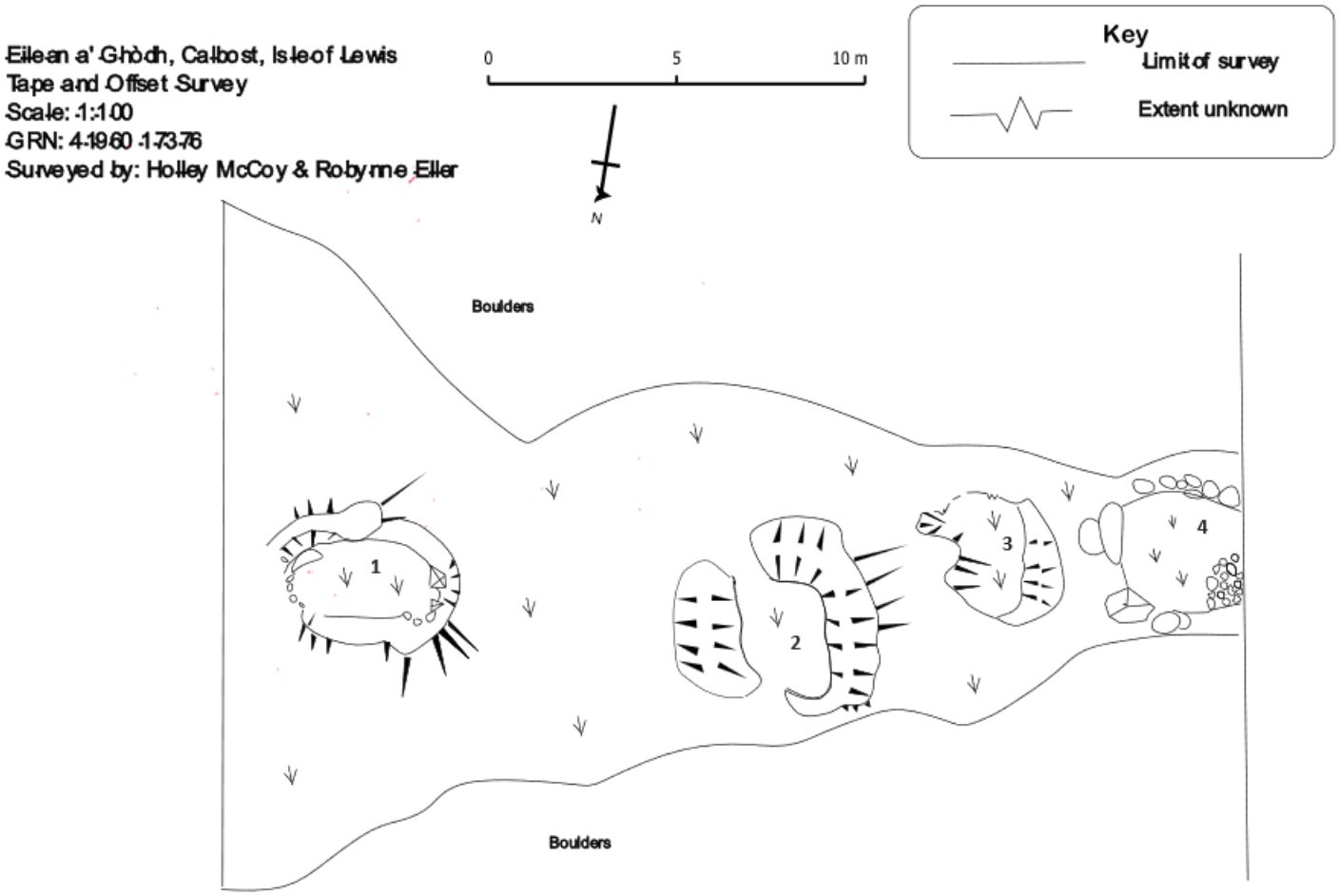


Figure 4-26: Site plan, Eilean a' Ghòdh with feature identification. Features 1,2 & 3 are the kelp pits.

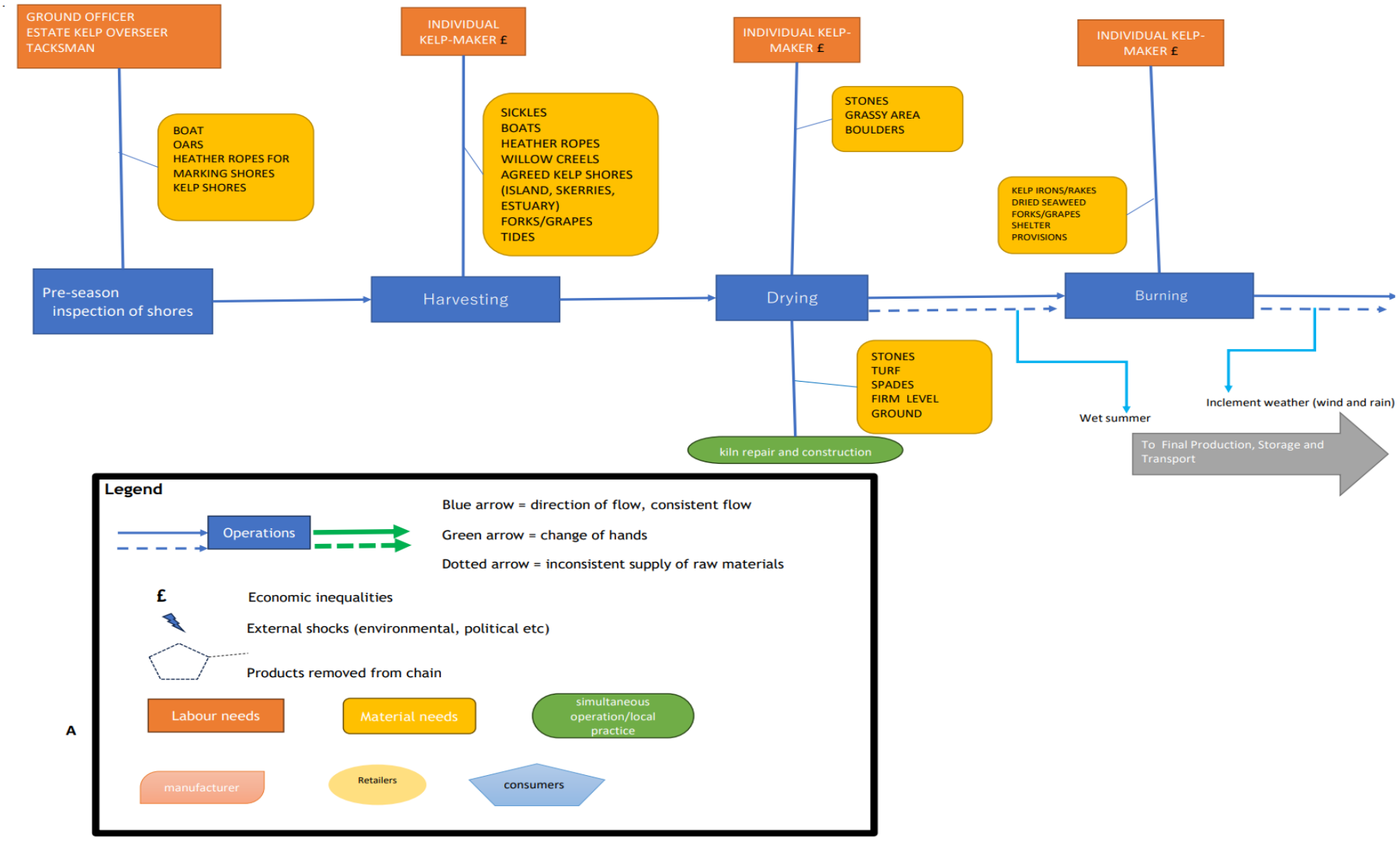
4.8 The story of the kelp industry in Calbost, Lewis: A study of commodity, ecological entanglements, and connections

Despite its current perception as an isolated, tranquil rural area, the southeast coast of Lewis was historically a dynamic, interconnected maritime landscape, particularly from the mid-18th century onwards, with the development of the kelping and fishing industries. Kelp emerged as a significant commodity during this period, supplying several early industries with alkali and other crucial chemicals necessary for producing various finished goods. This section seeks to analyse the complex production chain that transformed the raw material, seaweed, into the finished product of kelp, subsequently tracing its journey to broader markets and final consumers.

Through an examination of the commodity chains and networks, the economic and sociological connections of this Gaelic-speaking township on the periphery of Europe become evident, linking it not only to central Scotland and the industrial centres of England but also within the broader international framework of the British Empire. A comprehensive exploration of the processes involving both human and non-human agents within this landscape allows for a re-evaluation of the historical narrative, illustrating how this apparently quiet locale was, in fact, a vibrant centre of industrial activity.

In order to construct a comprehensive narrative of the kelp production process, various techniques and sequences were synthesised from multiple sources, including ethnographic accounts from Orkney and contemporary descriptions of recommended practices documented by the Royal Highland Society. Furthermore, the available resources and tools in the landscape, such as landing sites and possible kelp shores, were analysed alongside the specific processes enacted at Eilean a' Ghòdh. By integrating the documentary and ethnographical sources with the archaeological findings, this case study aims to enhance our understanding of the historical, economic and environmental significance of kelp production in this small township and the region more broadly.

The following three diagrams, Figure 4-27, Figure 4-28 and Figure 4-29, illustrate the commodity chain created for Calbost, breaking down each step in the production process. As outlined in Chapter 2.1.1 regarding constructing a CCA diagram, the blue boxes represent the 'nodes' of operation. In the upcoming narrative, each section corresponds to a node in the production sequence.



A

Figure 4-27: A Commodity chain diagram showing the production sequence for Calbost, Part A

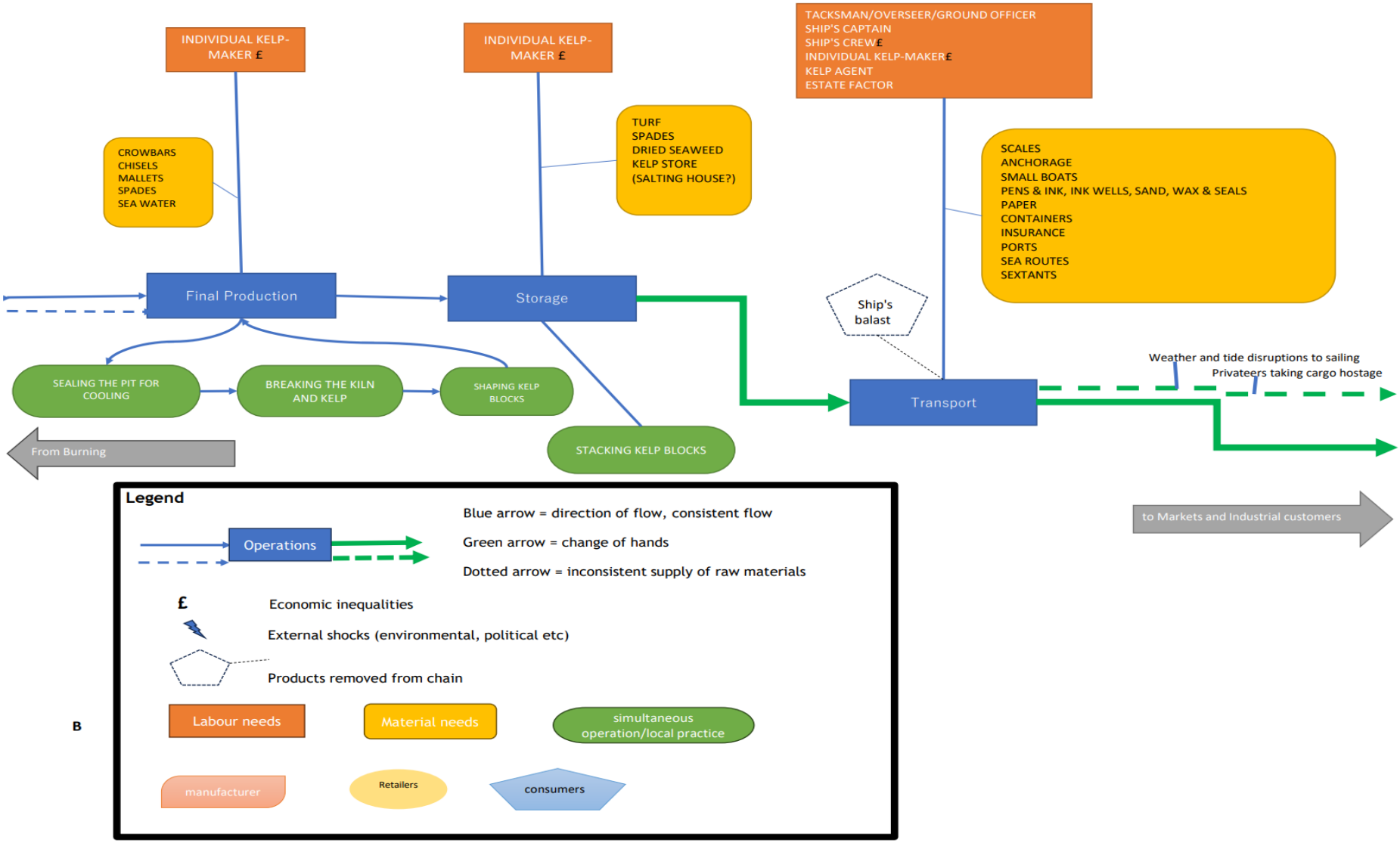


Figure 4-28: B-commodity chain diagram cont.

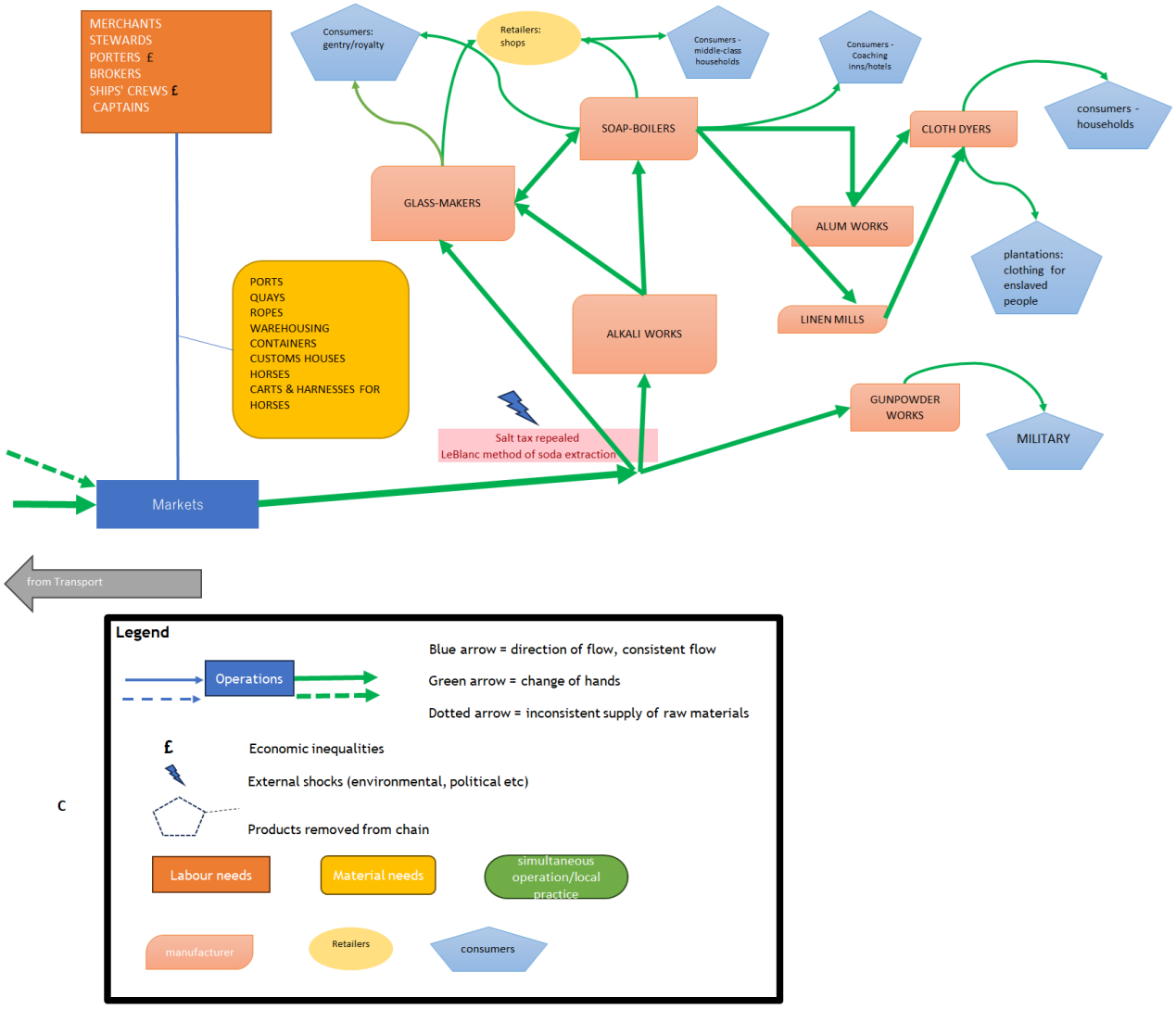


Figure 4-29: C-commodity chain diagram cont.

4.8.1 Harvesting the seaweed and bringing it ashore

MAOIS	*RAFT*
Seachdainn roimh an Òrdugh	*The week before the Communion,*
Mus do thòisich an àiteach	*Before the planting was started*
Bha reothart mòr ann	*There was a springtide*
's chòrd ri pàirt dhuinn	*And we played a part*
Chaidh gach nì ann an òrdugh	*Each thing went in order*
Chaidh iarraidh ròpan air Teàrlach [bùth Theàrlaich]	*Ropes were ordered from Charles [Charles Morrison's chandlery shop]*
Ailein leis a' gheòla	*Alan with the yawl*
Ag iarraidh coinneach' an àrd thonn	*Wanting to encounter the high waves*
- *An Fheamainn-dhubh.*	- *The Bladderwrack*
Chaidh gach corran a ghleusadh	*All sickles were sharpened*
Air gach sgian chuir iad faobhar	*On each knife they put an edge*
Airson spìonadh an Fheamainn	*For the cutting of the seaweed*
A bha am fianais on bhùrn dhith	*That could be seen of it from the water*
'S chaidh a dreughadh anns na riamhan,	*It was dragged into the drills*
Às an t-sliasaid, às na taobhan	*Off the quarter, off the sides,*
Às sùil-na-leis'	*Off the port.*

(Comann Eachdraidh Sgìre a' Bhac: 19)

The poem from *Griais* (Gress) in the Back district of Lewis describes the process of cutting and gathering *feamainn-dhubh* (bladderwrack) into a *maois* (square net of seaweed) from a boat at low spring tide, towing the *maois* with a boat, and then dragging it ashore at high tide for manuring the *feannagan* (lazy beds/cultivation rigs). This poem provides a rare account in Lewis Gaelic of a technique used all over Lewis to tow seaweed back to shore for kelp-making and manuring crops. The

crucial first part of the process leaves no evidence behind, neither in the cutting process nor in the hours of labour nor the danger involved in its collection.

The coast near Calbost is exposed to the open sea and has a steep drop-off, making it difficult to find the types of seaweed needed for kelp in sufficient quantities for just one burning, let alone for an entire season. This situation meant that seaweed gatherers would have to sail to more suitable kelp shores, ideally those that were more sheltered, allowing *feamainn-dhubh* and other *fucus* species to grow in abundance and be easily accessible by boat. The Calbost subtenants may have sailed north up the coast to the sea lochs to specified shores to collect seaweed already harvested by others. Perhaps Weir collaborated with other tacksmen whose tacks were adjacent to the kelp shores being harvested in Lochs Mharbhig or Èireasort to bring their loads with their own gatherers, using Eilean a' Ghòdh as a processing site. William Daniell's aquatint engraving of a foreshore in the Shiant Islands, located off the southeast coast of Lewis (Figure 4-30), gives a glimpse into how Eilean a' Ghòdh could have served as a kelp processing station for seaweed collected from other areas. The picture shows *sgothan* (skiffs) coming in, while a figure is either loading seaweed or unloading finished kelp into the awaiting boat, with more figures approaching with creels on their backs as kelp smoke is behind them close to the shore's edge. Daniell's engravings from his travels around the coasts of Britain are valuable resources for understanding the maritime material culture of various regions in Scotland during the time when kelping was active.

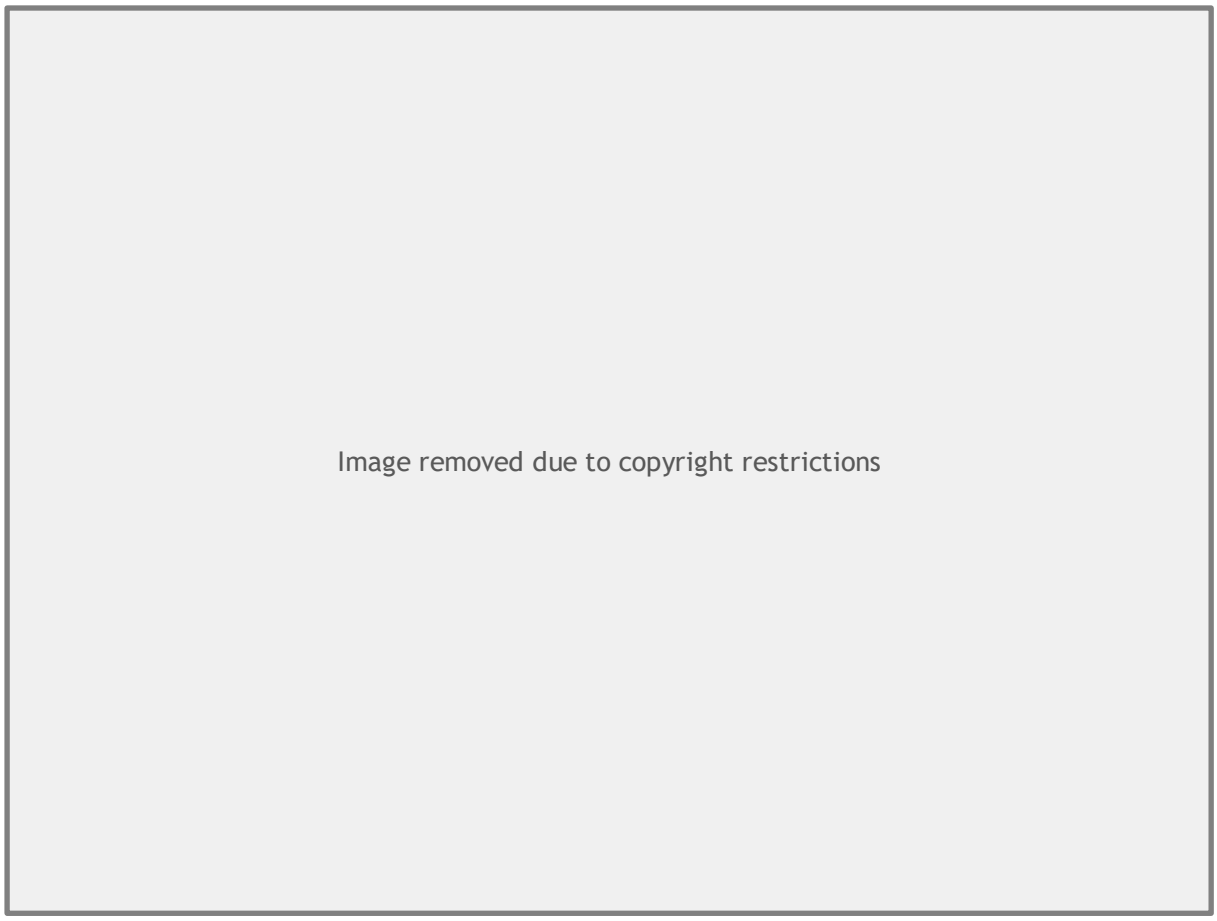


Figure 4-30: Part of the Northern face of one of the Shiant Isles, William Daniell (1769-1837). These islands lie off the southeast coast of Lewis. This aquatint engraving depicts kelp burning on the shore, with figures carrying creels on their backs approaching open-decked double-ended clinker-built, oared single-masted skiffs. These skiffs were used for gathering seaweed, transporting blocks of kelp to cargo ships and inshore fishing. Image obtained from https://artcollection.dcms.gov.uk/artwork/14028/

Since the inhabitants of Calbost likely could not afford their own boats, they may have had shares in at least one boat with money advanced by Lord Seaforth. The type of boats they used at this period were double-ended open-decked clinker construction with a 12-20ft keel, single-masted dipping lugs, much like the later 19th-century *sgothan Niseach* (Ness skiffs) (Macdonald, Donald 2004: 136; MacLeod, Angus 1998). After the death of Robert Weir in 1821, a public auction of his household effects listed a boat among the items (see Appendix A) (MacLeod, Angus n.d.-e). It was not unusual for a tacksman to have his own boat in the Outer Hebrides, particularly in Lochs where the lack of roads meant it was easier to travel by boat (Grant, Kevin 2016: 184). Robert Weir operated a fish-curing business, which meant his boat was multi-purpose: for transport, fishing and collecting seaweed and transporting kelp to awaiting cargo ships. Ultimately, the

expenses for tools, wood and boat construction were likely covered by the proprietor, Francis Humberston MacKenzie, Lord Seaforth (Macdonald, Donald 2004: 136).

The season for the cutting and gathering of seaweed in Lewis began from about the 6th of June each year (Macdonald, Donald 2004: 126). Before the kelp harvesting season, the ground officers (*maoir*) or main kelp overseers, like George MacAulay of Linsiadar, would inspect the kelp shores. They aimed to determine which areas would be cut and estimate the expected yield for the upcoming season. A heather rope would demarcate the areas to be cut. This estimate would then be sent to the Factor, who would advise the kelp agent. The kelp agent, such as Sir John Inglis at Leith, would use this information to charter a suitably sized vessel, order oatmeal for the kelpers, and negotiate prices at the markets (GD 427/131-135; GD 427/136).

To cut the seaweed, the best method, in general, was to access the shore at low tide and harvest with a *corran na feamad* (seaweed, or serrated sickle) as practised in other kelping areas (Grant, Kevin 2019: 75). *Corran* is Gaelic for sickle, but a seaweed sickle has a serrated cutting edge so that it saws the tough stems rather than slices. Cutting the seaweed instead of uprooting it allowed for re-growth, which usually took two to three years. Consequently, the cutting sites, as seen on other estates or islands, were managed on a two to three-year rotation (Macdonald, Donald 2004: 126; MacDonald, J 1811: 802; Thomson 1983: 27).

In order not to overload the boat with seaweed and people for the trip back, the safest way to bring the seaweed back to *Mol a' Ghòdh* would have been to make seaweed 'rafts', called *maoisean,* or *ràthan*. *Maoisean* were made by laying down a square of heather rope *(sìoman)*, filling in the square with criss-crossed ropes at low tide, and throwing the seaweed into the centre (DASG: Maois). As the tide came in, the seaweed raft would float and could then be towed behind a boat or if close to shore, pulled into shore. A *ràth* (DASG: Ràth) was similar, but instead of a square of criss-crossed ropes under it, it was a circle of rope with no ropes under it. Both methods for towing seaweed back with a boat are known in the north Pàirc area, so it is possible that either method could have been used at Calbost for

kelping. The currents and tides along that part of the coast of Lewis can be quite strong, so those in the boats towing these rafts needed to ensure that the ropes were not pulled too quickly. They also had to keep the rafts as close to the boat as possible to prevent them from flipping (Beaton 1799: 34-35). Close to shore, using grapes *(gràpan)* or pitchforks, the seaweed could be swished about to remove any debris before pulling the raft up onto the pebble shore. Any debris, such as sand or stones, would affect the quality, and therefore the price, of the kelp (The Highland Society of Scotland 1824: 254). The pebbly shore, lacking sand, was thus ideal for making higher-quality kelp. Then once ashore, creels *(clèibh)* made from willow with a heather rope strap *(iris)* that went across the chest would have been filled with the seaweed and carried to the *sgaoilteach*, the place for spreading out and drying. Everyone who could carry a creel, male and female, older children and adults, would have been required, especially given that just to obtain one hundredweight (cwt) of kelp (about 50kg), at least forty creels were required, and ten times this to get a ton. According to one account, it was estimated that one rectilinear kiln could produce 2 -3 tons in a season (The Highland Society of Scotland 1824: 253), with the smaller round kilns producing 1-2 tons. This meant at least 1200 creels were needed for the three kilns at Eilean a' Ghòdh per season.



Figure 4-31: The narrow channel through which the boats were hauled up onto the shingle at Mol a' Ghòdh. The fronds of laminaria digitata can be seen floating at the water's edge, indicating the sudden steep drop.

4.8.2 Drying

For proper drying, favourable weather conditions are essential. Late May and June are the optimal times to attempt this in Lewis, although this cannot be guaranteed. Both the pebble beach at Mol a' Ghòdh and the wide 'arrow-shaped' part of Eilean a' Ghòdh are ideal sites for a *sgaoilteach* without having to build drying walls. Eilean a' Ghòdh has both large boulders as well as a broad grassy sward, free of sand and open to the breezes coming in from the sea to help the drying process. Each evening, the seaweed would be gathered up into small ricks *(badan)* for storage overnight. In a similar process to that of hay or oats, as the seaweed became drier, it was put into progressively larger stooks *(curracagan)* and left continue to dry for up to eight days, depending on where the seaweed was cut from (The Highland Society of Scotland 1824: 254). If cut from brackish estuaries such as found at Calanais, it would be left for up to twenty days as this was reputed to contain less alkali salts, whereas the seaweed where there were strong tideways, and therefore higher salinity, was better (The Highland Society of Scotland 1824: 253).



Figure 4-32: The head of Eilean a' Ghòdh. The rock outcrops and ground would have provided a natural *sgaoilteach,* in addition to the pebbly beach.

At the beginning of June, the construction or renewal of the kilns needed to be completed. Shallow, oval, or round pits were dug on the neck of the peninsula, with their walls built up using turf or stones (Ballin Smith 2018: 62; Fenton 1997: 65). Mid-sized beach pebbles, taken from the adjacent beach, would line the bottoms and sides of the shallow pits.

4.8.3 Burning

Cha dèan sgleogaireachd ceilp.
Blethering won't make kelp. (Nicolson 1996: 103)

This Gaelic s*eanfhacal* (proverb) implies the labour-intensive nature of the burning stage, suggesting that idle conversation may have served as a means to delay the long, unpleasant but inevitable task faced by the kelpers.

The next step in the process was the burning once the ware was sufficiently dry. The best days for burning were a dry day with a good breeze to help fan the flames. Kindling would be placed at one end of the kiln depending on which way the wind was blowing - or in the centre on a calm day. If it was particularly windy, the windward side could be further built up with turf so that the fire could be lit. The kindling fuel to get the fire started was whatever burnable material was to hand given the available vegetation and terrain in the vicinity: handfuls of straw, dried heather twigs, old heather or straw ropes, peat dross (smùr) or small fibrous light-coloured peats known as *mòine bhàn*. The driest wracks, also the primary fuel source, would then be piled on gradually, so as not to put the flames out until the flames were even throughout the kiln (Fenton 1997: 66; The Highland Society of Scotland 1824: 65). The tacksman, if a ground officer was not present, would be on-site ensuring that at this stage no impurities such as sand or stones were being added to the pile: it would be too late to stop this once the fire got going (Grant, Kevin 2019: :77). One description from Orkney (Fenton 1997: 64-66) describes that the wracks 'would be placed round about, then across the middle, then round again until the filled pit rose about two feet (61cm) above ground level'. Orkney is used here as an analogue to imagine what may have also been done on Eilean a' Ghòdh

as Orkney continued to use round kilns instead of the long narrow trenches right through to the early 20th century (Thomson 1983: 34-38).

Once the seaweed was reduced to ashes, then the raking process would begin, using kelping irons, or *iarrainn-ceilpaidh,* which had long wooden handles with a bent iron foot on the end. At least three to four kelpers would be needed at this stage to work through the ashes, as 'if there were fewer, then the ashes will not be sufficiently worked through and a great part of them must be mixed into the next burning' (The Highland Society of Scotland 1824: 256). If it was too calm a day or the seaweed not dry enough, the ashes would 'cool and cake into white crusts' (The Highland Society of Scotland 1824: 255) or the seaweed would just cook instead of burning. This aspect of 'cooking the seaweed' into white crusts was observed by the author during an experimental kelp burn conducted in September 2021 at Eilean Mhàrtainn near Ullapool where the seaweed became partially rehydrated due to the damp air. The kelpers would pause the burning process, carefully rake through the ashes, and then resume burning to prevent the kelp from developing a 'white and porous texture.' Typically, kelpers would wait around thirty minutes after loading the last of the seaweed into the kiln to ensure thorough combustion, resulting in a uniform black colouration. This phase of the process was not only the most time-consuming but also the most labour-intensive and malodorous due to the acrid, soot-filled smoke. The kelpers engaged in rotating shifts over a twenty-four-hour period to maintain a continuous stirring of the kelp until it reached a molten or glassy consistency. Stirring the ashes would agitate a significant amount of soot, resulting in the ground upwind of the kiln and the kelpers themselves becoming covered in the residue and the stench. One minister from Stornoway parish (Cameron, Rev. John 1845: 134), criticising the detrimental effects of the industry on the community and the environment in Lewis in 1833, said, 'This process, if not injurious to health, is ruinous to the eyes.' He believed the crops were neglected because labour was taken away from tending them. He also argued that the smoke was harmful to crops. Additionally, he thought removing the immense volume of biomass from the sea each year affected fishing by depriving young fish of shelter and as a result, that it would take years for fishing stocks to recover from the kelping industry.

Once all or most of the ashes had become ‘like molten glass’ or the consistency of clay, then the cooling process would begin. The kelp would need to be covered to protect it from the changeable Hebridean weather until it could be broken open. In Orkney, the kelp would be hit with spades or shovels, and the odd bucket of seaweed would be thrown over it to help the cooling process (Thomson 1983: 35). Until the kelp was completely cooled, rain could damage the kelp by softening and dissolving the salts. To address this issue, the unpredictable weather in Lewis and the Western Isles often resulted in the pit being covered with a layer of dried seaweed, heavy beach stones, and turf. The pit would typically be left for several days, sometimes up to a week, until it cooled down or was stacked, ready for transportation (Beaton 1799: 37; The Highland Society of Scotland 1824: 256).



Figure 4-33: Figure 1 19: Unburnt material in bottom of kiln from a previous kelp burn. Experimental kelp burn, Eilean Mhàrtainn September 2021.

4.8.4 Final production

The next step once the kelp was cooled was to raise the cooled kelp out of the kiln. At this stage, crowbars (*geimhleag*) would be used to lever the kelp up from the bottom, ideally in one piece. A cold chisel (s*geilb-chruaidh*) would be placed in the middle and hit with a wooden mallet (*òrd-fiodha*) to break the raised kelp into large lumps of about 14-20kg. If there was burnt loose debris at the bottom of the pit, it was left as a basal layer until the next burning, known as *unlar* (Hebridean Seaweed Company; Newton, L 1951). The blocks of kelp would be stacked, ready for storage, and the smaller pieces shovelled as necessary onto open ground. The Gillanders Papers and Seaforth Muniments appear to be silent on the containers used for small kelp. It is unclear whether it was shovelled into sacks, as later occurred in Orkney and Tiree, or whether barrels may have been used instead.

4.8.5 Storing, Transporting, Markets and Industries using the product

The blocks of kelp would be stacked like a pyramid and then covered with turf to protect them from rain. Stacking in this way would allow any rain to run off instead of soaking into the kelp. Or perhaps the salting house that was used for curing fish in winter, could have been used for storage until collection.

The next stage of the process involved shipping the kelp to markets. Once the kelp had been loaded onto a boat being rowed from Eilean a' Ghòdh to Camas Chalboist – or to another collection point - and then to the awaiting cargo ship, the individual kelper was no longer concerned about its next destination. Very often, vessels were chartered from Leith and arranged to call into the various kelp-making areas at rendezvous points such as Loch Ròg, Loch Shìophort, and na h-Eileanan Bhairclin (the Birken Islands) which lie between Loch Liùrbost and Loch Èireasort, by the kelp agent. From the 1760s to the mid-1780s, the kelp agent for the Lewis Estate was the Edinburgh merchant Sir John Inglis, 4th Baronet of Cramond, son of John Inglis, 2nd Baronet and Postmaster General for Scotland. After 1787, the kelp agents were Angus and John Campbell of Ensay, the Factors for Harris, with vessels and captains coming from Stornoway instead of Leith (GD

427/137; GD 427/138). In addition to chartering the vessels, the kelp agent would negotiate prices with the factors and arrange for cargo insurance. In the 1780s, in addition to insuring against damage to cargo due to weather, insurance was required in the event privateers from Dunkirk operating in the Minch would hold cargo for ransom. One of the most notorious was the Irishman Captain Luke Ryan of Rush (Shiels 1971), who was named in the Gillanders of Highfield Papers. In two letters written in 1780 to George Gillanders from the Rev. John Downie, minister for Stornoway parish, Ryan was said to be anchoring in Loch Shell after capturing a Greenock vessel off Cape Wrath and holding its captain Norman MacLeod prisoner at a ransom for £500, and with Rev. Downie complaining that the 'government leaves our persons and property unprotected against these plundering vermin when one stout cutter would keep the seas clear of them from the Sound of Mull to Orkney'. In the second letter Rev. Downie stated that Ryan was said to have made more than 20 captures and was 'grateful for the protection of 8-or-9-armed English merchant men in the harbour'. Piracy such as this would have increased the price of insurance (GD 427/131-135; GD 427/218/8-9 1780–81; GD 427/233 1780).

The bay of Camas Chalboist was an ideal location for cargo ships collecting fish or kelp as it is a deep bay. Cargo ships would arrive in Lewis from about the end of July to the beginning of September (GD 427/114). The ship would anchor in the centre of the bay, and the processed kelp would be rowed from *Eilean a' Ghòdh* to the awaiting ship, possibly by Robert Weir himself. It was not unusual for the tacksmen ferry a load of kelp themselves as they would need to supervise the weighing and handing over of the kelp. There is an elegy from South Uist where the tacksman Aonghas Òg Àirigh a' Mhuilinn (Angus MacDonald, Milton) drowned while ferrying kelp for the same purpose (Grant, Kevin 2016: 147). The cargo would be taken onboard, and the quantity weighed while the tacksman observed. The captain would then write a receipt verifying the amount taken and the date and give it to the tacksman or ground officer (Figure 4-34). These would then be turned over to the Factor for his records.

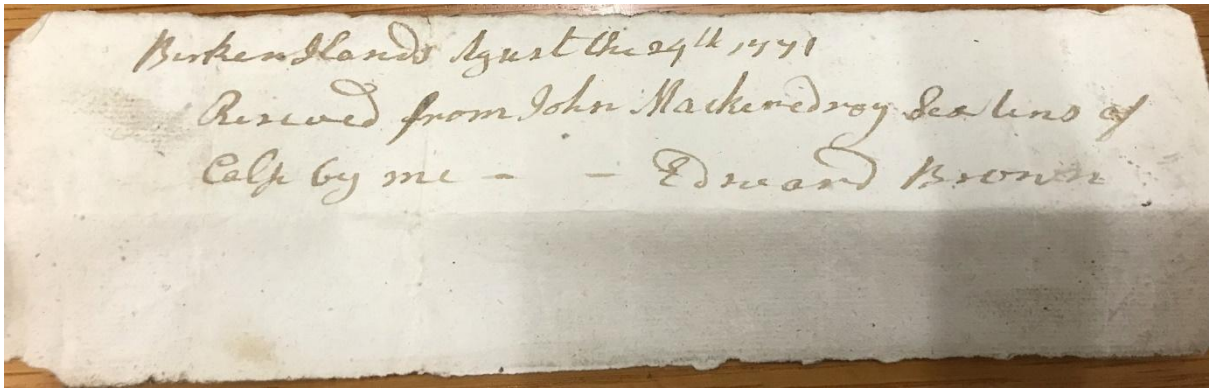


Figure 4-34: An example of many handwritten receipts for kelp from 1765 to 1794: Birken llands, Agust the 29th, 1771. 'Received from John Mac Enes Roy sections of Calp by me - - Edward Brown.' Na h-Eileanan Bhàirclin lie at the mouth of Loch Liùrbost. From the Gillanders of Highfield papers, GD427/110/2.

No receipts have yet been found from ship captains of kelp taken at Calbost in the Gillanders of Highfield papers, indicating that kelp was not likely produced at Calbost until after 1784, perhaps not getting underway until the 1790s. It also could be that the kelp was rowed to documented collection points, such as Loch Mharbhig or na h-Eileanan Bhàirclin. After Alexander Gillanders died in 1794 and his father retired in 1796, it seems that these kinds of receipts, which number in their hundreds, were not kept in the Seaforth Papers after they took direct control of the kelp industry in Lewis. There may be such receipts in Robert Brown's Papers, who was Factor after 1810, but these papers are not accessible. Preliminary research suggests that more remains to be discovered in these large collections. Future research recommendations regarding the Lewis kelp industry are discussed in Chapter 7.3.1.2

What is known about ships calling into Camas Chalboist has come from the oral tradition in Calbost (MacLeod, Angus n.d.–h):

> At one time, ships called at Calbost Bay to load dried fish and kelp in order to bring these products to market. Tradition relates that these ships were returning from Ireland, light (that is, without cargo). Apparently, it was the custom to use Irish soil as ballast and subsequently unload the soil at places like Calbost when they called for another cargo.

John MacKenzie, a Stornoway merchant and shipowner who was operating during the time the Campbells of Ensay were the kelp merchants for Lewis (CS-96/4475

1795–1836), mentions that his sloops carried kelp. It may be that cargo ships were calling into more places to collect kelp from 1795 onwards than was the case prior to 1794 due to more areas of Lewis being compelled to manufacture kelp. From what can be gleaned from the ships' receipts in the Gillanders Papers, it seems the vessels collecting the kelp would call at different central collection points in the main kelping areas, such as at Loch Dròbhainis in Loch Ròg or one of the Eileanan Bhàirclin in Lochs. Getting into one of these central collection point would require a local pilot to guide the ships in to avoid unseen hazards such as submerged reefs. Once they verified and received their cargoes, weather permitting, the cargo ships would set sail to the various ports further south to which they had been directed, with Liverpool being the main market for Lewis. Once a cargo was loaded, this was no guarantee that the kelp would arrive safely to its destination: wet and windy weather at sea could damage the kelp, a vessel could be held up for weeks along the west coast waiting for a weather window (GD 46/17/70 1826), or a French or Irish privateer from Calais prowling the Minch looking for easy cash, could take a cargo and demand ransom (GD 427/131-135). Even as late as 1798, when one of John MacKenzie's captured ships was discovered to have been sold in Norway (CS-96/4475 1795–1836), ships continued to be vulnerable to privateers.

Once the cargo finally arrived at the destination port, the next step was to unload the vessel, have it inspected by customs officers, and finally transport it to warehousing. The port that featured most in the correspondence between Sir John Inglis and the Gillanders when arranging transport was Liverpool. Liverpool was an ideal market for kelp due to its proximity to various glass and soap manufacturers, coal fields, a source of natural salt, and the vegetable oils and fats arriving at Liverpool from around the Empire, such as Africa and North America. Additionally, Liverpool had good transport links, not only through the port but also by road with the rest of England (Haggerty 2002: 100). These were also the main reasons why Merseyside became so prosperous as a result of these industries (Coley 2000: 48). Figure 4-35 shows the sort of busy scene at the Old Dock and Custom House at Liverpool that the captains and their crew may have experienced once they had docked.



Figure 4-35: Custom House (with flag) and Old Dock, Liverpool, c1750. Image obtained from: https://bygoneliverpool.wordpress.com/2021/03/18/goree-liverpool-part-one/

The glassmakers in general, whether in Glasgow, Liverpool, Leith, London or Bristol, tended to be sited close to the alkali works, soap-boilers and lime-makers. Liverpool, Warrington and St Helens were the main centres of early manufacturing, particularly for glass. The proximity of coal, Cheshire salt and the quality of the local sand made Sutton and St Helens in particular an ideal location for glass, especially crown and plate glass (Barker and Harris 1993: 3-11, 108-120). The glassmakers would use the waste products of salt (NaCl) and soda (Na_2CO_3) from the soap-boiling, or they would process the raw kelp themselves. Sandiver, or the scum of insoluble salts, was the by-product from the molten glass; this would be sold on as fertiliser as it contained high levels of potash or potassium carbonate (K_2CO_3). The soap boilers would use the soda and mix it with lime to create a caustic substance known as lye and mix that with fat to create soap. The by-product from this process would be potassium chloride (KCl), another type of potash, and this was sold on to the alum-makers for alum, which was used as a mordant for dyeing cloth. A new method of bleaching linen was developed using soda. This method was faster than the old technique, which involved spreading cloth over arable fields, known as 'bleaching fields', and soaking the cloth with soured milk or buttermilk for up to a year. Linen mills would boil yarn in a dilute potash solution for three hours and then further soak and rinse it in an alkali solution several times until it was ready to be woven into cloth. The cloth would be bleached using the buttermilk method for only forty-eight hours, instead of the year it used to take. Another product was potassium nitrate (KNO_3), also known as saltpetre or nitric acid. Saltpetre is a volatile alkali and is used for gunpowder (Coley 2000: 62).

The production of these goods was fuelling a rapidly expanding consumer economy. This encompassed the sale of affordable glassware, windows and soaps in town centres to an emerging middle class (Gittins 1982: 30; Seed 1992: 116). Additionally, large quantities of finished textiles, such as coarse 'osnaburg' linens for clothing slaves and farmers, were being supplied to merchants in North America and the Caribbean (Bellais 1987: 13).

4.9 Conclusion

This chapter set out to investigate the impact of the kelp industry at Calbost, Isle of Lewis, during the late 18th and early 19th centuries. Calbost was used as a microcosm to explore broader questions about economic, ecological and social change. The primary aim was to reconstruct how kelp production shaped the landscape, affecting livelihoods and the environment of this coastal area. It also sought to situate these local experiences within broader local, regional and global contexts. Rather than providing a comprehensive history of the Lewis kelp industry, which does warrant a more in-depth study (see section 7.3.1.2), the chapter focussed on examining the local experiences and the socio-economic and environmental impacts within this small community. To achieve this, the chapter discussed the historical and social context, landscape organisation and community practices. It also analysed the archaeological remains of the processing site at Eilean a' Ghòdh and its context, building a foundation for kelp production in Calbost.

This chapter traced the evolution of kelp production within its historical and social contexts. It began by examining the roles of those who inaugurated and controlled the Lewis industry: the Seaforth MacKenzies, the Gillanders factors and the tacksman Robert Weir. This analysis highlighted how estate management and commercial pressures shaped not only the island as a whole but also the smallest hamlets. The landscape organisation was reconstructed through oral tradition, archival research and archaeological evidence, revealing how kelping was integrated into the seasonal rhythms of work, alongside agriculture, milling, fishing and fish-curing. This evidence suggests that communal knowledge, adaptation and a blend of inherited practices, such as seaweed harvesting methods, alongside innovation, such as fish-curing and kelp-making, were crucial for the community's resilience and ability to respond to changing economic pressures.

The chapter mapped the full production sequence, from harvesting and towing the seaweed into Mol a' Ghòdh to the sale of the products made from kelp. This analysis demonstrated how Calbost was embedded in broader economic circuits, linking the individual kelper to national and international markets. A central theme that emerged was the ecological impact of kelp production. Intensive

seaweed harvesting would have altered coastal ecosystems, affecting biodiversity. The burning process, which lasted six weeks, contributed to soil and air pollution. Removing vast quantities of seaweed disrupted habitats for marine life and destabilised the delicate balance of the intertidal zone. Physical changes to the shoreline, such as the augmentation of the isthmus of Eilean a' Ghòdh, the alteration to the channel to create a slipway at Mol a' Ghòdh, and the construction of kelp kilns and the salting house, further reshaped the coastal landscape. The smoke from burning kelp also affected human health. This evidence suggests that these ecological changes were closely linked to social and economic processes, such as maintaining sustainable seaweed harvesting to meet the demands from the estate and growing markets. This depended on local knowledge of tides, weather and seaweed regrowth cycles. But as rising market and estate demands increased, this pushed communities beyond sustainable limits. This led to resource depletion (see pp. 37, 244) competing needs and increased vulnerability to economic shocks, which in turn brought new tensions: between estate and tenants, communal and individual interests, and economic opportunity and environmental limits. The eventual collapse of the industry left lasting marks on the township's landscape and the social fabric, as displaced families from cleared *bailtean* in southern Pàirc were relocated to Calbost. Nevertheless, Calbost's diversified economy and robust community connections provided some resilience throughout the 19th century. This chapter has aimed to show how a small township navigated and negotiated broader economic, ecological and social changes. It reminds us that economic and social histories are deeply embedded in, and constrained by, the natural world. The benefits and challenges in applying these conceptual frameworks to this coastal landscape will be further developed in Chapter 7.1.

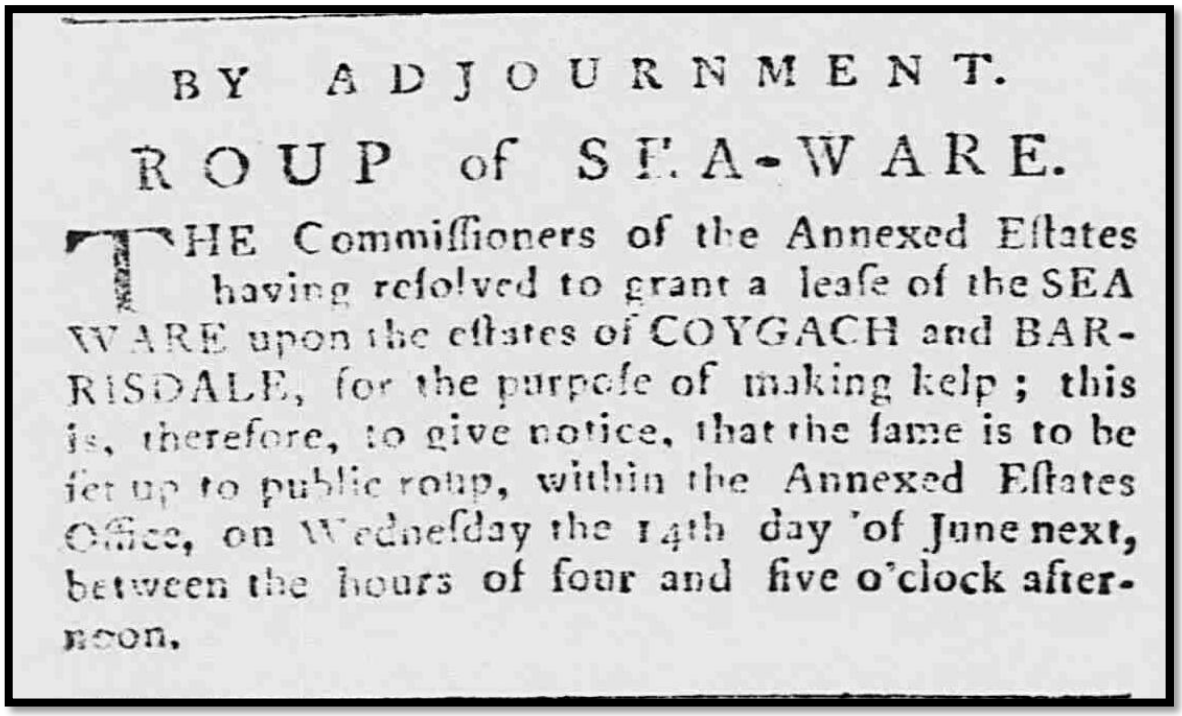
Chapter 5 A' Chòigeach: Leasing shores and Transforming Landscapes – The Kelp Industry in Coigach,1760s-1821

In the aftermath of the Battle of Culloden, several Highland estates belonging to individuals involved in the final Jacobite rebellion were forfeited in 1747 and annexed to the Crown in 1752. These estates were then managed under the authority of the Commissioners of the Forfeited and Annexed Estates (Smith 1975: vi). Under the ownership of George MacKenzie, the 3rd Earl of Cromartie, the Cromartie estate was one of the annexed estates. The Barony of Coigach is the northerly part of the Cromartie estate, located about 60 miles from Castle Leod in Strathpeffer, where the administration of the Cromartie estate was based. Between the years 1784 and 1820, the time after the estates were returned to Cromartie, there were five successive heritors of the estates, none of whom brought additional capital or competence to its management (Richards, Eric and Clough 1989: 111-128).

In the development of the kelp industry in Coigach, those who managed the estate failed to recognise its economic value, whether it was the Commission of Annexed Estates or, later, the Cromarty MacKenzies. Instead of investing in the industry's development in Coigach, the decision was made to lease the estate's kelp shores to outside entrepreneurs. Prior to the return of the estate to its proprietors, the Commissioners also sought to lease the kelp shores to outside interests rather than the factors managing the business. The fragmented nature of the documentary evidence may be attributed to this leasing to outside interests. As a result, this has led to historical assumptions about the industry in the Coigach area, stating that 'there was never the same concentration or economic dependence on kelp as in the outer isles or parts of Orkney.' (Baldwin 1994). Although the Cromartie estate did not rely directly on kelp production for financial gain, many archaeological sites relating to kelping found in Coigach suggest that the kelping was intensive and widespread (Long *et al.* 1996; Skinner *et al.* 2018). These number and size of these sites indicate that even for a brief period, kelp production served as a vital source of income for the small tenants and cottars of Coigach, enabling them to meet their rising rental expenses alongside their involvement in commercial fishing and illegal whisky distilling.

Coigach has been chosen as a compelling case study because it exemplifies several significant themes. The local economic dynamics and resource management strategies reveal the methods of handling resources and the ramifications of external leasing arrangements. This case highlights the critical consequences of resource mismanagement, where a lack of investment led to reduced economic opportunities for local inhabitants, resulting in distressing outcomes such as clearance and emigration. Moreover, it offers valuable insights into the aftermath of the Jacobite rebellions, demonstrating how these historical events profoundly affected local economies and land stewardship. Additionally, it is essential to recognise that research on kelping in the Highland estates on the west coast mainland is scarce when compared to the research undertaken in Orkney and the Hebrides, underscoring the need for further exploration in this area.

Coigach's situation can be compared to other contemporary kelping areas, such as Calbost, Lewis. This comparison allows for an analysis of the differences in economic and environmental adaptation and resource exploitation. Additionally, the archaeological remains of extensive kelp processing sites challenge the prevailing historical narratives about the area's economic dependence, making them valuable for exploring the complexities of local livelihoods. Examining these local livelihoods can also provide glimpses into the lives of small tenants and cottars in Coigach. It explores how they navigated challenges through economic activities such as kelp-making, fishing, and whisky distilling. This exploration ultimately humanises the data.



BY ADJOURNMENT.

ROUP of SEA-WARE.

THE Commiſſioners of the Annexed Eſtates having reſolved to grant a leaſe of the SEA WARE upon the eſtates of COYGACH and BARRISDALE, for the purpoſe of making kelp; this is, therefore, to give notice, that the ſame is to be ſet up to public roup, within the Annexed Eſtates Office, on Wedneſday the 14th day of June next, between the hours of four and five o'clock afternoon.

Figure 5-1: The first advertisement in the Caledonian Mercury of the auction of a lease of the Coigach seaware, 31 May 1769. Extract obtained from https://www.britishnewspaperarchive.co.uk/

The main objective of this case study is to understand the kelping landscape in Coigach, given the scarcity of extensive documentary evidence. The coastline is characterised by diverse geological features that provide insight into the historical kelp industry. Numerous cobbled storm beaches dot the shoreline, featuring hollowed-out circular or oval burning pits, sub-rectangular structures which could be interpreted as seasonal dwellings, and roughly piled stone alignments. These features are not merely scattered remnants but form complex archaeological sites that offer a glimpse into the intensive seaweed gathering and processing activities that once thrived in this area. The kelp-burning pits, in particular, are noteworthy for their scale and visibility. Some are so large and well-defined that they resemble meteor craters when viewed from satellite imagery. This striking visual evidence underscores the significant impact of kelp processing on the landscape and hints at the scale of the industry that once operated along these shores. These complexes, interpreted as kelp processing sites, provide tangible proof of the extensive nature of kelp-related activities in Coigach despite the limited documentary evidence available.

The contrast between the abundance of archaeological evidence and the scarcity of written records is a central challenge in understanding the full extent of the kelp industry in Coigach. Documentary evidence, such as the Cromartie

Muniments (GD 305) is limited compared to the Hebridean and Argyll estates archives, considering the apparent importance of kelp to the local economy. There could be further information on shipping arrivals into Liverpool in the Lloyd's List Reprints (1741-1826) at the National Museums Liverpool on microfiche, which is beyond the scope of this thesis. The most fruitful sources for Coigach have been the Exchequer Records of Forfeited Estates 1745 (E746) when attempts were made to establish a kelp industry in Coigach by the Board of Commissioners in Edinburgh and the British Newspaper Archives, where advertisements of the lease of kelp shores and shipping arrivals into Liverpool can be found.

Advertisements for the lease of Coigach kelp shores appeared in the Caledonian Mercury (Figure 5-1), a prominent Scottish newspaper in the 18th century, several times from 1769 to 1819. These advertisements provide some of the few written records of the kelp industry in the area, offering glimpses into the commercial aspects of kelp production. However, they do not provide detailed information about the day-to-day operations or the impact on local communities.

The Cromartie Muniments (GD 305), a collection of historical documents related to the estate, contain very little information regarding kelp manufacture after the estate's restoration to John MacKenzie, Lord MacLeod, in 1784. That lack of documentation can be challenging to fully understand, as it coincides with a period when the kelp industry was at its peak in many parts of Scotland. In addition, neither the Customs Accounts, Collectors Quarterly accounts for Isle Martin held at the NRS (E510/155-157, E511/338-341) or the Register of Ships, Isle Martin Port at the Highland Archive Centre (HCA/D31/5/2/2/1-2) showed any cargos of kelp. This was likely due to the fact that kelp manufactured in Scotland was not subject to duties (Calcraft 1818: 24), further increasing the gap in statistical evidence.

Two main historical accounts of Coigach from the late 18th to early 19th century mention the kelp industry only briefly, despite its likely significant impact on local lives (Baldwin 1994: 386; Richards, Eric and Clough 1989: 88, 348). This cursory treatment in contemporary sources further complicates efforts to reconstruct the full picture of kelp production in the area. The disconnect between the apparent scale of the industry, as evidenced by the archaeological

remains, and its limited representation in written records is a key issue that this case study seeks to address.

The oral tradition, which often preserves local histories and memories not captured in official documents, is largely silent on the subject of kelping in Coigach. This silence is likely due to mass emigration that followed the clearances of Coigach for sheep farming after 1802. The displacement of local populations would have disrupted the transmission of oral histories, leaving gaps in our understanding of the kelp industry's impact on community life. A potentially valuable source of oral history, recordings made by James N. Fraser in 1982 of Mrs Morag Shaw MacKenzie from Coigach, where kelp workers were mentioned, remains unlocated by the author (Richards, Eric and Clough 1989: 444). These recordings, if found, could provide crucial insights into local memories and traditions related to kelp production, offering a perspective that is largely absent from current research.

By examining and connecting the political and social context in Coigach, the Cromartie estate and the Highlands more broadly, it becomes evident that while kelp manufacture was not central to the estate's finances. However, it provided crucial income both for small tenants, subtenants and cottars attempting to meet their ever-increasing rent arrears and for entrepreneurs seeking profits through leasing the shores. This economic dynamic is key to understanding the role of kelp production in the local economy and social structure.

Coigach subtenants were required to pay their rentals in cash. This demand that could be challenging in a subsistence economy, where the tenant bore the risk if crops failed or if prices at market fell. They were obliged to pay regardless of these hardships. Unlike in-kind payments accepted elsewhere, this cash requirement reflected changing landlord practices during the period and placed additional pressure on tenants (Richards, Eric and Clough 1989). Kelp manufacturing offered a means to meet this obligation, providing a cash income in an economy that was increasingly monetised. This economic pressure likely contributed to the intensive exploitation of kelp resources along the Coigach shores.

The relationship between the extensive archaeological remains in the landscape and the written record highlights the importance of interdisciplinary approaches,

as outlined in Chapter 2. Combining archaeological evidence with documentary sources, although fragmentary, can build a fuller picture of past economic activities and their likely impact on local communities. This case study aims to bridge the gap between the abundant archaeological evidence and the sparse historical record, with the aim of achieving a deeper understanding of the kelp industry in Coigach. By doing so, it contributes to our broader knowledge of economic activities in coastal Highland communities during a period of significant social and economic change. It also examines the potential scale of the environmental impacts, such as ecological alterations to intertidal zones and depletion of natural resources, caused by intensive seaweed harvesting and kelp burning (see pg. 37). Throughout, the study of the rich archaeology, such as remnants of kelp kilns or patterns of shoreline modification, provides insights into these impacts that the documentary evidence could not.



Figure 5-2: Location of Coigach in Scotland. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023.

5.1 The Land of Fifths: A Geography Shaped by Rugged Geology

A' Chòigeach (Coigach) is a peninsula in the northwest Highlands of Scotland, situated north of Ullapool in the Wester Ross area of Ross and Cromarty. The name 'Coigach' derives from the Gaelic *a' Chòigeach*, meaning '[land of] the fifths'. Watson (1904: 257) notes that dividing land into fifths was a 'common and ancient Gaelic practice', with the 'five-fifths of Erin' being the most well-known example. Coigach is divided into five 'fields', or '*na còig achaidhean*':

Achadh na h-Àird (Achnahaird)-Field of the Promontory

Achadh an Lochain (Achlochan)-Field of the Lochan

Achadh an Inbhir (Acheninver)-Field of the Estuary

Achadh a' Bhraighe (Achabhraighe)-Field of the Brae

Achadh an Dubh Àrd (Achduart)-Field of the Black Promontory.

These placenames reflect the diverse landscape features of the Coigach peninsula, including mountains, estuaries and rivers, lochs, offshore islands and rocky promontories. The interior is characterised by peatland interspersed with lochs, streams and rivers with prominent peaks such as *Beinn Mòr na Còigich* and *Càrn Conmheall* in the southeast and *Stac Pollaidh* to their north. The coastline varies significantly, featuring rocky slopes and cliffs along Loch Broom in the southeast, interspersed by pebble beaches, rock platforms and steep-sided inlets. Off the Loch Broom coast lie the Summer Isles, including *Tannara Mòr* (Tanera Mor), *Tannara Beag* (Tanera Beg), *Eilean a' Chlèirich* (Priest Isle), *Eilean Ruisteil* (Isle Ristol), *Eilean Eich* (Horse Island), Eilean Dubh and several smaller islands. *Eilean Mhàrtainn* (Isle Martin), which was a main port in the 18th century and herring station to the south of the Summer Isles, is located just off *Àrd Mhèara* (Ardmair) on the mainland, near Ullapool. The exposed coast facing the Minch and the Isle of Lewis is characterised by rocky shores, sea stacks and headlands, punctuated with shell-sand beaches and beach-cobble storm bars at *Rubha na Còigich*. Notable coastal features include the *Achadh na h-Àird* (Achnahaird) estuary with its

intertidal sands, salt marsh and dune system. *Bàgh na Garbhaidh* (Garvie Bay) boasts a shell-sand beach and a cobblestone storm beach. The highly indented rocky coastline continues along *Bàgh Aoineart* (Enard Bay) to *Rubha na Brèige*, just south of *Inbhir Chirceig* (Inverkirkcaig), showcasing the peninsula's diverse and dramatic coastal landscape.

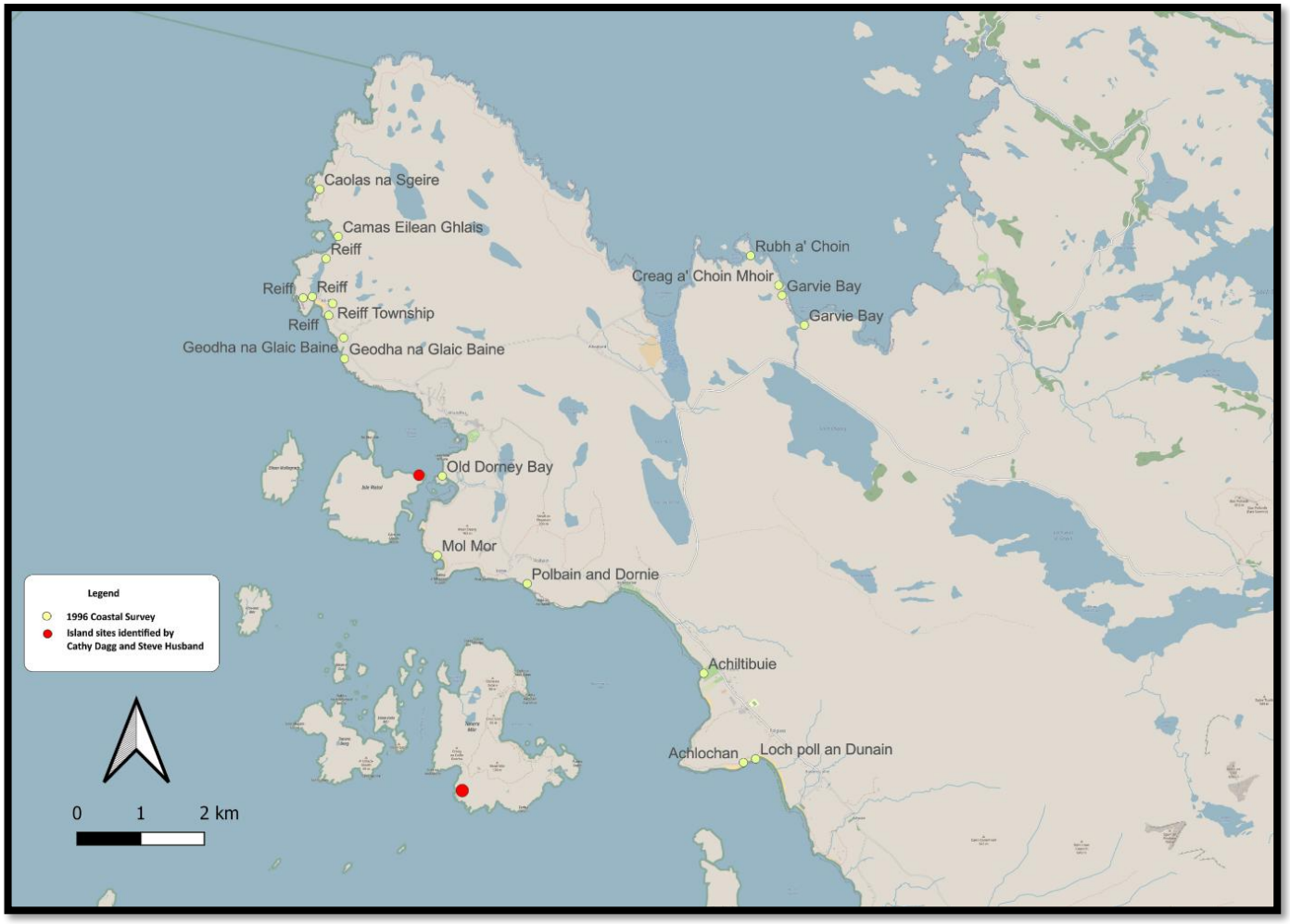


Figure 5-3 Possible kelp processing sites in Coigach identified by the Coastal Assessment Survey in 1996, Catherine Dagg's survey of Eilean Ruisdeal in 2017 and a further site on Tannara Mòr identified by local Achiltibuie resident Steve Husband. The sites at Geodha na Glaic Bàine, the south end of Rieff Township, and Camas Eilean Ghlais do not appear to be processing sites but possible seaweed composting/storage pits from a later date. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023. Data obtained from the SCAPE Trust https://scapetrust.org/sites-at-risk/

5.2 The Cromartie Estate's Transformation: Political and Economic Dynamics in Coigach, 1752-1820

In 1835, the Rev Thomas Ross mentioned kelping in his report for the New Statistical Account (pp.85-86) regarding manufactures in Lochbroom Parish, though kelp manufacture was not mentioned in the Old Statistical Account in the 1790s for this same parish:

> There is no manufacture of any consequence carried on in this parish. Even the manufacture of kelp, which was once a source of considerable profit, is now discontinued, since the duty on barilla was taken off, and the raw material is used only as manure for the land.

The kelp industry in Lochbroom Parish and the wider Coigach area experienced significant changes in the early 19th century. While, as Rev. Ross explained, it was once a source of profit, by 1835, kelp production in Coigach seems to have ceased. The seaweed then went back to being used as a manure for crops, which continued until the early 20th century. This shift reflects the broader economic changes affecting the Scottish Highlands and Islands during this period, as local industries such as kelping and fishing faced challenges from global market forces and policy changes.

As previously highlighted, the history of kelp production in Coigach and Lochbroom is not well-documented, resulting in a fragmented understanding of its development and impact. However, the limited information available indicates that kelp production in Coigach started relatively late compared to other Highland and Island estates, not gaining momentum until the 1780s. Unlike estates in the Outer Hebrides or Orkney, the Cromartie Estate, which included Coigach, never developed a strong economic dependence on kelp (Baldwin 1994: 386). Instead, the estate preferred to lease its shores to outside interests for kelp production. This approach may have influenced the industry's development and its eventual decline in the area. It is necessary to examine two distinct phases to gain a more comprehensive understanding of the kelp industry's history in Coigach: the period during the Annexation of the estate to the Crown after 1745 and the subsequent return of the estate to John MacKenzie, Lord MacLeod in 1784.

5.2.1 Annexation

Before the final Jacobite rebellion in 1745, Coigach, under the Earls of Cromartie, was a Gaelic-speaking area with a pastoral way of life. The area had minimal cultivation, using the *cas-chrom* or foot-plough to plough the rough terrain or to create *feannagan* (lazy beds). It relied on seasonal fishing and cattle rearing, resembling the Outer Hebrides more than the other easterly baronies of the Cromartie estate at Strathpeffer and New Tarbat along the Moray Firth. The rents in Coigach, dating back at least to the 17th century, were paid in cash (in the form of silver coins) earned from cattle sales in Beauly, salt herring in Stornoway, and butter, cheese, and plaids at Dingwall. The men of Coigach also provided the most recruits for Cromartie's regiments both before and after annexation (Richards, Eric and Clough 1989: 38, 41).

After 1746, the estate was annexed, meaning it was placed under the management of a committee appointed by the government to oversee estates whose proprietors were involved in the final Jacobite uprising at Culloden. These proprietors not only lost their estates, but their titles were also attainted, with many of them going into exile. The abstract of the Act describes its purpose:

> An Act for annexing certain forfeited estates in Scotland to the crown unalienably, and for making satisfaction to the lawful creditors thereupon; and to establish a method of managing the same, and applying the rents and profits thereof, for the better civilising and improving the highlands of Scotland, and preventing disorder there for the future.'(25 George II c.41 1752).

The Cromartie estate was forfeit with its associated title attainted due to treason because of the last Earl of Cromartie's involvement in the Jacobite uprising. Although the Earl was eventually pardoned, he was required to live in London while his son, Lord MacLeod, went to serve in the Swedish army (Dunlop 1952: 57; Richards, Eric and Clough 1989: 51-68).

Fifty-three forfeited estates were surveyed, and of these, only thirteen were annexed. The Cromarty estate was one of these thirteen estates annexed in 1752. The purpose of this Act was to not only annex certain forfeited estates in Scotland,

but as it stated in its title, it was also ‘for Hands-on management of the estate'; though officially annexed in 1752, the management did not begin until the early 1760s and after extensive surveys of the estates had been commissioned in the 1750s (Figure 5-4). According to Jean Dunlop (1952: 59), the Board of Commissioners, as a result of the surveyors' reports, viewed Coigach as a place that had poor agriculture, with a population supported by cattle rearing and an excellent fishery.

As with the other estates, as part of their remit, the Board began a programme of improvement focusing on manufactures as the land was unsuitable for extensive agriculture. One of three linen stations in the Highlands was opened at Lochbroom in 1753 with a grant from Parliament, which failed due to a lack of supervision and proper accounting. Two other attempts to resettle sailors and soldiers failed because money and equipment were provided without adequate security. In the case of the sailors, who were supposed to become fishermen and were given boats, equipment, and money, they took the boats and equipment and sailed away. These failures cost the Board and the public a considerable sum of money. It may have been due to these unsuccessful attempts to improve that the kelp shores were offered to external entrepreneurs rather than trying to develop the industry from within the estate structure and address legal issues regarding rights to the foreshore. In the 1771 Articles and Conditions of Sale of the Seaware (E746/176/4(2)), the Board made it clear that the preferred bidders were required to provide security. If they failed to do so, they would have to pay a penalty of £30. This requirement reflected their concerns about potential financial losses due to the previous failed scheme involving sailors.

Several outside entrepreneurs had proposed leasing the kelp shores of Coigach even before the Board began advertising them in the Caledonian Mercury in 1769. The first proposal was from the new factor of Coigach, Hector MacKenzie in 1765. Hector MacKenzie, who was a merchant based in Dingwall, was not only a MacKenzie but was also a Gael - unlike Ninian Jeffrey, the previous board-appointed factor from Kelso in the Borders or the overall factor Capt. John Forbes from Aberdeen. His proposal is alluded to in the Board’s *Proceedings dealing with the Shores of Coygach* (E746/176/1 1765–1766) on 21st January 1765:

> The Factor in Coygach having Reported that it is his Opinion several Tons of Kelp might be made of the Sea Ware upon the Coast of the Barony of Coygach that the Inhabitants lay the Sea Ware upon the Ground for manure, but by its being burnt into Kelp they would be obliged to make use of Shelly Sand, a much more valuable manure, and if the Board will give him liberty to burn the Kelp for Five years and prohibit the Tenants from Cutting any of it, he will keep an Exact Account of the produce and at the End of Five years, the Board will then be Enabled to Judge what Rent ought to be paid for it.

At these proceedings, MacKenzie was granted permission to direct the tenants to begin burning seaweed for kelp at a 'guinea per ton', keep exact accounts and then they would decide how to remunerate him. It is unknown if he managed to start this business in the spring of that year because, in the same year, Lt. William MacKay of the 32nd Regiment of Foot also applied to lease the shores of Coigach. Still, Lt. MacKay did not receive an offer to go ahead as it was stipulated that as the tenants had the rights to seaweed, either for manuring or burning, the Lt. MacKay needed to set up an agreement with the tenants in the first instance. He proposed to take a lease for 12 years for £5 per year 'tack duty'.

The decision as to whom to give a lease of the shores was deferred while the Board asked the glasshouse managers at Leith about what they would offer for the Coigach shores. Further decisions were deferred due to the tenants' objections regarding using the seaware for kelp instead of manuring crops. The Board then wrote to the Lochbroom parish minister, Mr James Robertson, to clarify how the tenants used the seaweed and if they knew the difference between seaware and kelp. The Board finally decided that the tenants were not to be deprived of seaware and that the tenants should be encouraged to use 'shelly sand' for manuring crops (E746/176/2 1769–1771). The 'shelly sand' referred to here is not the typical beach sand made from mollusc shells. Instead, it is made from maerl (*phymatolithon calcareum*), a coralline marine alga. Maerl forms beds of fragmented nodules in sublittoral zones up to 30m deep in the British Isles. This seaweed has been used to neutralise acidic soils instead of lime for centuries. The botanist John Ray (1690: 1) noted this use of maerl in 1690 in Cornwall. The rights to utilise seaware for manuring were asserted during the Board's management. MacAskill (2003: 11-12) has argued that the customary rights to gather seaweed in the coastal Gaelic speaking communities, as reflected in this incident, were

consistent with principles found in the Ancient Laws and Institutes of Ireland, or Brehon Law, indicating a community awareness of a customary right to gather and collect seaweed from the foreshore.



Figure 5-4: Peter May's Map of the Barony of Coigach, 1756. Image obtained from the National Library of Scotland.

Another legal issue that caused a delay in decisions from the Board, in addition to the customary rights to seaweed by the community, is that of 'wadsets'. Much of the Cromartie Estate was in 'wadset' – that is, it was a mortgage of land or other heritable property conveyed, in the case of the Cromartie Estate, to a tacksman (being the creditor) who then undertook to reconvey it on to the estate on repayment of the price while the tacksman would draw rents as interest on the money lent to the estate(Scottish National Dictionary 1976). This situation caused a complex web of legal obligation and undermined the estate's future income because wadsets were extended over multiple areas of the estate (Richards, Eric and Clough 1989: 48-49). The Board had stated that leasing kelp shores to outsiders was a legal issue related to the ownership of seaweed and other plants such as bracken. Some Coigach tacks were still held under wadset, raising the possibility that the wadsetters could claim rights to the seaweed and bracken and profit from it. Bracken, referred to as 'fernes' in the 18th century, was also utilised for the commercial production of potash for glassmaking, bleaching and soap in the 18th century, but not to the same extent as seaweed was used for kelp (E746/176/2 1769–1771; Rymer 1976: 159-165; Turnbull 2001: 69).

Below is a timeline of the multiple attempts to lease the kelp shores of Coigach from 1768 to 1779:

1768 – William Borthwick, merchant, Edinburgh, applies for a lease of the kelp shores of Coigach, the Summer Isles and adjacent islands of Lochbroom, with the 'fernes' [bracken] to burn into ashes. He proposes 7s 6d per ton of kelp as the yearly 'Rock rent', which he claims is the sum his tenants paid to Sir Alexander MacDonald of Sleat for his kelp shores, the amount of rent to be secured as soon as the quantity manufactured and be ascertained (E746/98/1 1768; E746/126 1768).

1770 (June and August) – Colin Mackenzie, kelp merchant, Lochbroom, applies for the lease of kelp shores and Dorney for the development of commercial fishing, along with a Letter of Recommendation from the Heritors, recommending him for the fishing. However, they do not mention the lease of the shores for kelp. Nothing in the Board's proceedings indicates he was ever offered a lease of fishing or kelp shores. (E746/127/1 1770; E746/127/2(1) 1770; E746/127/2(2) 1769)

1771 – Several attempts at public roups [auctions] of the Kelp Shores of Coigach and Barrisdale were made: the idea was first proposed in February 1769, but nothing seemed to come of it until 1771. 12s per ton were set as rent to commence the day of the roup and to end at Martinmas (11th November) in 1773; that tacksmen would be obliged to keep a book containing entries of whole kelp- 'whole kelp' meaning blocks of kelp. The roup first took place on 22nd May at the Annexed Estates office, then was adjourned to 17th June (Figure 5-6) and 24th June, with no one attending any of the roups, including either of the previous applicants, Borthwick and Colin MacKenzie (E746/176/4(2) 1771).

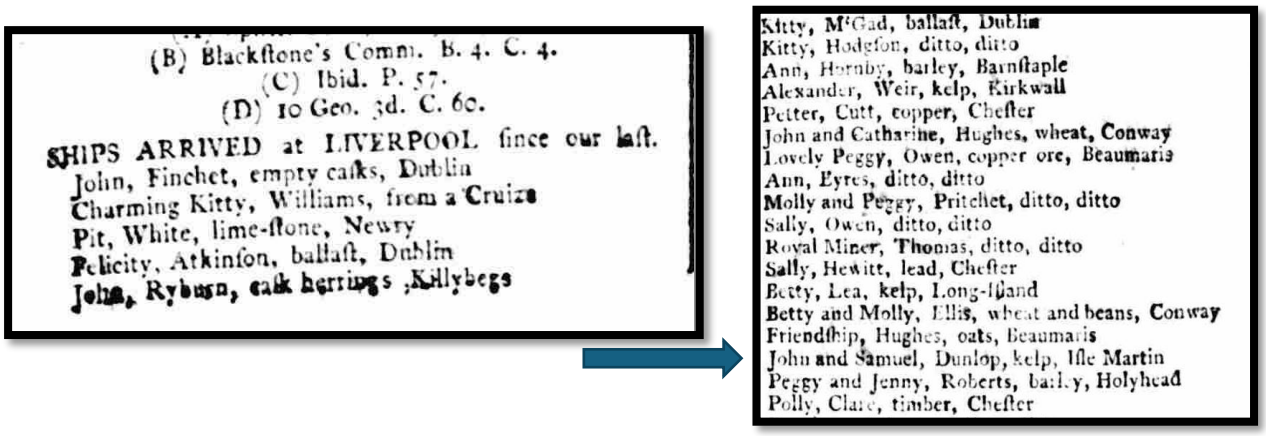
20th July 1771, Borthwick applied again after the failed attempts at a roup and includes a letter naming Michael Nasmith as his cautioner. Read to the Board 22nd July. He applied again on 10th August, urging a reply in order that he could make a proper survey and order meal to allow burning to commence for the forthcoming season. There does not appear to be an answer from the Board to him. The decision was deferred until William MacDougall could enquire about Borthwick's circumstances. (E746/98/2 1771; E746/98/3 1771; E746/98/4 1771; E746/176/2 1769–1771)

1779, March – John Ross, a Stornoway-based merchant, applied for a lease of the Coigach shores, having posted this proposal directly to Hector MacKenzie instead of the Board of Commissioners. Hector MacKenzie took it upon himself to grant the lease to John Ross on behalf of the Board, stating he did not wait for approval due to the Board not meeting until the following Spring when it would be too late to get business underway for the season. The rent agreed was 16s for every ton of kelp made or 20s per ton if the quantity exceeded 40 tons (E746/76/13(2) 1779; E746/76/13(3) 1779). The Factor defined the tenants' rights to seaweed (E746/76/13(3) 1779):

> It will be necessary you pay regard to the accommodations of the Tennants who live upon the shores by leaving a proper allowance for their Manure – which I think can be done without prejudice to you or them – But I have no doubt they will murmur a good deal at the Innovation. However, if any will attempt to Intercept you or your labourers by giving you the smallest Molestation in the prosecution of the Business you are to acquaint me with the Particulars.

It is unknown who Ross's 'labourers' were, whether small or subtenants adjacent to the shores of Coigach or kelpers from elsewhere, perhaps from the Isle of Lewis. There is a John Ross, merchant in Stornoway, named as a tacksman in 1787 for Eisgein (Eishken) and Stìomrabhagh (Steimreway) in Pàirc, Lewis (GD 427/15/3 1787), who may be this very merchant who went to Coigach. MacKenzie did not specify the length of the lease term. However, it is possible that it was no longer than five years, as Lord MacLeod advertised 'Farms to Let' on the Estate of Cromarty, including the kelp shores of Coigach, in 1785 (Figure 5-7). While the lease length is not mentioned in these letters, it is possible that the terms ended with the estate's restoration in 1784. Ross' presence in South Lochs as tacksman in 1787, if this is the same man, also indicates he had left Coigach for Lewis. A shipping notice from February 1780 indicates that Ross started operations straight away (Figure 5-5).

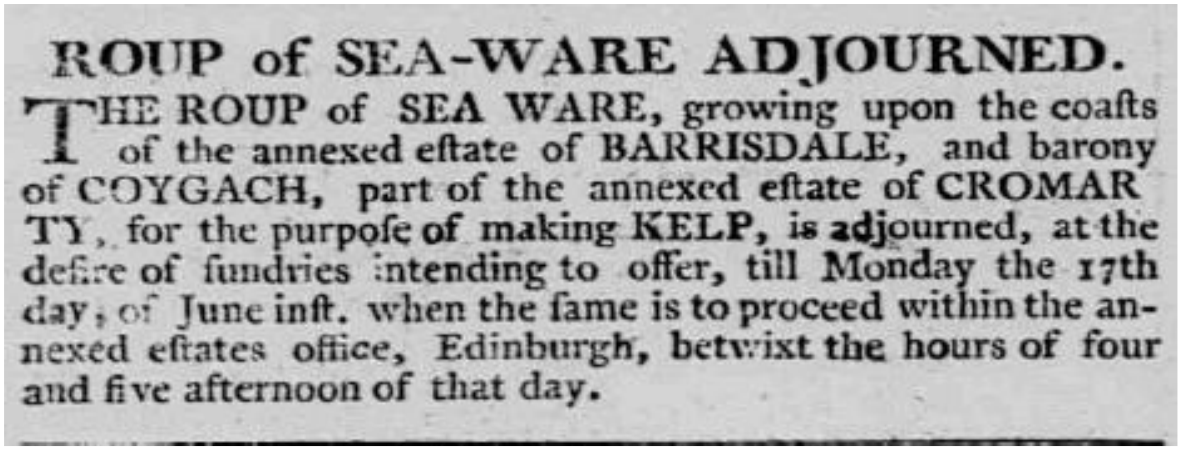
1784 – The Cromarty Estate is restored to John MacKenzie, Lord Macleod.


(B) Blackſtone's Comm. B. 4. C. 4.
(C) Ibid. P. 57.
(D) 10 Geo. 3d. C. 60.

SHIPS ARRIVED at LIVERPOOL ſince our laſt.
John, Finchet, empty caſks, Dublin
Charming Kitty, Williams, from a Cruize
Pit, White, lime-ſtone, Newry
Felicity, Atkinſon, ballaſt, Dublin
John, Ryburn, cask herrings, Killybegs

Kitty, M'Gad, ballaſt, Dublin
Kitty, Hodgſon, ditto, ditto
Ann, Hornby, barley, Barnſtaple
Alexander, Weir, kelp, Kirkwall
Petter, Cutt, copper, Cheſter
John and Catharine, Hughes, wheat, Conway
Lovely Peggy, Owen, copper ore, Beaumaris
Ann, Eyres, ditto, ditto
Molly and Peggy, Pritchet, ditto, ditto
Sally, Owen, ditto, ditto
Royal Miner, Thomas, ditto, ditto
Sally, Hewitt, lead, Cheſter
Betty, Lea, kelp, Long-Iſland
Betty and Molly, Ellis, wheat and beans, Conway
Friendſhip, Hughes, oats, Beaumaris
John and Samuel, Dunlop, kelp, Iſle Martin
Peggy and Jenny, Roberts, barley, Holyhead
Polly, Clare, timber, Cheſter

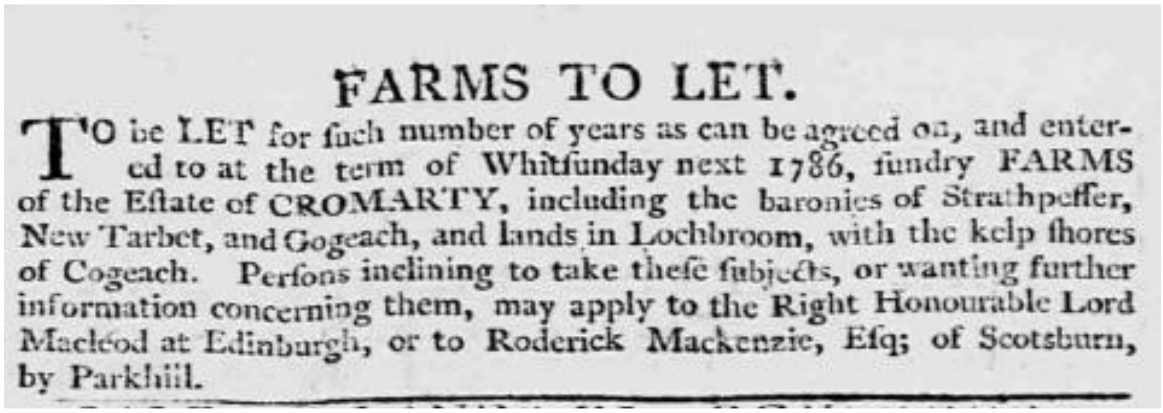
Figure 5-5: List of Ships that arrived at Liverpool, Feb 15th 1780, Manchester Mercury. The ship 'John and Samuel', under Captain Dunlop arriving with a consignment of kelp from Eilean Mhàrtainn is listed. No tonnage is given. This indicates that John Ross became active immediately after he was granted the lease, as this kelp would have been made in the previous summer. Extract obtained from https://www.britishnewspaperarchive.co.uk/



ROUP of SEA-WARE ADJOURNED.

THE ROUP of SEA WARE, growing upon the coafts of the annexed eſtate of BARRISDALE, and barony of COYGACH, part of the annexed eſtate of CROMARTY, for the purpoſe of making KELP, is adjourned, at the deſire of ſundries intending to offer, till Monday the 17th day of June inſt. when the ſame is to proceed within the annexed eſtates office, Edinburgh, betwixt the hours of four and five afternoon of that day.

Figure 5-6: Advertisement in the Caledonian Mercury June 8th 1771, advising of an Adjournment of the Roup to June 17th. Extract obtained from https://www.britishnewspaperarchive.co.uk/



FARMS TO LET.

TO be LET for ſuch number of years as can be agreed on, and entered to at the term of Whitſunday next 1786, ſundry FARMS of the Eſtate of CROMARTY, including the baronies of Strathpeffer, New Tarbet, and Gogeach, and lands in Lochbroom, with the kelp ſhores of Cogeach. Perſons inclining to take theſe ſubjects, or wanting further information concerning them, may apply to the Right Honourable Lord Macleod at Edinburgh, or to Roderick Mackenzie, Eſq; of Scotsburn, by Parkhill.

Figure 5-7: Advertisement for Cromarty Estate farms (tacks) to let, Caledonian Mercury, October 17th 1785. Extract obtained from https://www.britishnewspaperarchive.co.uk/

5.2.2 After 1784: Return of the Cromartie estates

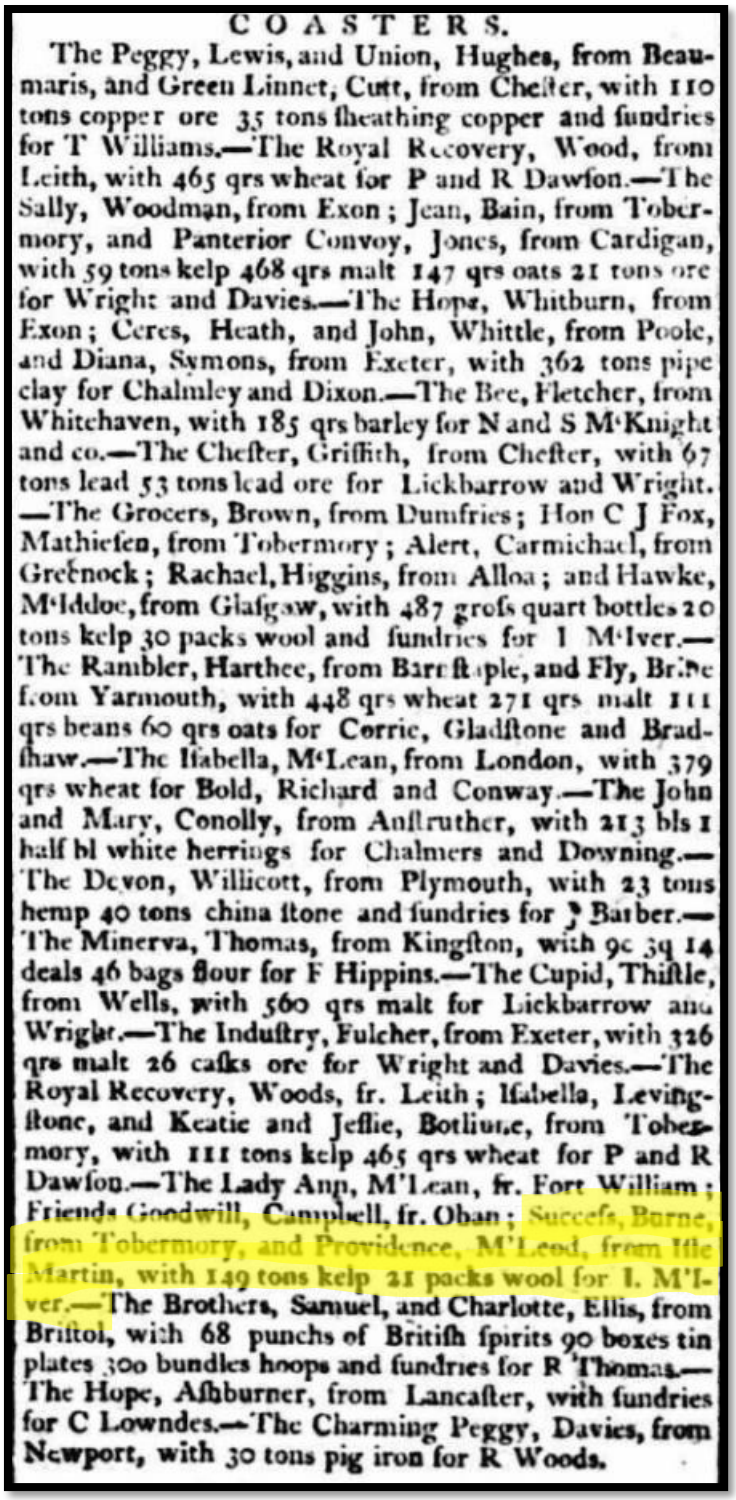
In 1784, a public act was passed that effectively repealed the Act of Annexation of 1752 and allowed the return of the annexed estates in Scotland, providing certain conditions were met (24 George III Session 2 c. 57 1784). In the case of Lord MacLeod, he had to prove his loyalty by raising a regiment and serving in the military. Additionally, he had to repay the debts attached to his estate in order to buy back his estates. However, this repurchase led to a lack of capital investment in developing kelp manufacturing or fisheries in Coigach. Within five years of regaining his estates, he died in 1789 (Richards, Eric and Clough 1989: 129). During this post-restoration period, records regarding the kelp industry are more fragmented, much of it coming from shipping notices and advertisements 'to let' in newspapers. These advertisements indicate that the estate continued to follow the pattern of leasing the shores to outside entrepreneurs. After 1785, apart from the advertisements putting up the various farms and kelp shores to let, there is a gap in the Estate records as to whether anyone else was leasing the shores until a shipping notice appeared in the Manchester Mercury of August 12th, 1794 (Figure 5-8) telling of a consignment that came from Eilean Mhàrtainn, showing a combined tonnage of 129 tons of kelp along with another ship from Mull destined for Liverpool-based merchant Iver McIver. It is unknown who had the lease of the shores between 1785 and 1794, but in 1795 Donald Shaw had the lease of the shores for five years, paying £25 per year (Baldwin 1994: 375; GD 305/1/163 1866: 200). The Coigach rentals between 1784 and 1795 do not indicate whether the shores were leased. The notice of the arrival of kelp from Eilean Mhàrtainn during Donald Shaw's tenure shows 35 tons for that summer's kelp output (Figure 5-11). Again, this indicates how much the Loch Broom and Coigach shores could produce annually. It is unknown who Donald Shaw was, but it appears he may not have been living in Coigach or Lochbroom as he does not appear on the Seaforth militia lists for Lochbroom from 1798 (MacDonald-Ross 2012). In contrast, James Woodhouse, the Liverpool merchant who ran the herring curing station at Eilean Mhàrtainn, was on this list.

The shores were advertised again at the end of this term in 1799 for 19 years (Figure 5-9, Figure 5-10). By this time the estate had passed through several

proprietors to Lady Elibank, who was now in her 70s. The estate had no external sources of capital but was in heavy debt. In contrast to other Highland proprietors like the Seaforths, who actively worked on improving their estates, the Cromartie estate relied primarily on rental income. This income included proceeds from the kelp shores rental. The short-term five-year leases until 1800 indicate that improvement was not a priority (Richards, Eric and Clough 1989: 132).

The final advertisement for the kelp shores was in 1819 in the Inverness Courier (Figure 5-10). The Cromartie rental does not indicate that anyone took this lease. This may likely have been due to the steady decline in kelp prices following the end of the Napoleonic Wars in 1815. This final advertisement gives the name of the person who had held the lease since 1800: John Nicolson. John Nicolson, who appears to have come from Skye, held the lease of Tannara Mòr from James MacDonald of Skeabost, Skye, who had purchased the island from the Cromartie estate. Nicolson seems to have been living on Tannara Mòr between 1800 and 1827 for the duration of his lease. He was the agent, manager or business partner of James MacDonald's son Donald MacDonald, who was based at Culag, Lochinver, Assynt, where he ran another herring curing station. MacDonald also held the lease for the kelp shores of Assynt. Nicolson and MacDonald controlled the entire kelp industry from the Point of Stoer in Assynt to Ullapool. Due to the variable nature of the herring industry, kelp during this period would have been another source of income when the herring season failed. Available evidence suggests that Nicolson emigrated to Canada after the kelp and herring industries failed in the 1820s (Fraser-Darling 1943; Skinner *et al.* 2018).

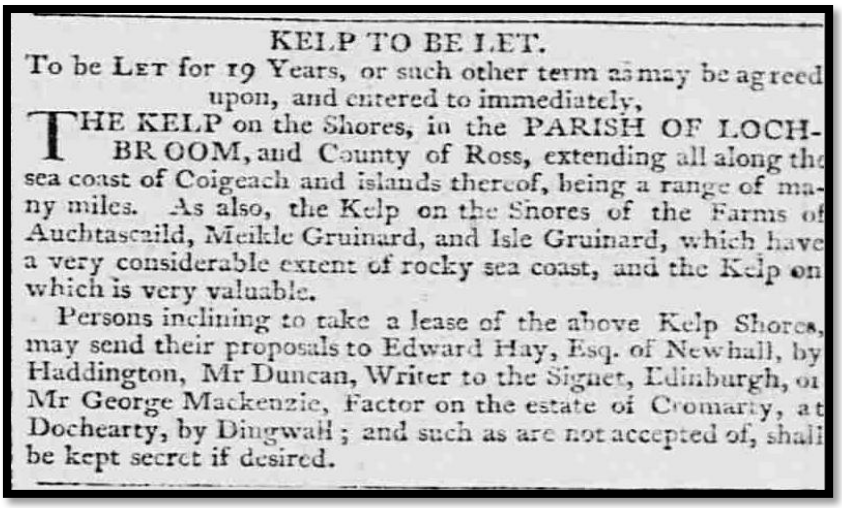
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COASTERS.

The Peggy, Lewis, and Union, Hughes, from Beaumaris, and Green Linnet, Cutt, from Chester, with 110 tons copper ore 35 tons sheathing copper and sundries for T Williams.—The Royal Recovery, Wood, from Leith, with 465 qrs wheat for P and R Dawson.—The Sally, Woodman, from Exon; Jean, Bain, from Tobermory, and Panterior Convoy, Jones, from Cardigan, with 59 tons kelp 468 qrs malt 147 qrs oats 21 tons ore for Wright and Davies.—The Hope, Whitburn, from Exon; Ceres, Heath, and John, Whittle, from Poole, and Diana, Symons, from Exeter, with 362 tons pipe clay for Chalmley and Dixon.—The Bee, Fletcher, from Whitehaven, with 185 qrs barley for N and S M'Knight and co.—The Chester, Griffith, from Chester, with 67 tons lead 53 tons lead ore for Lickbarrow and Wright.—The Grocers, Brown, from Dumfries; Hon C J Fox, Mathiesen, from Tobermory; Alert, Carmichael, from Greenock; Rachael, Higgins, from Alloa; and Hawke, M'Iddoe, from Glasgow, with 487 gross quart bottles 20 tons kelp 30 packs wool and sundries for I M'Iver.—The Rambler, Harthee, from Barnstaple, and Fly, Brine from Yarmouth, with 448 qrs wheat 271 qrs malt 111 qrs beans 60 qrs oats for Corrie, Gladstone and Bradshaw.—The Isabella, M'Lean, from London, with 379 qrs wheat for Bold, Richard and Conway.—The John and Mary, Conolly, from Anstruther, with 213 bls 1 half bl white herrings for Chalmers and Downing.—The Devon, Willicott, from Plymouth, with 23 tons hemp 40 tons china stone and sundries for J Barber.—The Minerva, Thomas, from Kingston, with 90 39 14 deals 46 bags flour for F Hippins.—The Cupid, Thistle, from Wells, with 560 qrs malt for Lickbarrow and Wright.—The Industry, Fulcher, from Exeter, with 326 qrs malt 26 casks ore for Wright and Davies.—The Royal Recovery, Woods, fr. Leith; Isabella, Levingstone, and Keatie and Jeffie, Botliune, from Tobermory, with 111 tons kelp 465 qrs wheat for P and R Dawson.—The Lady Ann, M'Lean, fr. Fort William; Friends Goodwill, Campbell, fr. Oban; Success, Burne, from Tobermory, and Providence, M'Leod, from Isle Martin, with 149 tons kelp 21 packs wool for I. M'Iver.—The Brothers, Samuel, and Charlotte, Ellis, from Bristol, with 68 punchs of British spirits 90 boxes tin plates 300 bundles hoops and sundries for R Thomas.—The Hope, Ashburner, from Lancaster, with sundries for C Lowndes.—The Charming Peggy, Davies, from Newport, with 30 tons pig iron for R Woods.

Figure 5-8: Arrived at Liverpool, Coasters, August 12th 1794, Manchester Mercury. The arrival of kelp from Eilean Mhàrtainn is highlighted. The total tonnage is a combination of Tobermory and Lochbroom kelp. Extract obtained from https://www.britishnewspaperarchive.co.uk/



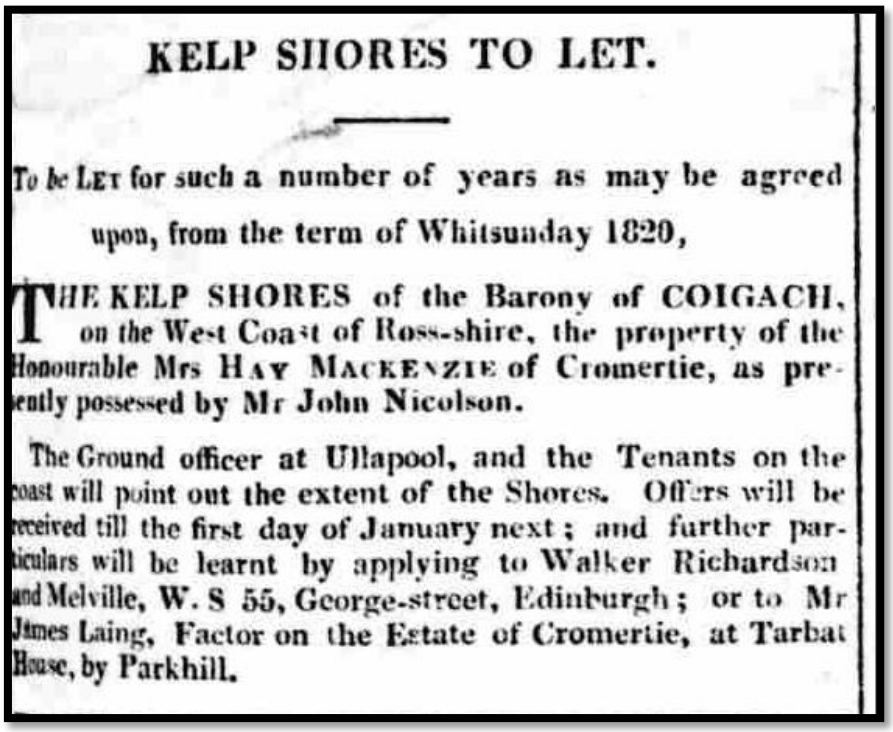
KELP TO BE LET.

To be LET for 19 Years, or such other term as may be agreed upon, and entered to immediately,

THE KELP on the Shores, in the PARISH OF LOCHBROOM, and County of Ross, extending all along the sea coast of Coigeach and islands thereof, being a range of many miles. As also, the Kelp on the Shores of the Farms of Auchtascaild, Meikle Gruinard, and Isle Gruinard, which have a very considerable extent of rocky sea coast, and the Kelp on which is very valuable.

Persons inclining to take a lease of the above Kelp Shores, may send their proposals to Edward Hay, Esq. of Newhall, by Haddington, Mr Duncan, Writer to the Signet, Edinburgh, or Mr George Mackenzie, Factor on the estate of Cromarty, at Dochearty, by Dingwall; and such as are not accepted of, shall be kept secret if desired.

Figure 5-9: Kelp Shores of Lochbroom as well as Auchtascaild, Meikle Gruinard and Isle Gruinard to be let. Caledonian Mercury, November 28th 1799. Extract obtained from https://www.britishnewspaperarchive.co.uk/



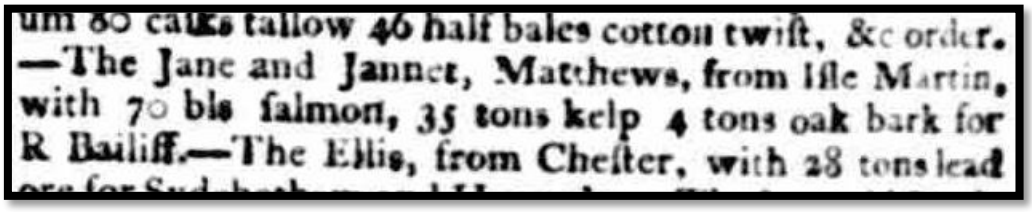
KELP SHORES TO LET.

To be LET for such a number of years as may be agreed upon, from the term of Whitsunday 1820,

THE KELP SHORES of the Barony of COIGACH, on the West Coast of Ross-shire, the property of the Honourable Mrs HAY MACKENZIE of Cromertie, as presently possessed by Mr John Nicolson.

The Ground officer at Ullapool, and the Tenants on the coast will point out the extent of the Shores. Offers will be received till the first day of January next; and further particulars will be learnt by applying to Walker Richardson and Melville, W. S 55, George-street, Edinburgh; or to Mr James Laing, Factor on the Estate of Cromertie, at Tarbat House, by Parkhill.

Figure 5-10: Advertisement for the Coigach Kelp Shores, Inverness Courier, December 9th, 1819. Extract obtained from https://www.britishnewspaperarchive.co.uk/



um 80 casks tallow 46 half bales cotton twist, &c order. —The Jane and Jannet, Matthews, from Isle Martin, with 70 bls salmon, 35 tons kelp 4 tons oak bark for R Bailiff.—The Ellis, from Chester, with 28 tons lead

Figure 5-11: Manchester Mercury, arrival of kelp from Eilean Mhàrtainn. Liverpool October 18, 1796. Extract obtained from https://www.britishnewspaperarchive.co.uk/

5.3 The Kelping Landscape of Coigach:

In the Coastal Assessment Survey (Long *et al.* 1996) carried out from Ullapool to Lochinver, no less than twelve sites were identified as possible kelp processing sites, all of them within the bounds of Coigach and located on cobbled storm bars or tombolos of tied islands. The archaeology gives a different picture of a region where the historical record does not suggest dependence on kelp production.

The following sites were visited in May 2022: *Bàgh na Garbhaidh* (Garvie Bay), *Rubha a' Choin*, the north end of *Loch na Ribhe* (Loch of Rieff), *Bàgh na Seann Dòrnaidh* (Old Dorney Bay), and *Loch Poll an Dùnain*. All of the sites visited had similar structures: circular, sub-oval or sub-rectangular kelp burning pits or kilns hollowed out of the beach cobbles on a storm bar with the sides of the kilns built up; with at least two, sometimes up to four, in close proximity, roughly built stone alignments close to the burning areas for drying seaweed and areas of cobbles flattened for a safe working platform; and possible shelters near to the site, built of stone or turf.

Some structures at Loch Poll an Dùnain, initially interpreted as possible kelp kilns (TROVE: 4468 1994) were re-evaluated in 2016 (The SCAPE Trust) and suggested to be possible boat nausts instead. However, five depressions located east of the broch ruin display the typical morphology seen in other areas of Coigach, even though these are now grassed over rather than pits hollowed out in the beach shingle. The main reason for scepticism about these five depressions for not being kelp kilns is the presence of the deserted 18th/19th-century township of Achlochan (Baldwin 1994: 294; The SCAPE Trust 2016b) located within 120m of the round depressions. In contrast, all other processing sites in Coigach are situated well away from any settlements. Because of their proximity to a settlement, these pits could be interpreted as seaweed storage pits, resembling those located at the south end of Loch na Ribhe (The SCAPE Trust 1994b), used to de-salinate seaweed for manuring crops. Only a chemical soil analysis similar to that done in Orkney (Riekie *et al.* 2006) could confirm if these were pits for burning or de-salination.

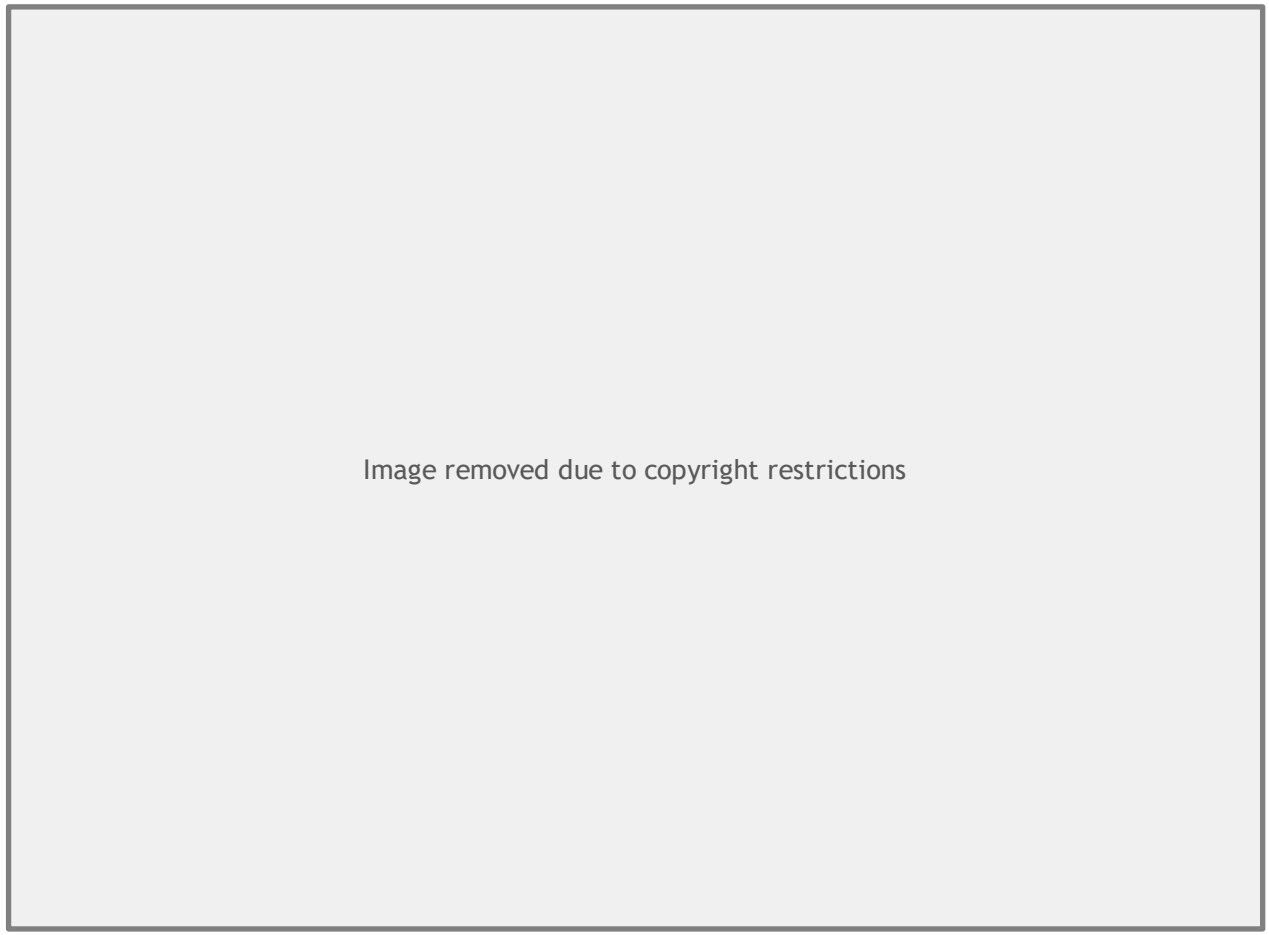


Figure 5-12: Loch Poll an Dùnain. Depressions thought initially to be kelp kilns but may rather be boat nausts instead. The openings are all orientated towards the shingle beach, indicating that boats were dragged up from the shore to store them. These are labelled as 'kelp kilns' in the Trove.scot database (formerly Canmore). © Crown Copyright: HES

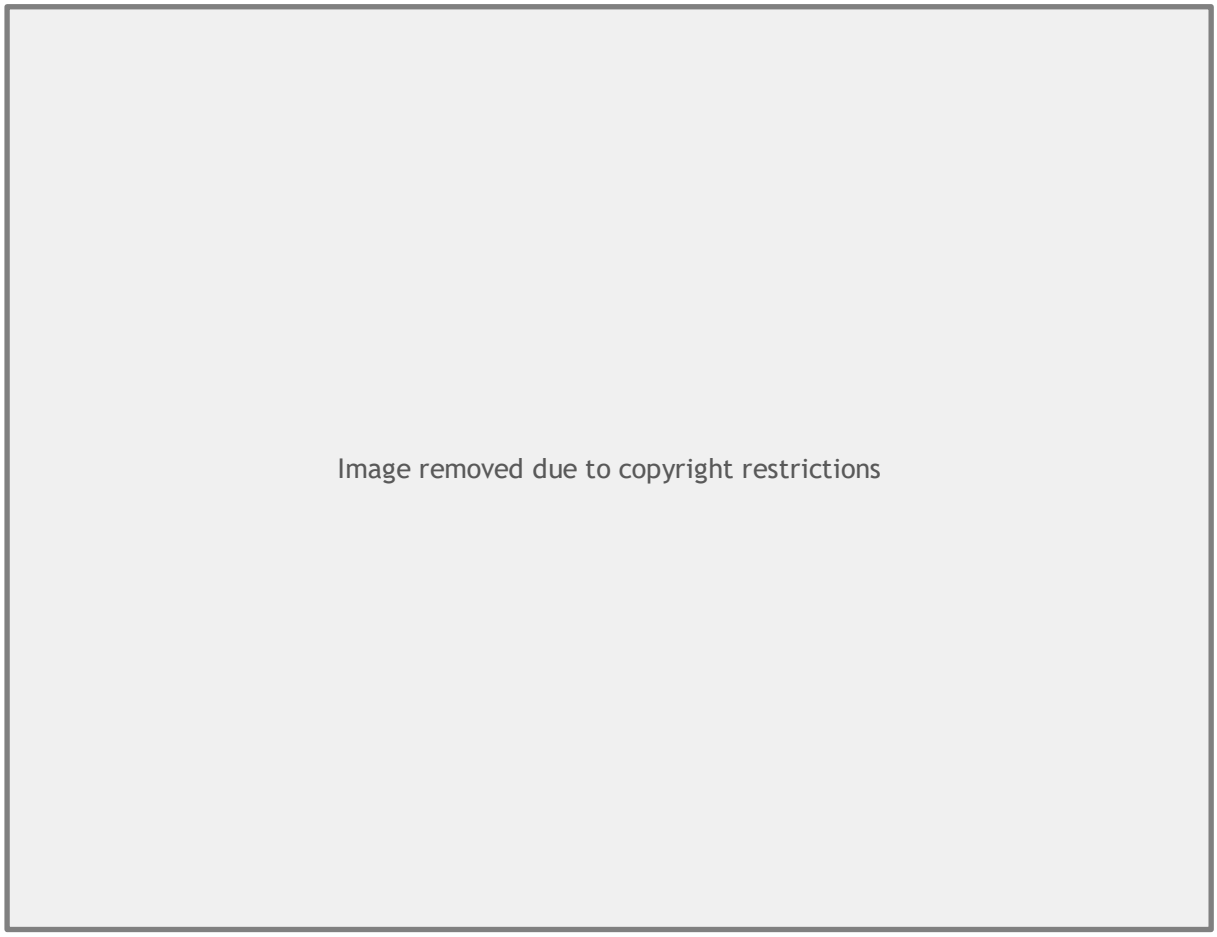
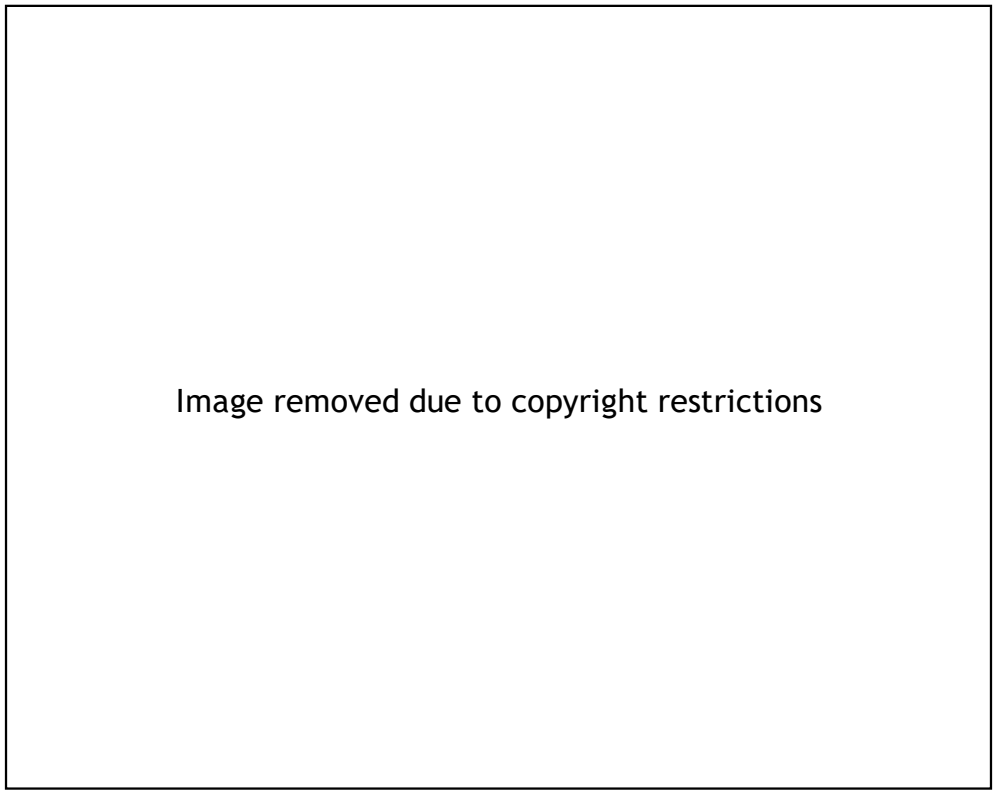


Figure 5-13: Oblique aerial view of Achlochan and Loch Poll an Dùnain, looking NW. The red arrow indicates the hollows identified as boat nausts, the yellow arrow the position of the five shallow depressions. The blue arrow is the site of Achlochan. Between the arrows is the site of the broch and later 19th century dwelling. © Crown Copyright: HES

The *Achd 'Ille Bhuidhe* (Achiltibuie) and *Am Poll Bàn* (Polbain) sites stand out from the other kelp burning sites due to the unique morphology of their kilns. These two kilns are long, narrow hollowed-out trenches measuring at least 3m long, 1.5m wide, and between 0.5 to 1m deep (Figure 5-14). Both sites contain a single trench on the storm bar or shingle beach. Furthermore, Am Poll Bàn features a potential drying wall located further up the storm bar, just behind the trench. Notably, there are only two trenches of this type in the Coigach region, prompting the question of why more are not present in the various storm bars, especially given that kelp manufacturing continued until 1819. It raises the possibility that these trenches belonged to individual families, enabling them to utilise the shore below

their crofts to generate additional income. This knowledge gap, however, may ultimately remain unanswered.



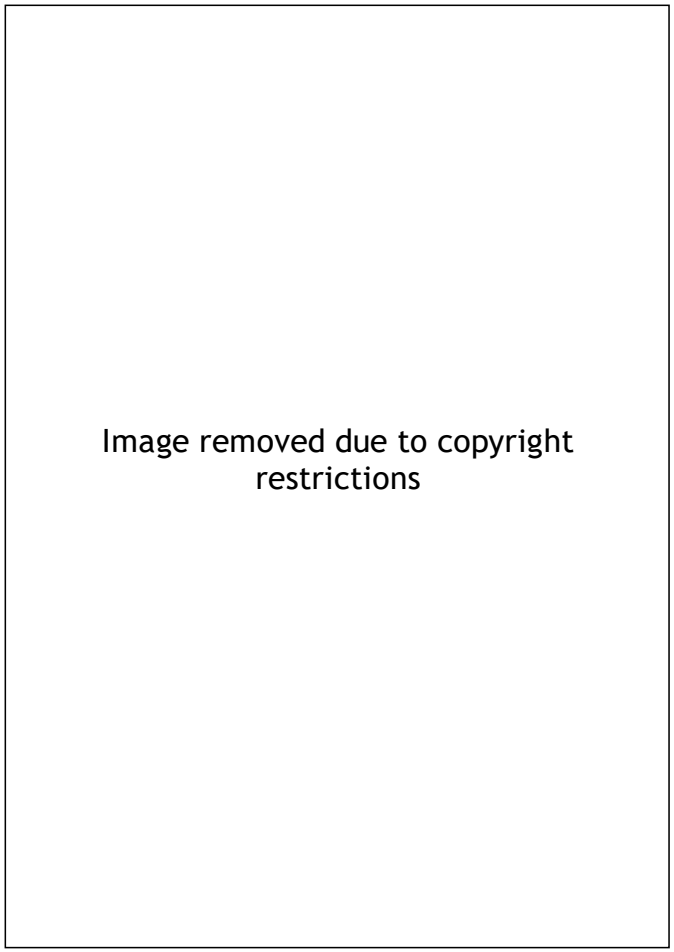


Figure 5-14: Narrow rectilinear trench with associated walling at Am Poll Bàn (Polbain). Photographs obtained from Facebook group 'Historic Uses of Kelp' ©Iain Muir (left) 2020 and ©Lesley Muir (right) 2020

5.3.1 The main processing sites

This section focuses on three of the largest processing sites: *Bàgh na Garbhaidh* (Garvie Bay), *Loch na Ribhe* (Loch of Rieff), and *Bàgh na Seann Dòrnaidh* (Old Dorney Bay), along with their associated built remains. While there are at least twelve processing sites throughout the district, these three have been selected for detailed examination due to their representative characteristics. The chosen sites share similar morphological traits, environmental settings and associated maritime infrastructure, with structures akin to those already described. By concentrating on these key locations, insights into typical processing sites in the region can be gained without redundant analysis.

Applying a conceptual framework that includes commodities, ecological entanglements and connections to the entire region can be challenging, especially given the fragmentary documentary and oral history and the extensive shorelines that suggest a potentially brief yet intense period of industrial-scale activity. Therefore, it is essential to adopt a focused approach for this case study, concentrating on these three primary processing sites to understand their historical significance within a broader ecological and economic context.

By narrowing the scope to these specific locations, the analysis can be structured around the primary production nodes of the commodity chain. This approach effectively demonstrates the interplay between human endeavours, industrial activities, and the local ecology. It allows for a deeper examination of each site's function within the broader context of Coigach's economic, social and environmental history. It also provides an opportunity to investigate how kelp was extracted, processed and transported while considering its lasting impact on the surrounding ecosystem. Furthermore, this structure enables a more nuanced understanding of the connections between these processing sites and their role in shaping the region’s industrial legacy despite the challenges posed by fragmentary historical documentation.

5.3.1.1 Bàgh na Garbhaidh (Garvie Bay)

The storm beach at the top of the sandy beach and the shores along the bay's western edge up to *Rubha a' Choin* show the most extensive and intensive evidence of kelp processing in Coigach (Figure 5-15). Access to the bay is from a footpath that starts from the main road and runs along *Abhainn na Garbhaidh* (River Garvie) and around *Loch na Garbhaidh* (Loch Garvie). The area west of the river and to the eastern edge of Achnahaird Bay is known as *an Fhliuch Bhad*, meaning 'wet place', which describes the generally boggy moorland terrain. The central part of the site is along the top of the storm bar above the sandy beach. Along the western shore are two smaller sites, one below what was described as a 'tear-drop shaped enclosure' in the Trove HER (TROVE: 116395 1994) and another at *Creag a' Choin Mhòir* (The SCAPE Trust 1994a). A track from *Creag a' Choin Mhòir* over this headland leads to another large processing site on the tombolo of the tied island at *Rubh' a' Choin* (TROVE: 136570 1994), which has been mistakenly identified on Trove as 'Creag a' Choin Mhoir'. An additional track follows the coast from Rubh' a' Choin to Achadh na h-Àird.

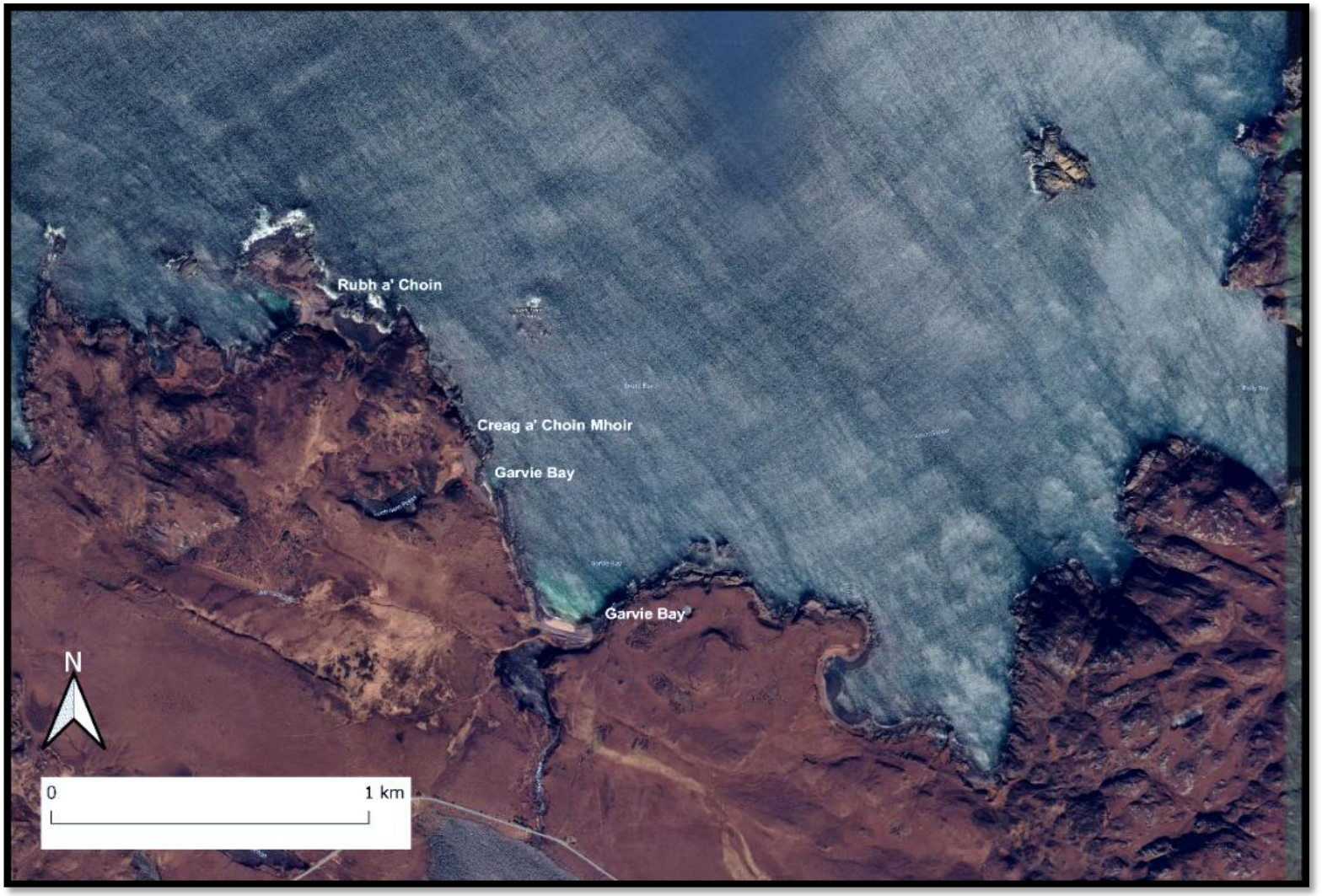


Figure 5-15: Satellite map showing extent of the processing site at Bàgh na Garbhaidh (Garvie Bay), from the storm bar at the top of Tràigh na Garbhaidh (Garvie Beach) and along the shore on the west side of the bay to Rubha a' Choin. Satellite image: Google Earth. Data obtained from the SCAPE Trust (www.scapetrust.org/sites-at-risk/).

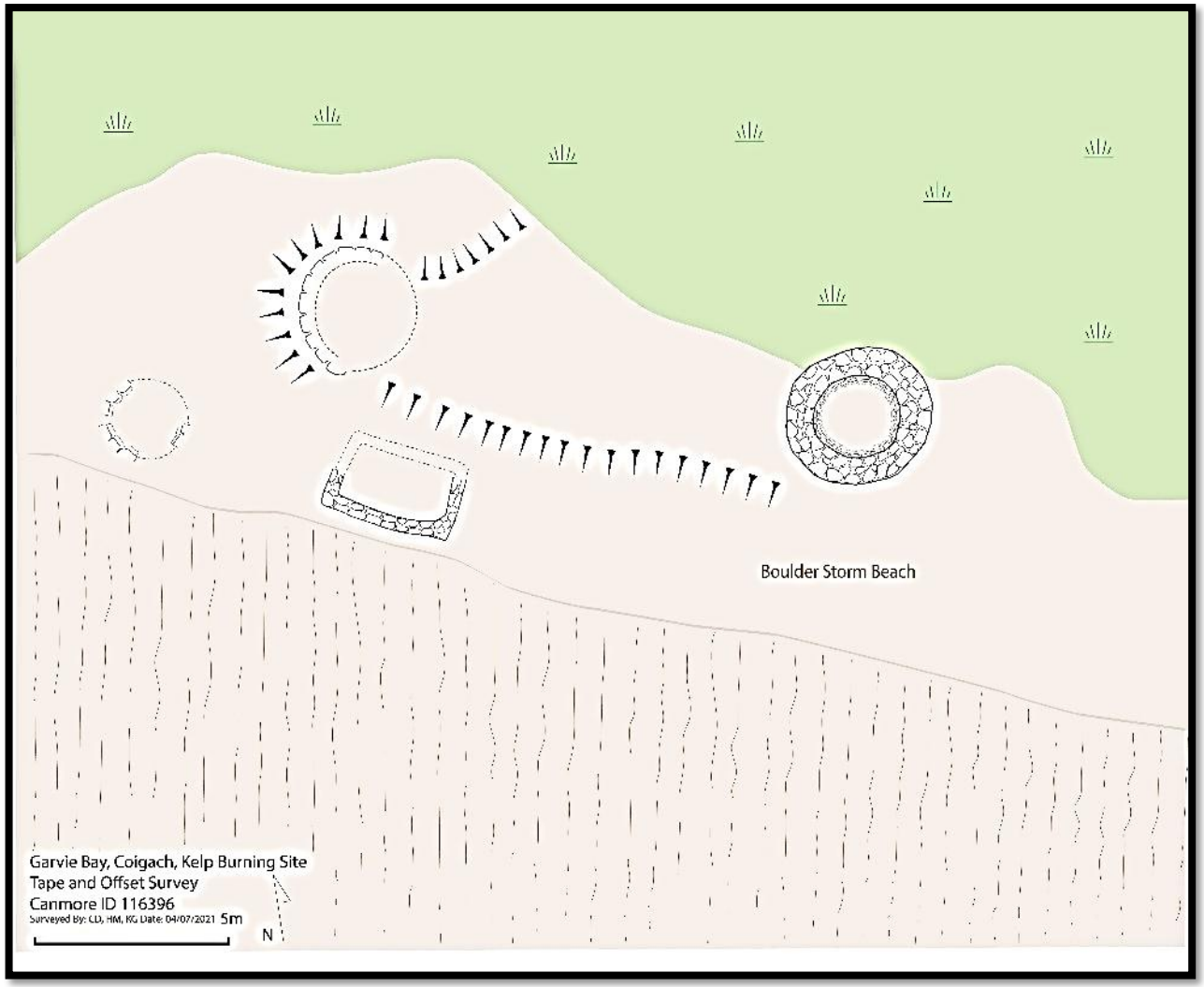


Figure 5-16: Site survey plan of the east end of Garvie Bay kelp burning site, TROVE ID 116396. Tape and Offset survey by Holley McCoy, Kevin Grant and Catherine Dagg, 2021.

At the top of the storm bar at *Tràigh na Garbhaidh* (Garvie Beach), four kelp-burning pits were surveyed to the east of the centre of the bar (Figure 5-16). The largest pit (Figure 5-17) measures 2m in diameter and approximately 1m in depth, with built-up sides. It is still in good condition and is recognisable as a kelp-burning kiln. Heat-split cobbles can be seen at the bottom of the pit. About 10m east of the largest pit lies a second sub-circular pit of similar dimensions, but it is more degraded. Between these two pits and on both sides of the central pit, there is an area of flattened cobbles, presumably used as a working area. Two additional pits were recorded below the second pit. One is sub-circular, the other is sub-rectangular, and both are in a degraded, fragile condition. To the west, two more sub-circular pits were noted, one directly in the centre of the storm beach and the second in a similar state of degradation to the pit directly east of the sub-rectangular pit. At the very west end of the storm bar, immediately above the cobbles, there is a flat area of grass, possibly exposing ephemeral footings of a sub-rectangular structure (Figure 5-44). This area comprises a low bank with occasional flat stones measuring 3m by 5.5m. It could have been a seasonal turf-built shelter associated with the summer kelp industry.

As one continues up the west side of the bay towards *Creag a' Choin Mhòir*, more sub-circular pits can be observed in the cobbles of the storm beach below the path. There is what at first sight looks to be an enclosure just above a pit in the storm beach, described as 'tear-drop shaped' on the Trove HER and the SCAPE Trust's Sites at Risk report (Site: 194,The SCAPE Trust 2020–2024a; TROVE: 116395 1994). On the first visit in July 2021, it was hard to determine the purpose or age of the so-called 'tear-drop' enclosure due to significant overgrowth of bracken and heather (Figure 5-18). When the site was revisited in May 2022, before summer growth began, it became more apparent that it was not so much an enclosure but possibly walls for drying seaweed in preparation for burning (Figure 5-19). This was evident from the rough construction of beach cobbles and the location of a kelp pit just below it (Figure 5-20). Other pits along this stretch of the storm bar up to *Creag a' Choin Mhòir* are less clear in shape due to the collapse of the cobbles, which is caused by the unstable building material and their proximity to the tidal action on the shore. At least four pits could be recognised among the cobbles (Figure 5-21).



Figure 5-17: The largest, best-preserved pit on the storm bar at Tràigh na Garbhaidh.



Figure 5-18: Tear-drop shaped enclosure located between Tràigh na Garbhaidh and Creag a' Choin Mhòir (cliff in centre background), taken in July 2021, showing overgrowth of bracken. The cobbles have been roughly piled to make the walls.



Figure 5-19: 'Tear-drop enclosure' from another angle, looking towards Tràigh na Garbhaidh, May 2022. The extent is more visible due to less vegetation. The roughly piled construction suggests seaweed drying walls.



Figure 5-20: Sub-circular kelp pit just below and adjacent to the 'tear-drop enclosure'.



Figure 5-21: One of at least four recognisable pits on the storm beach shore leading up to Creag a' Choin Mhòir.

To access the site at *Rubh' a' Choin*, there is a path going up to *Creag a' Choin Mhòir* (Cliff of the Big Dog) from the lower shore, which follows along the coast to *Rubh' a' Choin* (Figure 5-22). *Rubha a' Choin*, which translates as 'Dog Point', is a tied island with a cobble and gravel tombolo, or isthmus, connecting it to the mainland. In the 1996 Coastal Zone Assessment (CZA) (Long *et al.* 1996: XIV) , the site is described as follows:

> A complex of at least 9 rough circular depressions (1.5-2.5m dia) defined by rings of piled boulders / cobbles and stone revetting situated on a storm bar linking a small island (Rubh' a' Choin) with the mainland (max extent 150m x 50m NNW-SSE). Generally, the features are very shallow (<0.2m deep), however some are very deep (1.5m deep). Many of the features contain fire shattered stone and some clearly show signs of use as recent fireplaces. However, others are highly lichenous and appear to be quite old. Isolated sections of rough stone walls indicate the presence of other disturbed structures in the vicinity.

During the field visit in May 2022, only four of the nine previously described circular depressions were discernible (Figure 5-23, Figure 5-24, Figure 5-25, Figure 5-26). These sub-circular pits were concentrated within the tombolo nearest the mainland. The site's increased exposure to tidal action compared to *Tràigh na Garbhaidh*, coupled with evidence of campfires used since the 1996 CZA, suggests that the other depressions may have collapsed or disappeared entirely. The suggested presence of up to nine circular depressions or kelp-burning pits would make Rubh' a' Choin the largest processing site in Coigach. The 'isolated sections of rough stone walls' (Figure 5-27) could potentially be interpreted as seaweed drying walls. While rough or collapsed stone walls were observed on a grassy section of the promontory, the specified 'isolated sections' referenced in the original survey were not identifiable. No structures indicating a possible shelter or bothy was evident during this site visit.

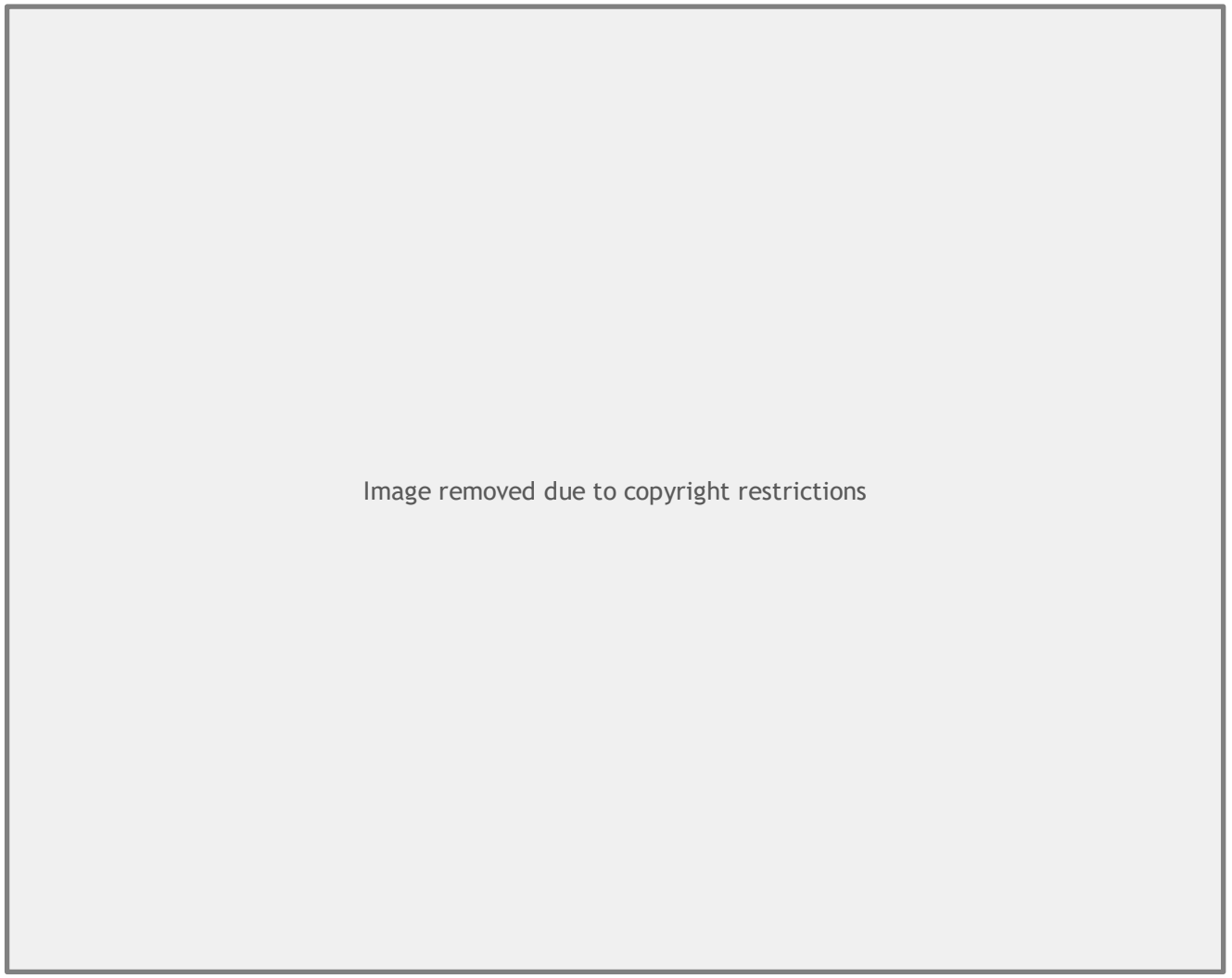


Figure 5-22: Oblique aerial view of Rubh' a' Choin. The orange arrow indicates the general area where the kelp pits are located, and the blue arrow shows the possible seaweed drying walls. Image obtained from https://trove.scot./collection/1304224 © Crown Copyright: HES 2012



Figure 5-23: One of the remaining visible circular depressions on the storm bar between Rubh' a' Choin and the mainland. This was the largest and deepest. Note the lichenous stones at the bottom of the pit indicating its possible age.



Figure 5-24: Pit no. 2 near the pit in Fig 5-22.



Figure 5-25: Pit no. 3.



Figure 5-26: Possible fourth pit.



Figure 5-27: Collapsed isolated sections of rough stone alignments on the tied island, which could be interpreted as drying walls.

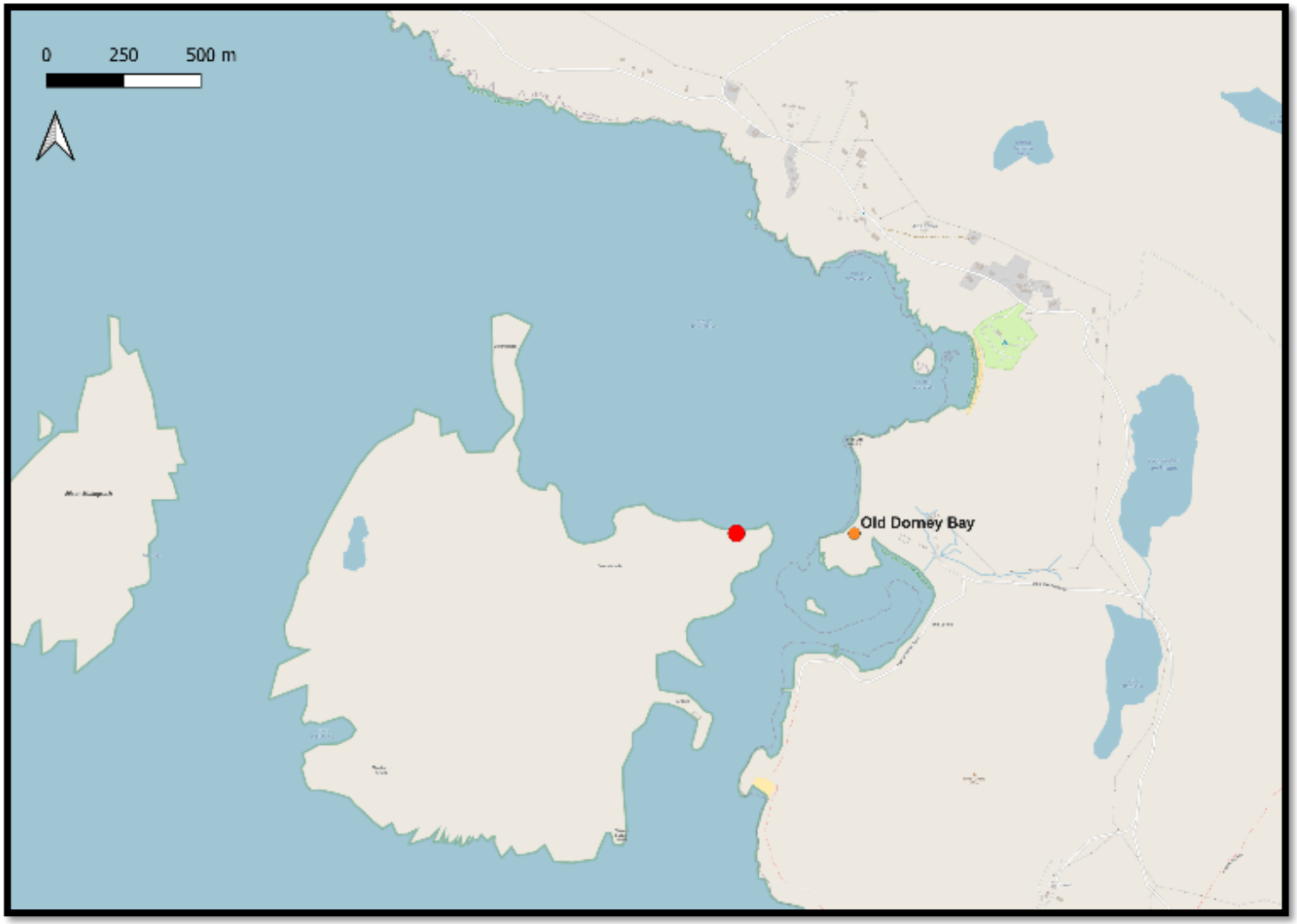


Figure 5-28: Map of Bàgh na Seann Dòrnaidh and Eilean Ruisteil (island to the left of Old Dorney Bay), indicating two processing sites. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-

5.3.1.2 Bàgh na Seann Dòrnaidh (Old Dorney Bay)

The site at *Bàgh na Seann Dòrnaidh* (Figure 5-28) is at the top of a cobble storm beach on the north side of a tombolo connecting the mainland to a promontory. This landscape feature also separates the bay from the sea loch *Loch an Alltain Duibh* (Loch Altandhu), thus creating an estuarine environment within the bay and between *Eilean Ruisteil* (Isle Ristol) and the mainland (Figure 5-29). This sheltered estuarine environment is also one of the possible 'kelp shores' of the Cromartie estate as ascophyllum nodosum and fucus species are abundant in the bay. There is another processing site nearby on *Eilean Ruisteil*, but it was not possible to visit this site during the field visit in May 2022 due to tidal conditions.

On the top of the storm bar, at least four circular pits were visible, the two largest being similar in size, depth and shape to that found at *Bàgh na Garbhaidh*. Each of the large pits had at least one smaller, also circular pit adjacent within 2m (Figure 5-33, Figure 5-34, Figure 5-35, Figure 5-36, Figure 5-37, Figure 5-38). Along with the pits, several roughly piled stone walls were still visible, the longest along the south edge of the storm beach (Figure 5-32). Just below this, in the lee of the storm beach, there is one bipartite sub-rectangular structure with a dense concentration of shellfish shells, mainly made up of winkles and cockles (Figure 5-46). This deposit being so close to the kelp manufacturing site suggests that this may have been a seasonally occupied dwelling for kelpers. In other areas, particularly in the Western Isles, it was stated that shellfish were part of the staple diet of kelpers during the kelping season (MacGillivray 1831: 301). It may be that this structure as well as structure 3 could have been seasonal dwellings for kelpers or a kelper and family. This site is complex, as the coastal assessment survey conducted in 1996 (Long *et al.* 1996) revealed a variety of structures that indicate different periods of occupation (Figure 5-30). On this same side of the storm bar, there is a wide slipway going from the centre of the bay up to the grassy edge of the isthmus (Figure 5-31). The slipway is a wide area cleared of stones to either side to allow boats to land more easily with their cargo. This feature would have served a dual purpose; landing harvested seaweed in small boats and taking away the finished kelp to Eilean Mhàrtainn for shipping, as well as

use in the fishing industry established in the late 18th century by the British Fisheries Society.

Along the top of the storm bar, there are five recognisable hollowed-out pits. The two larger pits, one to the east and the second to the west, are about 2m across and 1m deep with built-up rivetted sides. The smaller adjacent pits are about 1.5m and .5m deep. Pits 1 and 2 can be seen in aerial or satellite photographs, appearing like meteor craters.

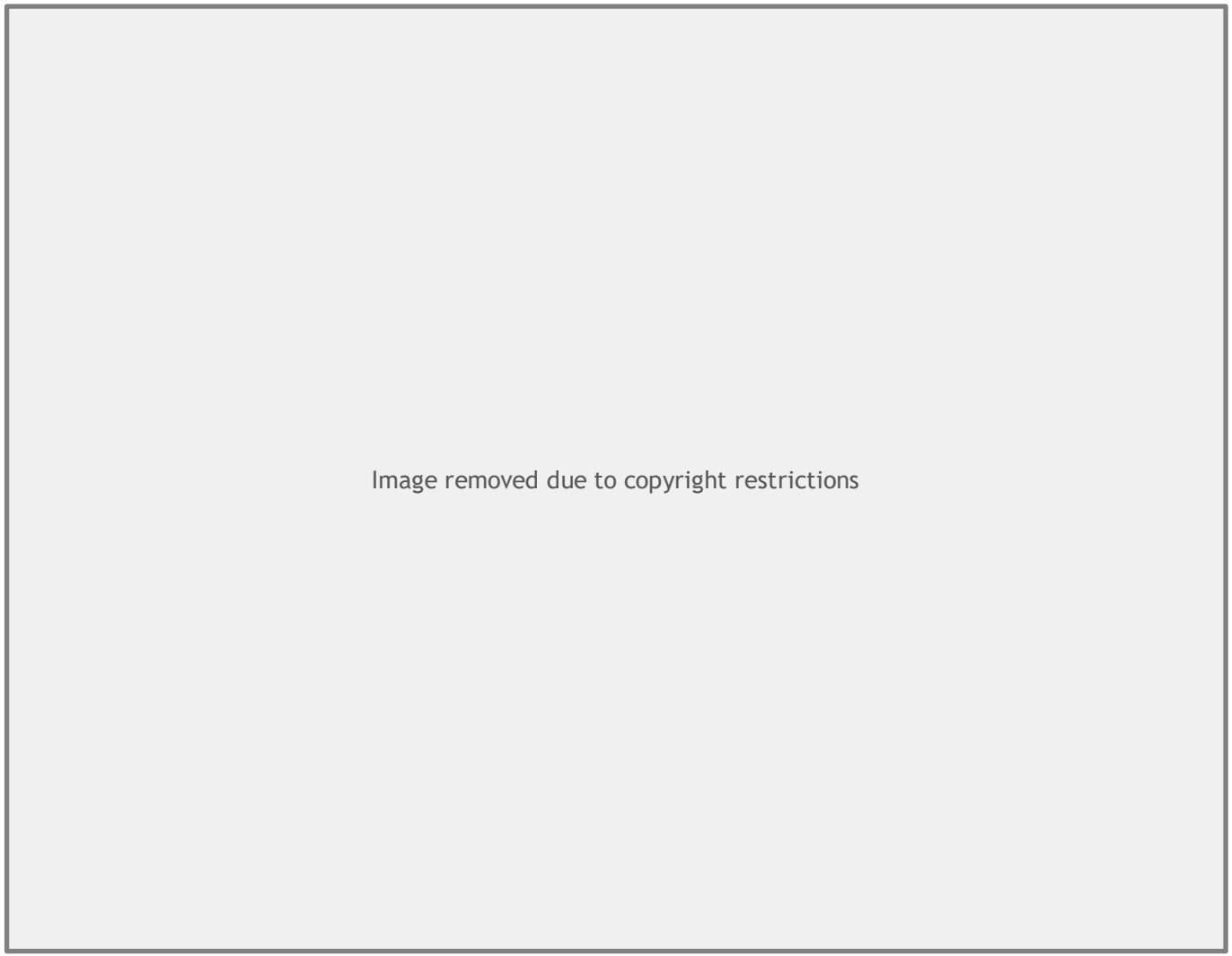


Figure 5-29: Oblique aerial view of Bàgh na Seann Dòrnaidh and Eilean Ruisteil (top right). This image shows the abundance of bladderwracks growing within the bay. The north-facing storm beach site on Eilean Ruisteil is at the top right-hand corner. The site on the tombolo's storm beach is centre-right. Image obtained from https://trove.scot/collection/1304256 © Crown copyright HES 2012



Figure 5-30: Survey plan from the 1996 Coastal Assessment Survey, Ullapool to Lochinver Vol. 2, pg XIXX



Figure 5-31: Slipway directly behind the storm bar into the bay.







Figure 5-32: Sections of walling in various places around the storm bar. The bottom centre photo is the wall directly behind the bipartite structure 1 in the site plan (see Figure 5-30).



Figure 5-33: Pit 1 to East, ringed dark outline of Pit 2 is directly west of Pit 1.



Figure 5-34: Pit 1 with smaller pit 3, 2m away

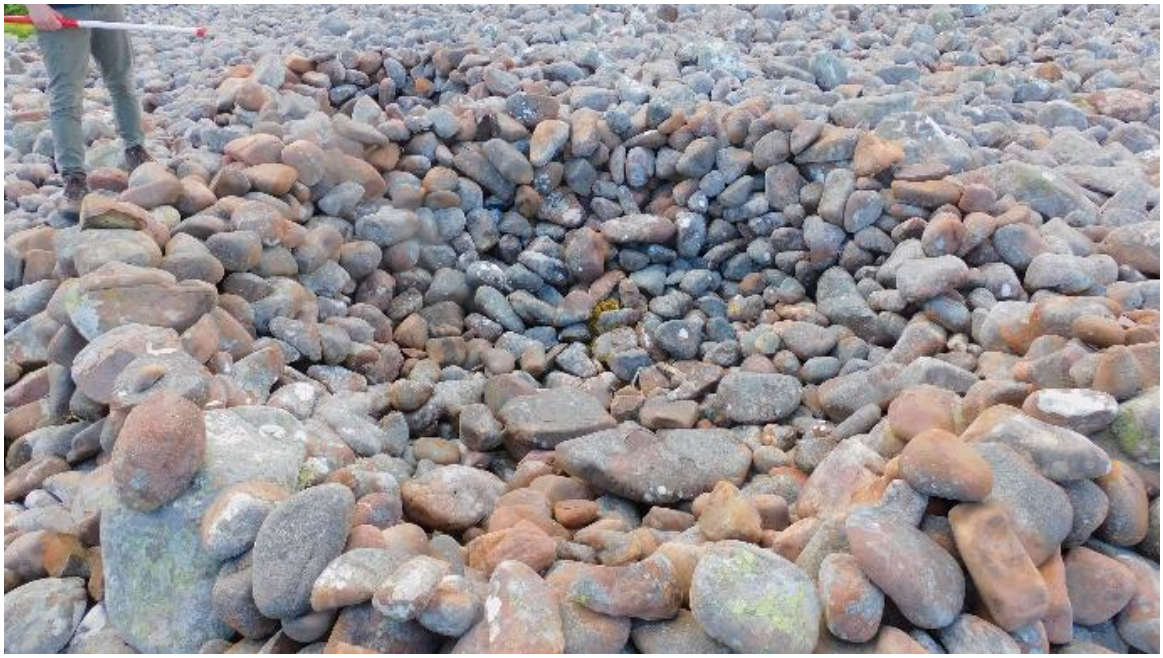


Figure 5-35: Pit 2 on W side of storm bar



Figure 5-36: Smaller pit 4, also within 2m of Pit 2

Image removed due to copyright restrictions.

Figure 5-37: Drone image of Pits 2 and 4. Flattened areas of cobbles can be seen surrounding the pits. Alan Thompson created a 3-D model of this image. Image ©Alan Thompson 2023



Figure 5-38: Pit 5 at edge of walling above bipartite structure (See Figure 5-30), described as a 'hollow' on the site plan.



Figure 5-39: Possible kelp related sites, Loch na Ribhe. There are two kelp processing sites at Loch na Ribhe identified in the Coastal Assessment Survey; on the storm bar at the north end of the loch and the second along the south west exposed shore, also on a storm bar. The north end site is the site examined in the next section. The markers at Reiff Township, below the township and near the mouth of the outlet are not kelp burning pits but are likely seaweed storage/composting pits for manuring. Data obtained from SCAPE Trust.

5.3.1.3 Loch na Ribhe (Loch of Reiff), North

Loch na Ribhe (Loch of Reiff) is an artificial estuarine environment rather than a fresh-water loch. Two channels were cut in the loch, one at the south end that empties into Reiff Bayand the other located about half-way up on the west side. The south end may have been cut through prior to the 1754 survey by May as this channel is indicated on the map but the other channel half-way up on the west side is not shown on these earlier estate maps. According to Baldwin (1994: 335), the 'Loch of Reiff, in spite of the reef, is said to have been one of the three key harbours in this part of Coigach (the others being Old Dornie and Tanera), and that its entrance was subsequently altered.' Access to the site on the north end of the loch is via a narrow path along the east shore. Like the other kelp processing sites around the Coigach shores, this site is on a raised storm bar or tombolo at the north end of the loch and faces towards *Camas Eilein Ghlais*. The storm bar at Loch na Ribhe is composed of large cobbles and boulders, which makes it more difficult to traverse than the other storm bars. The complex, surveyed in 1996 (Long *et al.*: XXXV), comprises a stone bothy or shelter, at least four sub-circular hollows or pits and roughly constructed sections of walling in various places. This walling contrasts with the two dry-stone field boundary walls bisecting the raised beach. There are also the remains of a jetty or boat naust on the loch side of the raised beach. Most of the pits are located within the two boundary walls, apart from one pit at the western edge of the storm bar. Although most of the pits have collapsed and are therefore less explicit in their shape compared to those at *Bàgh na Seann Dòrnaidh* and *Bàgh na Garbhaidh*, the built sides of the pits along with heat-fractured stones at the bottoms are present and are interpreted as kelp kilns or pits. The other types of rough structures that make up kelp processing complexes elsewhere in Coigach are also present at this site: heaped stone alignments suggesting drying walls, rough stone bothy and boat nausts, jetties or slipways leading into the site.



Figure 5-40: The raised storm beach at the north end of Loch na Ribhe, the loch to the left, Camas Eilean Ghlais to the right. Two boundary walls bisect the site. A jetty and boat nausts can also be seen behind the boundary walls at the north-west edge of the loch.

5.4 From Storm Beaches to Liverpool: The Kelping Narrative in Coigach.

This section examines the entire district's industry using primary production nodes from a commodity chain analysis. Instead of constructing a new commodity chain flow diagram, the study will utilise the production nodes from the contemporaneous Calbost case study. This approach allows for a comprehensive understanding of the region's economic dynamics while leveraging an established framework. By applying the example of the Calbost diagram to this case study, the analysis highlights the interconnectedness of regional industries during this period. It suggests that distribution channels, including kelp agents in Scotland and merchants in Liverpool, were likely shared or comparable between the two cases. This similarity extends to glass and soap manufacturers and markets, indicating a degree of economic integration within the broader region. Focusing on these shared elements can reveal patterns of trade, economic relationships, and the overall industry structure characteristic of the wider area, not just limited to the specific district under study. This approach enables a more efficient and comparative analysis, providing insights into the economic landscape of the region during this period, despite a lack of documentary evidence for this area.

The narrative of the process, intertwined with the environment and its connections, is built upon the main production nodes. It blends the documented history and oral accounts, though fragmentary, with evidence found in the landscape and embodied experiences from an experimental kelp burn at Eilean Mhàrtainn in September 2022. Unfortunately, the names and origins of the kelpers, whether they were local or itinerant workers, have been lost over time. Thus, the story illustrating the scale and impact of the short-lived kelp industry in Coigach can be understood, despite existing gaps in knowledge.

5.4.1 Pre-season preparation

The exact start date of the cutting and burning season for kelp in Coigach is not known. Generally, this period stretched from mid-May to late July or early August throughout the other kelping areas, as seen in the Calbost case study. The only

indication of the time of year is hinted at in the shipping notices of arrivals in Liverpool (Figure 5-5, Figure 5-8, Figure 5-11). As the season approached, the workers would travel to that year's site, carrying their tools and provisions in willow creels on their backs, possibly miles from home. Sites such as *Bàgh na Garbhaidh* and *Rubha a' Choin* (Figure 5-15) are the furthest away from the nearest settlement at Ach' na h-Àird and have to be accessed using well-worn tracks through sometimes rough, boggy terrain such as through (Figure 5-41) or following the rocky coastal path from *Ach' na h-Àird* to *Rubha a' Choin*. This initial journey was to prepare the site where they would live for the summer season: repairing their bothies, building or repairing the kilns, making the working area around the kilns safer and augmenting the drying walls.

Once the kelpers arrived, they set to the laborious task of gathering stones, boulders and cobbles from the storm beach or cutting turfs to repair the walls and roofs of their rough shelters where they would stay. The walls of the rectangular structure at *Loch na Ribhe* (Figure 5-43) are rubble-faced, built out of the same stones and cobbles from the storm bar it adjoins. Its size suggests that it may have been a kind of 'bunkhouse', housing a number of kelpers. The roof may have been thatched or turfed, mirroring other stone bothies seen scattered about in the summer sheilings throughout Coigach (Baldwin 1994: 350). A bipartite structure adjacent to and below the storm tombolo at *Bàgh na Seann Dòrnaidh* may also have been used for the same purpose (Figure 5-45). This structure's interior surface is strewn with winkle and cockle shells, indicating a diet that was easily obtainable from the nearby shore (Figure 5-46). The flat area of grass at the edge of the kelp working area at *Tràigh na Garbhaidh* suggests an ephemeral structure, perhaps of turf cut nearby on the moorland directly behind the beach (Figure 5-44).



Figure 5-41: Track through An Fhliuch Bhad to Tràigh na Garbhaidh.



Figure 5-42: The best-preserved pit at Tràigh na Garbhaidh. Not only is the pit made from hollowing out the cobbles, but the sides are revetted. The cobbles surrounding the pits have been flattened to make the working area easier and safer to walk on.

Afterwards, the team would initiate the construction or repair of the kilns. In creating a new kiln, they would excavate the burning pits and reinforce their sides with cobblestones. They would also repair any existing kilns and extend the drying walls if suitable areas for drying seaweed were lacking. The uneven stone alignments in the shingle indicate that these kilns were built quickly to meet the seasonal demand for drying seaweed, which likely influenced their size depending on the amount collected (Figure 5-47, Figure 5-48).

With the physical exertions of the season's preparations complete, seaweed harvesting could begin. Overseers appointed by the leaseholder of the kelp shores, or the leaseholder himself, such as John Nicolson, who resided at Tannara Mòr during his twenty-year tenure, examined the kelp shores and estimated the tonnage for the season. Their assessments were crucial, as the leaseholder relied on this information to arrange suitable cargo ships and secure insurance on the cargo. However, this part of the operation lacks documentation. The records detailing who the overseers or kelp agents were remain scarce or have not yet been discovered. Their essential contributions to this part of the production leave an incomplete narrative of the true scope of operations. The general scale of any potential harvest can only be guessed at from the extensive archaeological remains at the sites.



Figure 5-43: Sub-rectangular structure, possible kelpers seasonal bothy or bunkhouse. Loch na Ribhe.



Figure 5-44: Ephemeral footings suggesting a possible turf bothy. Tràigh na Garbhaidh.

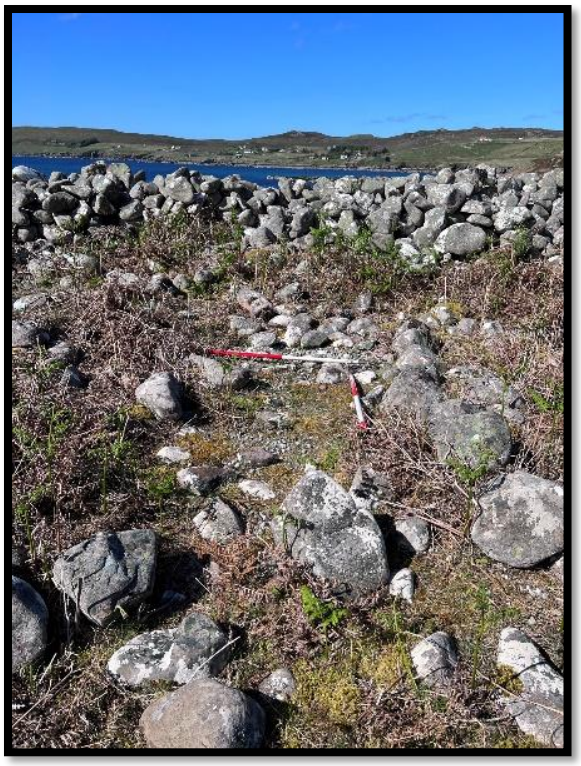


Figure 5-45: Section of bipartite rectangular structure located in the lee of the storm beach where the shellfish deposit is found. (See Figure 5-30, Structure 1 in site plan). Directly behind, on the edge of the storm bar, there is built-up rough walling interpreted as a drying wall.

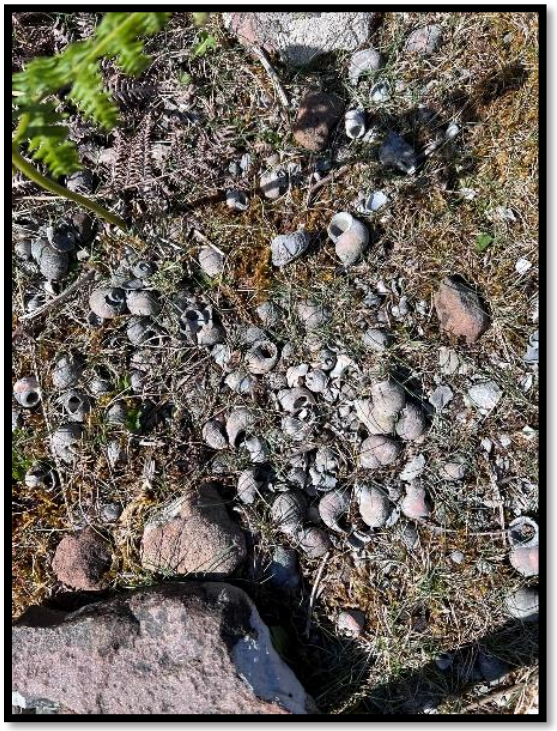


Figure 5-46: Closeup of the shells littering the ground surface of the structure in Figure 5-45, consisting of winkles and cockles.



Figure 5-47: Loch na Ribhe, the eastern edge of the raised beach, shows roughly piled walling.



Figure 5-48: Bàgh na Garbhaidh. This structure is more likely to be seaweed-drying walls than an enclosure

5.4.2 Harvesting and drying

The available documentation on kelping in Coigach is limited, making it unclear whether all sites were utilised each year or if only a few were used in rotation. If there was a rotation of processing sites, it potentially depended on where the previous season's harvest was collected and which shores were in their two to three-year growth cycle. The quantity of *fucus* species along the Coigach shores that are exposed to the Minch and its strong currents is less plentiful compared to the more sheltered sea lochs of the Outer Hebrides. In contrast, the Lochbroom side of the peninsula offers more suitable rocky and sheltered foreshores, where the abundance of *fucus* mirrors that of the Hebridean sea lochs, both on the Coigach mainland and the Summer Isles, as observed at *Bàgh na Seann Dòrnaidh*. (Figure 5-28) (Jackson 1948: 138). The shores of Lochbroom, stretching from Ullapool to *Ribhe*, are dotted with numerous coves and inlets, providing a rich habitat for *fucus* species to flourish in abundance.

The seaweed gatherers would meet at that year's designated shore during low tide, equipped with *corrain-fheamad* (serrated seaweed sickles) and ropes, perhaps made of straw or heather. They would travel on foot to a designated harvesting site for the season, sail to an island or down the coast closer to Ullapool, ensuring they arrived in time for the intertidal rocks to be exposed by the low tide. In addition to using *corrain,* essential for cutting the bladderwracks from the rocks (Baldwin 1994: 319), the gatherers would have relied on their small boats to navigate coastal waters or to venture out to the Summer Isles, where they would cut and collect seaweed to transport back to the processing site, such as that at *Loch na Ribhe*.

While Baldwin notes the later use of serrated sickles by the Coigach inhabitants, it is evident that many techniques and tools from the kelp industry era continued to be employed even after its decline to fertilise their *feannagan*. In Coigach, there does not seem to be any mention of using seaweed rafts (*maoisean* or *ràthan*) to tow seaweed with boats; however, Baldwin highlights that when seaweed was harvested in the Summer Isles, it was loaded into the hulls of boats at low tide, and brought back ashore at high tide (Baldwin 1994: 319). A poignant anecdote

from *Cùl-cinn* (Culkein) near the Point of Stoer in Assynt, recounts a maritime accident in 1863 involving a purpose-built boat intended for transporting a substantial cargo of seaweed in its hull (Ferguson 2019: 26-28). The residents of *Cùl-cinn* would sail to the uninhabited offshore island of *Cròna*, situated two miles east of *Cùl-cinn*. The advantage of carrying seaweed in the hull is that the journey back is quicker than towing it behind, especially over longer distances and in challenging currents. Although this accident occurred in 1863, over thirty years after the decline of the kelp industry in Coigach, it illustrates who may have gone out in boats to gather seaweed during the kelping years and the dangers they faced each season with collecting and returning with their bounty. Historical accounts from other kelping areas, including the Old Statistical Accounts, further support this notion, indicating households and extended families, including older children, were frequently engaged in the seaweed gathering process (MacGillivray 1831: 300; MacLeod, John 1794: 359-360). It may be that those gathering were not necessarily those working at the more remote shores like *Bàgh na Garbhaidh*. This may have been a different story for *Loch na Ribhe* and *Bàgh na Seann Dòrnaidh* because they are closer to settlements and harvesting sites where the whole community may have been involved.

The processing sites needed to have ready access for boats bringing their heavy, wet cargo ashore. At *Bàgh na Garbhaidh*, boats may have been dragged up the sandy beach below the storm bar on the high tide, while other sites, such as *Loch na Ribhe* and *Bàgh na Seann Dòrnaidh*, had built infrastructure such as nausts, jetties and slipways adjacent to the working area. At *Bàgh na Seann Dòrnaidh*, the presence of a boulder-edged slipway at the north end of the loch, just below the processing site (Figure 5-31), indicates that this slipway could have been used to haul heavily laden boats in at high tide and unload their cargo there. Once the seaweed was brought up the slipway, everyone would fill their creels with the dripping, heavy seaweed from the shoreline and continue up the tombolo over the precarious beach cobbles in their bare feet, made more slippery by the seaweed dripping down their backs through the willow creels. They would then dump the seaweed across the rough-hewn drying walls, then go back for more until the boats were emptied, perhaps only resting or eating as the tide allowed. For at least the

first two weeks of the harvesting season, they would tend the drying seaweed by turning and stacking it until enough was dry for the first burning and hoping that any inclement weather would not ruin the season's harvest.

5.4.3 Burning, final production and storage

As detailed in Chapter 4.8.3, kelp burning was the most arduous for those immersed in this work, consuming up to 24 hours. The natural geology of the tombolos and storm bars in Coigach provides an ideal place for the manufacture of kelp: most of them are situated well away from any settlements, have convenient landing places on which to construct infrastructure, and the cobbles or shingle were quickly transformed into wall, shelters, and pits. The hollowing out to make pits in the cobbles instead of on soil or sand brought an advantage. It ensured better control of heat and air while burning and eliminated the risk of contamination from sand and small pebbles; the result was a higher quality kelp that could command better prices in the market.

The burning would begin with starting a fire in the bottom of the pit, perhaps with peat, hay, heather or dried seaweed used as kindling. The previous year's charred remains would be incorporated into this year's burning. As the heat intensified, dried seaweed was gradually added, causing the bladders of the wracks to burst due to the rising temperature. Immediately, the kelpers were confronted with thick, acrid smoke that resembled the smell of burning rubber (Figure 5-49). Anyone unfortunate enough to be standing downwind would experience the unpleasant odour directly, causing irritation to the face and eyes. Once enough seaweed was added and the fire was sufficiently intense, the stirring process would begin, requiring careful attention over 24 hours. Stirring, while a necessary step to bring about the clay-like consistency, would create more smoke and black soot, covering the ground downwind in its blackness. The thick cloud of smoke obscured visibility, making it challenging to work on the uneven surface of a storm beach. On warm days, the rocks and cobbles retained the sun's heat, adding to the hot atmosphere of the kiln. The smell from the thick smoke would have pervaded everything: clothing, hair, and the environment along the coast.

During the burning, there would be continuous activity between landing more seaweed for drying and tending non-stop to the burning process. As one pit’s kelp was cooling, the next pit could be started until all the pits were in use, depending on the amount of seaweed brought in that season. The kilns' smoke and fire burned day and night, visible from offshore. For at least six weeks until the end of the season, the kelpers would have endured a relentless schedule of shifts between resting in rough shelters, foraging for shellfish, eating the meagre provisions of oatmeal, burning, breaking blocks, unloading seaweed and loading finished kelp blocks into waiting boats in the long summer days.



Figure 5-49: Experimental kelp burn, Eilean Mhàrtainn, September 2021. This image shows how thick and choking the smoke is, even at the start of burning.

5.4.4 Transporting the kelp to markets in Liverpool from Eilean Mhàrtainn

The hub for transporting kelp to market for Lochbroom and Coigach was *Eilean Mhàrtainn* (Isle Martin). Once the kelp was cooled and lifted out of the pits, it was cut into blocks using crowbars. These kelp blocks were then loaded onto small boats, rowed to the channel at the south end of the loch, near the township of Ribhe, and down the coast to Eilean Mhàrtainn. Similarly, the cleared slipway behind the site at Bàgh na Seann Dòrnaidh suggests that it was also used for this purpose.

The pier at Eilean Mhàrtainn was suitable to allow cargo schooners to call in to either deliver cargo or collect shipments, such as kelp or cured red herring (Richards, Eric and Clough 1989: 93). The documentary evidence does not say if any of the entrepreneurs who leased the kelp shores had hired the estate ground officers, as was suggested in 1779 by Hector MacKenzie to John Ross (E746/76/13(3) 1779) or if they brought in their own managers. When Coigach was under the control of the Annexed Estates, it was stipulated in the terms of the lease that the leaseholders would be responsible for hiring and paying the kelpers, as well as negotiating insurance and commissions with any kelp agents or merchants.

In 1800, John Nicolson from Skye held the lease for Tannara Mòr from James and Donald MacDonald, father and son merchants and tacksmen from Skye, who had brought in fishermen and curers from Skye and Gairloch (Skinner *et al.* 2018: :4-7). In addition to the lease of Tannara Mòr, Nicolson also held the lease of the Coigach kelp shores. Given Nicolson's reputation for being a shrewd businessman, it was likely that he was doing the negotiating, from hiring the kelpers to overseeing the on-board weighing and the final prices with the merchants in Liverpool. Daniell's engraving (Figure 5-50) illustrates the bustling activity in Lochbroom during the time Nicolson oversaw the herring and kelping businesses. This engraving shows small open-decked double-ended boats that may have been used for transporting kelp and wet seaweed along the Coigach coast.

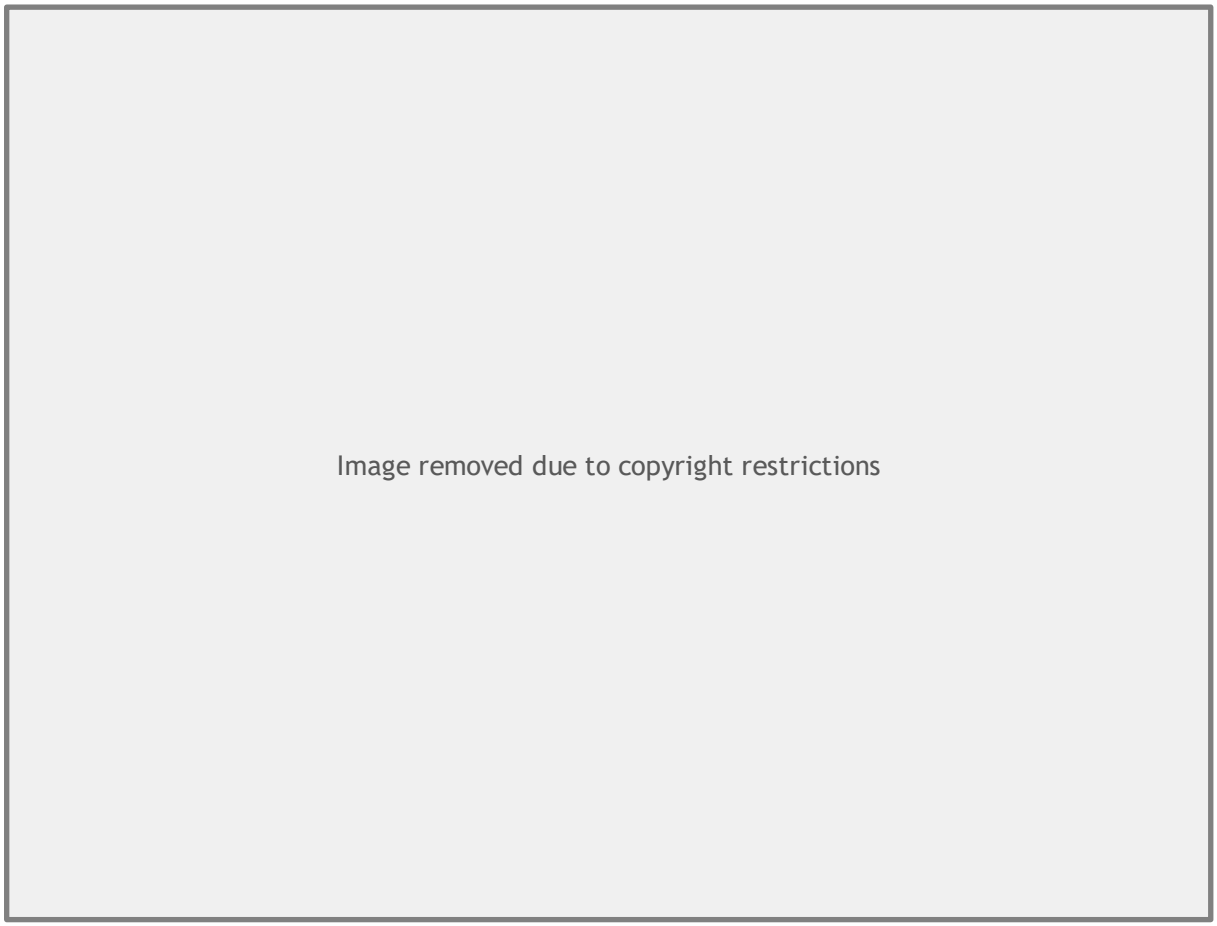


Figure 5-50: Pier at Tanera, Loch Broom. William Daniell. This view of the Tannara Mòr quay overlooks the Coigach mainland. This engraving was created when Nicolson held the lease for Tannara Mòr. Image obtained from https://artcollection.dcms.gov.uk/artwork/14036/

From the limited shipping notices and John Ross's 1779 proposal, it can be estimated that Coigach and Lochbroom may have averaged between 30 and 40 tons per year, which would be approximately 600-800 tons of wet seaweed. A survey of the littoral seaweed in Scotland conducted in the 1940s by the Scottish Seaweed Research Association (Jackson, 1948:138), found that Lochbroom produces approximately 38 tons of littoral seaweed, (specifically, *fucus* species) per acre. However, it is impossible to determine if this amount was consistent each year, as weather conditions often affected the success of the kelp burning season.

The shipping notices in the 1790s where Eilean Mhàrtainn is mentioned come primarily from Liverpool, with lesser references to Greenock, and Leith. Iver McIver is identified as the merchant managing kelp consignments in Liverpool, along with other goods such as wool in the same shipments. Iver McIver and his brothers, Peter and William, were merchants from Greenock; their grandfather was believed to have originated from Uig in Lewis (Campbell, Peter Colin 1873).

This same MacIver family were said to have originally come to Lewis in the 17th century from Leckmelm in Lochbroom when the Seaforth MacKenzies took possession of Lewis. The McIver brothers eventually settled in Liverpool, becoming merchants and shipowners, ‘having almost a monopoly of the trade between Liverpool and Glasgow’(Campbell, Peter Colin 1873: 106). From the Liverpool docks, the McIvers negotiated sales with soap-boilers and glassmakers in the city.

5.5 Conclusion

The kelping industry in Coigach was perhaps more short-lived compared to the industry in the kelping estates such as South Uist and Lewis. This was due in large part to the estate having been annexed in the aftermath of the Battle of Culloden and then after the restoration of the estates, to the lack of capital and capacity to manage their estates directly. This was evidenced by archival documents showing that numerous attempts were made to begin kelping, but it did not really begin until 1779 – a time when the Highlands and Islands were experiencing a famine. Once the estate was returned, the proprietors continued the practice of leasing the kelp shores to outside interests rather than becoming a 'kelp proprietors' themselves, showing that this form of increasing revenue to their debt-laden estate and perhaps improvement in general was not their priority, relying on rental incomes instead. Although the kelp industry was not central to their estate coffers, this does not mean it was not an important income source for someone, as the extensive evidence of the archaeological remains on many of the storm bars around Coigach show; from Ach ’Ille Bhuidhe on Lochbroom-side, the Summer Isles up to Rubha a’ Chòigich and past Ach' na h-Àirde to Bàgh na Garbhaidh. Gray’s contention (1951: 199) that although kelp-making on the west coast mainland remained subordinate to agriculture, being on the outer ring of influence, was '…a scattered, widespread and locally unimportant industry, [which] added only slightly to the returns of agriculture' is true of Coigach only to a degree. Kelp-making in Coigach, although less important to the estate, was an important source of income for the local sub-tenants and cottars – especially since the arable land in Coigach was marginal at best and the district more suited to grazing cattle than growing crops. Fishing was the main industry for the Lochbroom area, particularly on the Lochbroom coast of Coigach. Evidence from some of the sites in Coigach show that these

two industries were operating within the same space, perhaps at the same time of year, sharing infrastructure of slipways, nausts and piers. Kelping also brought in cash for the years the fishing failed. Newspaper archives from Manchester have also provided fragments of information of amounts of kelp produced in a year along with the names of ships and their captains, and the merchants who were receiving the kelp. These snippets of easily overlooked information help to fill in some of the gaps about the industry in Coigach.

Although there are at least twelve identifiable processing sites in Coigach, it was not the aim of this case study to explore each site in depth but instead to look at three specific sites that had clear archaeological remains to build up a full picture of the industry within its lifetime, in spite of the lack of in-depth documentary evidence. The archaeological remains of *Loch na Ribhe, Bàgh na Garbhaidh* and *Bàgh na Seann Dòrnaidh* are all similar in morphology and location of processing; on a storm bar at the top of a beach or tombolo with multiple burning pits in proximity, remains of shelters close to the processing area and roughly piled stone alignments for drying large amounts of seaweed. The nature of the remains at each site helped to inform which approach would be the most appropriate to interpret the site. None of these three sites can be described as a 'kelping pendicle' that show participation at the single household level, or as one author termed it as a ‘cottage industry’ (Currie 1927; Grant, Kevin 2016: 150); a small site showing household subsistence farming with kelp-kiln and perhaps a landing stage that was common at Loch Aoineart in South Uist and at the cleared hamlets along the shores Loch Sheilg in Lewis. Instead, they show production at an intense and industrial scale with a seasonally occupied dwelling on or near the burning site and at a distance from the nearest settlement.

Loch na Ribhe was chosen due to it being an important harbour for the northern part of the Coigach peninsula, linking the site to Eilean Mhàrtainn, Eilean Ruisteil, Bàgh na Seann Dòrnaidh, and Tannara Mòr further down the coast. It was at Eilean Mhàrtainn where cargo sloops would call in to collect kelp consignments being brought in by the small but manoeuvrable boats powered by oars and sail. Loch na Ribhe's artificial but sheltered estuarine environment makes it a sea loch, especially conducive to bladder wrack growth to supply the processing sites at both ends of the loch as well as a safe harbour for fishing

boats. The leaseholders of the kelp shores would have had to provide the tools, oatmeal, and possibly boats for the kelpers. There are no records showing what the kelpers' seasonal wages were in Coigach, but like as not, the labour involved was not equal to what they may have received as rents were still rising and the tenantry was falling into arrears, mirroring a general trend in the Highlands and Islands (Richards, Eric and Clough 1989: 144).

The combined sites of *Bàgh na Garbhaidh* and *Rubh' a' Choin* represent the remotest and largest scale of production in Coigach. There are at least nine identifiable pits in the bay alone, along with another significant site at *Rubha a' Choin*. The scale of collecting and bringing seaweed to shore, while the tenantry of Coigach – at least to the end of the 18th century - still had a right to cut seaweed for manure, would have meant competing needs. Once John Nicolson obtained his twenty-year lease of the shores, it seemed cutting for manure was no longer recognised as a right. The story passed down through oral tradition was that he used to rent out shore access to the tenants living adjacent to the shore for cutting seaweed. Living and working so far from home would have been not only backbreaking and hot work but also difficult in terms of gaining enough nourishment to fuel their bodies for six weeks. The site at *Rubha a' Choin* would have been near desert-like with a lack of easily accessible fresh water. The environmental effects of production here would not have been small, from the scale of harvesting seaweed and its effects on biodiversity to the air pollution from the smoke of the burning pits. There were years when herring fishing was unsuccessful. Some reports from the 18th century attributed this to the over-exploitation of seaweed harvesting for kelp and its impact on herring spawning during that time of year (McErlean 2007: 92). Whether the actual failure of the herring was due to industrial level seaweed exploitation and/or over-fishing remains to be seen – the point being that even in the 18th century, there were environmental concerns about the effects of extensive kelp burning.

Connections within Coigach examined the material culture linked to movement, alongside the relationships with Lewis formed by merchants from Stornoway, including the historical ties of the McIvers in Liverpool to both Lochbroom and Lewis. These merchants initiated the fishing and kelping industries in Coigach. Additionally, connections were formed with the Isle of Skye and Assynt through figures like the MacDonalds and John Nicolson.

The material culture of movement connected to the sea is in evidence throughout the region: boats, nausts, slipways and jetties in Coigach. For example, at Bàgh na Seann Dòrnaidh, this infrastructure is still visible in and around the processing site atop the tombolo. *Eilean Ruisteil*, accessible on foot at low tide from the tied island at the end of the tombolo, is part of this harbour scene and connectivity, with a further kelp processing site on its north-facing storm bar. Between fishing and kelping, the scene in *Bàgh na Seann Dòrnaidh* would have been a very busy one, with boats coming in and out, being tied up or coming in on the high tide to bring in load after load of seaweed and going out to *Eilean Mhàrtainn* with the finished kelp.

The evidence from these three sites demonstrates that, contrary to some historical sources claiming that kelping was unimportant or small-scale, it was a significant industry in the region. The scale and number of processing sites, along with the substantial amount of labour and materials required to produce the kelp that reached the market, indicate that the industry was intense from the 1790s to 1819, that is, this was during the profitable period of the Napoleonic Wars.

By piecing together fragments of documentary and oral evidence along with archaeological remains found in the landscape, we can gain a clearer picture of the kelping landscape in Coigach during its boom years. This coastal landscape reflects a maximised exploitation of the intertidal zone and highlights the hard and exploitative work of the people involved in the industry, resembling that of the larger kelping estates in the Outer Hebrides across the Minch.

Chapter 6 The Glassary Factory and Tiree's Seaweed Economy: Technological Advances and Social Challenges, 1863-1932

Tiree (*Eilean Thiriodh*) emerged as a key centre for the kelp industry's next phase, focusing on iodine extraction and, to a lesser extent, the production of potash and other chemical by-products. The seaweed industry in Tiree has a rich history that spans over 250 years. It began in the mid-18th century with alkali extraction, said to have been introduced c.1746 by the 3rd Duke of Argyll (O'Dell and Walton 1962: 195; Petre 2019: 19; Rymer 1974: 143) and continued until the early 21st century, concluding with the end of the alginates phase. As a result, Tiree's seaweed industry is one of the longest running in the region, alongside those of Orkney and the Uists.

Analysing Tiree's coastal landscape is a crucial part of the thesis, focusing on key research questions about the complex entanglements on the island during the iodine phase. Specifically, this chapter explores how scientific advances and industrial developments impacted the lives of the island's inhabitants, including aspects such as local labour practices and land ownership dynamics

By placing Tiree within the broader thesis framework, the interplay between technological progress and social change is highlighted. This dynamic illustrates how industries have influenced both the economic landscape and the fabric of society in a rural island community. In spite of their role in contributing to economic growth, the core argument contends that these innovations have also precipitated significant challenges, including displacement and socio-political unrest.

This coastal landscape study aims to illustrate the dual nature of progress: how innovation and opportunity can thrive alongside the emergence of conflict and disruption. By doing so, it seeks to provide a nuanced understanding of the complexities encountered by the island's inhabitants during this transformative period, thereby contributing to a broader discourse on the effects of industrialisation in similar historical contexts.

The burning of seaweed for the iodine and potash industry commenced in the 1840s in Tiree and other Scottish Islands as kelp-burning for alkali extraction was declining. However, the arrival of chemist Edward C. Cortis-Stanford in 1863, at the request of George Campbell, the 8th Duke of Argyll, marked a turning point. Tiree became the first island to implement Stanford’s innovations in iodine extraction, pivotal in paving the way for more industrial operations at Clydebank near Glasgow, North Uist, and Ireland. Stanford's contributions to seaweed research, particularly his novel method of extracting iodine from seaweed and his later discovery of alginic acid in 1883, were significant, the latter eventually leading to Scotland's third primary industrial phase after WWII, which continues to have a worldwide impact on the food and cosmetics industries (Harvie 2014: 93-94).

6.1 *Tiriodh, an Tìr Ìseal* (Tiree, the low-lying land): a geography of sun, sand and kelp forests

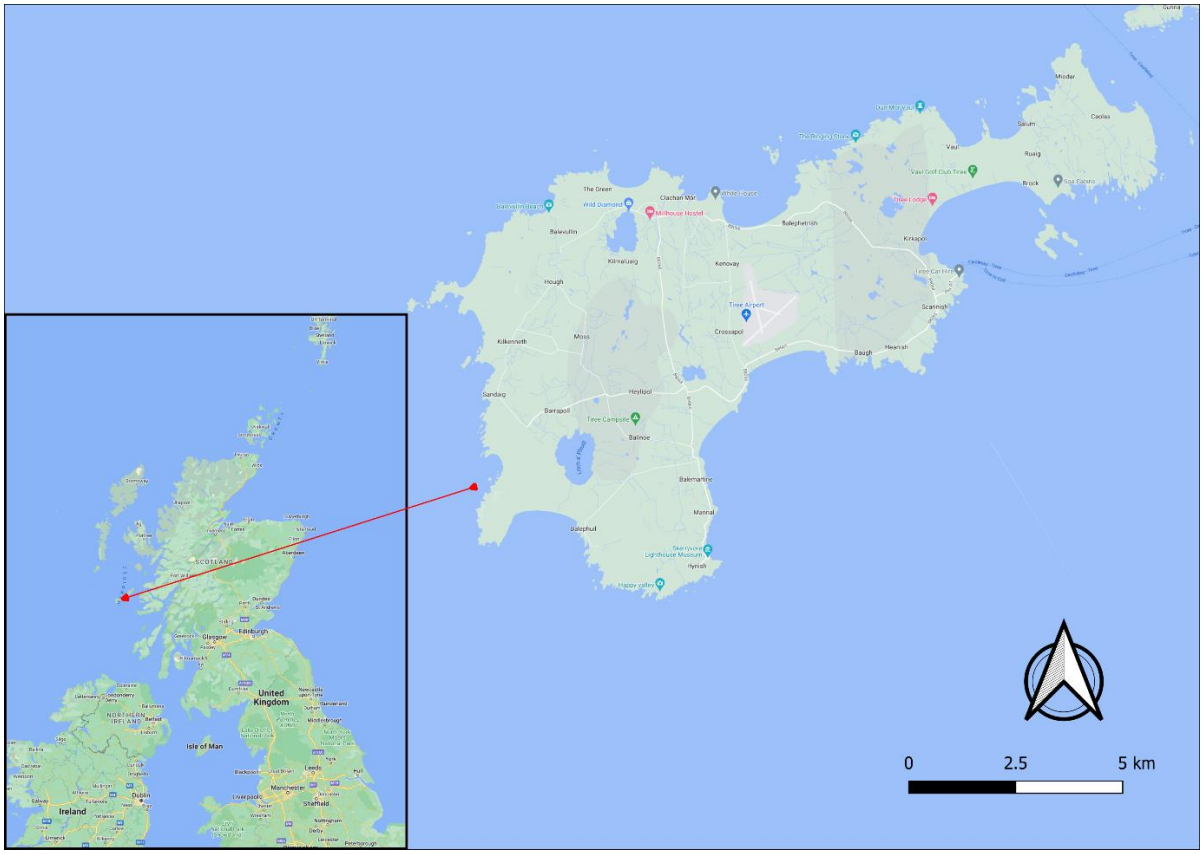


Figure 6-1: Location of Tiree in Scotland. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023

Tiree, along with its neighbouring island Coll, is the most westerly island of the Inner Hebrides, located some 22 miles off Ardnamurchan Point on the west coast of Scotland. It is a low-lying island, measuring some 18.5km at its longest point from *Rubha Dubh* in the north to *Rinn Thorbhais* ; no more than 10km wide at its widest point from Rubha Phort Bhiosg in the north-west Atlantic coast and *Haoinis* in the south-east, and just over 1km at its narrowest between Vaul and Gott Bays in the north. It lies on the Skerryvore Bank, which forms part of the Lewissian Complex. The climate of these two islands is maritime. However, due to their proximity to the Gulf Stream, being low-lying, and being exposed to direct strong waves and wind action from the Atlantic, they tend to be sunny and windy compared to the west coast mainland and other Hebridean islands (Dawson 2003: 2). The Gulf Stream also creates the nutrient-dense conditions of the seas surrounding Tiree and Coll, giving rise to extensive forests of *laminaria* seaweed species (L. *hyperborea and* L. *digitata*)-now generically termed 'kelp' – that grow in the sub-littoral zones along the coast.

The Tiree landscape consists of an outer ring of extensive dune systems and a flat, flower-rich sandy grassland known in Gaelic as *machair*, a cultivatable fertile inner ring whose soil is a dark mixture of sand and peat, and an innermost ring of peat bog known in Tiree Gaelic as *sliabh*. Sandy beaches are interspersed with rocky promontories, cliffs, and shingled beaches. There are only three hills on the island, with the highest point in the southwest, called *Beinn Haoidhnis* (Ben Hynish), which rises to 151m above sea level.



Figure 6-2: Beinn Haoidhnis (Ben Hynish) from Am Baile Nodha (Balinoe). Beinn Haoidhnis, the highest point on Tiree, is on the south-west coast. The fertile 'inner ring', which comprises mixed sand and peat soil, can be seen in the foreground.



Figure 6-3: Tràigh Bhì (Balephuil Bay Beach) towards Ceann a' Bharra (Kennavara). White-shell sand beaches and their associated dune systems surround Tiree. On shores such as this, winter storms and high tides throw *Laminaria* species onto the shore.



Figure 6-4: Rocky shore of Lewissian gneiss near Haoidhnis an Iar (West Hynish). It is on shores like this that shingle beaches can be seen on Tiree.

6.2 Advances in the Seaweed Industry: Edward Cortis-Stanford's Chemical Innovations and Tiree

Following the decline of the kelp industry for alkali extraction, the potato famine and high unemployment in Tiree, the 8th Duke of Argyll encouraged Edward Charles Cortis-Stanford to establish an iodine factory on the island as a means of stimulating the local economy while also securing his own renewed economic benefit from the estate's seaweed resources. In winter, significant amounts of laminaria species wash ashore after winter storms in many of the Scottish islands, particularly in Tiree. Because of this, Tiree was an ideal location to set up tangle gathering for both iodine extraction and, later in the 20th century, for alginates. The next section explores the history of this phase, from the discovery of iodine in France to Stanford's part in its development in Tiree.

The end of Alkali, beginning of Iodine



Figure 6-5: Sample of solid iodine. Image obtained from Wikimedia Creative Commons ©Lucem-Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=21325951

In 1811, French saltpetre manufacturer Bernard Courtois sought to extract saltpetre from kelp for gunpowder but accidentally created iodine while using excessive sulphuric acid to clean copper pans (Childs, Peter E 2022: 200; Kelly 1961; Wisniak 2001). Iodine is not found in its pure form in nature but exists in

compounds. It is abundant in the oceans and therefore can be sourced from seaweeds, sponges, and certain corals. Until the late 19th century, seaweed, especially the laminaria species, was Europe's main source of iodine extraction until the discovery of sodium nitrate (caliche) in northern Chile. Iodine content in seaweed varies with factors like season, temperature, and latitude, with higher concentrations typically found at northern latitudes (Wisniak 2001: 521).



Figure 6-6: Iodine vapour in a glass flask. Image obtained from Wikimedia Commons ©Matias Molnar-Laboratorio Quimica Inorganica II-UBA, Argentina, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=1936001

Iodine became valuable in medicine as a dietary supplement, thyroid treatment and anti-bacterial agent, and Louis Daguerre used silver iodide in photography by 1830. It remains important in medical applications and is listed in the World Health Organisation's Model List of Essential Medicines (2023).

Interest in iodine grew in the United Kingdom, as noted by Samuel Parkes (1817) and Andrew Ure (1817). Parkes described iodine as a remarkable substance with potential uses in colour-making and printing (pp.115-116). In the same year, Ure, a Chemistry professor at the Anderson Institute, now the University of Strathclyde, released the findings of his experiments on extracting iodine from kelp residues. His primary objective was to discover a more convenient and cost-effective method of producing iodine. Ure sought to develop a cost-effective method for extracting iodine from kelp, driven by high import prices (1817: 161).

During the Industrial Revolution, Glasgow emerged as a key centre for the chemical industry, supported by its universities, which produced influential chemists like Charles MacIntosh and Ure. The city's location and thriving textile industry also contributed to its development, with the St Rollox Works playing a vital role in producing iodine and potash (Christie 2018). Moreover, Glasgow held prominence as the centre for glassmaking and soap-boiling in Scotland from the middle of the 18th century. During the peak years from 1790 to 1815, these industries were the primary consumers of kelp. Even after the industry's decline after 1820, they continued to utilise kelp up until around 1845, despite the availability of the more affordable and purer LeBlanc method of extracting soda. Peter Childs (2022: 200) suggests that some soap-boilers continued using kelp soda 'probably because tradition dies hard'. Whether this was the case or not, the ongoing use of kelp meant that it created a market for its by-products, namely iodine and potash, although demand never reached the levels witnessed during the boom years of kelp prior to the end of the Napoleonic Wars.

From 1814 to 1840, iodine extraction from kelp residues was carried out using the waste products from soap-boiling, also called soap leys. This point marked the beginning of small-scale chemical manufacturing of iodine in Glasgow. This led to the city having the largest and the most numerous iodine production facilities in Europe for at least fifty years (Childs, Peter E 2022: 200; Henderson, George G 1901: 182; Wisniak 2001: 519). By 1863 the combined Glaswegian iodine works were processing 14,000 tons of kelp annually, which in turn produced about 150 tons of iodine (Booth 1963).

The situation in Tiree from 1805 to the arrival of Stanford in 1863

Tiree, Coll, Mull and Morvern were key kelp-producing areas on the Duke of Argyll's estates until the early 19th century (Argyll Estate Instructions1964). The repeal of the Salt Tax and the introduction of the LeBlanc soda extraction method led to a decline in kelp prices, impacting both the estate and its subtenants. Unlike other estates with rack-renting, the 5th Duke of Argyll linked rents to the capacity of his tenants to pay in preference to increasing rents (1964: xxxv). In contrast, a short extract from '*Manitoba',* a poem by the Baile Mhàrtainn bard John

Maclean (Cameron, H. (ed.) 1932: 164-5) challenges the view that kelp production benefited its workers in Tiree and identifies an additional motive for immigration: *'S am beagan a dh'fhan dhiu air rudhachadn mara* / (The few of use left are chased to coastal points) / Ga'n iomain gu cladach, 's ga'm feannadh le *màl* (Driven to the shorelines and flayed by the rents). However, the Duke expressed caution about overreliance on kelp due to its price volatility, a concern that proved valid as the kelp industry declined from the 1820s. By the late 1830s, the alkali phase in Tiree was considered finished. The heavy reliance on potatoes also proved catastrophic in Tiree in the potato famine of the 1840s.

In 1847, the Marquis of Lorne became the 8th Duke of Argyll (Figure 6-7) and initiated a programme to reduce the population by promoting emigration, believing that excess population hindered estate improvements. Tiree's population dropped from just under 5,000 in 1840 to around 3,200 by the 1860s (Mulhern 2006: 55-60). Stanford gives detailed descriptions of the poverty-stricken state of the *Tiristich* (Tiree people) in his first year.

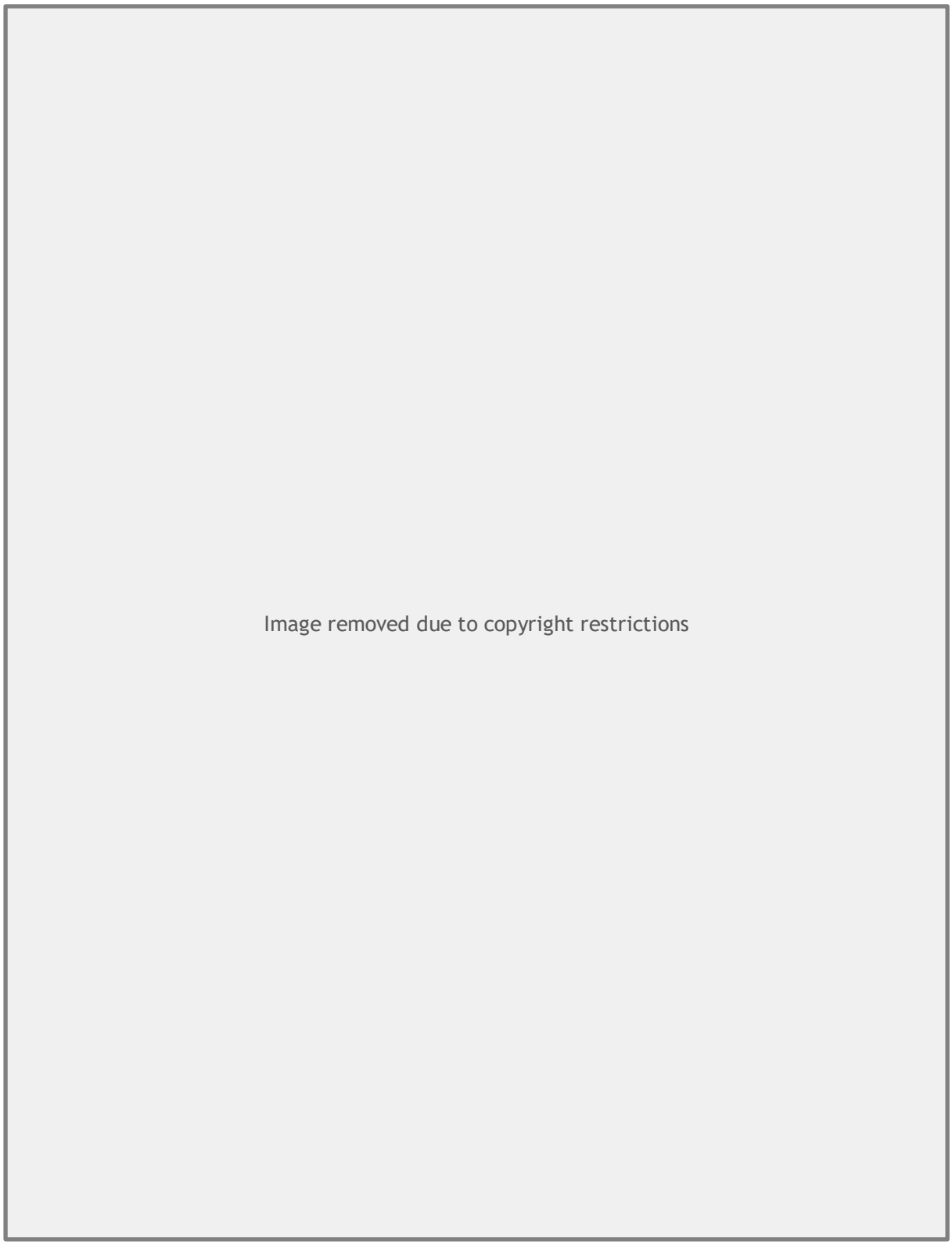


Figure 6-7: George Douglas Campbell, 8th Duke of Argyll, 1823-1900. Photo and published by William Walker 1865. © National Portrait Gallery, London

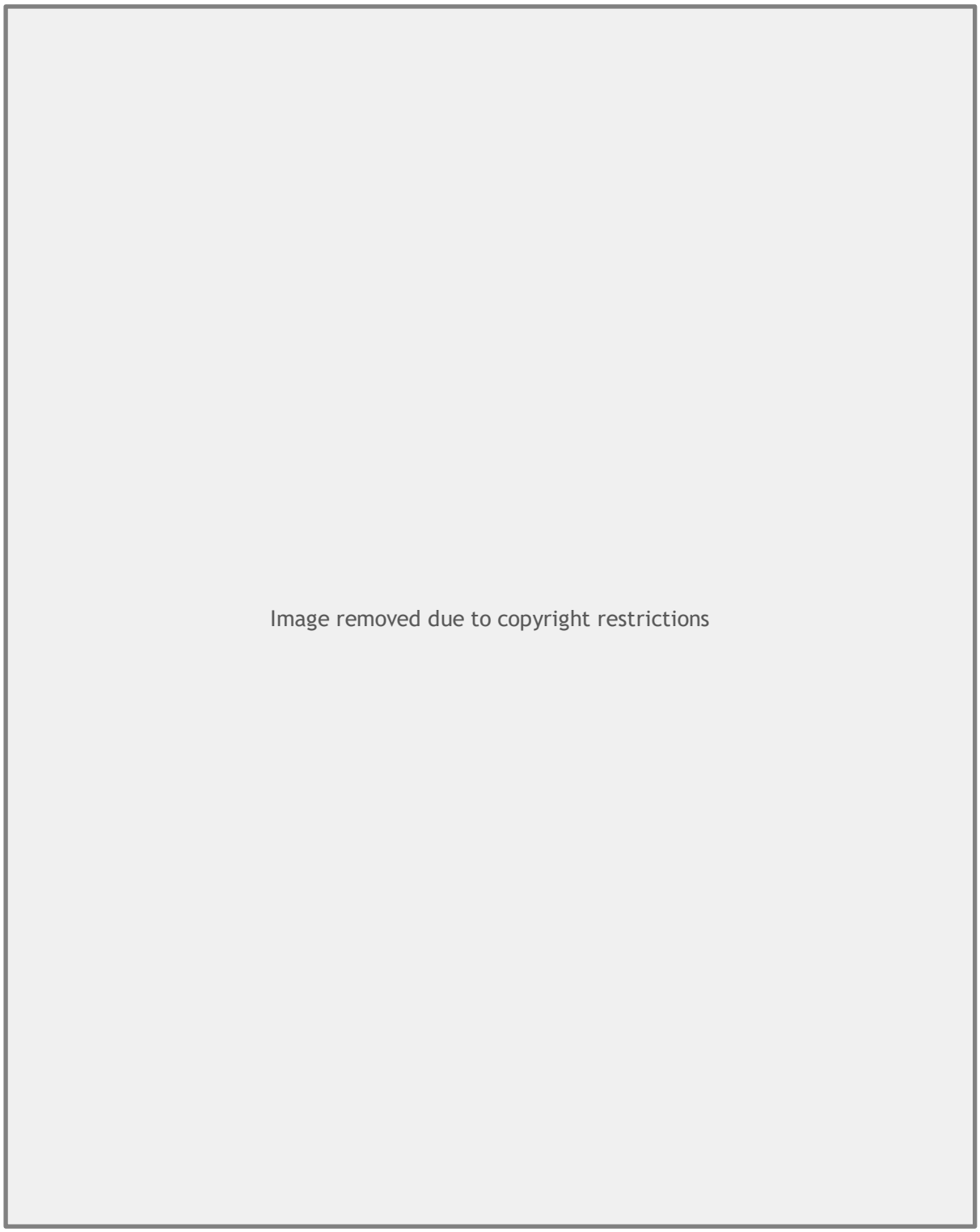


Figure 6-8: Edward Charles Cortis Stanford c1858. Image obtained from https://www.photohistory-sussex.co.uk/Cortisblog.htm

Edward Charles Cortis-Stanford

Edward Charles Cortis-Stanford (1837-1899)(Figure 6-8) was central to pioneering advances in iodine manufacture and chemical research into seaweed uses (Booth 1963; Childs, Peter E 2022; Harvie 2014). His research on seaweed significantly impacted the iodine industry in Scotland and Ireland during the late 19th century. As the discoverer of alginic acid, he played a crucial role in developing the alginate industry, which led to the third industrial phase in the second half of the 20th century. This development has had a global impact, as alginic acid is still used as a component in various food and cosmetic products (Booth 1963; Harvie 2014).

Between the ages of fifteen and twenty, Stanford showed remarkable aptitude in chemistry and entrepreneurship. He began lecturing and writing scientific papers in addition to running his own photography business at a young age. His ongoing experimentation with seaweed, which began on the Sussex coast and led to the discovery of alginic acid in 1883, exemplified his progress in finding more efficient methods for extracting iodine (Harvie 2014: 78-79; Simkin 2014). The detailed plans for his iodine factory in his notebook (TD871/4 1862–1864) anticipated a new academic discipline – chemical engineering - which did not become part of university syllabi until the early 20th century (Hanson 2024).

In the late 1850s, Edward Stanford began experimenting with seaweed while working as an itinerant lecturer in Chemistry in Worthing, Sussex. This research culminated in a public lecture entitled ‘On the Scientific Applications of Seaweed’, for which he received a £100 prize through the Society of Arts from Sir James Trevelyan in 1862. His lecture and subsequent paper (Stanford 1861) attracted the notice of George Campbell, the 8th Duke of Argyll (Figure 6-7). The 8th Duke, known as the ‘intellectual duke’ because of his varied scientific interests, invited Stanford to Scotland to develop the iodine industry on his Tiree estate (Harvie 2014: 80; Napier Commission 1884d: 3056).

When Stanford first arrived in Tiree in 1863, he quickly realised the challenges of operating on an island with limited facilities and a struggling population. He

remarked on his experience staying at the inn on the island in his private journal *Retrospect of 1863* (TD871/4 1864):

> The accommodation is most execrable, nothing but fish and eggs to eat, the most filthy water to drink and no stimulant of any kind sold in the whole island. … I found every supply very bad and dear, the people poor and famished and the storekeepers flourishing.

He documented these challenges in the first year of operations, noting issues like the difficulty of shipping his cast-iron equipment and interacting with the local Gaelic-speaking population, who viewed him with suspicion. This led to conspiracy theories about his intentions on Tiree, such as being a French spy. His retrospective journal accounts for various obstacles, including establishing the factory and managing personnel while coping with environmental and logistical difficulties. Section 6.4 goes into further details on interactions between Stanford, the Duke of Argyll and the Tiristich, focusing on interpreting the landscape and archaeological remains with oral history within an iodine commodity chain framework.

6.3 Archaeological remains in Tiree

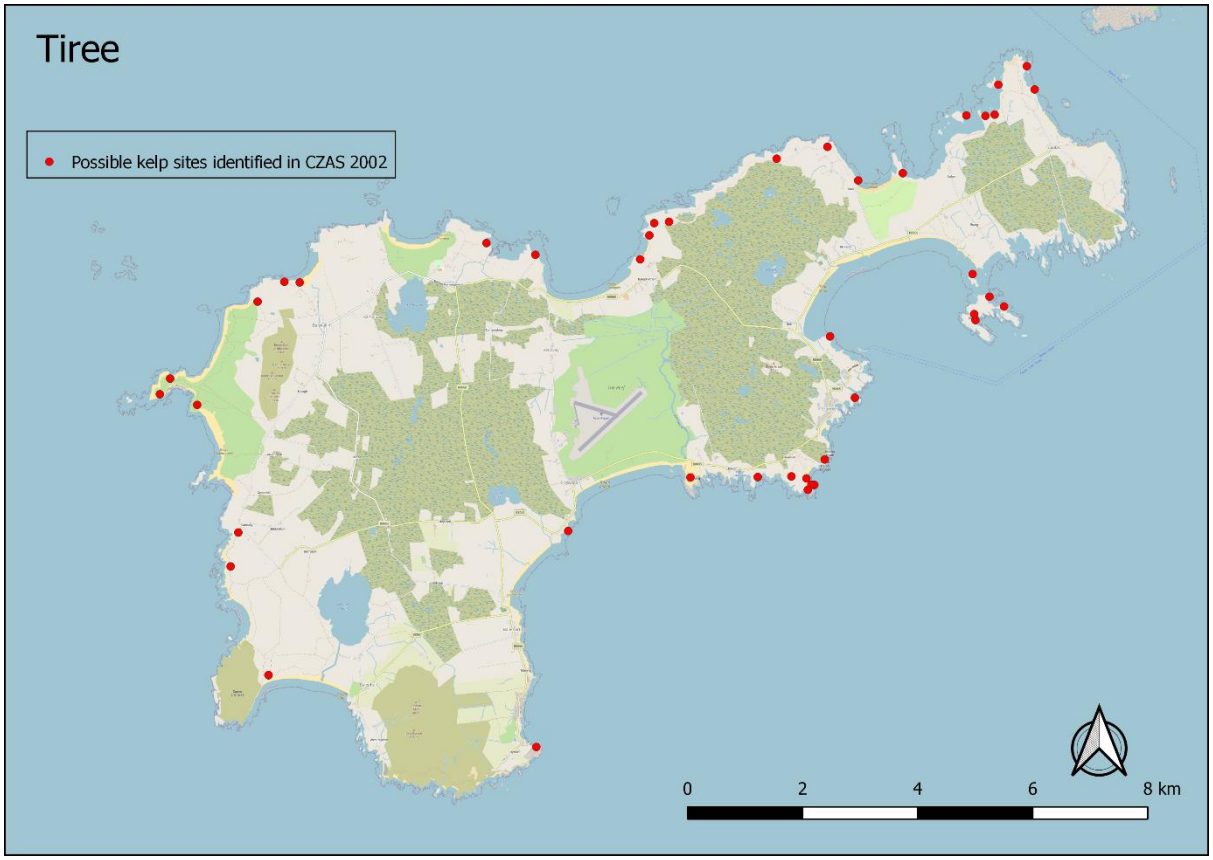


Figure 6-9: Location of sites relating to kelping in Tiree. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023ontains OSM data. Data obtained from ©SCAPE Trust.

The sites shown in the map above (Figure 6-9) are not a comprehensive representation of all the places in Tiree where kelp processing sites have been found. For example, the kilns at Haoidhnis an Iar in the southwest of the island were not surveyed by SCAPE, so they are not represented here but are in the map in Figure 6-10. The map in Figure 6-9 also does not distinguish which sites were from the different phases. The extensive site in the northwest at Cràignis has structures likely used in all three phases in its storm beaches. The Glassary factory, where iodine and seaweed charcoal were manufactured at Baile Meadhanach, is not represented here either. However, what this map indicates is how widespread the processing sites were on all shores of the island.

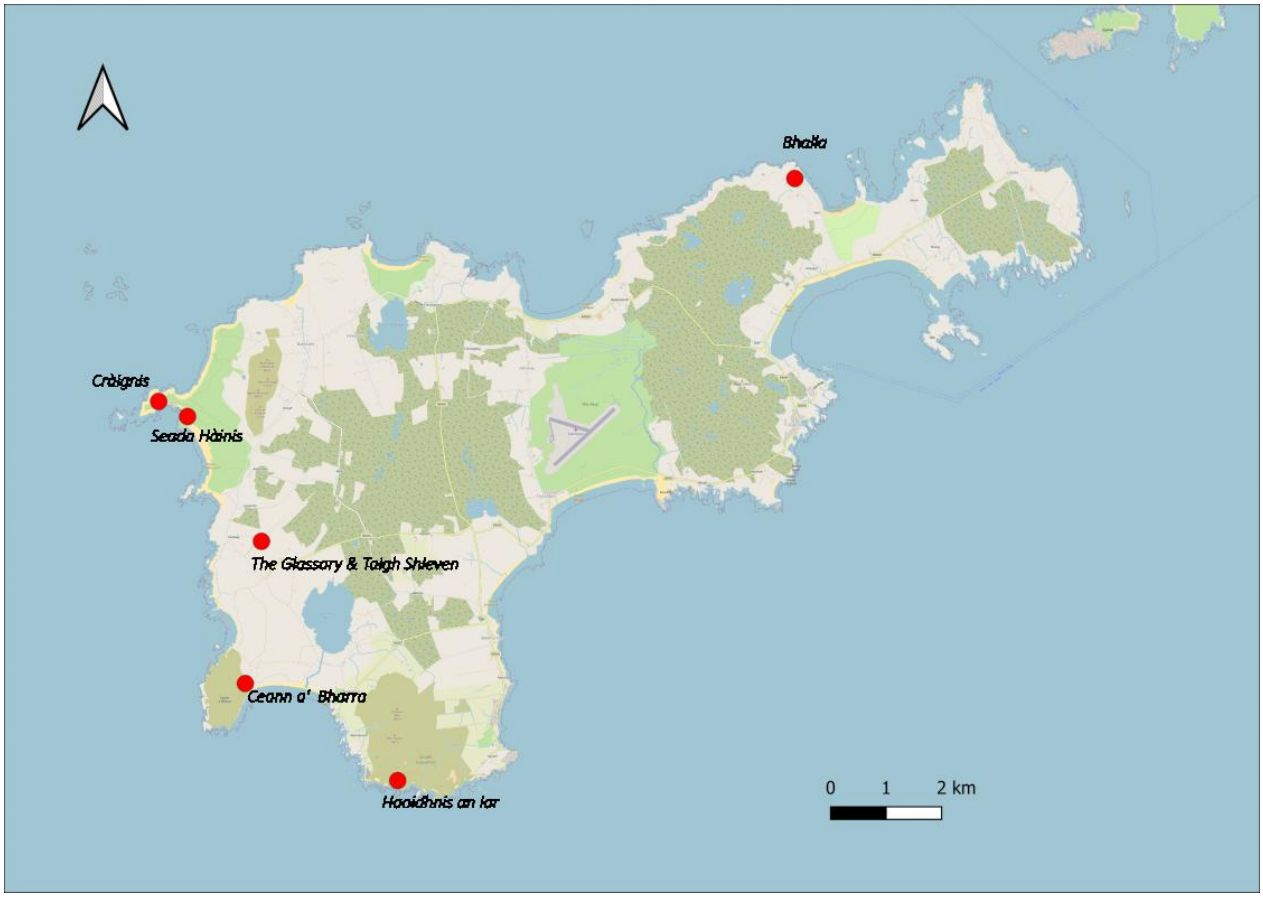


Figure 6-10: Map indicating the sites visited in June 2023. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023

The sites visited in Tiree were the ruins of the Glassary factory at *Baile Meadhanach* (Middleton) and *Taigh Shleven* (Middleton Cottage/Sleven's House) *Haoidhnis an Iar* (West Hynish), *Ceann a' Bharra* (Kennavara), *Seada Hàinis* (the kelp shed), *Cràignis* (Craignish) and *Bhalla* (Vaul). The cigar-shaped trenches in these sites can be seen along most of the shores surrounding Tiree. However, from 1863 to the early 1930s, most of the larger processing sites tended to be located on the island's west end nearest the Glassary factory. As a result, narratives recorded on Tobar an Dualchais (TAD) regarding the seaweed industry in Tiree were from these west end locations. Although there were a number of kelp kilns at Bhalla, it is not included in the narrative because of the lack of oral histories associated with that township and the Glassary.

6.3.1 The Glassary kelp factory and Middleton Cottage

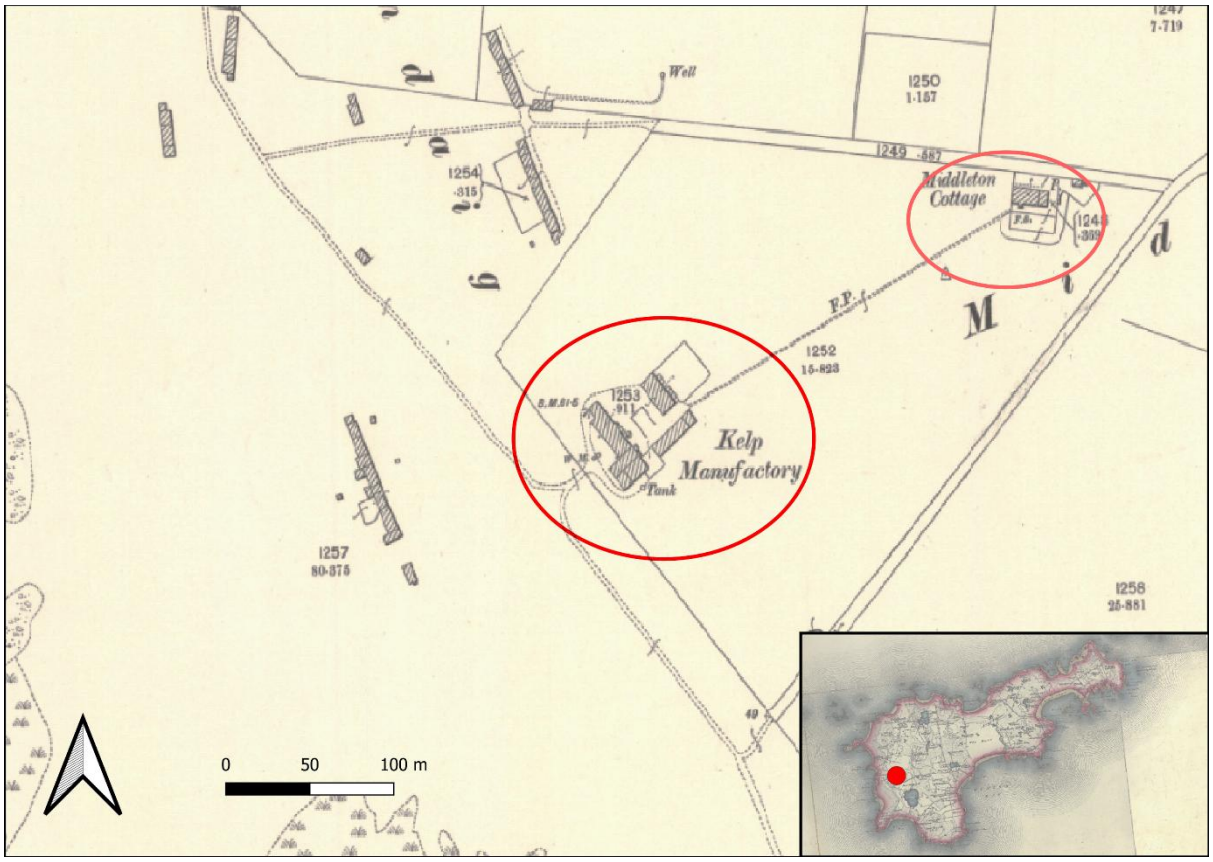


Figure 6-11: Location of The Glassary Factory and Middleton Cottage in Tiree (inset) from 1898, showing the relation of the two sites within Baile Meadhanach. The extent of the factory complex Is also shown, with the lixiviating tank marked. Map obtained from National Library of Scotland https://maps.nls.uk/, OS Map, Argyll and Bute LXIV, surveyed 1898, published 1900.

The 'Kelp Manufactory' noted in the map in Figure 6-11 (NL 94221 43246), known locally as 'the Glassary', was located at *Baile Meadhanach* (Middleton), in the west end of Tiree, mid-way between *Haoidhnis an Iar* (West Hynish) to the south and *Cill Moluaig* (Kilmoluaig) to the north. The Glassary was in operation from 1863 to 1901. Middleton Cottage, also known in Gaelic as *Taigh Shleven* (Sleven's House) (NL 94443 43359), now called Middleton House, was the house Stanford initially rented in 1863 when he was setting up operations. Later, it became the factory manager James Sleven's residence and the company store *Bùth Shleven* (Sleven's Shop). Sleven was the seaweed factory manager from the mid-1860s until its closure in 1901. The map shows a footpath connecting the factory with the house. This footpath remains visible in satellite imagery (Figure 6-12). These two sites sit upon sandy machair, with the factory lying c.450m from the rocky shore. The dry-stone boundary walls in the satellite match the boundary lines of the 1882 OS map.

The remains of the factory now form part of a modern working croft. Only the south wall of what were the stables are still standing on the site. The remaining walls show a construction of dressed stone blocks and mortar. In 2002, scrap metal from the factory was photographed on Grianal Beach (Figure 6-18), indicating where much equipment, including piping, was dumped after the factory was demolished during WWII. Sketch plans from Stanford's notebook (Figure 6-13, Figure 6-14, Figure 6-15) give an indication of purpose of the buildings on the site in the 1882 OS map : drying house, retort house, and re-distillation house.



Figure 6-12: Satellite map regression,the Glassary factory, Baile Meadhanach. The only remains of the factory are the stable walls at the south end of the site, to the right of the track, the footpath between the factory, Middleton Cottage, and the stone-dyke boundary walls. 1882 OS Map obtained from NLS: https://maps/nls.uk/view/228775972. Satellite image obtained from Google Satellite.

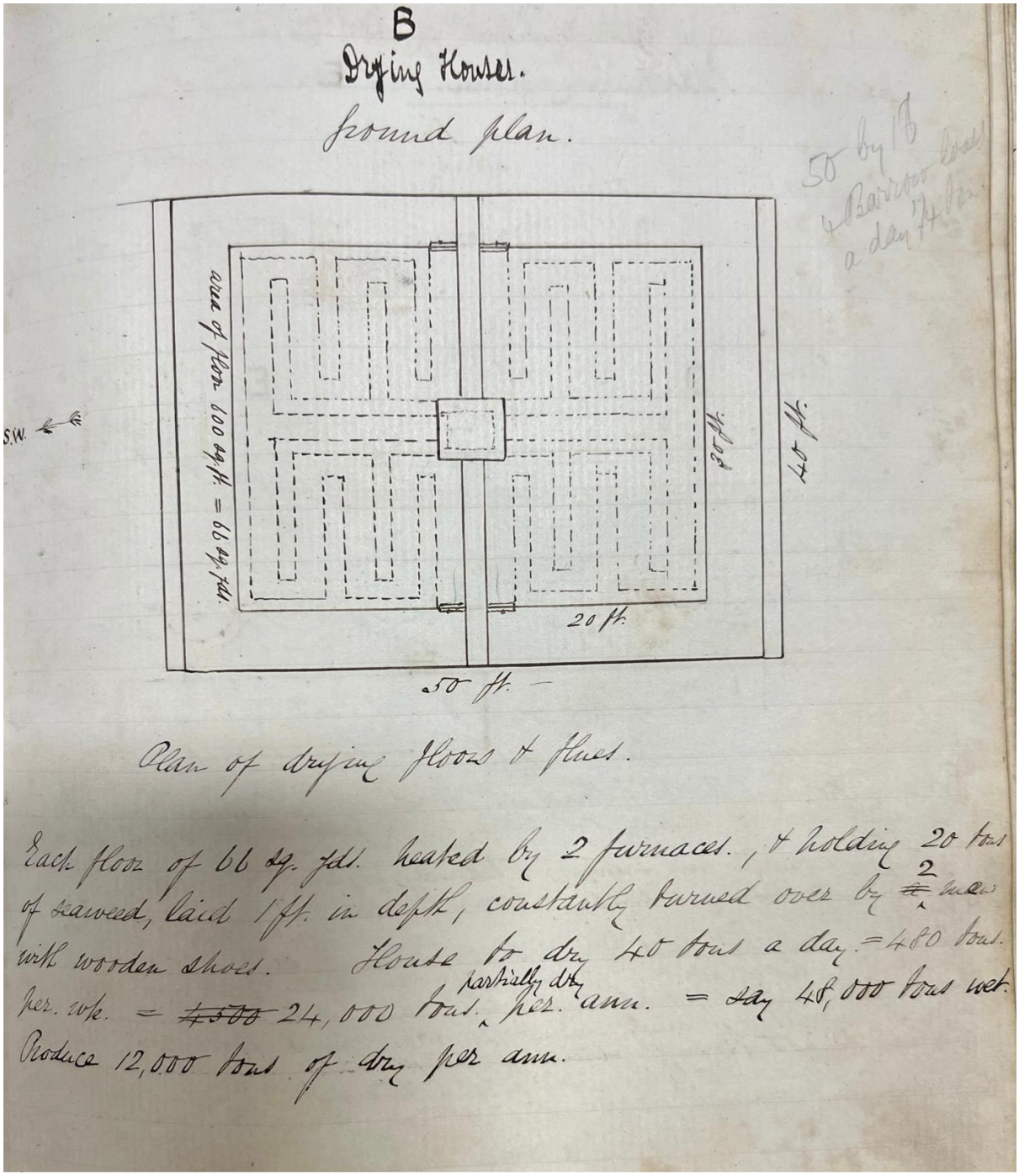


Figure 6-13: Ground plan of drying houses and flues. This building was used to dry the stipes further and burn them into charcoal. From Stanford's notebook (TD871/4 1862–1864)

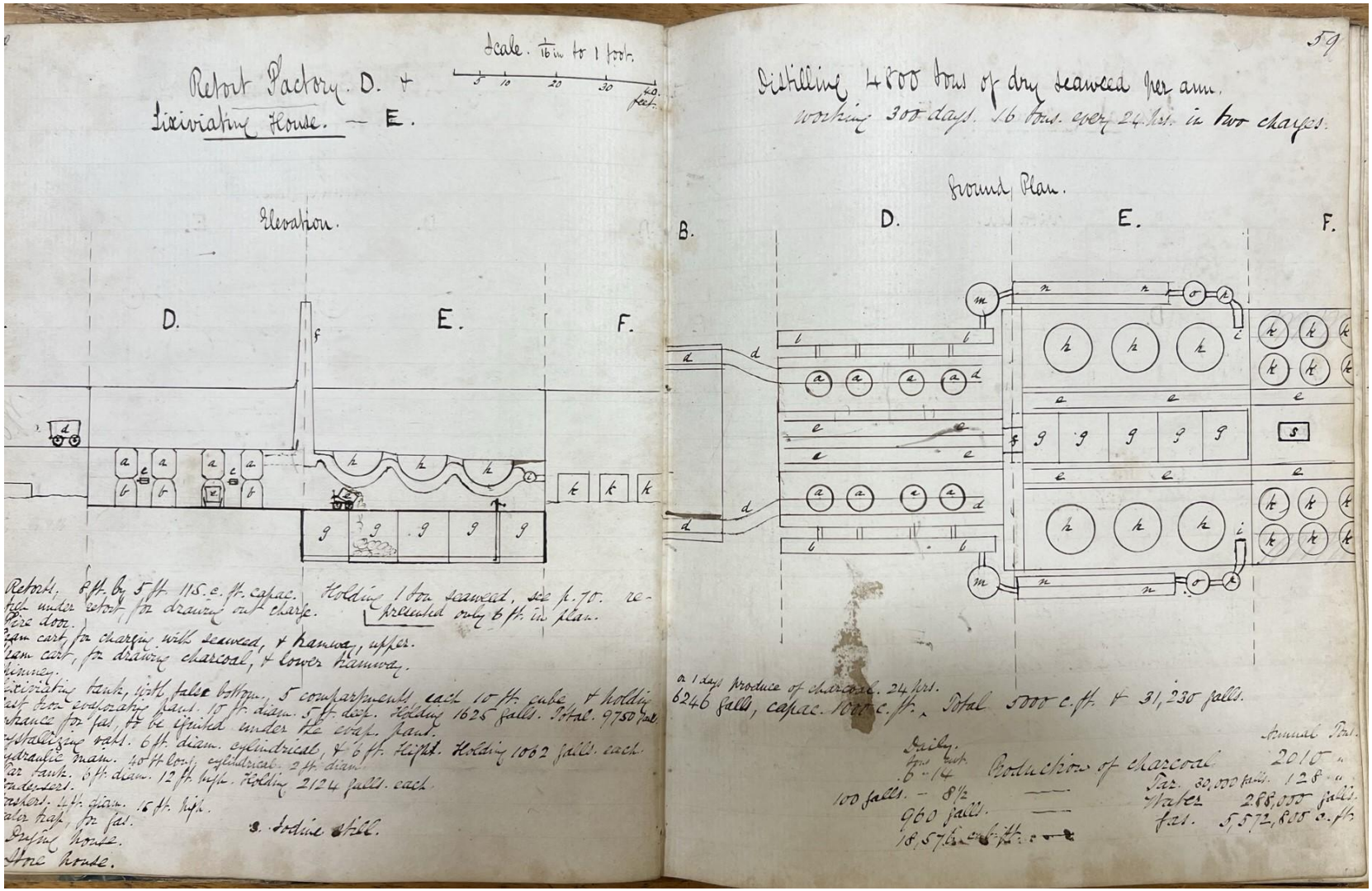


Figure 6-14: Sketch plans of Factory. From Stanford's notebook (TD871/4 1862–1864).

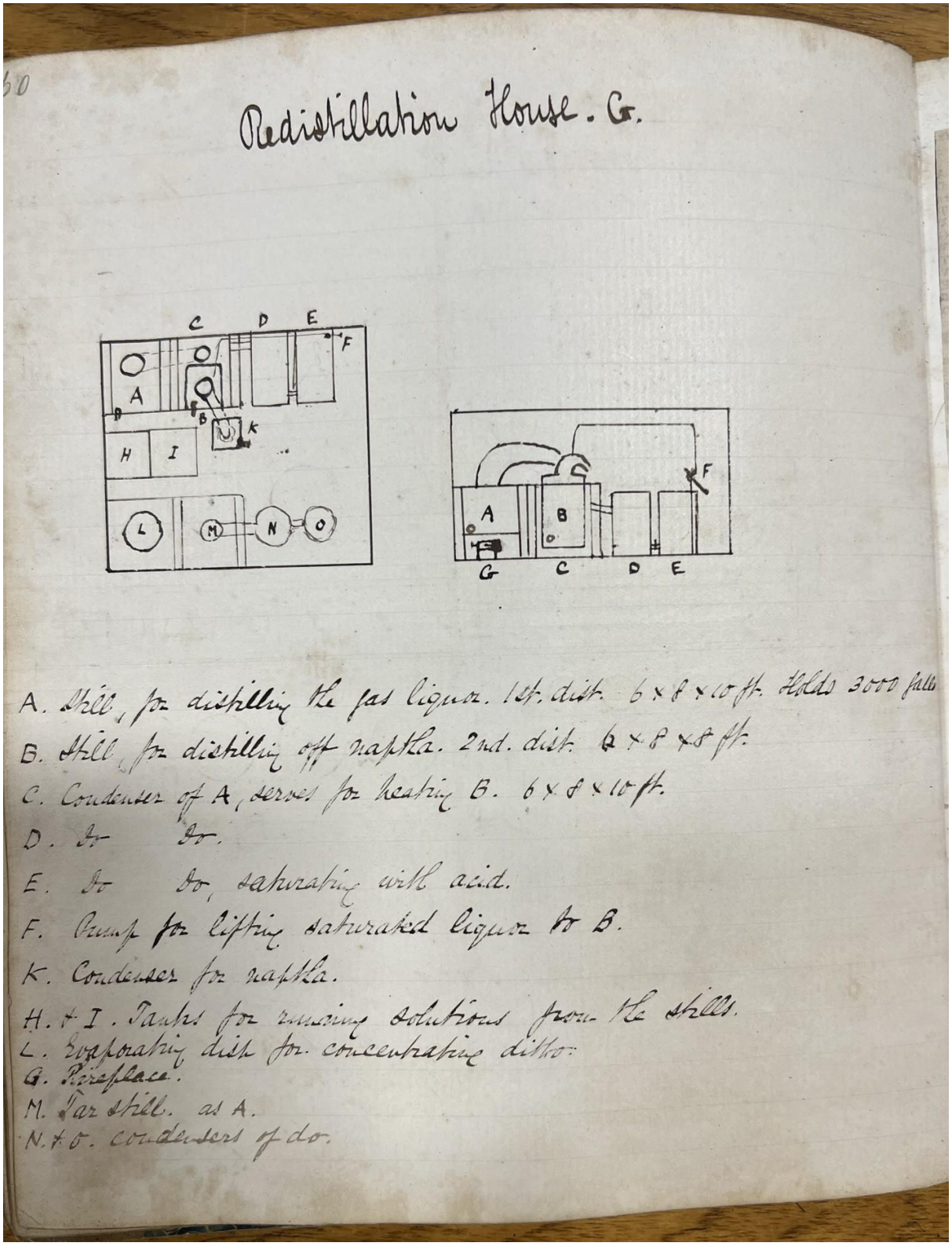


Figure 6-15: Sketch plan of Redistillation house with legend key to explain the components. From Stanford's notebook (TD871/4 1862–1864).

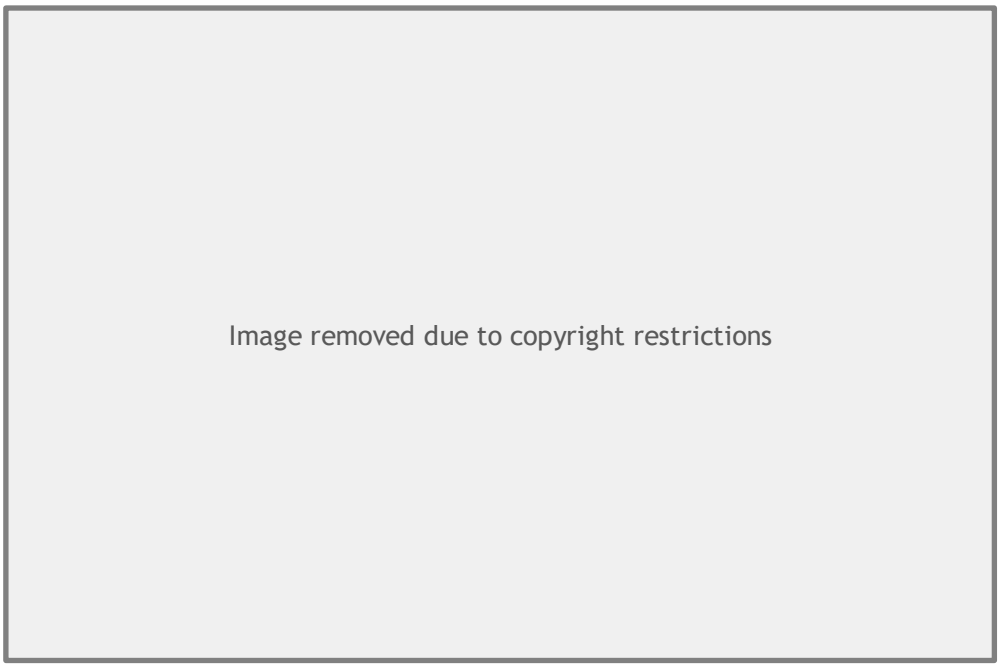


Figure 6-16: The only known photograph of the Glassary seaweed factory showing the roof, the chimney stack and the buildings. This photo was taken in the 1920s, about 20 years after the factory's closure in 1901. Photo obtained from https://www.aniodhlann.org.uk/wp-content/uploads/photos/k/k48.jpg

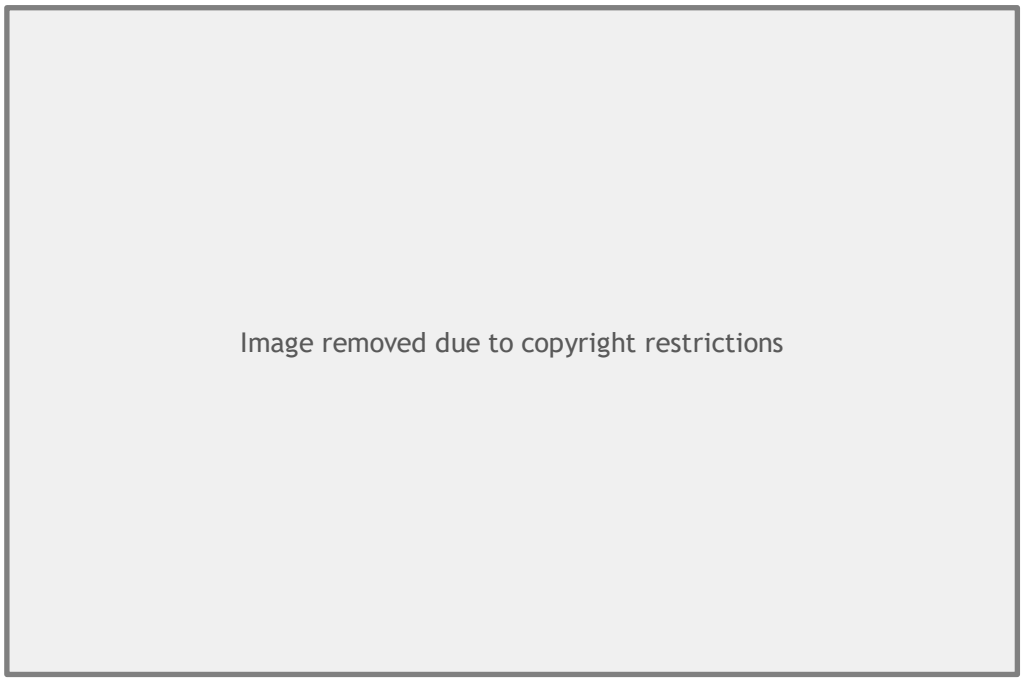
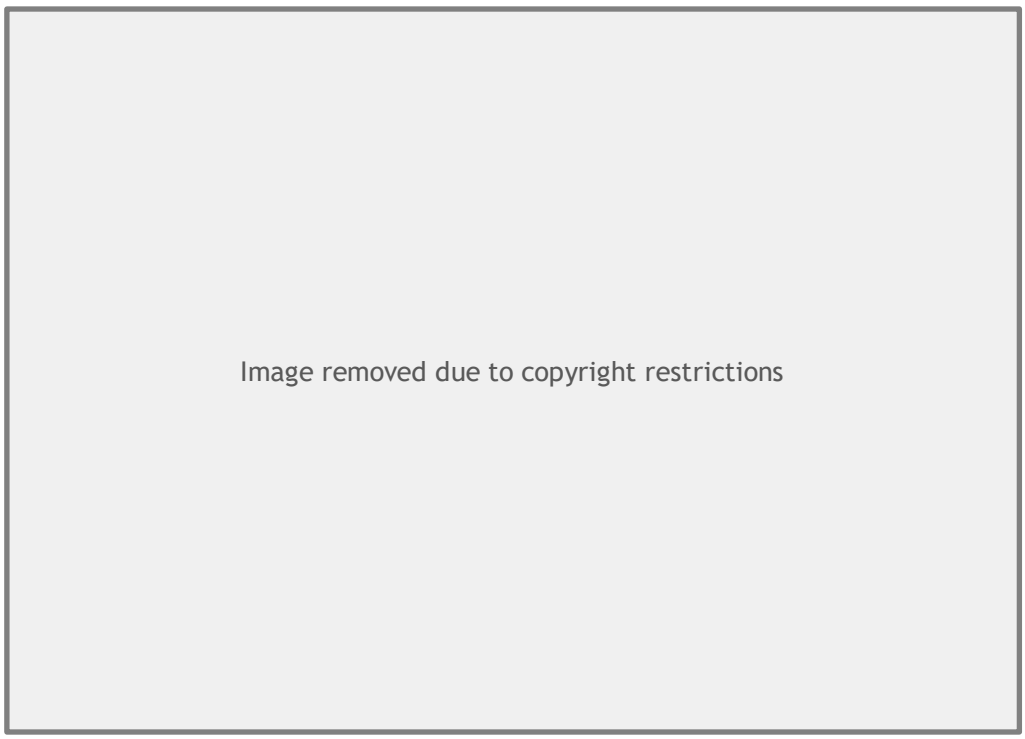


Figure 6-17: The Glassary factory ruins, c. 1930. The factory was demolished in 1941 to provide hardcore for the runways for the RAF station at Reef. Photo obtained from https://www.aniodhlann.org.uk/wp-content/uploads/photos/p/p29.jpg



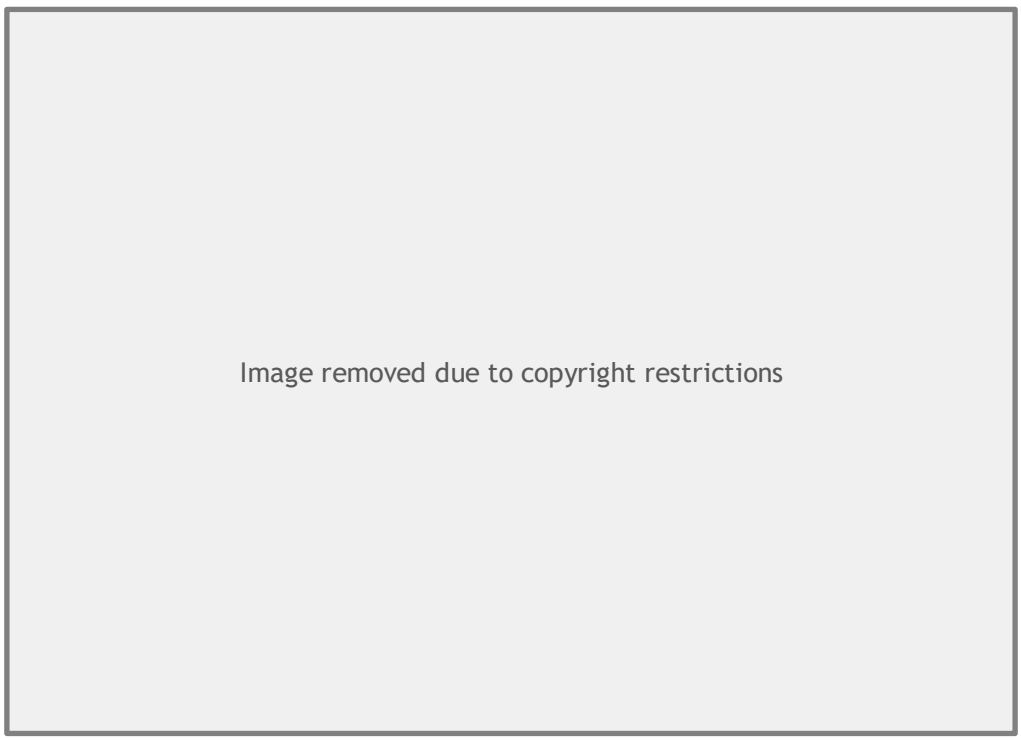


Figure 6-18: Two photographs from 2002 showing scrap metal from the Glassary seaweed factory, Grianal beach. Photos obtained from An Iodhlann www.aniodhlann.org.uk



Figure 6-19: Glassary remains - part of the remaining walls of what would have been the stables.



Figure 6-20: Taigh Shleven/Middleton Cottage (now Middleton House). The company store was the annexe on the left with the two red doors. This shop later became the Middleton Post Office.

6.3.2 Seada Hàinis – Tangle store, Hàinis

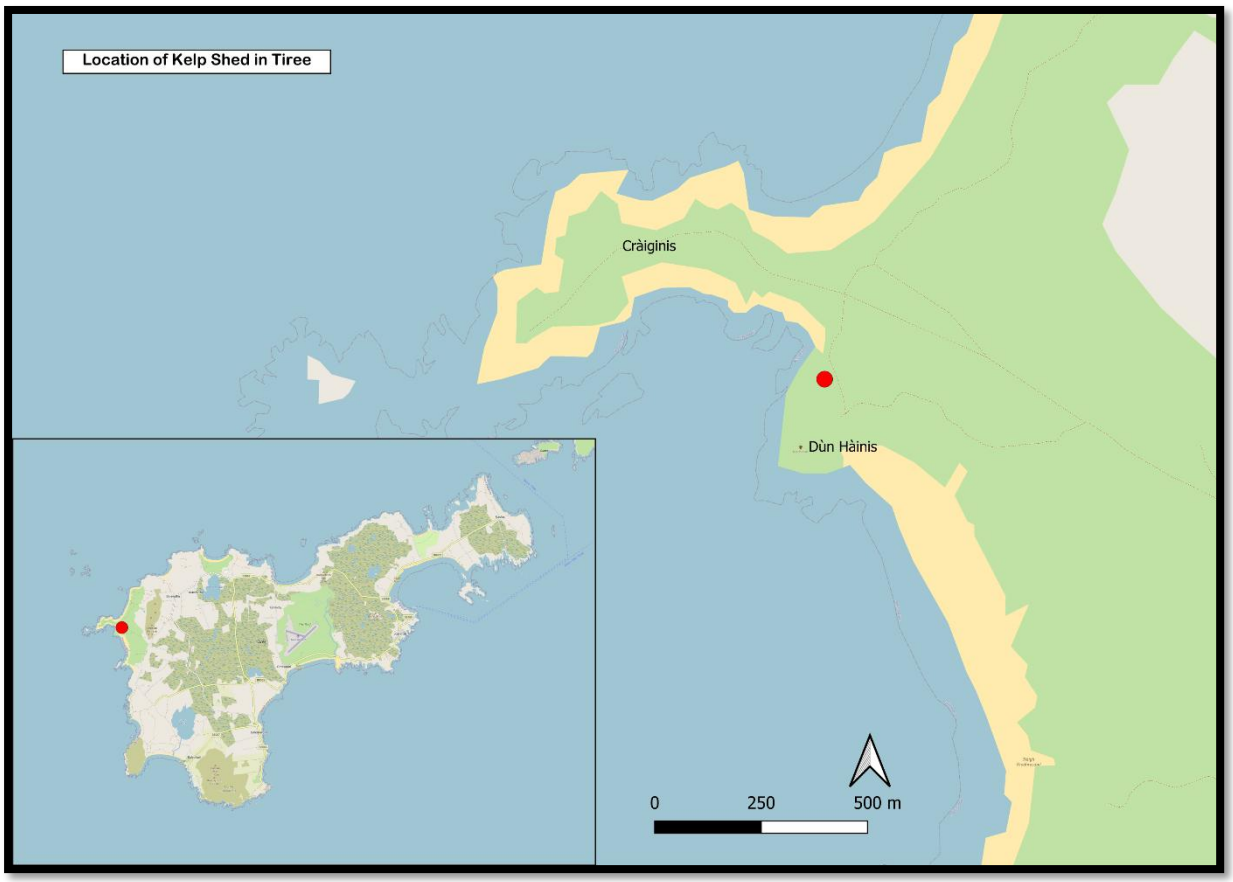


Figure 6-21: The location of the Kelp Shed (Seada Hàinis) in Tiree. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010.

The ruin of the Kelp Shed or *Seada Hàinis* (NL 93342 45640), is located at *Port Hàinis*, which lies between *Rubha Chràignis* and the promontory *Rubha Hàinis* (Figure 6-21). Stanford designed the Kelp Shed to drain, partially dry and store tangle rods (*stamhain*) collected from around the area until they could be carted to the kelp factory at Baile Meadhanach. According to Stanford's notes (1864: 4), he had three sheds erected in 1863 while the factory was being built: two at *Cràignis* and one at *Baile Phuill*. To date, the ruin at *Hàinis* is the only known remain of the three sheds (Holliday 2023). The sketch plan of the drying shed (Figure 6-26) indicates the size of the proposed structure (20ft by 40ft, 20ft high on one side, 16ft on the open side), an explanation of how the drainage process would work, the type of flooring required, and his expectations as to what the drained seaweed in six sheds could produce annually.



Figure 6-22: Ruin of Seada Hàinis or Tangle store, near Cràignis, Hògh.

The oblong structure (Figure 6-22) with partial walling and footings measures approximately 19m by 9m. This structure, which appears in the OS map of 1882, matches the location in the satellite image (Figure 6-24), and is set in rough grass behind the coast edge. The satellite image (Figure 6-25) shows a gap at the south end of the structure, which may have been the entrance. The construction consists of multiple courses, built in sections, of beach gravel and stone set with a cement mortar and lime or cement mortar between each course. Because there are no exposed iron rebars in the walls, the structure does not appear to be reinforced concrete. There is what appears to be a rough cement rendering over the concrete, which has detached in patches, likely due to weathering (Figure 6-23). Most of the walls have collapsed, with up to 3m high of the wall still standing in places; other sections have been reduced to less than 1m high. The tumble scattered about the site consists of sections of collapsed walling. Both long sides of the structure appear closed, unlike in Stanford's sketch plan, where he proposed

that one side would be open with a divider through the middle so that one side would be empty while the other was being filled (Figure 6-265). It is unknown how long this shed was in operation, and it may have been used as a temporary store for tangles collected at *Rubha Chràignis* when it was no longer used for draining and partially drying the stipes. The oral history indicates this use for drainage was possibly abandoned in favour of drying the stipes on walls because individuals or families were in thrall to the truck system in place in Tiree. The abandonment of drying under cover is also mentioned in the Government Report on the Home Industries of the Highlands and Island, but does not give a reason (Scott 1914: 121). The truck system meant that the individual would get a line of credit, dependent on the amount of tangles collected, in lieu of cash to be redeemed for goods at the company store (Holliday 2023). The truck system and its impact will be discussed more in-depth in section 6.4.1.1.

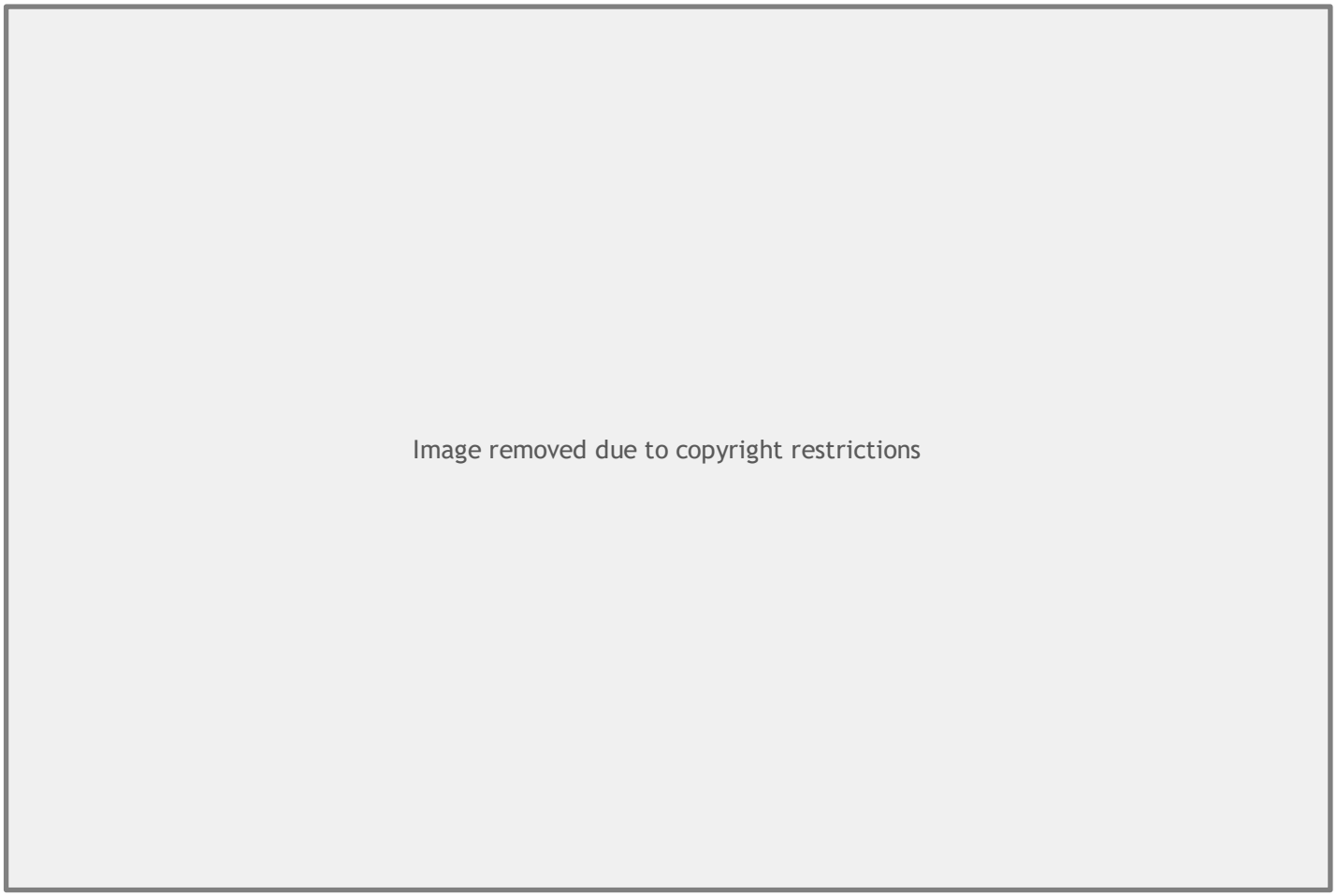


Figure 6-23: Close-up of the beach stone and concrete courses of the interior face of the tangle shed. Photograph obtained from Tiree and Archaeology Database: https://tireeandcollarchaeology.org/object/tangle-store-hanais/

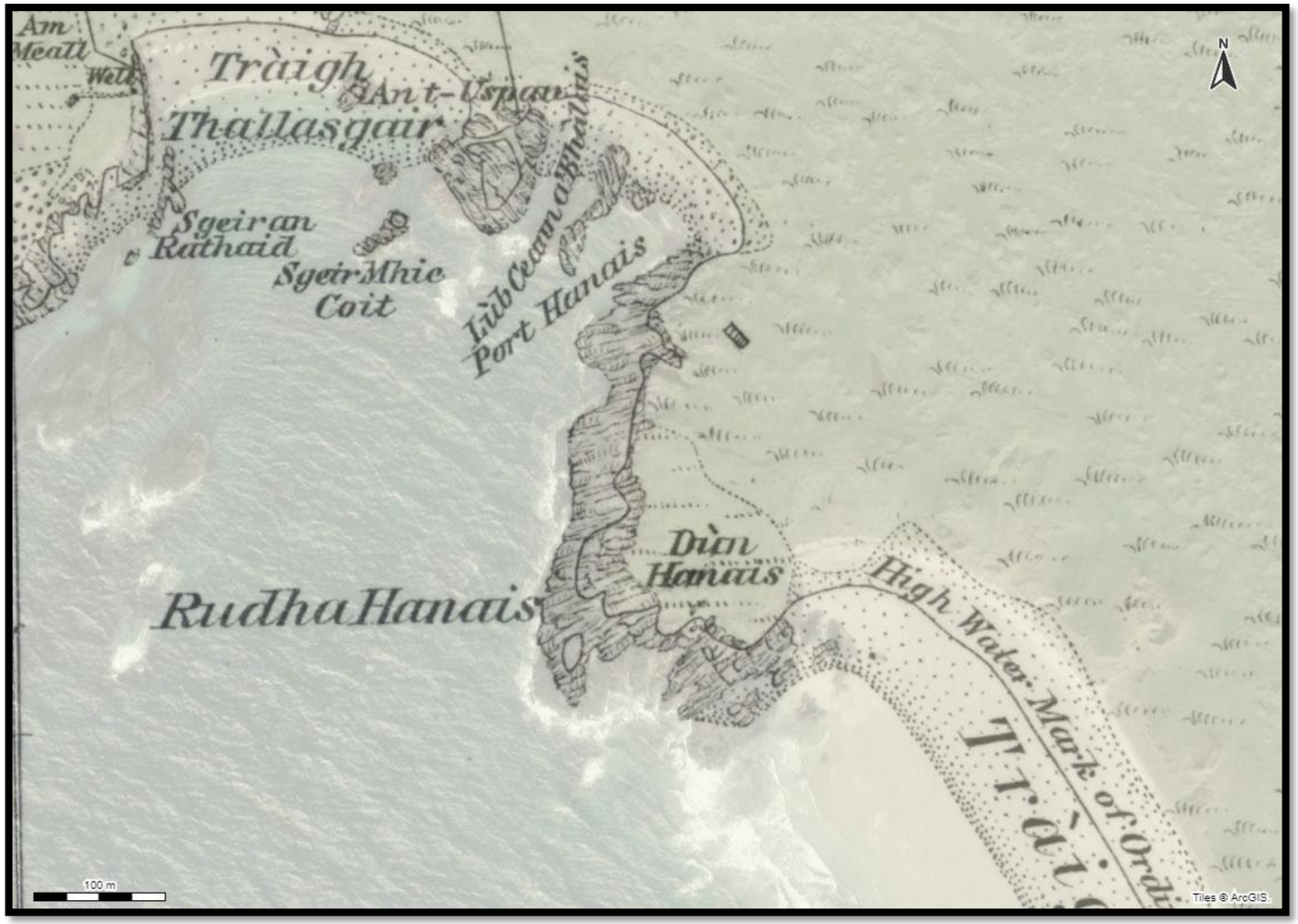


Figure 6-24: Satellite image with 1882 OS map overlay showing the tangle shed at Port Hàinis. The lines in the shed indicates that it was roofed at the time of the survey. Map obtained from NLS https://maps.nls.uk/ contains OS 1882 data, satellite image: ESRI World Image



Figure 6-25:Satellite image of Seada Hàinis showing the shape of the structure. The south end of the building appears to be the entrance. Map data: Google Satellite .

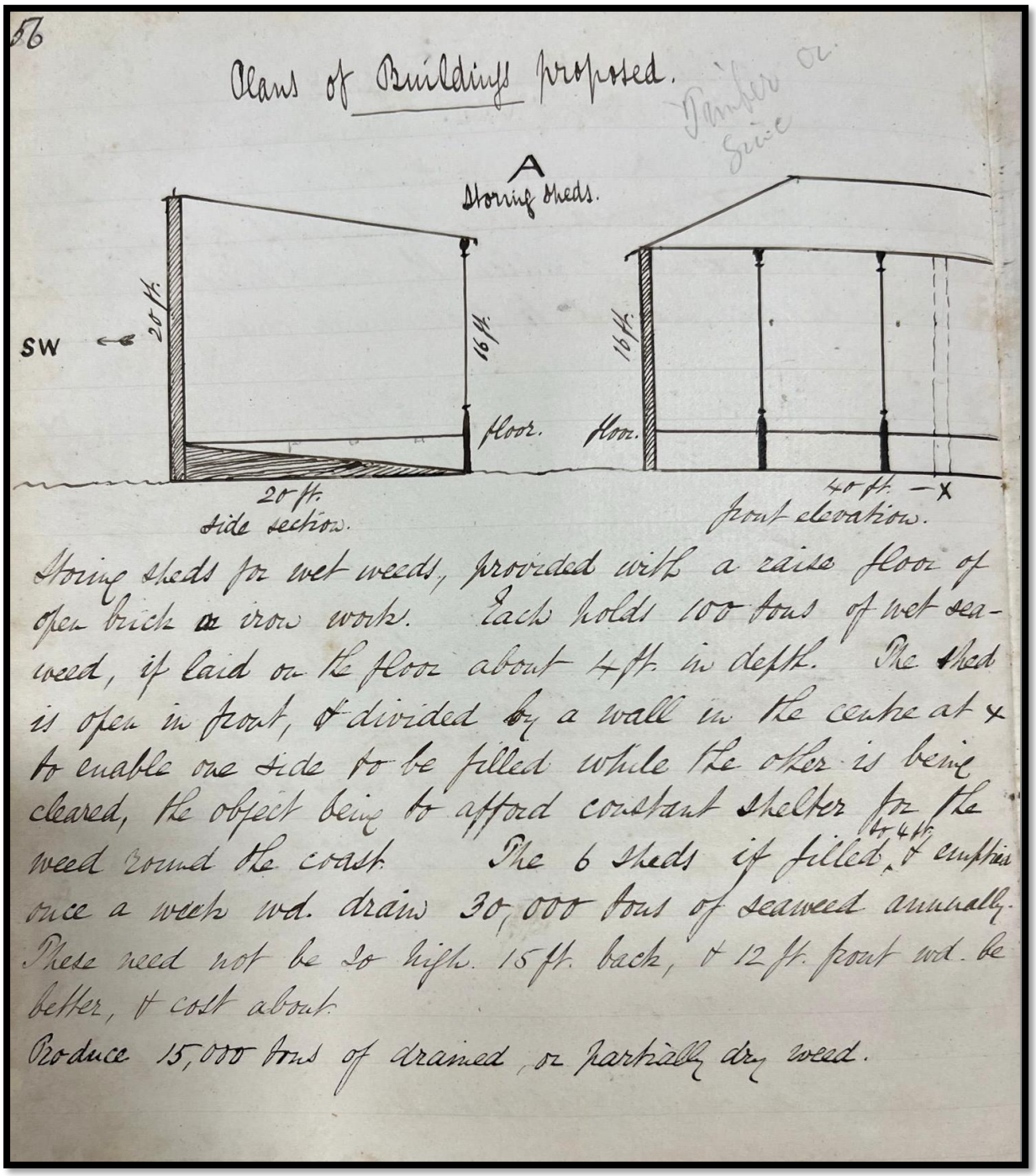


Figure 6-26: Sketch plan of tangle storing sheds with notes, taken from Stanford's notebook. (TD871/4 1862–1864)

6.3.3 Kelp processing sites associated with the Glassary

Kelp-working sites in Tiree are on various shores surrounding the whole island. They can vary in size from one or two kilns to extensive sites comprising drying walls, five or more kilns, cart tracks leading into the site and large, flat, grassy swards. Some of these larger sites tend to show multi-period structures associated with the three phases of the seaweed industry (including the Alginates phase post-1945), so it can be difficult to say for certain to which phases some structures belonged. Indeed, the documented and oral history evidence suggests a continuity of use, as seen in the larger processing sites. For example, kilns for burning seaweed into kelp were repaired each season, and this pattern of repair and re-use may have continued from the alkali phase to the industry's iodine and potash phase. Likewise, the rough alignments of beach cobbles (*buthagan*) that served as drying walls (*làraichan* or *cruachan nan stamh*) also suggest that these could have been used in the 20th century when *laminaria* stipes were used for alginate extraction. Cart tracks are also a feature of these sites as horses and carts were used to collect the seaweed from the beach and transport the dried tangle rods to the factory in Baile Meadhanach or to take finished kelp blocks to storage. Large, flat, grassy areas are a feature in these sites. They provide a suitable area to work, with the level ground needed to cool the molten kelp to an even slab for easy removal from the kiln.

Most of the kelp burning kilns in Tiree are the distinctive 'cigar-shaped' rectilinear trenches located on flat grassy areas close to the shore edges surrounding Tiree. They are termed 'cigar-shaped' because the rectilinear stone-lined trenches are capped at the top with the opposite end open (Figure 6-27 & Figure 6-28). The distinctive shape of these trenches can be identified in aerial or satellite imagery. The kilns generally are within 10m of the shore edge, often parallel to the edge, but their orientation varies. This may reflect either the direction of the prevailing wind or the available working space. Trench sizes generally fall between 3.2m to 5m long and .5m to .9m wide internally. The kiln length could be adapted according to the amount of seaweed collected. Eric Cregeen recorded interviews in the late 1960s and early 1970s with some elderly Tiree residents who had taken part in making kelp and gathering tangles for the factory. Donald Sinclair (DCB), a

resident of Haoidhnis an Iar (*Dòmhnall Chaluim Bhàin*, 1885-1975) describes the general dimensions of the kilns, how they were constructed, and the kelp-making process with Eric Cregeen (EC) (1968):

> **DCB**: They were building the kilns, say, according to the amount of wrack [laminaria fronds] you got. You were paving the bottom of the kiln with stones-flat stones and building the sides with soft seaweed and stones so as to make the kiln airtight.
>
> **EC**: Was the seaweed in the middle between the stones?
>
> **DCB:** Aye. It was packed in the middle between the stones. When that was ready, all the wrack was in dry ricks, maybe as high as that. You would start building it then. It was burned into kelp.
>
> **EC:** How long did it take to burn down?
>
> **DCB:** Not very long, according to what you have to burn. I've seen kilns going day and night. That kiln would output two or three tons of kelp.
>
> **EC:** I see. At Haoidhnis here?
>
> **DCB**: Yes, and at Ceann a' Bharra over there. I've seen them, I remember them well…
>
> **EC:** How high were the kilns?
>
> **DCB:** About two-and-a-half feet high.
>
> **EC:** How long and wide were they?
>
> **DCB:** Some of them were about two feet wide at the bottom and two feet six at the top. About ten to fourteen feet long, according to the quantity of wrack you've got to burn.

The morphology of these kilns largely conforms with a description of an ideal size of kelp kiln described in an essay from 1799 (Beaton: 30). The narrow rectilinear kilns, instead of the round pits, were optimal for controlling the heat and ensuring the middle material would be burned. This ensured that a more significant amount of kelp could be produced – sometimes up to 3 tons in a season for a single kiln (Sinclair, Donald 1968). This type of kiln seems to have been used continuously in Tiree from the late 18th century to the beginning of the 20th century.

Kilns are present at small, scattered sites of perhaps only one to three kilns, and large concentrations of up to fourteen kilns indicate a large processing site, such as that at Ceann a' Bharra. In the more significant sites, the kilns are generally well-spaced away from each other to allow enough working space and distance from the resulting smoke from the kilns. One site on a raised beach on the north shore of *Rubha Chràignis* shows the same sub-circular morphology as seen in other districts from the earlier alkali phase, such as the hollowed-out pits found on storm beaches and tombolos in Coigach. There are photographs by Erskine Beveridge from the turn of the 20th century that show tangles were burnt directly on rough shingle beaches to get loose seaweed charcoal ash (*luaithre na ceilpe*), the purpose of which will be discussed in 6.4.1.3 - rather than the kelp slag made in kilns (Figure 6-39). These pits may have been used for this purpose or were from the earlier alkali phase in the mid-18th century before the use of the rectilinear type of kiln became more common.

Seaweed drying walls (*cruachan nan stamh, làraichean*) can be seen near the rectilinear kilns by the coast edge and as built-up alignments of cobbles on shingle beaches. As seen in the other case studies, these are roughly piled alignments, sometimes in multiple parallel rows, sometimes as singular long walls parallel to the shore edge. Drying walls could also include augmenting natural stone outcrops and the use of drystone boundary dykes (Holliday 2024: 3).

Cart tracks that cut through machair lead into many of these sites. These well-worn tracks can be seen on satellite and aerial imagery, indicating continuing use for the seaweed industry and other agricultural purposes. Some of these tracks were annotated in the 1882 and 1899 OS maps.

The sites discussed in the following sub-sections were visited in June 2023. The variation in the extent of sites represents what is found all over Tiree - from single isolated kilns, perhaps representing a family's share, to extensive sites that show a potential multi-phase use.

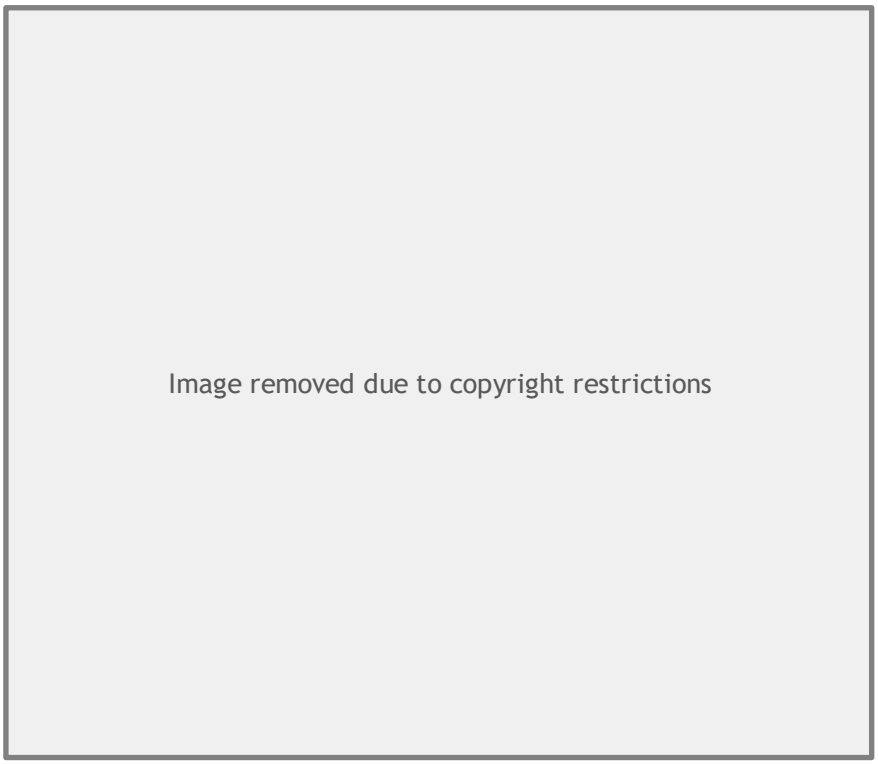


Figure 6-27: Kelp kiln and stand drawing, Ceann a' Bharra. This 'cigar-shaped' trench kiln is the most common type seen in Tiree. The 'stand' could be the end cap of the kiln, removed so that the cooled kelp could be removed. Drawing ©Dugald MacInnes

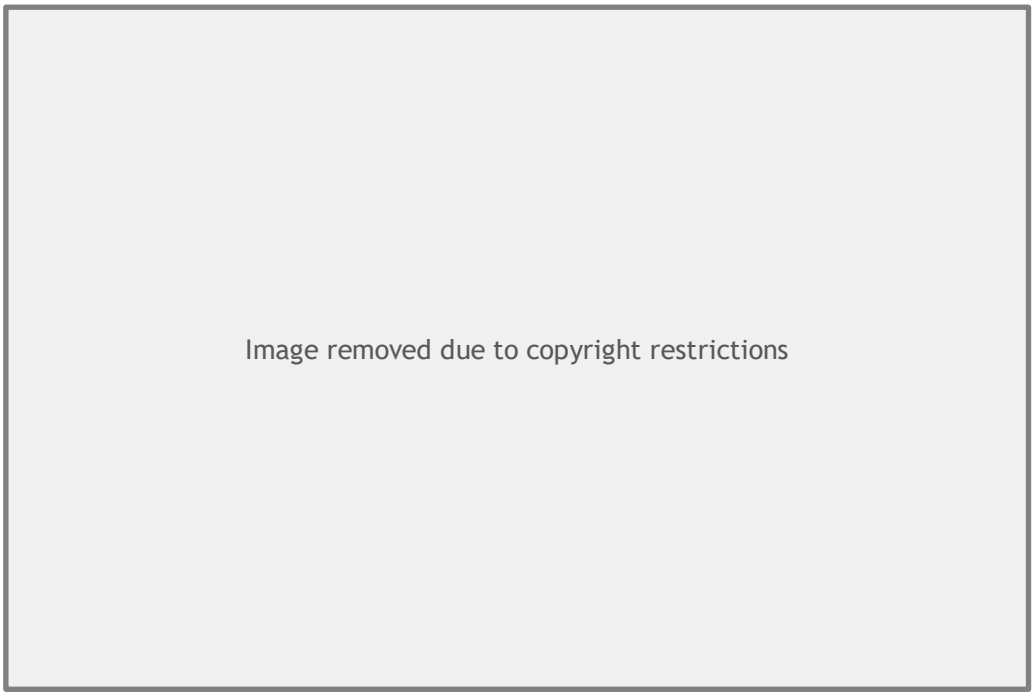


Figure 6-28: Photo of the kelp kiln and stand in Figure 6-27. Photo courtesy ©Dugald MacInnes

Ceann a' Bharra (Kennavara)

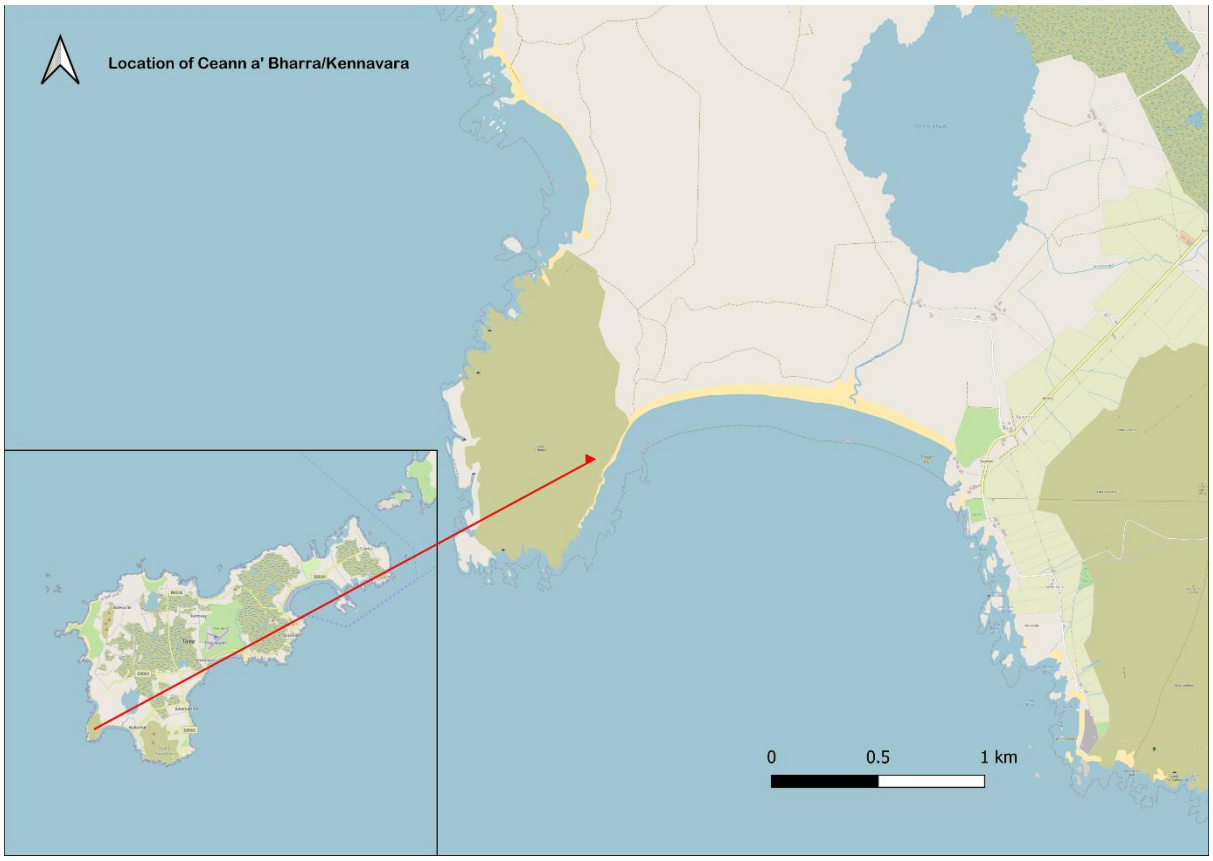


Figure 6-29: Location of Ceann a' Bharra. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023.

Ceann a' Bharra (Kennavara) is a headland located in the south-west of Tiree, at the west-end of Balephuil Bay. *Ceann a' Bharra* is perhaps the most extensive processing site in Tiree, comprising at least fifteen kilns and several sections of drying walls that run parallel to the shore edge (Figure 6-30), and a cart track that runs into the site from the machair. The 1882 OS map marked a cart track, which can still be seen in satellite images.

Ceann a' Bharra is the only kelp processing site outside Orkney designated a scheduled monument by Historic Environment Scotland (HES). The area designated (Figure 6-31) is much smaller than the actual extent of the site (Figure 6-32). The outlined area in Figure 6-31 is the section of shore with four kilns and a drying wall, as shown in the satellite image in Figure 6-32. The description in the legal document outlines why this is the case: 'The area to be scheduled comprises the

remains described and an area around them within which related material may be expected to survive' (SM9048 2002). In addition, *Ceann a' Bharra* is still used for grazing livestock; therefore, designating a representative sample of the site rather than the entire extent is also a practical measure.



Figure 6-30: Section of seaweed drying wall (*làrach/cruach nan stamh*) that runs parallel to the shore at Ceann a' Bharra.

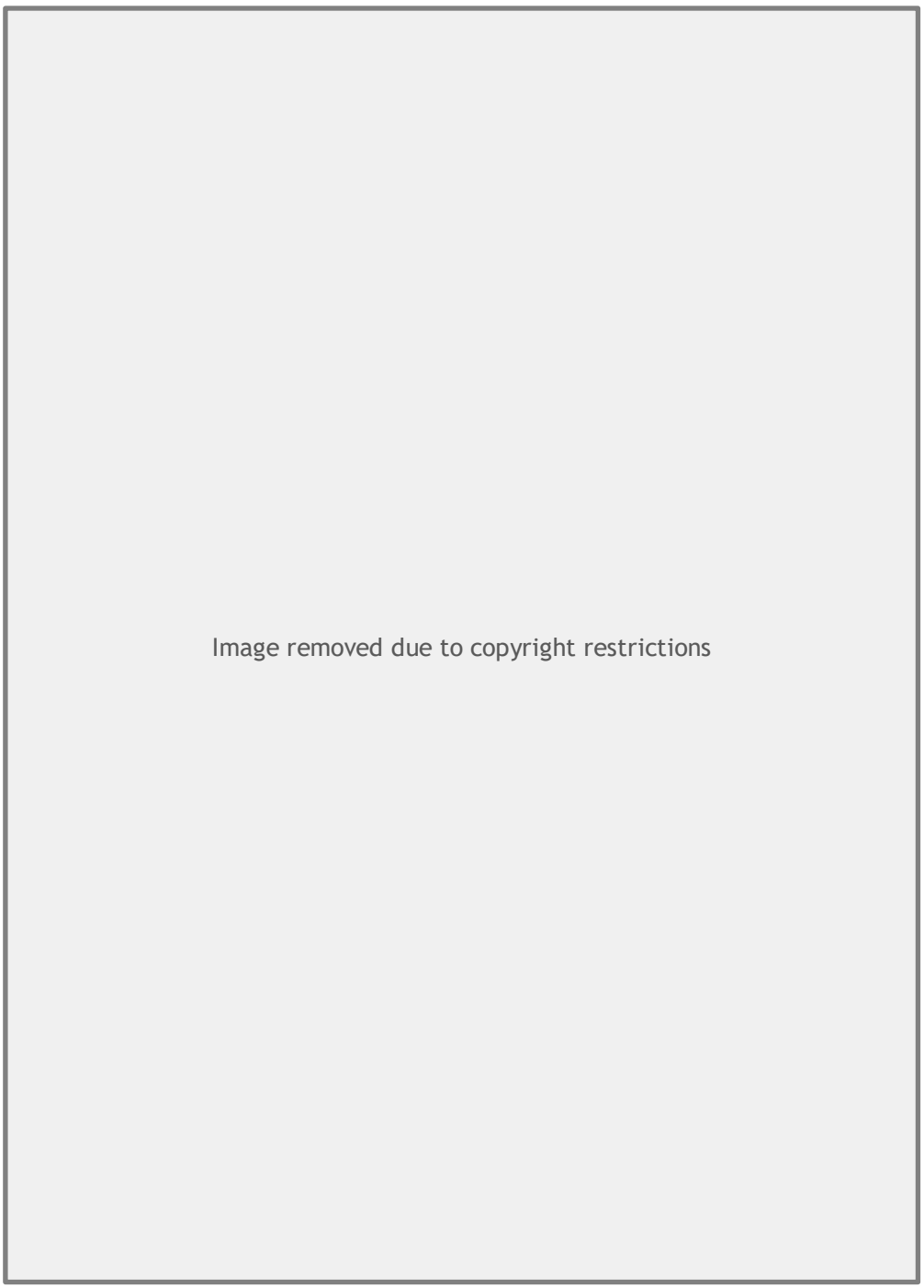


Figure 6-31: Legal document outlining extent of scheduled monument area of Kennavara, 2002. Note the cart track leading into the site. Document obtained from HES https://portal.historicenvironment.scot/designation/SM9048



Figure 6-32: Satellite image showing the full extent of the Ceann a' Bharra kelp processing site highlighted in bright green. Kilns are indicated in red and drying-wall sections in pink. The scheduled area is outlined in yellow. Map Data: Bing Virtual Earth.

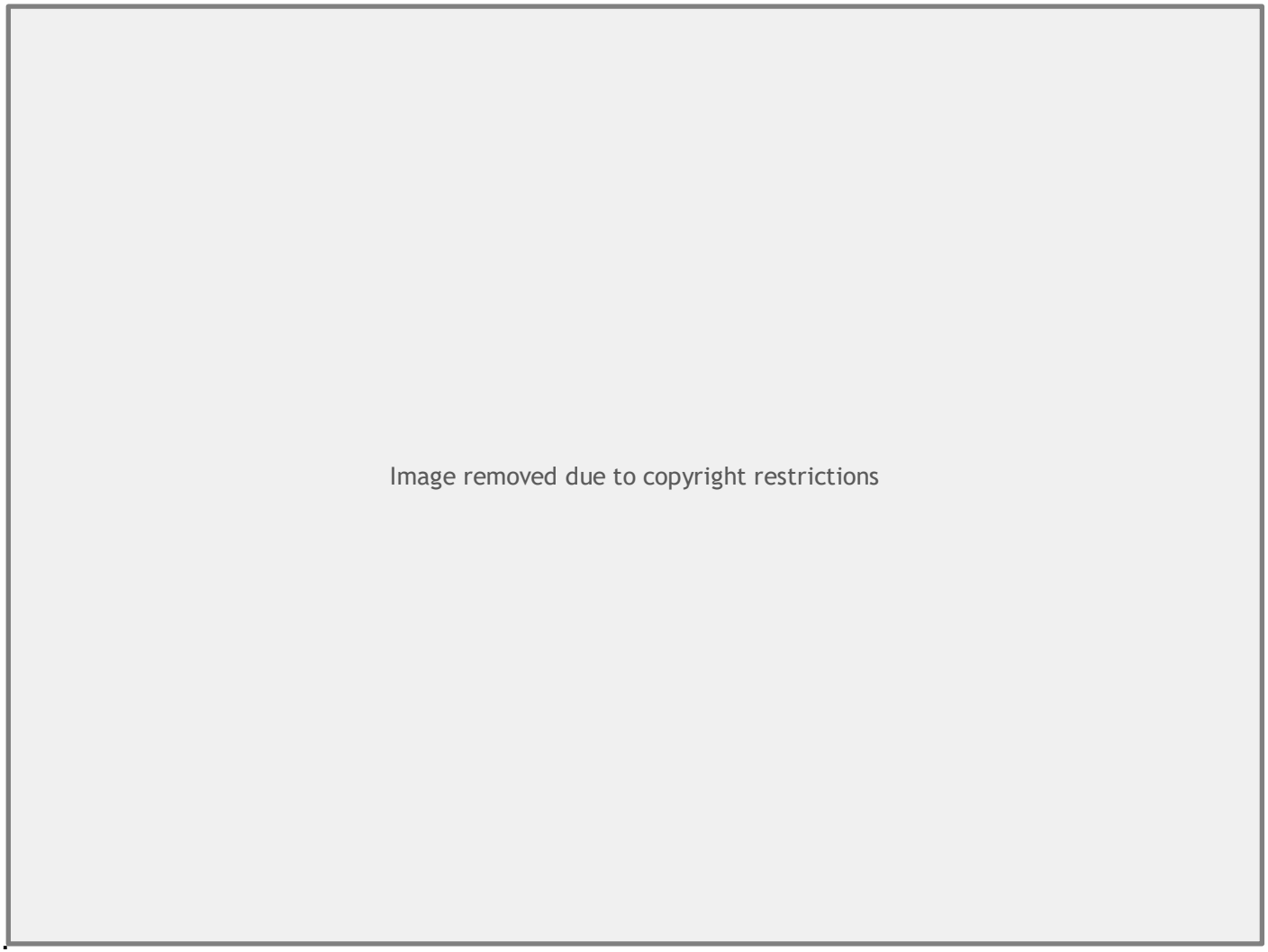


Figure 6-33: Photo by Erskine Beveridge from c1903 showing a kelp kiln at Ceann a' Bharra in use. The photo also shows the height of the kiln sides and seaweed. Photograph obtained from An Iodhlann Historical Centre: https://www.aniodhlann.org.uk/object/2000-129-1/

Rubha Chràignis, Hògh (Craignish, Hough)



Figure 6-34: Location of Cràignis in Tiree. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023

Rubha Chràignis is another large processing site on the northwest coast of Tiree. Multiple rough stone alignments, often in parallel lines, can be found throughout the raised shingle beaches on the south end of the headland. The remains of numerous rectilinear kelp kilns averaging between 2-3m long are also found around grassy shore edges. On the north side (Figure 6-37), there appear to be circular hollows in the shingle, roughly conforming in morphology and size to those found in the storm beaches in Coigach: 3m diameter by 0.5m depth. Deep-rutted cart-tracks can be seen going through the shingle at An Urabhag, where a large complex of stone walling can be seen. Tangles and *liath mòr* (laminaria fronds or 'wrack') were collected from this area from the alkali phase through to the end of the Alginates phase in the early 21st century (Figure 6-36). For this reason, the kelp drying walls and the tracks in the shingle cannot be definitively assigned to any

one phase, as some photos show tangle rods being dried on the shingle in the 1990s (Figure 6-36).



Figure 6-35: An Urabhag, Rubha Chràignis. Orange arrows indicate drying walls built up in the beach shingle

Image removed due to copyright restrictions

Figure 6-36: Tangles laid out on the shore at Cràignis for Alginates, 1997-1998. Photo obtained from An Iodhlann: www.aniodhlann.org.uk/object/2013-110-9

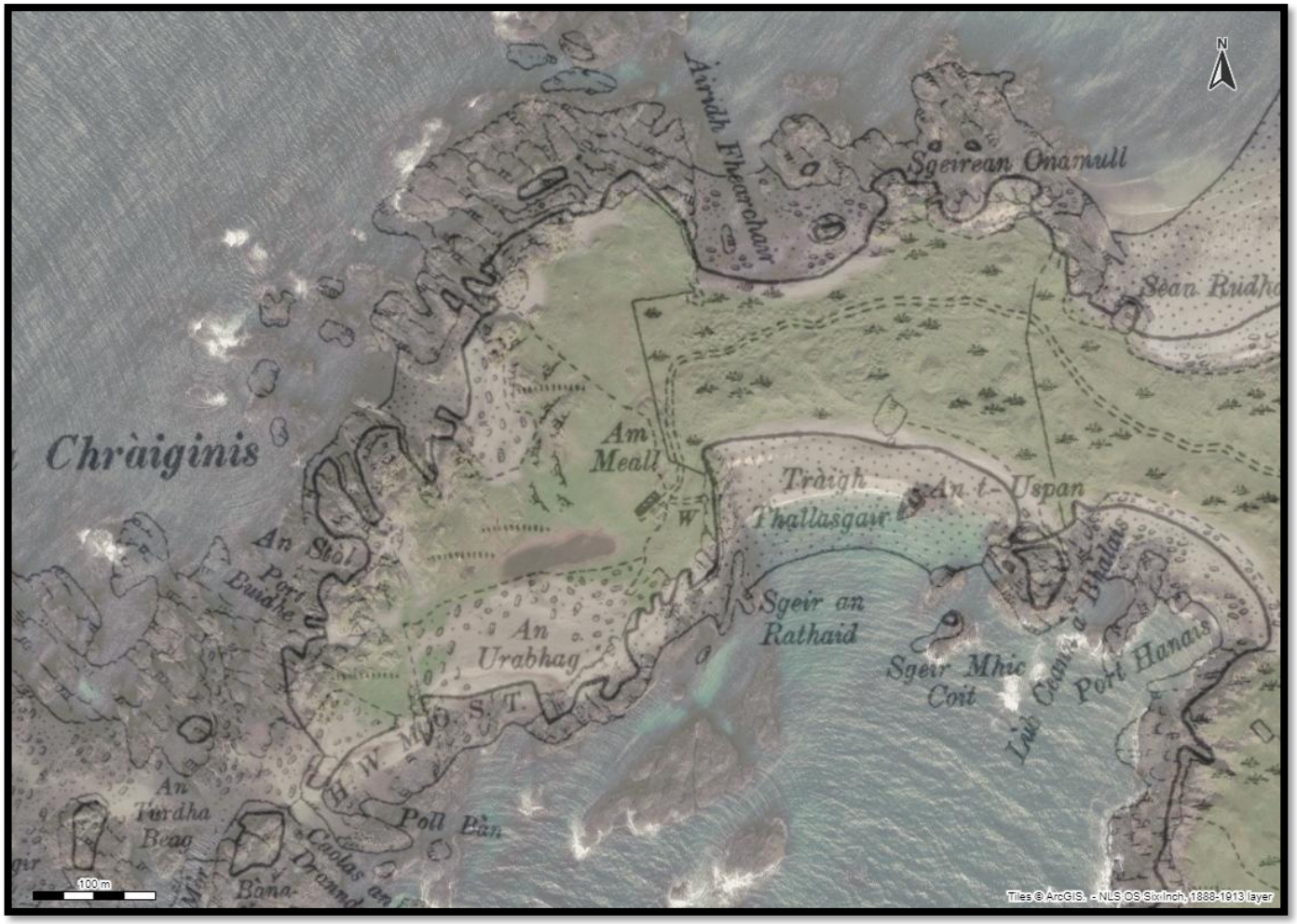


Figure 6-37: Satellite image with1882 OS Map overlay of Rubha Chràignis showing placenames. *Seada* Hàinis is the rectangular feature to the south of Port Hàinis in the lower right of the image. Most of the drying walls are located at the two raised beaches at Tràigh Thallasgair and An Urabhag. Two sub-circular pits were found on the storm beach just to the northwest of *Am Meall* on the north shore of the promontory. OS Map obtained from https://maps.nls.uk/.

Haoidhnis an Iar (West Hynish)



Figure 6-38: Location of Haoidhnis an Iar (West Hynish) in Tiree. Basemap: ©OpenStreetMap https://www.openstreetmap.org/copyright Contains Ordnance Survey data © Crown copyright and database right 2010-2023

The township of Haoidhnis an Iar (West Hynish) is on the southwest coast between Baile Phuill (Balephuil) to the northwest and Haoidhnis an Ear (East Hynish) to the southeast. The shore along this section of coast is rocky, interspersed with shingle beaches and small, flat grassy areas. A local heritage group surveyed eight rectilinear kilns at Haoidhnis an Iar, measuring their dimensions and orientation to the north (Holliday and An Iodhlann Heritage Centre 2023). These are located at the edge of Haoidhnis an Iar township and along the east side of Dùn Shiadair (Figure 6-41). The surveyed kilns measured between 2.3m to 3m long and .5-.6m internal width (see Appendix C: Table 2).

A combination of photographic and oral history evidence shows a continuity of use from possibly the late 18th century to the early 20th century. As previously discussed, the rectilinear kilns' morphology improved from the 1790s. Two

photographs by Erskine Beveridge taken c. 1900 show the site in use, burning directly into the shingle and in the kilns (Figure 6-39 and Figure 1-38). Donald Sinclair, a resident of Haoidhnis an Iar, recounted kelp-making and shore division in Haoidhnis an Iar in recordings with Eric Cregeen in the 1960s.

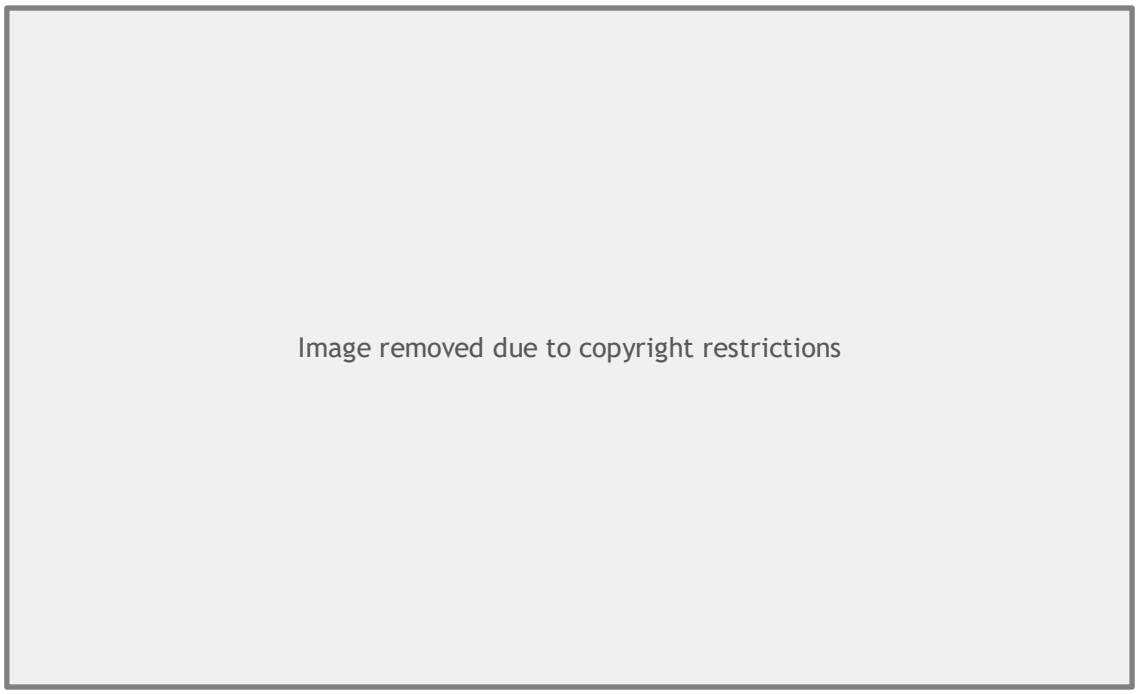


Figure 6-39: Photograph of tangles drying and kelp being burnt directly on the shingles and in a kiln, Dùn Shiadair by Erskine Beveridge. Image obtained from https://trove.scot/collection/1203859 ©RCAHMS

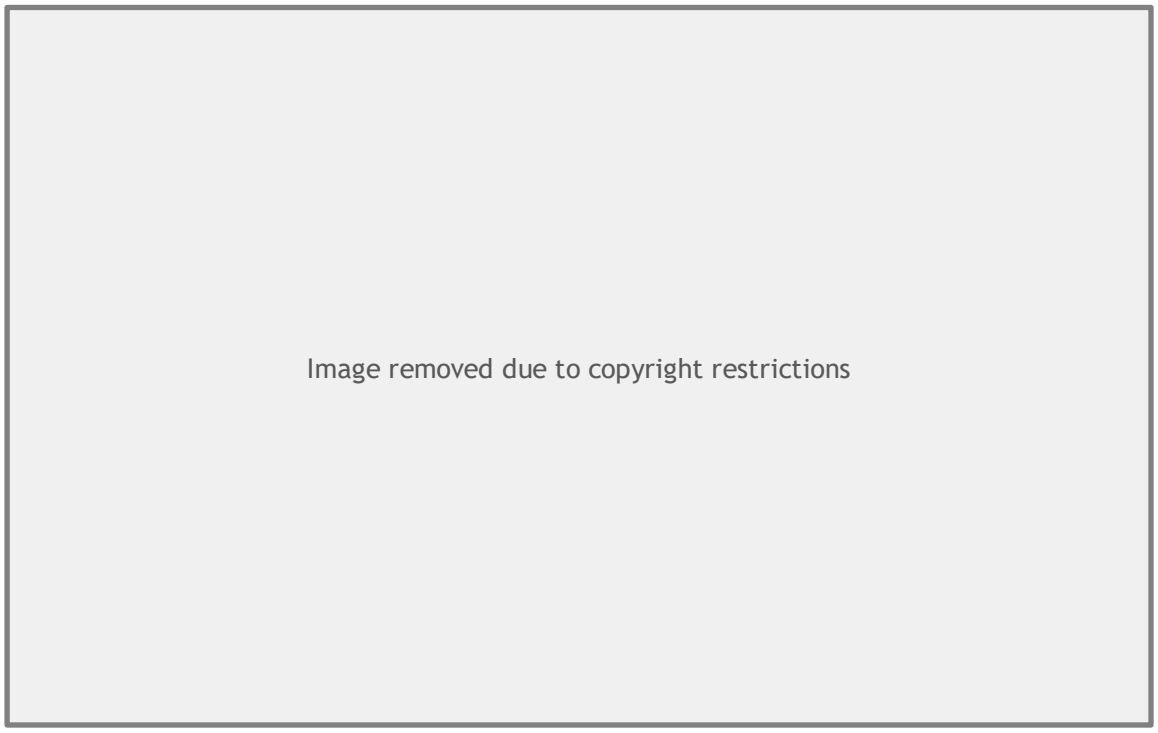


Figure 6-40: Dùn Shiadair with kelp burning just below the rock in background with kiln cooling, covered in turf and seaweed in the right foreground. Photo by Erskine Beveridge, c. 1900. Photograph obtained from https://trove.scot/collection/1203858 ©RCAHMS

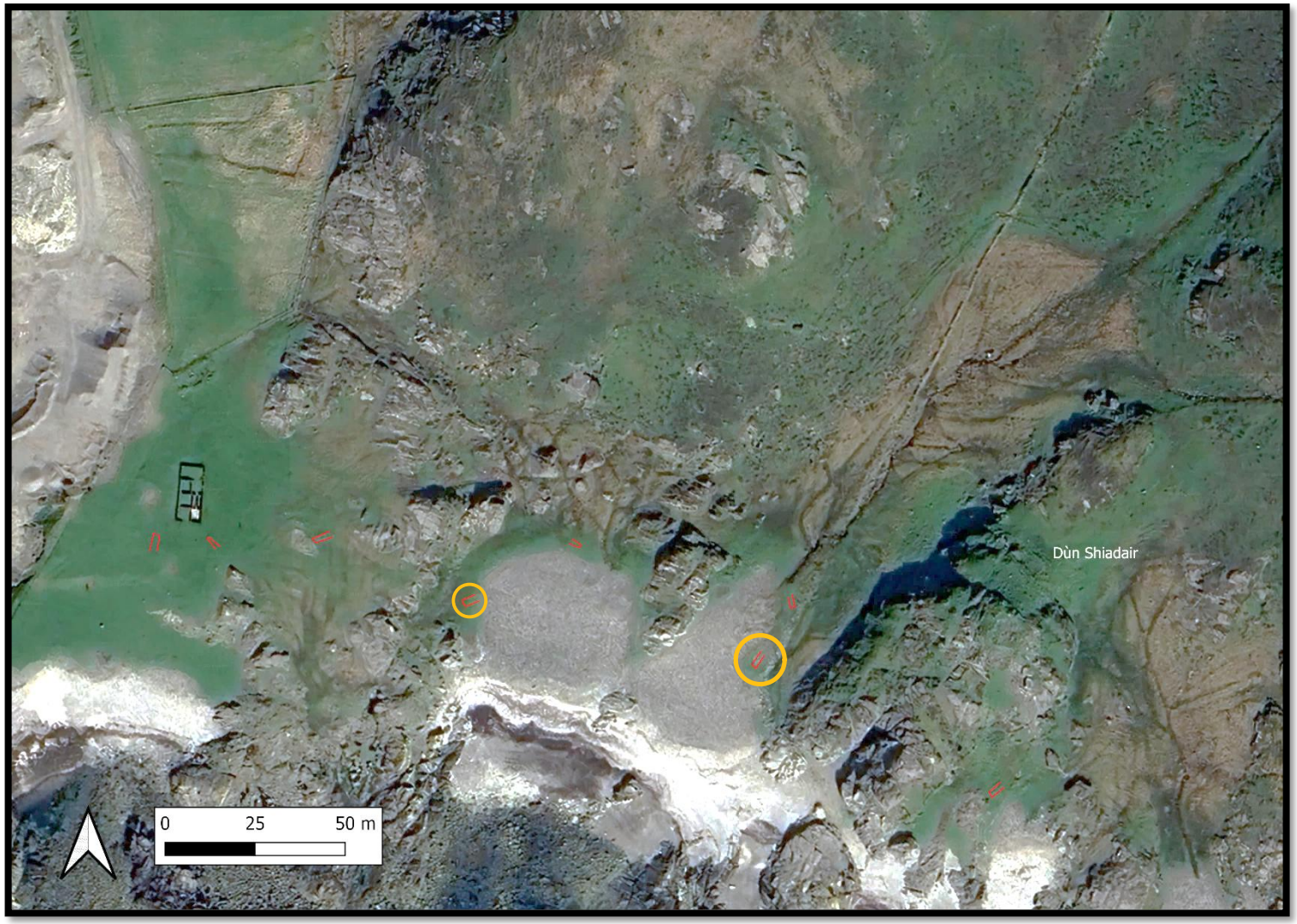


Figure 6-41: Haoidhnis an Iar kiln positions (in red). The kilns circled in yellow indicate the kilns featured in Beveridge's photo in Fig. 1- 37. Contains Google Satellite data.

6.4 From Tiree to Clydebank: tracing the journey of iodine production

Two commodity chain diagrams were constructed to visualise the people and processes along the production sequence for two distinct periods. The first period, when Stanford established the British Seaweed Co. Ltd in 1863 to its liquidation in 1876, focused on iodine and other by-products manufactured at the Glassary factory. After iodine production stopped in Tiree in 1876, Stanford re-established his company as the North British Chemical Co. Ltd. The local production then focused on seaweed charcoal only. The final stages of iodine production from lixiviation to distillation moved to the Whitecrook works at Clydebank until the 1930s when iodine production ceased altogether in Glasgow. The iodine lixiviation and distillation process will be explained in Section 6.4.1.4. The industrial situation in Tiree was complex as people collected tangles for iodine production or seaweed charcoal in the factory while also continuing to make kelp in shore kilns. This analysis encompasses the entire iodine production process, from raw material gathering to final production in Clydebank, during a period of rapid technological advances, improved connections and fluctuating markets.

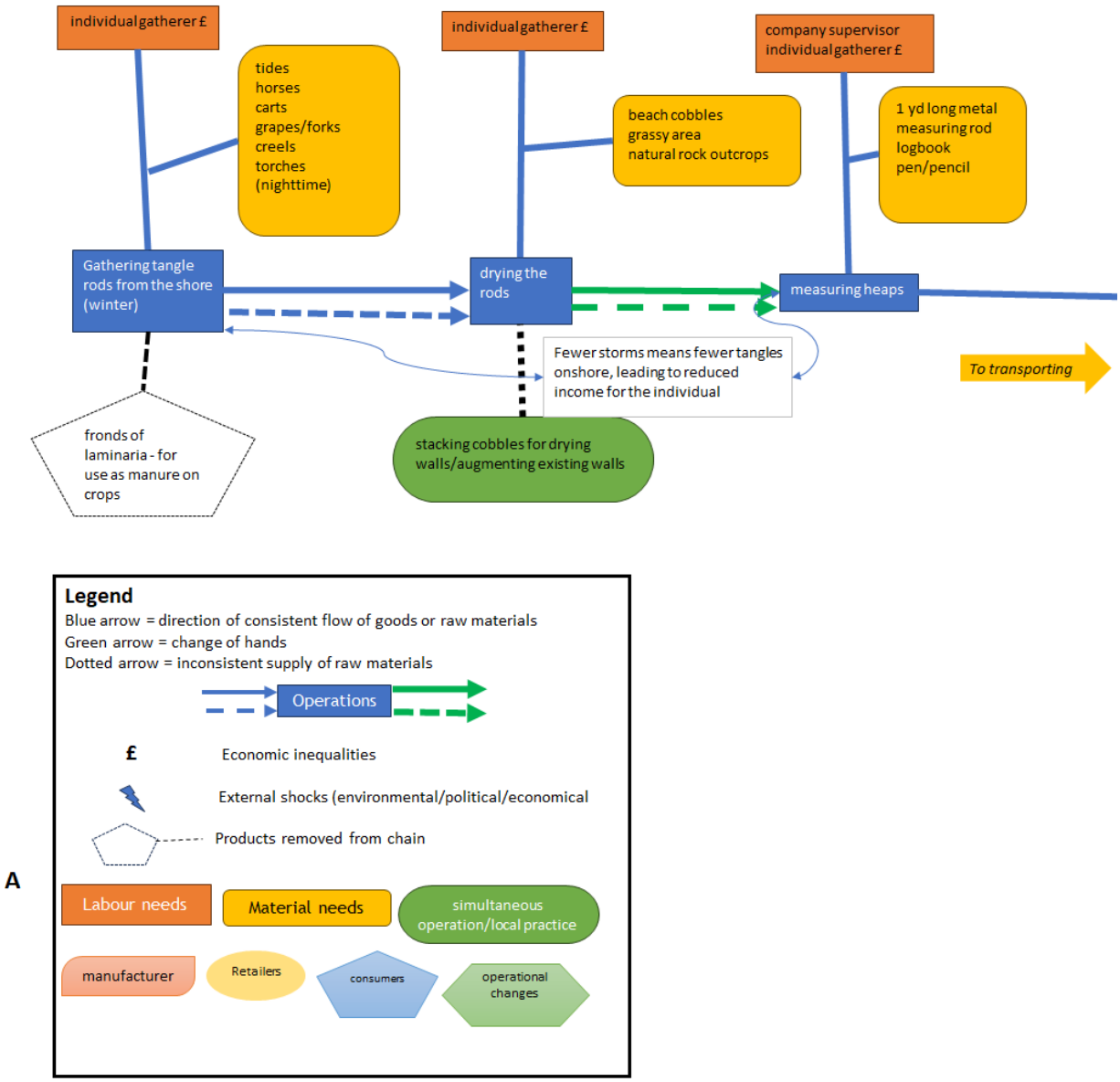
Entangled within iodine and seaweed charcoal production was the tension between the Duke of Argyll's policies of improvement, modernisation, and population reduction and the islanders' efforts to overcome poverty through protests for land reform. The *Tiristich* became increasingly aware of their ability to effect change through organised agitation, mirroring similar movements in Ireland and other parts of the Highlands and Islands. This led to the formation of organisations like the Land League and prompted government intervention through the 1883 Napier Commission, which investigated the living conditions of cottars and crofters in the region (Petre 2019: 63-94). The Commission heard testimony from various interested parties, including crofters, cottars, the factory manager James Sleven and Stanford himself. The land struggle also created internal tensions among the *Tiristich*, particularly between cottars and crofters, which extended to those working in the seaweed industry. These testimonies offer not only insights into the lived experience of individuals involved in the seaweed industry in Tiree, but also enrich the narrative of the commodity chain analysis.

The next two sections (6.4.1 and 6.4.2) explore the journey of iodine production through the framework of a commodity chain analysis similar to that of the previous chapters. The analysis is split into two chains to reflect the complexity of operations: first, the iodine production at the Glassary factory to its closure in 1901 and second, kelp-making in summer to the end of kelping in the 1930s. Both chart the journey of the seaweed industry's development on Tiree, emphasising the intricate interplay of economic, technological and social factors and its close connection to Glasgow. These analyses will also explore in greater detail the specific impacts of these changes on the local community, investigating how the evolving dynamics of seaweed harvesting and processing influenced the livelihoods and social structures of the Tiristich.

6.4.1 Iodine processing in the Glassary factory

Stanford's patented 'char process' in 1861 represented a significant advancement in iodine extraction, building upon the foundation laid by Courtois in 1811 (1813) and further developed by Andrew Ure in 1817. This innovative method addressed the inefficiencies of previous techniques, particularly the loss of iodine during the high-temperature kelp-burning process in open-air kilns. Stanford's approach involved creating seaweed charcoal from dried laminaria stipes in a low-heat, closed vessel environment, which promised improved iodine yields and offered potential for continuous employment on the Isle of Tiree (Harvie 2014; No. 1411.1861 1875; Stanford 1861, 1861–1862, 1877).

The iodine production sequence comprised eight primary operations using Stanford's method, from collecting tangles on the shore at low tide to innovative marketing methods and distributing the final product to end consumers. This process initially centred around the Glassary factory in Baile Meadhanach, Tiree, but later evolved to split production between Tiree and the Whitecrook Chemical Works in Clydebank. This division of labour, with Tiree focusing on seaweed charcoal production and Clydebank handling lixiviation and distillation, represented a significant shift in the production chain. A single analysis will describe the distillation process to avoid redundancy, as the process at both premises would have been identical. For the Clydebank facility, a brief overview of its production output and distribution networks will be provided instead.



A

Figure 6-42: A-Commodity chain diagram for iodine production continues in B and C

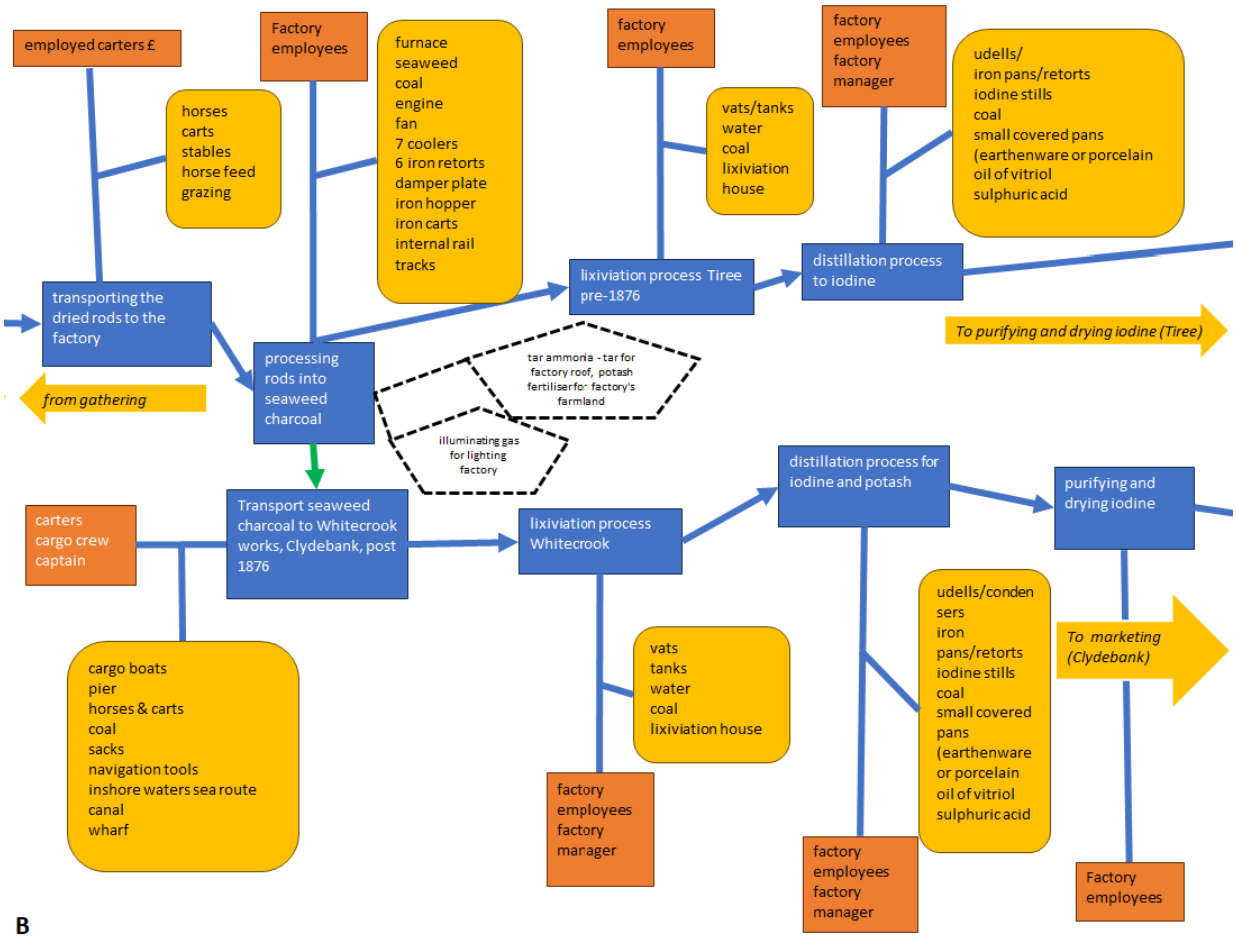
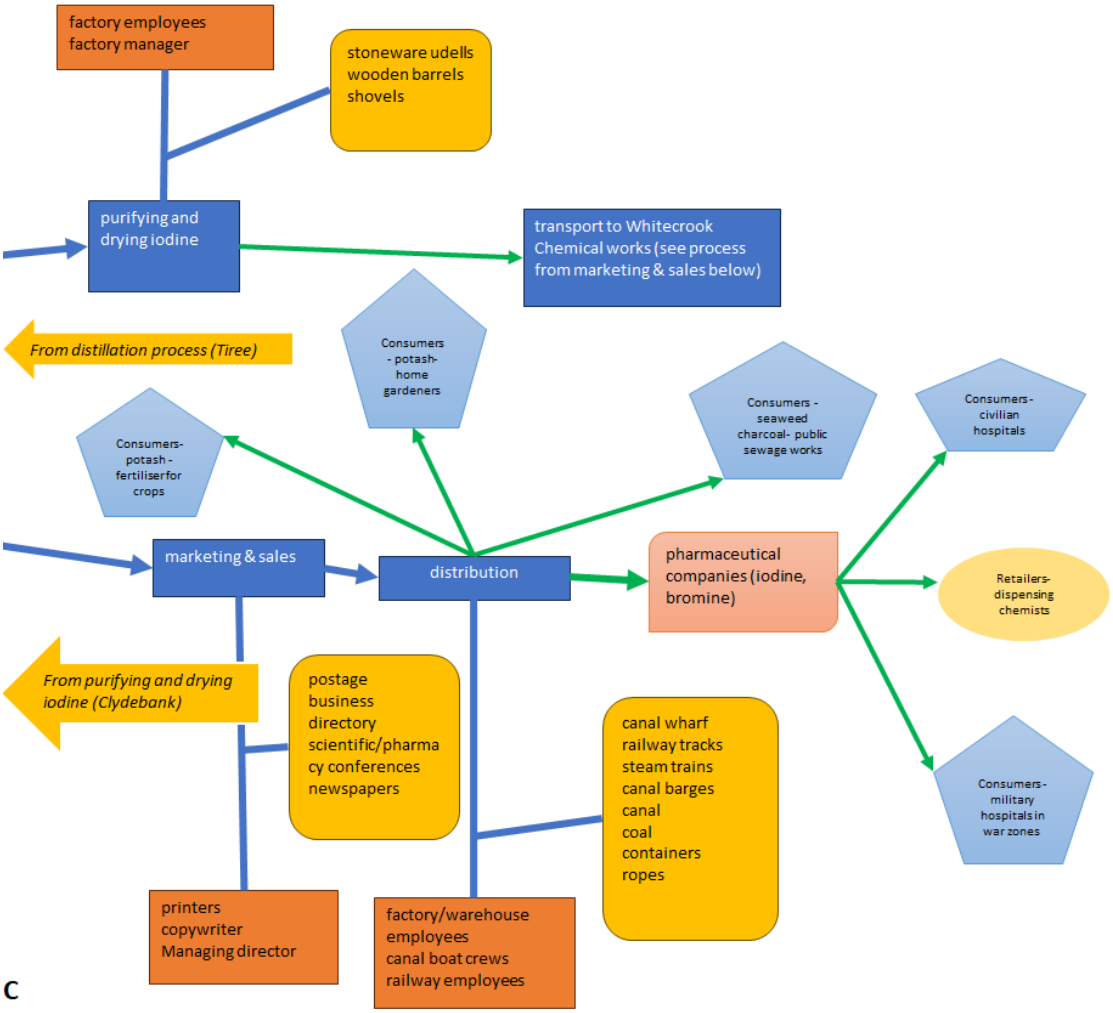


Figure 6-43: Part B (cont.), showing the split in the chain, pre-1876 when iodine was still produced at the Glassary and after the production was moved to Whitecrook, Clydebank.



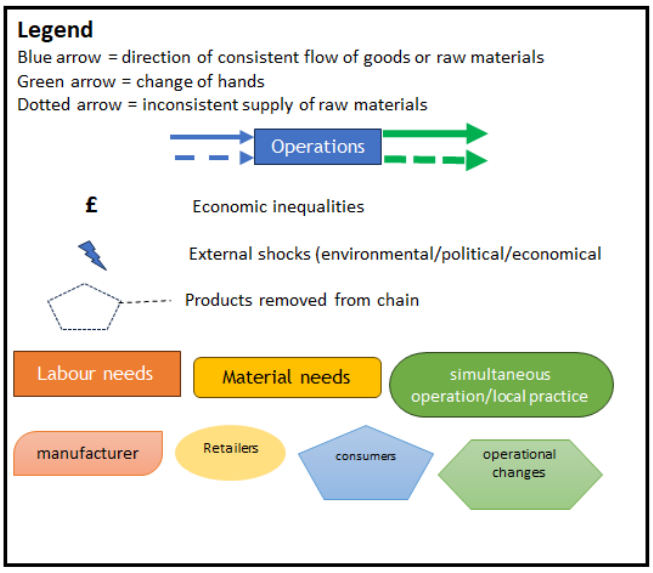


Figure 6-44: Part C (cont.).

6.4.1.1 Winter: Collecting and drying tangles

Tha mise seo gun chroit gun sgoth *Tha mise seo 's mi dìomhain* *Chan fhaigh mi caraid bheir dhomh not* *'s na cnuic cha toir iad sìon dhomh!*	I am here with neither croft nor boat, I am here without work: I cannot find a friend to give me a pound: The bare hillocks will provide nothing!
'S aithne dhuibh na Harry Graves *Tha 'g obair treun aig Sleven,* *A' tarraing stamh fo bheul a' làin?* *'S e 'n còta-bàn is prìs dhaibh.*	Do you know the Harry Graves Who are toiling away for Sleven, Dragging tangles from the high-water mark? A groat is all their pay.
'S cuir faileas feòil os cionn na poit – *Cha dèan e brot gu dìlinn* *Cha mhotha bhrathas a' ghrian an t-iasg* *'S na liaghain a' cur dìon air.*	Pass the shadow of the meat above the pot, It will never make soup for you; Nor will the sun betray the fish When the seaweed is protecting it.
'S an uair thig cupa dubh a-nall *Air seannlachadh 'san teapot,* *Am bonnach tur bhon ghreadail chruaidh* *Is fuaim aige fom fhiacail.*	And when a black cup comes along [Of tea] grown stale in the teapot, The dry bannock from the hard girdle [Is] crunching under my tooth.

(University of Edinburgh. School of Scottish Studies 1979: 94-95)

The song composed by local bard John Brown (*Iain Brùin,* 1854-1906) of *Cill Moluaig* (Kilmoluaig), stands as a rare example of Gaelic verse addressing the seaweed industry. Recorded by Dr Margaret Ann McKay for the School of Scottish Studies , the song was performed by Moss resident Hector Kennedy (*Eachann Mòr*)(Kennedy 1977a). In this witty composition, he draws a parallel between tangle gatherers and gold prospectors, dubbing them 'Harry Graves', after a purportedly renowned gold miner. The factory manager, James Sleven, is mentioned alongside the workers' meagre pay of a groat, or *còta-bàn* (lit. white coat), equivalent to four pence. The coin earned its nickname due to its pale hue (Kennedy 1977b; Sinclair, Donald and Kennedy 1971).

Eachann Mòr, in conversation with Dr Margaret Ann MacKay, elucidates John Brown's sardonic use of the name 'Harry Graves':

> Harry Graves was in gold mines. He was calling the ones that was willing to work on the tangles at Sleven. They were going through the moonlight down to the shore. Yes! He was calling them Harry Graves [laughing]. In order to get the money. They would be out in the moonlight putting up tangles.

Stanford's initial plan was to collect tangle stipes (*stamhan* or *slatan-mara*) year-round, aiming to provide consistent employment opportunities rather than limiting work to the brief summer season (Harvie 2014: 86). However, in practice, tangles were primarily collected from October to March for the factory. This five to six-month period is the time of year when substantial quantities of tangles are driven ashore by tides, especially following fierce Atlantic storms (Goodrich-Freer 1902; Holliday 2024). This new approach to the seaweed industry, focusing solely on gathering tangles for their stipes and bypassing the kelp burning process, marked a significant shift in practice. The gatherers' task was straightforward: collect tangles from the shore, move them beyond the tide's reach, and drain and dry them over low walling in preparation for collection by company employees. The tangle gatherers were self-employed because they were not hired by the British Seaweed Company or compelled to by the Argyll Estate. Many of the tangle gatherers, some of whom also worked in fishing, tended to be cottars, those without land of their own. The crofters who participated in tangle or wrack gathering would use their horses and carts, whereas the cottars having no land and therefore no horses, would be hauling the tangles up on their backs (Sinclair, Donald 1969c).

The *laminariae* species of seaweed, known collectively as tangles (*bàrr-dearg*), were the primary source of iodine extraction in the 19th century. Two species, *Laminaria digitata* and *Laminaria hyperborea,* were particularly valued for their high iodine content, particularly in their stipes (*stamhan*). *L. digitata*, growing in the sub-littoral zone just below the low water mark, could reach lengths of up to 2ms. *L. hyperborea*, found at greater depths of up to 36m, have longer stipes, sometimes extending to 3.5m, with a rougher and more rigid structure (Tyler-

Walters 2007). Eventually, *L. hyperborea* became the preferred species for iodine extraction due to its superior iodine content (Stanford 1861: 188; Thomson 1983: 18).

The harvesting of *stamhan* was a demanding and often perilous task involving entire families, including women and children. Gatherers would venture to the shore at all hours according to the tide, even in the dead of night, to collect the seaweed. Using tools such as grapes, narrow hayforks, or their bare hands, they would pull the tangles from the surf and carry them out of the tide's reach, often on their backs over treacherous terrain. The fronds of the tangles, *liath-mòr*, would not go to waste. These would be snapped off and used for fertilising crops. In the Napier Commission inquiry, some gave an account of these arduous and cold conditions, highlighting the physical toll and meagre compensation received by the harvesters, such as Donald Campbell and Duncan MacLean of Cill Moluaig (Napier Commission 1884c: 2178-79):

> They very often have to get up about midnight and go away down and pick up tangle out of the surf when the sea is washing over them, and take it up out of the reach of the tide on their backs over rough ground, and all they get is 4d. per cubic yard of root of tangle.

The economic impact of tangle gathering was significant yet unpredictable. Witnesses to Napier reported that even strong, young men could only hope to earn 2s. 6d. each on a good day, with periods of scarcity lasting weeks or even months. This unreliability of income underscored the precarious nature of the tangle-gathering occupation and its impact on the local economy, as the following testimony by Donald Sinclair and Archibald Campbell, Baile Phuill elucidates (Napier Commission 1884c: 2178-79):

> **Do you really say that women and children occasionally at least go out at midnight to gather the tangle upon the shore?** Yes; my sister was a widow with three children, and she was out with me gathering those tangles at night. The night was so dark that if I did not see it I could feel it among the sea-ware.
>
> **Was that in the winter?** Yes, it is in the winter that we take it.
>
> **How much is it possible to make by the day or week at this work – you named 4d? per yard?** I believe if there was a very strong young man and a

> very strong young man along with him they could both possibly make 2s. 6d. each in a day; but very often we can get none for weeks; sometimes not for a month – sometimes only an armful.
>
> **Did your sister's children work at this work at night with her?** – Yes, her children were along with her; and that is customary all over the place, as the tide suits.

The preparation of gathered tangles for drying involved the gatherers constructing walls of *buthagan* (beach cobbles) to keep the stipes off the ground and prevent rotting. It seems the shore was not divided into shares for gathering tangle as was done for gathering seaweed to burn kelp in kilns. Instead, the gatherers could gather wherever they lived and set up their drying walls wherever they were (Sinclair, Donald 1971a). These walls, typically two feet high and three feet wide, allowed for proper drainage and drying (Holliday 2024; Sinclair, Donald 1969d). Once a week, an employee from the factory would visit different townships to measure the tangles and determine payment. The employee would visit different townships on specific weekdays during his rounds. For the Baile Phuill township, for example, this was every Monday (Sinclair, Donald 1969d). The measuring stick which had an iron spike at its end, served a dual purpose: Measuring the stack's length and verifying that it did not contain excessive stones relative to tangles and that it was on a level surface (Goodrich-Freer 1902: 34).

The task of measuring and recording tangles, seemingly mundane, became a source of unexpected drama within the estate. The incident, which occurred in 1866, revolved around an employee allegedly known for his excessive drinking habits during his work rounds. This behaviour caught Lachlan McQuarie's attention. McQuarie, originally from Àrd Mòr in Mull, was the tenant for Hynish Farm and was previously an estate ground officer at *Hilibol* (Heylipol). McQuarie made a written complaint to the Argyll estate factor James Wyllie, urging him to dismiss the employee, although MacQuarie had no involvement in the local seaweed industry (907-1876-03 (1-3) 1876):

> Saucy Guthrie on his rounds, measuring and paying for tangle with a bag of the Duke of Argyll's money under his arm and so helplessly drunk that he must be assisted along by the very parties for whom he is measuring the tangle. You can scarcely credit this but it has been of frequent occurrence.

It is important to note that MacQuarie had a history of complaining to the Duke of Argyll and his estate factor about others, often maligning them. For example, he alleged that the new medical officer, Dr Alexander Buchanan, and the Tiree factor, Mr Geekie, drank excessively (1998.151.9 1866). MacQuarie was the sitting tenant at Baugh Farm, the tenancy of which the Duke had promised to the doctor. In MacQuarie's complaint to Wylie, there was a discrepancy regarding Guthrie in this particular case. The tangle gatherers were not paid in cash and certainly not with the Duke's money. The gatherers were paid 'in truck'; they were given a line of credit to purchase merchandise in the company's store. This was a common practice in in the 18th and 19th centuries in Britain, being most common in island communities with single industries, such as fishing, mining or kelp - where access to a variety goods and cash were limited. Landlords, company owners or tacksmen would pay their workers in lines of credit or tokens in exchange for goods, often at inflated prices, leading to a situation that was ripe for exploitation (Hunter, James 2010: 109; Macdonald, Donald 2004: 137). This would in turn keep their workers perpetually indebted and dependant to the company or tacksman's store.

Hiring and firing at the factory were the company's responsibility, not the Duke's. This inconsistency raises questions about the accuracy and motivations behind MacQuarie's complaints. Considering that the name Guthrie is not local, it is possible that Guthrie was recruited from Glasgow to work for the company when the company was first set up. His motivations regarding this are not clear, apart from the fact that many of the cottars that were pulling up tangles or making kelp were also fishing for him and getting merchandise from his store, which he also operated on a truck system in direct competition with the British Seaweed Company, pointing to a motive for this behaviour. Eventually, all the factory employees were locally hired as Stanford had originally planned. MacQuarrie's tendency to report misconduct, whether genuine or exaggerated, reflects the complex dynamics within the estate's management structure. While such reports could be used to maintain order in the smooth running of a complex estate, they could also be used as tools for personal gain or to discredit others.

Despite the efforts put in place to prevent fraud, an odd effort was made to manipulate the system in favour of the gatherer. The conversation below between

Donald Sinclair (Dòmhnall Chaluim Bhàin, DCB), Hector Kennedy (Eachann Mòr, EM), and Eric Cregeen (EC) discusses the endeavour of another man from Cill Moluaig to cheat the system, although it does not definitively confirm whether he succeeded. The described action appeared to require more energy and effort than it was worth (Sinclair, Donald and Kennedy 1971).

> **EM:** An old mannie came up, and he was working. What was his name? Iain Chawps. One of the MacDonalds.
>
> **DCB**: Iain mac Coinnich Chawps? I remember that man, I remember him well.
>
> **EM:** Well, he was working on the tangles, and he cut them in half with a small axe. So as he would make the height of the tangles. Well, he was building them up. They were coming around to measure them.
>
> **DCB:** a big man he was too! He was a big, hefty man. Aye, I remember him well. He was a wee bit away in the head. [laughing]
>
> **EC:** Where was he living, Cill Moluaig?
>
> **EM:** Cill Moluaig. I remember the croft where he was. One of the Groots, *na Grùtaich a bh' ann*.

Because Stanford had leased the shores directly from the estate, his company had 'the right to purchase at a price fixed by themselves all the kelp manufactured on the island' as evidenced by John MacFadyen, Caolas at the Napier inquiry (Napier Commission 1884c: 2137) which was four pence per square yard. The company employee would note how long each pile was under a particular man's name in his book. Each row of tangles belonged to one man or head of household. Each man would receive a line of credit, which could be redeemed for goods, such as coal, tea, oatmeal, tobacco etc., at the company store located at Middleton Cottage, where Sleven and his family resided (Napier Commission 1884c; Sinclair, Donald 1969a, 1969b, 1971a, 1971b). Sleven's wife and daughter, both working behind the store's counter, would confirm that the customer's remaining credit matched the amount of their purchases to prevent them from ending up in debt to the store. But, according to Sleven's testimony, most were in debt to the company, and they just gave goods to those that required them and did not speak of whether the debt was due (Napier Commission 1884c: 2180). Stanford explained why the truck

system had been implemented in his company's store in his evidence before the Napier Commission (1884d: 3058) when he stated that Sleven was obliged to give lines of credit to use in other shops in the island. However, due to complaints from the islanders about the high prices and poor quality in these other stores, the lack of supplies, and the fact that the nearest store was eight miles away from the works, he was petitioned by the islanders to open a store for them. However, a letter from the Tiree factor John Geekie in 1872 (ARG/6/T/4/2/1870/01) indicates there were widespread complaints from the local people about the truck system well before the Napier inquiry. Geekie addressed Stanford's complaint to the Duke of Argyll that he was unable to hire horses to assist them in shipping their products due to payment being made in goods 'not of the best quality and at high prices'. He emphasised this point further, stating:

> It is in this manner they pay all the labourers, and I may state that many of the poor people who gather the seaweed come to me to complain of them wishing me to interfere with the view of getting at least part of their wages in money. From inquiries I have made, I am quite satisfied they [the British Seaweed Company] would get plenty of horses to hire at a cheaper rate than in most places provided the Company would pay for them in money.

This was the truck system, which had been banned by an act of Parliament in 1831, making it illegal to pay workers in anything but the coin of the realm (Gulielmi IV. Regis). Stanford explained that the truck system was essential due to the absence of banks on Tiree, with the nearest one located in Mull, approximately thirty-four miles away. He explained the difficulties of bringing cash to the island. For example, a clerk left Glasgow with £300 but had to return with the same amount because he couldn't land in Tiree due to bad weather and a lack of suitable piers. Despite Stanford's and Sleven's claims, some of the Tiristich giving evidence felt that the goods were overpriced compared to other shops on Tiree, especially if a rare person asked for cash instead of credit for goods; they only received £2 per ton in cash for their wages rather than the £4 for goods. Stanford claimed he did not know of this situation despite his manager having testified that this was the case (Napier Commission 1884c: 2179).

In 1886, the Crofters' Holdings (Scotland) Act was passed. While it addressed the issues of tenancy for crofters, there was no provision for the cottars. This fanned

the flames of land hunger amongst the cottars at the island's west end, many of whom were gathering tangles for the factory. Land agitation and issues with the estate led to the formation of the Tiree branch of the Highland Land Law Reform Association (HLLRA), also known as the Land League. Land disputes, even among those members within the Land Leagues, finally boiled over, culminating in over 300 crofters and cottars occupying Greenhill Farm, adjacent to Stanford's North British Chemical Company land and factory, by putting their cattle to graze there (Harvie 2014: 90; Meek 2014: 159). The situation resulted in around 350 marines and 60 policemen being deployed to Tiree. Although opinions seemed to vary in the earlier Napier commission statements, complaints about the unfairness of the truck system were perhaps one of the triggers of the incident at Greenhill Farm.

According to Dòmhnall Chaluim Bhàin, when questioned by Eric Cregeen if there had been any Irishmen on Tiree agitating the locals, it was only Sleven who was Irish, but he was on the side of the cottars, and not the 'big shots' (Sinclair, Donald 1969e). The Duke of Argyll expressed his concern that since Sleven was Irish, was 'liable to have a bad influence on the people' (Bundle 3221 1887), stating that complaints were made regarding the 'rude conduct of the men about Sleven's works to all who were not Land leaguers'. The harassment was in the form of horns being blown at people who were not members of the Land League. It is uncertain whether Sleven encouraged this behaviour or not. However, it is more probable that the Duke of Argyll was anxious about external influences on his estate from outsiders and the heightened agitation in that part of Tiree for land rights than about Sleven’s part in the matter (Petre 2019: 77-86).

6.4.1.2 Transporting the tangles to the factory

This next step in the production process reflects the logistical changes that occurred when Stanford introduced the factory system in Tiree. A large part of this change was altering the responsibility from the tangle gatherers to the company after gathering. This shift in turn, impacted the transportation network across Tiree, where the company’s carters had the responsibility of collecting and transporting the tangles to the factory at Baile Meadhanach once the tangles were measured. This was a marked departure from previous kelping practice where the

kelp did not change hands until the finished kelp was ready for transport. This organisation of carters was meticulously planned: the company's carters made weekly rounds in the same manner as the employee who measured the stacks. This section aims to show how this node in the production process transformed Tiree's interconnectivity and the integral roles that those working for the factory had within their communities.

The company permanently employed six carters, with horses stabled at the factory premises. These horses and carts would traverse the island, following cart tracks through the machair and uneven roads to collect tangles from each township, adhering to a predetermined schedule for specific localities. These cart tracks were annotated on the 1898 OS map and can still be seen in the landscape all over Tiree. For example, the map in Figure 6-46 shows tracks going in and out of the factory in two directions, connecting it to the shore at *Rubha Chràignis*, the beach at Grianal where puffers would arrive, and other townships and shores around the island.

Initially, Stanford planned that tangles gathered would be carted directly to the tangle drying sheds to drain without rotting. His initial plan to utilise specially constructed sheds seems to have been abandoned in favour of a system wherein tangles were heaped onto walling for draining, drying, and measuring, a process necessary for recording payments and quantities collected. Using sheds for initial drying would have meant there would not have been a fair way to gauge payment. Therefore, the tangle sheds may have served as storage facilities after measuring heaps prior to bulk transportation to the factory from *Rubha Chràignis*. The shed close to *Rubha Chràignis* (Figure 6-22) may have continued functioning as a dry storage facility until the factory's closure.

The carters stabled the horses on the factory site as well as working the farm surrounding the factory site (Sinclair, Donald 1971b). Eachann Mòr (Hector Kennedy) named four carters still working there at the time of the factory's closure in 1901: John Carmichael, Duncan Morrison, John Donald MacArthur, and Arthur MacArthur, John Donald's brother. They all lived at Sanndaig, across from the factory (Kennedy, 1977b). John MacLean, *Cill Choinnich* (Kilkenneth) grew

fodder for the horses – he was known as *'Gaffar a' Churrain'* (the carrot gaffer) (Holliday 2002).

Neil MacLean was employed to look after the horses. His father, Charles, was one of five crofters removed from Baile Meadhanach to make way for the factory, ending up on a croft in *Baile Nodha* (Balinoe). The land the company originally rented comprised five lots or crofts, most of which were used to graze the company's horses. The crofters who were removed were offered other crofts and resettled in various places around Tiree (Holliday 2002; Kennedy 1979).

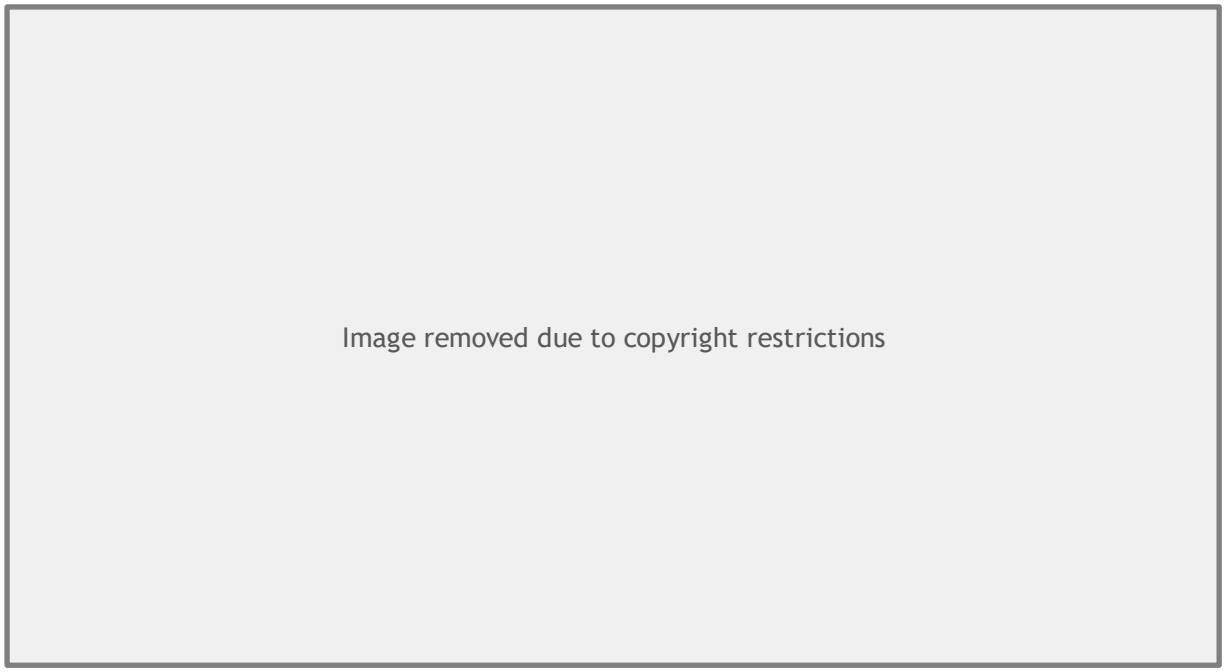


Figure 6-45: Brass cart plate from the Glassary seaweed factory. This plate is dated after 1876 when the British Seaweed Co. Ltd was re-established as the North British Chemical Co. Ltd. Image obtained from An Iodhlann, https://www.aniodhlann.org.uk/object/2002-67-1/

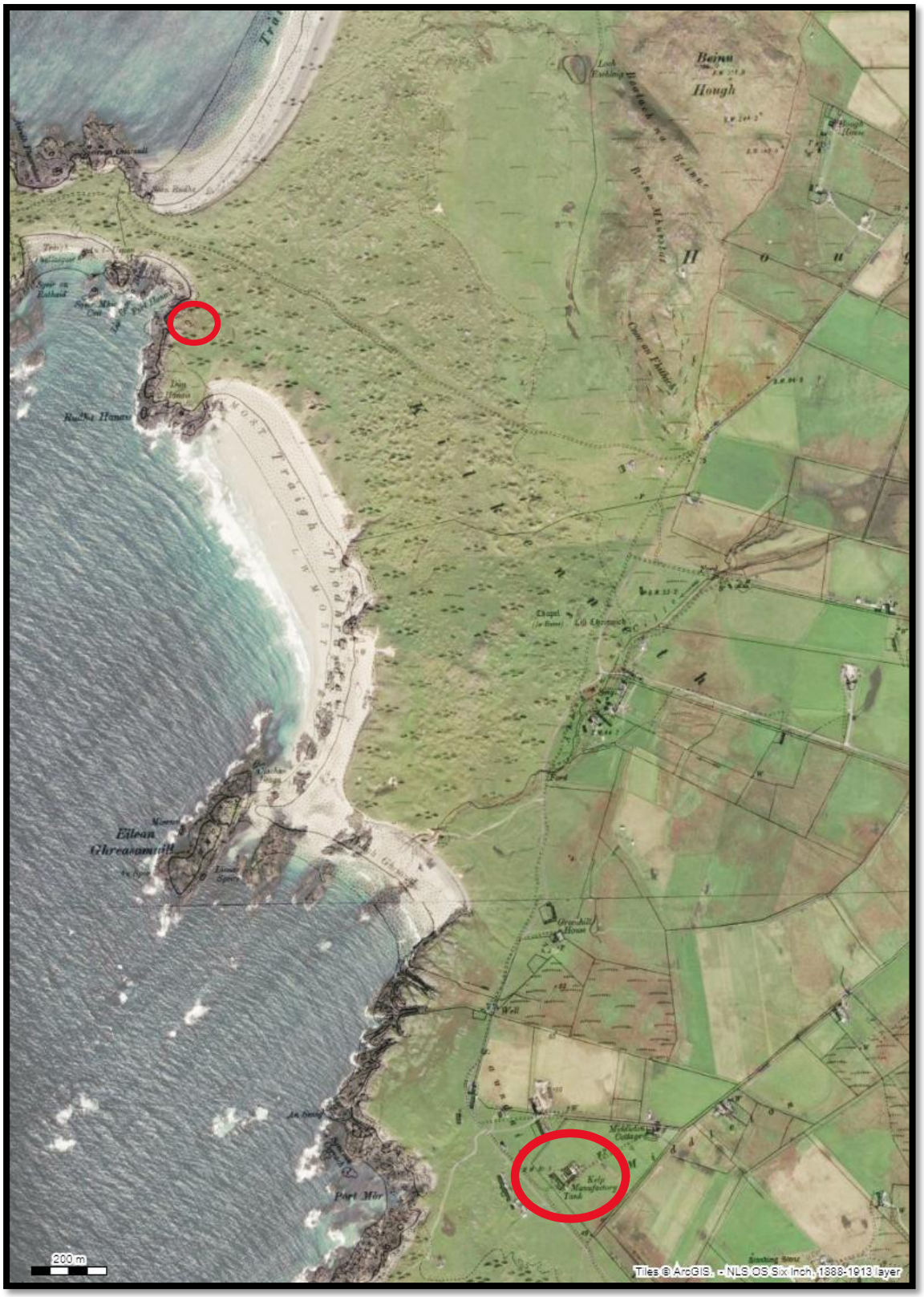


Figure 6-46: Satellite image showing tracks from Cràignis to the factory with 1898 OS map overlay. The Seada Hàinis and Factory are marked. Image obtained from NLS https://maps.nls.uk , OS Map, Argyll and Bute LXIII & LXIV, surveyed 1898, published 1900.

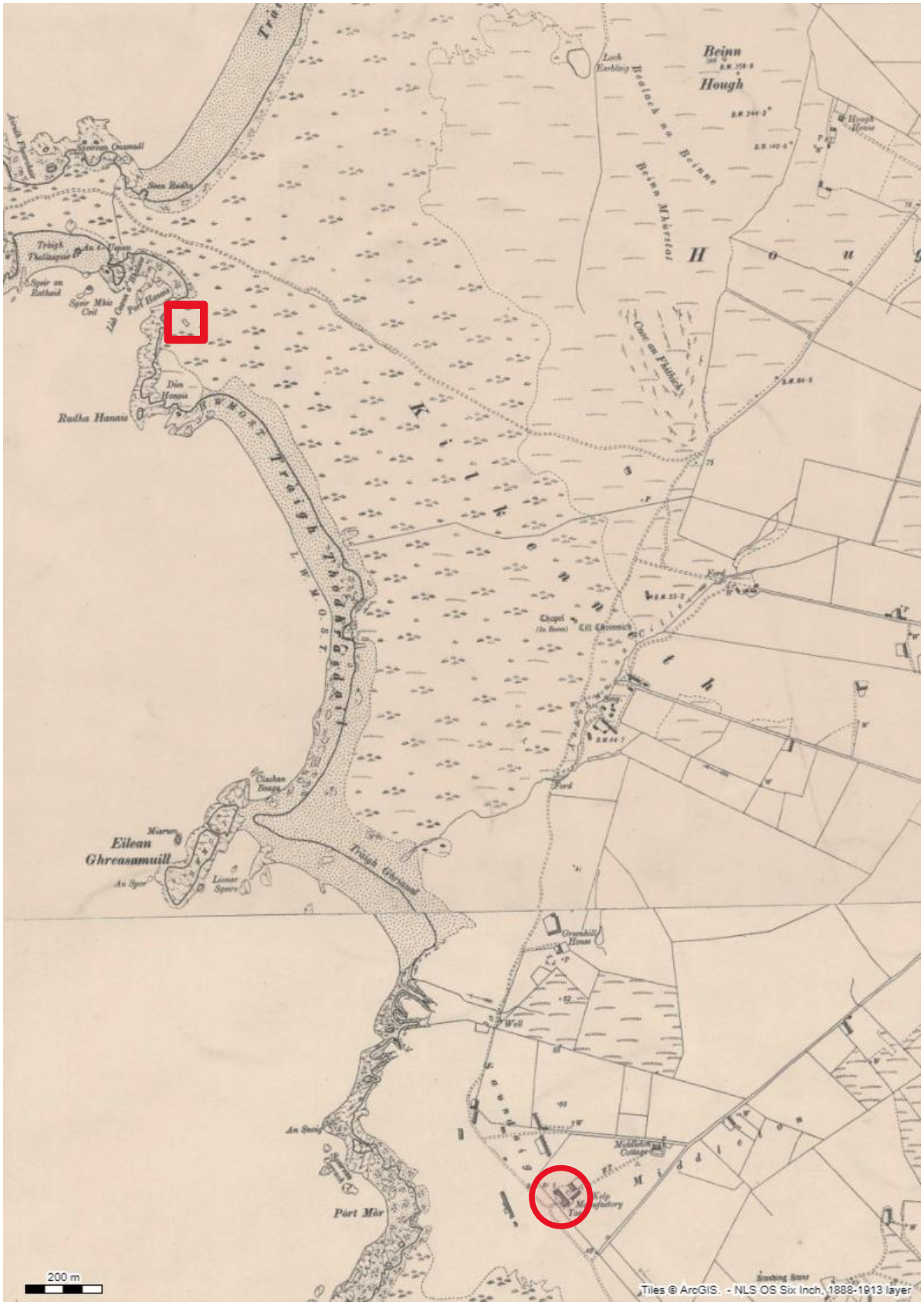


Figure 6-47: the same area as Figure 6-46, map only. Cart tracks are marked, showing different routes in and out of the factory at Baile Meadhanach to different townships. Map obtained from NLS https://maps.nls.uk , OS Map, Argyll and Bute LXIII & LXIV, surveyed 1898, published 1900.

6.4.1.3 Processing into seaweed charcoal at the factory

The patented innovation of producing charcoal from tangle stipes in closed cast-iron retorts using a low red heat was the main difference between Stanford's method compared to earlier iodine production methods of using crushed kelp blocks. This way, a higher iodine level was preserved to ensure minimal loss due to volatilisation. In 1861 Stanford outlined how this method would work practically in his paper *On the Economic Applications of Seaweed*. Here he describes how the seaweed charcoal is made (1861: 194):

> 3. The cakes, or the unpressed weed, are then to be distilled at a low red heat in iron retorts; the tar and aqueous products are to be collected in suitable condensers, and the gas in a gasometer. The gas may be employed for heating the stills used for rectifying the products, for heating the drying sheds, or even for lighting the factory… The best kind of retort for the purpose will, I think, be cylindrical vessels of wrought iron, heated externally, and placed vertically, having the base and also the upper end conical; the former furnished with an air-tight iron damper plate, for withdrawing the charge.

It seems that making 'seaweed cakes' was a step that was abandoned at the Tiree factory as it was not a necessary step but one more of maximising storage, according to the method outlined. Instead, the dried tangle was cut up and packed tightly into closed retorts (Wisniak 2001: 524). It was perhaps a decision to simplify processes in order to maximise production efficiency in the factory.

At least three or four men worked inside the factory, burning the tangles day and night. The tangles brought in by the carters would be stacked in large banks beside the factory. Dòmhnall Chaluim Bhàin names two that he knew and what he observed inside the factory (Sinclair, Donald 1969e, 1971b):

> The two men that were working there, burning the tangles. MacNeil. He was married in Baile Phuill and his children are here yet. Hector MacLean from Barrapol. MacNeil and Maclean both lost their eyesight. They were both blind. Years and years after [the factory closed]. Maybe it was the smoke that did it. There were big boilers there and big retorts while the tangles were burnt. As they worked there were doors, they would open. There was a gear or two to bring the ash out, right out. And they had steel barrows. I've seen them working at it. They were filling the barrows right up and putting them in a dump near at the end of the factory. Maybe it was the

> smoke and gas of the tangles that caused them to lose their sight. It was queer it was the two of them.

The by-products resulting from the char process included illuminating gas, tar ammonia, potassium salts, iodides, and residual charcoal, as described in his patent application for the extension of his patent (No. 1411.1861 1875). The residual charcoal he sold on as an 'earth-closet deodoriser':

> By destructive distillation the seaweed is converted into charcoal which remains in the retorts and ammoniacal liquor and tar condensed in suitable condensers and gas which is used for lighting purposes. The gas liquor yields ammonia and acetic acid. From the charcoal the salts of potassium and sodium with iodides and bromides are easily removed by washing and a residual charcoal is obtained which resembles that prepared from bones. This charcoal is a most powerful deodorizer, decolourizer and disinfectant and can be produced at one fourth the cost of animal charcoal.

Stanford's patent extension application included detailed production, expenses, and income accounts for the Tiree and North Uist factories in the first few years after the British Seaweed Company was established. The accounts included in this application are the only existing accounts for the British Seaweed Company Ltd in the Stanford Papers that give an idea of how well the business was operating. Table 1 in the Appendices details some of this data, excluding the balances and total amounts paid or received. The years between 1863 and 1867 are bundled together into a single sum. The balance at the end of 1874 showed that he was operating at an overall loss from 1863 to 1875. The highlighted price of iodine shows an increasing value from 1867, reaching a peak of twenty shillings and nine pence per pound in 1872, to a dramatic drop the following year in 1873 to fourteen shillings and five pence, and finally to eleven shillings, six pence per pound in 1874. When the price of iodine began to drop, the production costs also increased. The years 1873- 1874 are significant because they mark the beginning of the impact on the iodine markets from the importation of crude iodine from Chile. This crude iodine was a by-product of the natural nitrate deposits, known as *caliche*, found in Chile and Peru. Chilean producers could supply ten times the market demand, and they could do so more cheaply than obtaining iodine from kelp or Stanford's char process (Childs, Peter E 2022: 210). In 1885, Stanford stated that the only time the two island factories were in profit was when iodine was in short supply (Booth 1963). Even a year after re-establishing his business as The North

British Chemical Company, he knew his method could not be used more generally despite his innovation in creating a product with higher iodine yields (Stanford 1877).

From 1867 to 1901, Tiree solely produced the char process to make seaweed charcoal. The seaweed charcoal was then transported to Whitecrook at Dalmuir near Glasgow for final processing into iodine.

6.4.1.4 Lixiviation, distillation into iodine, purifying and drying iodine

After the seaweed charcoal had been made, it was lixiviated or leached using water to extract the soluble salts before being distilled. The charcoal was broken up and mixed with hot water in vats heated by steam. The process then was as follows: The clear solution was run off and boiled down in a hemispherical iron pan. The solids that appeared were fished out. The liquid was then cooled, and more crystals were removed. This process continued until this liquid, or 'mother liquor', became rich in iodine. The 'mother liquor' was mixed with concentrated sulphuric acid, strained off from the sulphur and run into the still. The iodine still was a deep iron pot covered with a strong lead lid and two earthenware arms connected to a series of udells - also called aludels - arranged in parallel banks (Figure 6-49). Udells were stoneware condensers which exchanged heat to transform iodine gas into a liquid state through cooling. The still was heated with coal, and then manganese oxide was added. The iodine was carried over in the steam and condensed in the udells (Figure 6-48). The iodine went through a purification process known as sublimation, which converts a vapour into a solid by gradual heating. This was carried out in small porcelain or earthenware pans. The solid iodine was dried and packed into casks for storage and transportation. The standard cask size was 1cwt or 112lbs. These were generally small wooden barrels or kegs. The iodine prices were expressed in shillings per pound rather than per ton as was the case with kelp or salt due to the kegs being measured in pounds (Table 1) (Childs, Peter E 2022: 201-202; Wisniak 2001: 207-208).



Figure 6-48: Diagram showing the industrial method of iodine distillation. Image obtained from: https://chemistrypage.in/iodine-uses-and-iodine-properties

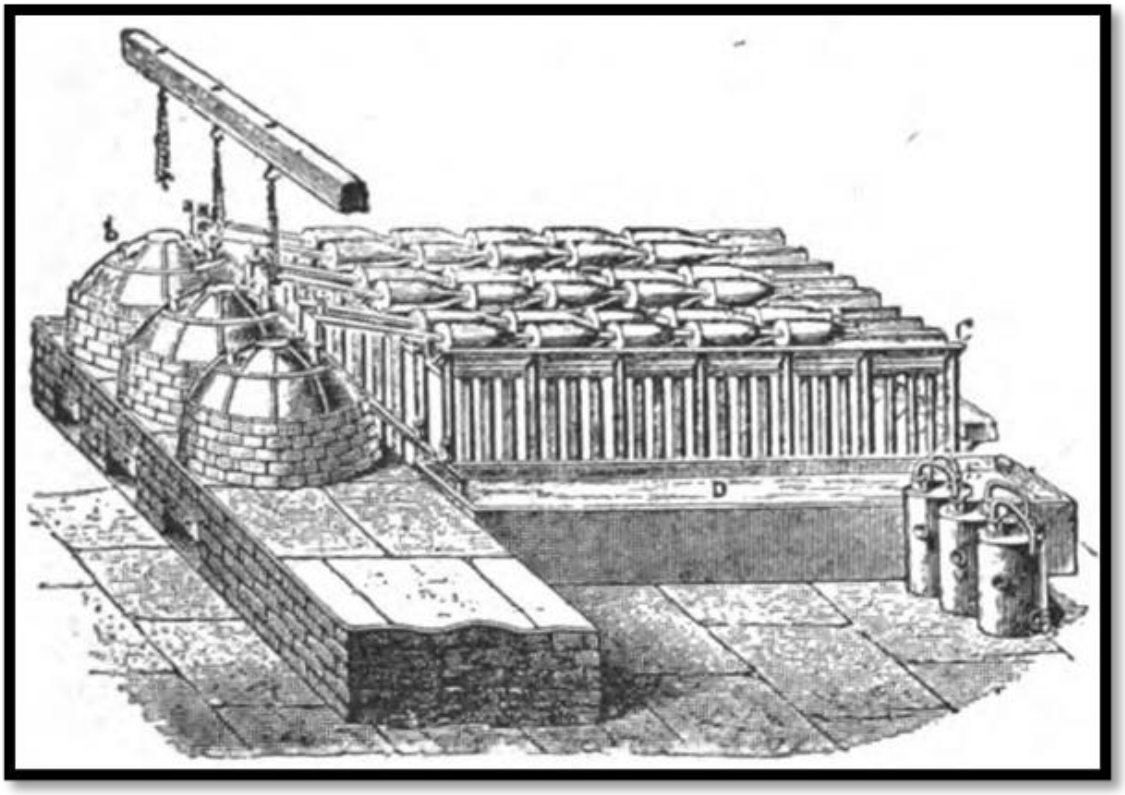


Figure 6-49: Iodine stills showing parallel banks of earthenware udells. Image from E. Molinari, transl. T. Pope, 1912, Treatise on General and Inorganic Chemistry, 2nd ed., J. & A. Churchill, London, p. 163.

When Stanford first started the distillation operations at the Glassary, he enlisted the expertise of experienced lixiviators from Glasgow. These lixiviators were not only well-versed in the lixiviating process but also had extensive knowledge of iodine distillation, which was crucial for the operations. Although Stanford hired Michael Kelly as his foreman because of his thirty years of experience as a lixiviator and he was 'useful in setting up the evaporation pans and other plant', it seems that his performance as a foreman did not meet Stanford's expectations (TD871/4 1864: :10-11). Once the factory was up and running, only Sleven was hired from outside Tiree. Stanford intended to eventually hire only Tiristich for the factory, including the foreman.

Although it is not precisely clear when iodine production ceased at the Glassary, iodine production had ceased in Tiree by 1876. The distillation process and final product was produced only at Whitecrook site after the liquidation of the British Seaweed Company in 1876 when the North British Chemical Company was established. It is possible that iodine production ceased as early as 1867. James

Sleven stated that the factory prepared the tangle in the 'rough state for the other work of the company, which is at Clydebank' (Napier Commission 1884c: 2180). The distillation process at Whitecrook is not repeated here because it would have been the same as that used at the Tiree factory.

One of the difficulties in maintaining the lixiviation and distillation process at the Glassary was the cost of purchasing coal and transporting it to Tiree. Coal was necessary as the natural peat reserves on Tiree had been exhausted. This was not an issue at the Loch Euphort, North Uist site, where peat was used to fuel the factory. Ultimately, this cost was the prime factor for moving the final iodine production to the Whitecrook plant (MacLeod, Donald 1886: 52).

6.4.1.5 Transporting the seaweed charcoal and iodine to Whitecrook

Once dried and packed into casks, the iodine was carted to the nearest pier, usually overland to Sgàirinis. The company's carts and horses at the factory would not only bring the tangles in from the Tiree shores but also take iodine or seaweed charcoal to Sgàirinis. The company would arrange the steamers directly. The pier was used at *Haoidhnis* after the Duke of Arygll was successful in putting pressure on the Lighthouse Commissionto allow its use in 1863 (Harvie 2014: 83-84). Flat-bottomed coastal steamers or 'puffers' would arrive and take the iodine, bringing coal and other provisions for the company's shop, most often coming into Scairinis pier, sometimes landing on an open sandy beach like Tràigh Bhì (Travee Beach) at Baile Phuill. Carts would drive over the sand to bring the iodine or seaweed charcoal to the puffer. The Clyde puffers continued to supply vital goods such as coal to Tiree until the 1950s (2017.70.4 2017).

The steamers would then be loaded with the casks of iodine or, later, sacks of seaweed charcoal bound for the Whitecrook works at Clydebank. The puffers would steam along the inshore waters of the west coast to the Clyde and then navigate up the Clyde to the Forth and Clyde Canal and the chemical works' wharf at Whitecrook near Dalmuir, Clydebank. Whitecrook was a farm of about 100 acres when Stanford purchased the property (MacLeod, Donald 1886: 52). The chemical works were built on a nine-acre site along the Forth and Clyde canal, originating

from where the former Forth and Cart canal intersected with the Forth and Clyde,and extending along the canal to the former site of a curling pond (Figure 6-50). Within thirty years, the area would transform from a rural landscape to a completely industrialised complex with extensive rail connections, factories and residential areas for industrial workers (Figure 6-51). Although the factory was at Whitecrook, the head office for the British Seaweed Company was at 94 West Regent Street, in the heart of the Glasgow city centre until 1876, when they relocated to nearby 149 Hope Street under the new name of the North British Chemical Company.

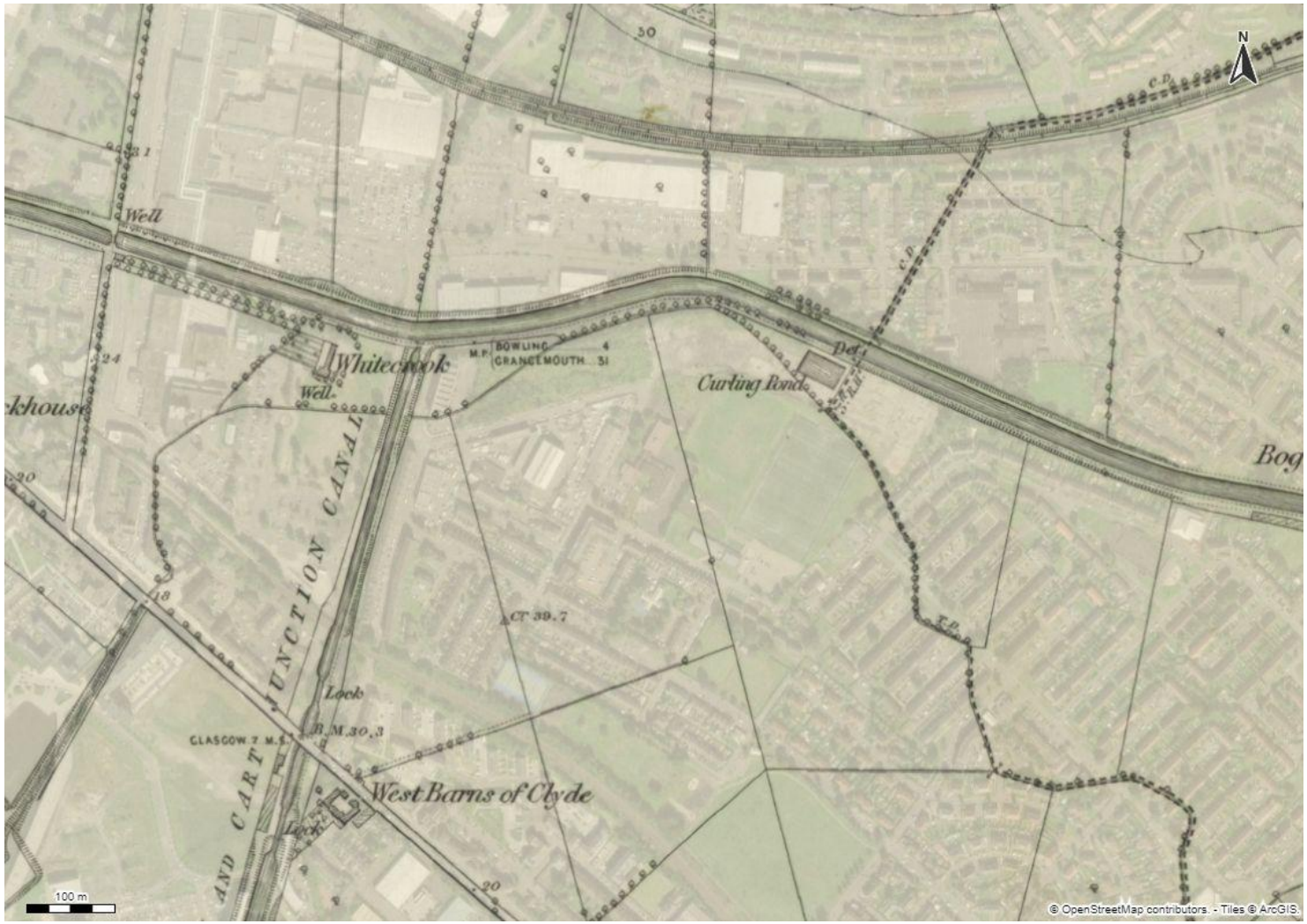


Figure 6-50: Whitecrook Farm at the time of Stanford's purchase. Contains ESRI World Image satellite data. OS Map: Dumbartonshire XXVIII (Inset XXIX), 1864 & Renfewshire VIII (with inset of IX), 1864. Map obtained from NLS: https://maps.nls.uk/

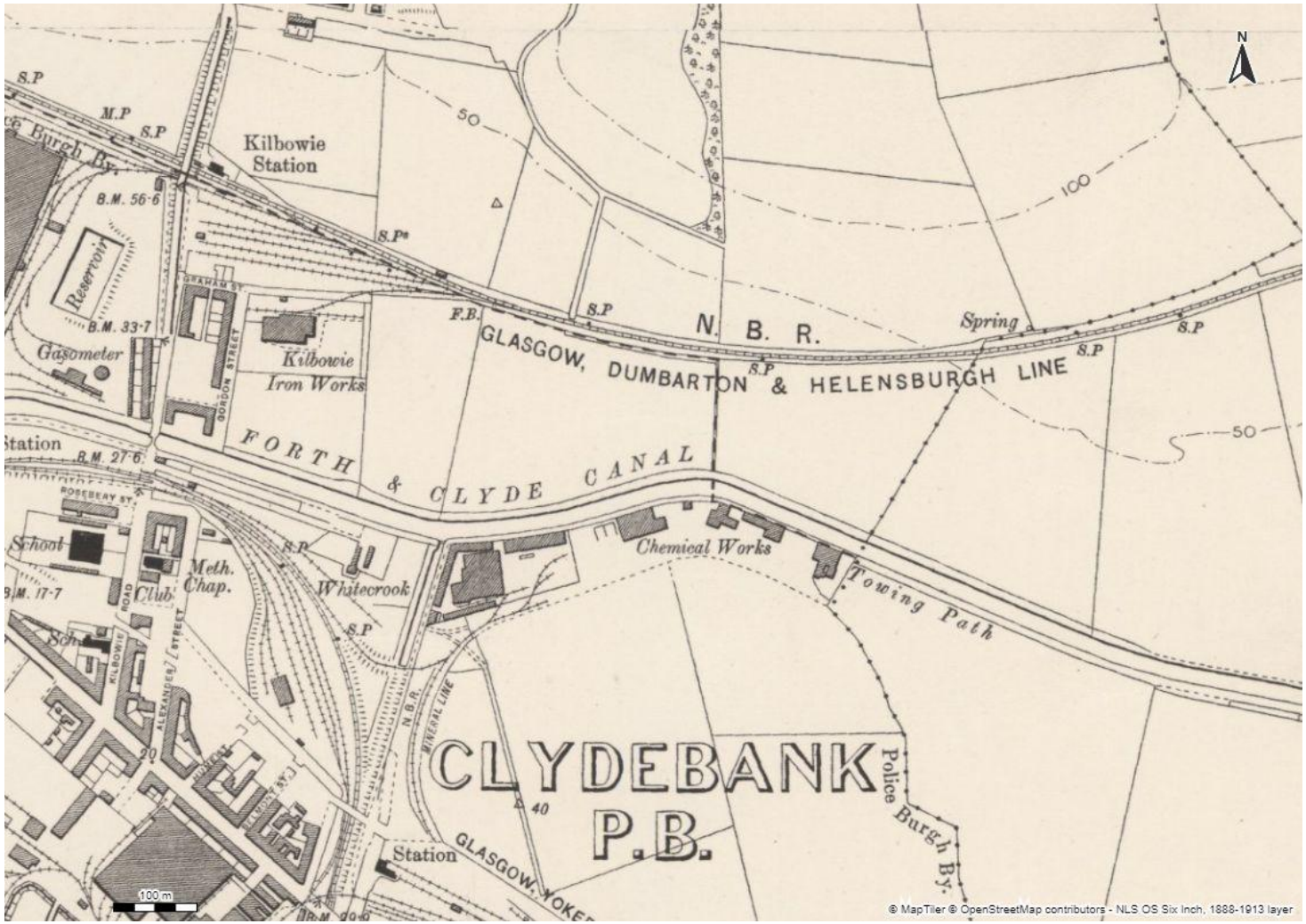


Figure 6-51: OS map showing Whitecrook Chemical Works, Clydebank, 1896. The works site boundaries go from the former Forth and Cart canal to the former curling pond site. The former Whitecrook farm and surrounding area transformed into an industrial landscape. The Forth and Cart Junction Canal connecting the Clyde to the Forth and Clyde Canal had been infilled by this point and converted to a road. Map obtained from NLS https://maps.nls.uk OS Map , Renfrewshire VIII 1896, published 1899. Crown copyright.

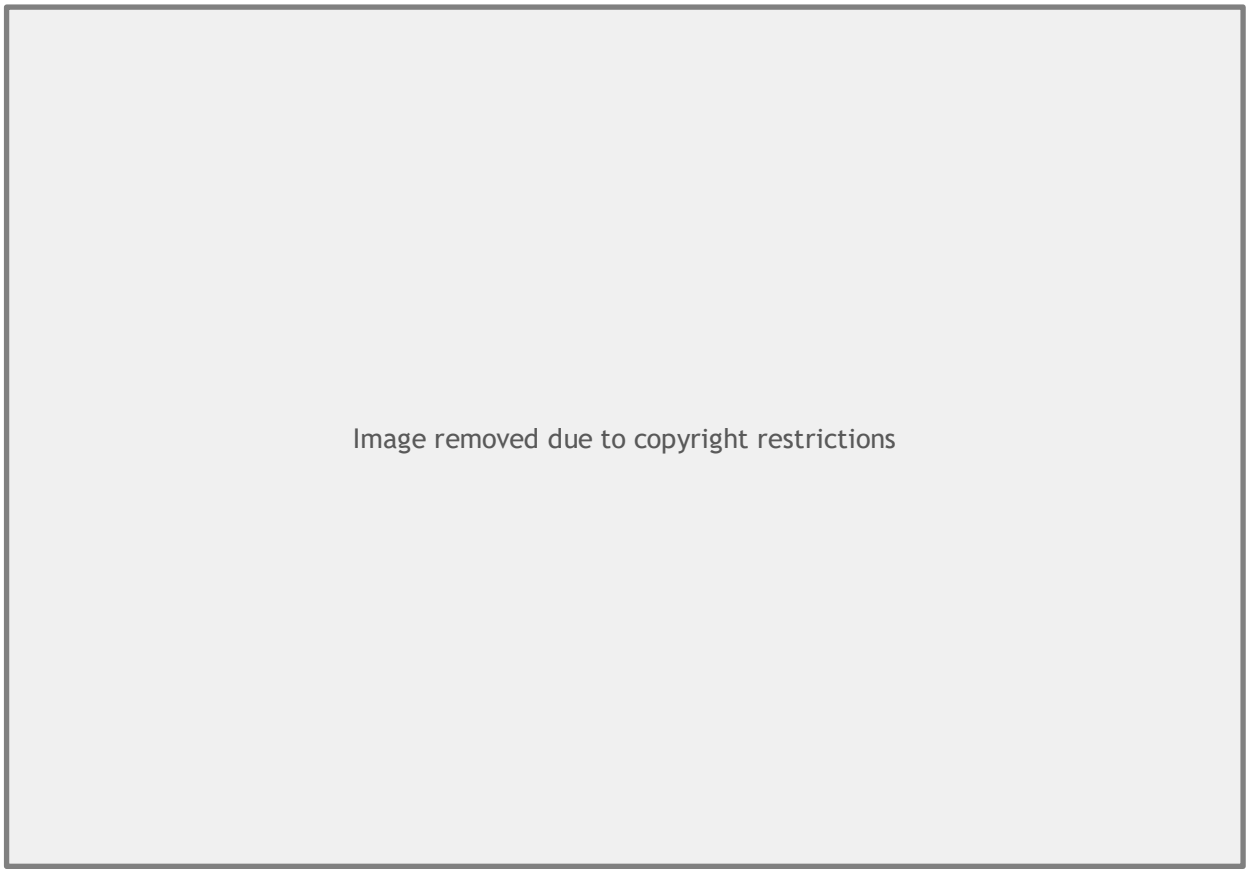


Figure 6-52: View down the Forth and Clyde Canal towards the Whitecrook Chemical Works, early 20th century. The single chimney stack belongs to the chemical works. Photo obtained from West Dunbartonshire Arts and Heritage: https://www.facebook.com/WestDunbartonshireHeritage/photos/pb.100064511087172.-2207520000/2104080589787070/?type=3

6.4.1.6 Marketing, sales and distribution

Marketing methods in the pharmaceutical and chemical industries underwent significant changes during the latter half of the 19th century. Newly introduced American pharmaceutical marketing methods influenced these practices (Church 2005: 298). These innovations were particularly evident in the marketing of iodine, which found applications in pharmaceuticals, photography and disinfectants. The product was sold to diverse customers, including city hospitals, war zones, doctor's surgeries and pharmacies, where it was also marketed as a dietary supplement. This diversification of target markets demonstrated a more sophisticated approach to product positioning and distribution. Expanding railway networks, in addition to the canal system, as shown by the contemporary OS map (Figure 6-51) showing rail lines directly connected to manufacturing facilities like the Whitecrook Works, further facilitated the efficient distribution of products to these varied markets.

Stanford's approach to marketing exemplified the evolving strategies of the time (Church 2005: 292). He produced informative booklets and pamphlets to advertise his chemicals, representing a novel method of product promotion. These materials included articles presented at conferences (Figure 6-53) and information on potash for manures, with medals gained at trade fairs or international competition (Figure 6-54), targeting both farmers and wholesale customers. This shift towards creating professional marketing collateral, including the use of copywriters for booklets and press releases, marked the beginning of modern pharmaceutical marketing practices that continue to influence advertising and marketing strategies to this day. Additionally, Stanford's participation in conferences for networking within chemical and industrial circles highlighted the growing importance of professional connections and knowledge sharing in the industry. These marketing innovations laid the groundwork for sophisticated, multi-channel marketing approaches still used in the pharmaceutical and chemical industries in the 21st century.

Mr. Ed. Stanford read a paper at the recent Pharmaceutical Conference in which he urged upon manufacturers the preparation of charcoal from seaweed. He states that the stems of the tangle-weed *Laminaria digitata* when thrown up on the shore of the Hebrides are several feet long, and about as thick as the wrist, and when properly burnt they are converted into an excellent porous charcoal. This charcoal resembles that produced from animal matters, and has excellent properties as a means of filtering water. It has the following composition :—Carbon 50, phosphate of lime 4, carbonate of lime 20, carbonate of magnesia 6, silicic acid 5, alumina 2, sulphate of potass 5, chlorine and iodine 5.

The ventilation of sewers is a subject which receives but little attention in London, perhaps because the Board of Works is unacquainted with any efficient and practical means of compassing the desired end. The method which has lately been suggested by Dr. Mackinder, though by no means novel, has much *à priori* reason to recommend its adoption. He suggests the employment of vertical shafts, which should pierce the sewers and open above near the top of some public building, factory chimney, &c. He proposed to place at the bottom of these tubes small chambers of charcoal, or furnaces, by which the foul gases would be filtered or oxidized before being thrown into the atmosphere.

ECONOMIC APPLICATION of SEAWEED.

Mr. Edward C. C. Stanford, F.C.S., has read a long and interesting paper "On the Economic Applications of Seaweed" before the members of the Society of Arts in London :—

He said that sixty years ago it would have been difficult to persuade a botanist to include one of the marine algæ in his herbarium, so worthless and insignificant were they then esteemed; now they are numbered amongst the choicest dried collections from the vegetable kingdom. It had been said that Dr. Johnson had included them in his "plants that are noxious and useless."

The first important application of seaweeds was made about the middle of the last century, it consisted in burning them for the ash as a source of soda-but barilla from abroad entered our market and the tall chimney of the alkali works rose up in competition against them, and seaweeds fell to a discount. Then the discovery of iodine was made, and the burning of seaweeds became a necessity, and at the present day we are mainly indebted to this humble source for the means we possess of borrowing the sun's light to paint his own image. Seaweed was the raw material which had enabled photographers to satisfy hundreds of thousands of Englishmen who longed to preserve the likeness of the illustrious deceased, whose sudden call to another Crown had plunged the whole nation in sorrow and mourning. Nevertheless seaweed had been but imperfectly studied, and the rich wreck of marine vegetation annually deposited on "our shores" remained unappropriated. Under the term seaweed, he included all plants growing in the sea and thrown up on the shore.

The principal economic applications of seaweed were as food or medicine, as manure, and in the manufacture of kelp. The algæ possessed nutritious and demulcent properties; they contained a peculiar gum, and sugar, starch, a little albumen, and a comparatively large proportion of nitrogen. The value of seaweed as manure was appreciated most in the Channel Islands, the *vares*, or *vraic*, as the weed is there called, is considered so valuable, that special laws are enforced for its regular collection and fair distribution amongst the agriculturist, many of whom use no other manure. About 30,000 loads of *vraic* of all kinds were annually obtained from the rocks and bays of Guernsey, and the adjacent small islands of Herm, valued at 3,000*l*., or two shillings per load; and that collected in Jersey was worth probably quite as much. The manufacture of kelp, or the burning of sea-weed to obtain its ash, was carried on for the value of the carbonate of soda contained in it; but when the high war duties were taken off foreign barilla and salt, kelp, for which the demand had been very great, deteriorated in value, and was scarcely worth making.

Figure 6-53: Press releases and presenting at conferences, two of the marketing tools employed by Stanford to promote his products. Newspaper clippings, The Penrith Observer, October 15, 1867, pg. 6 (left), The East Kent Gazette, Feb 22, 1862, (right), obtained from the British Newspaper Archive, https://britishnewspaperarchive.co.uk/

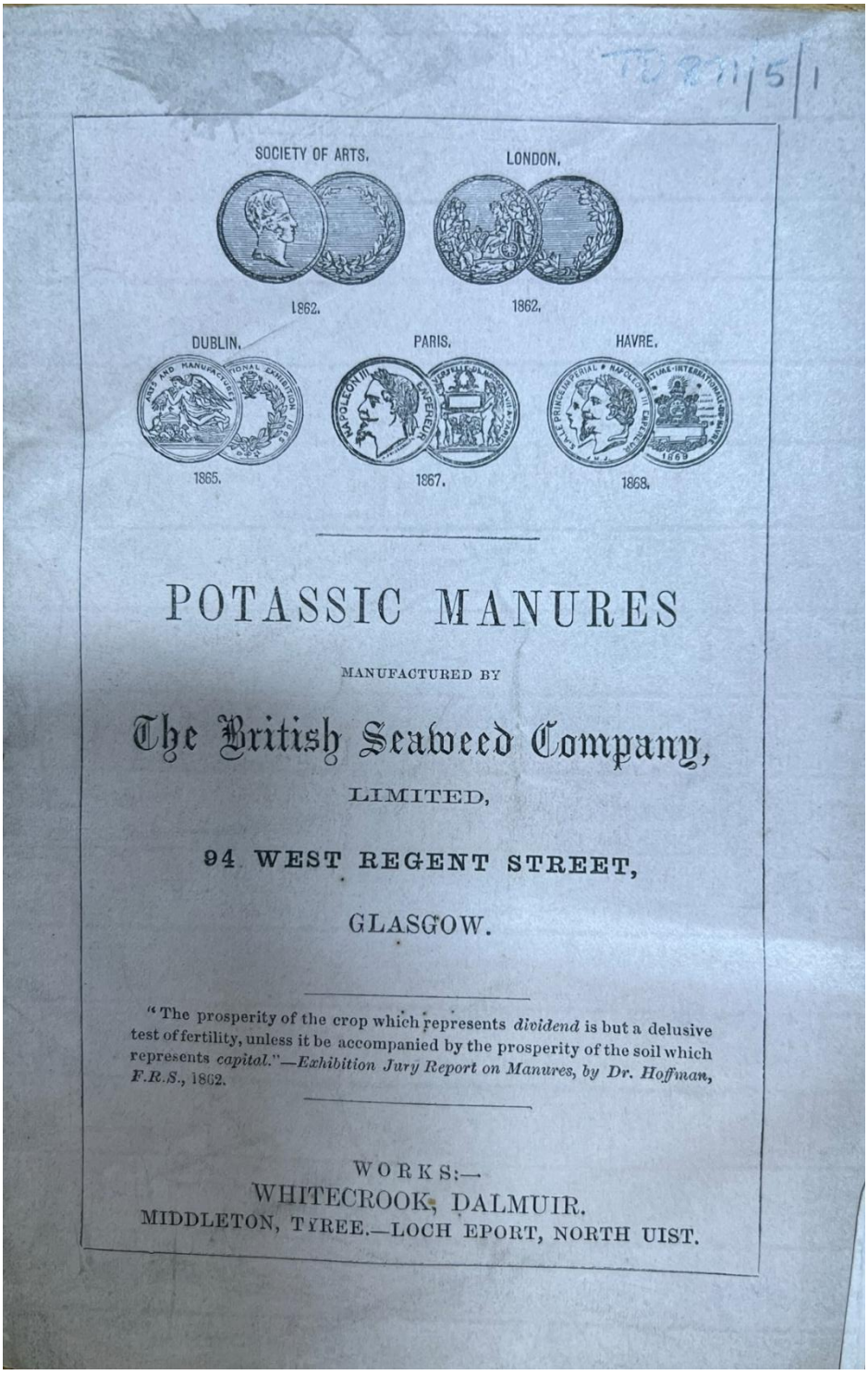
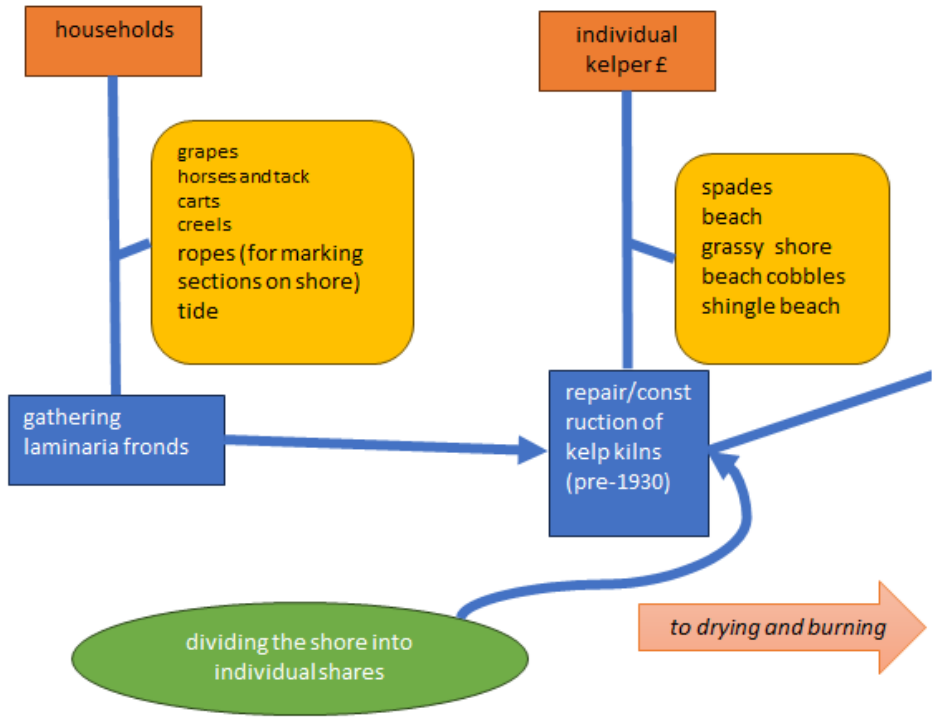


Figure 6-54: Marketing brochure for Potassic Manures. No date. The name of the company indicates this may be have been printed between 1863 and 1876. The works mentioned do not include the works in Ireland. TD871/5/1 Stanford Papers, Glasgow City Archives.

6.4.2 Continuity: Kelp-making

During the winter, tangles were gathered, and seaweed charcoal or iodine was being processed in the factory year-round. However, in summer, many local kelpers continued making kelp from laminaria fronds which are naturally shed in Spring and washed up onshore. These were burnt in rectilinear kilns, the same type that had been in use since kelping was introduced to Tiree in the mid-18th century. The following commodity chain diagram for the summer kelp burning shows a similar process as that seen in the earlier alkali phase, such as the Calbost case study in Chapter 4.8. This commodity chain departs from the earlier alkali phase in that potash, iodine and other compounds were being extracted from the kelp rather than soda. The CCA diagram (Figure 6-56) also marks the change after 1901 when loose seaweed charcoal was made directly on the beach shingle from tangle rods– which was mainly for iodine extraction after the Glassary factory's closure. This product continued to be sold to the Whitecrook Chemical Works at Clydebank until iodine manufacture ceased there in the 1930s.

To avoid unnecessary repetition, the production nodes will not be expanded upon after the raw kelp has been transported to the Whitecrook works.



A

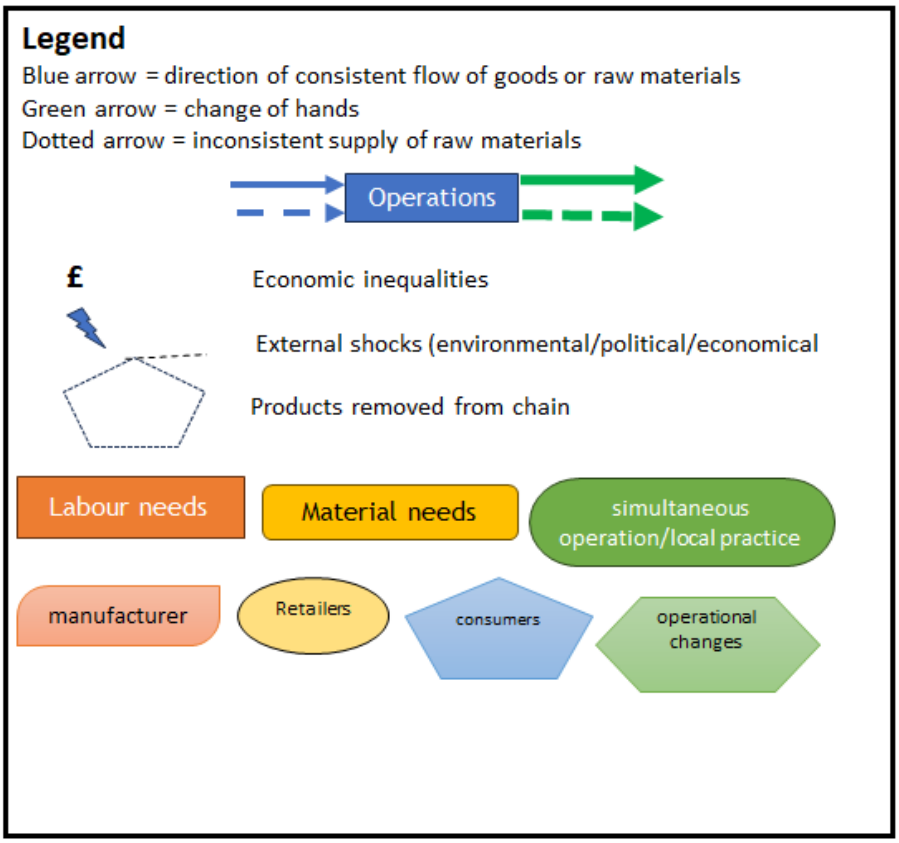


Figure 6-55: A- Commodity chain analysis, summer kelp production.

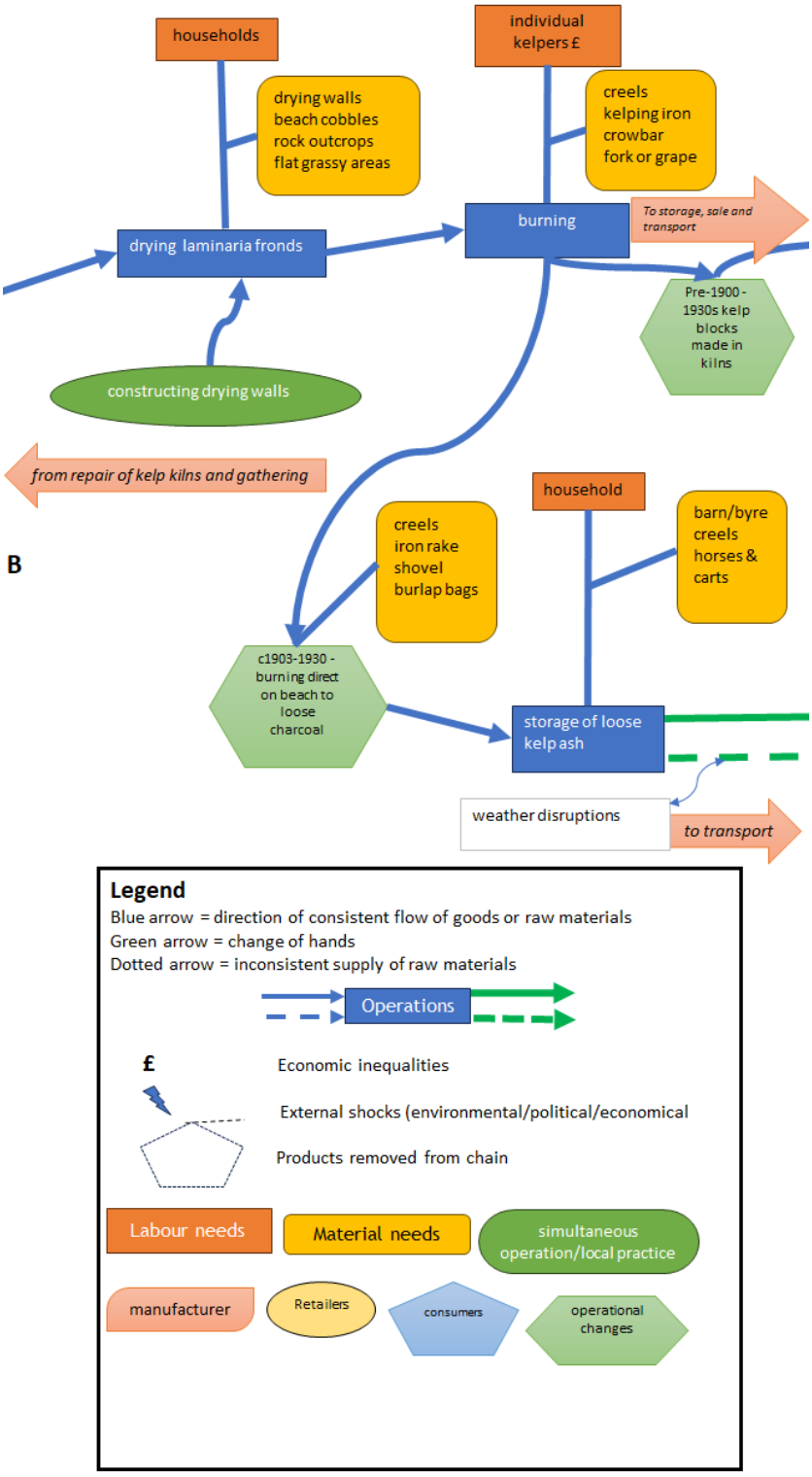


Figure 6-56: B (cont.), illustrating the change from burning seaweed in kilns pre-1900 and burning of tangle rods directly on beach shingles after 1901.

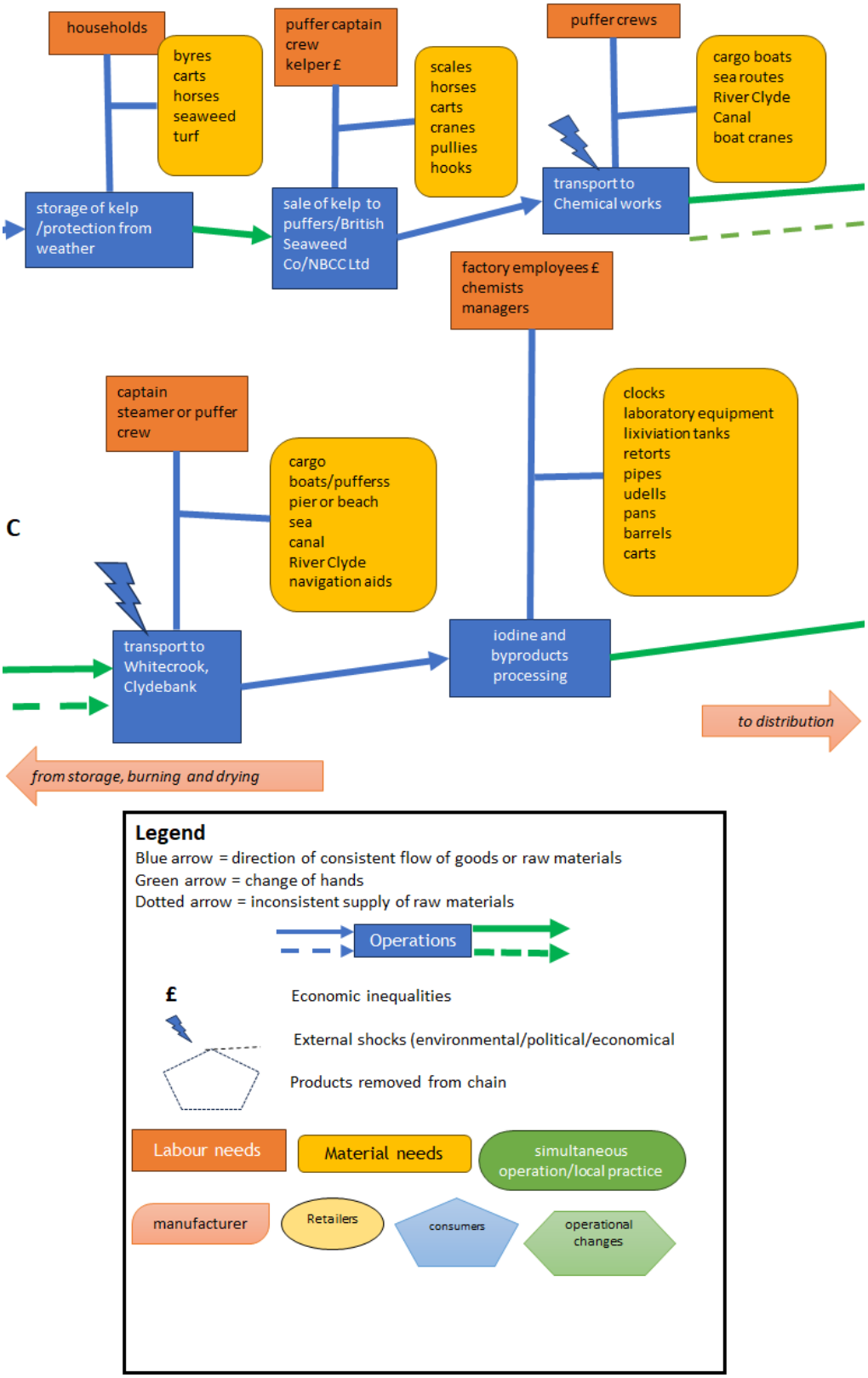


Figure 6-57: C (cont.) Showing split of kelp manufacture and transportation (top chain) and loose charcoal and transportation (bottom chain)

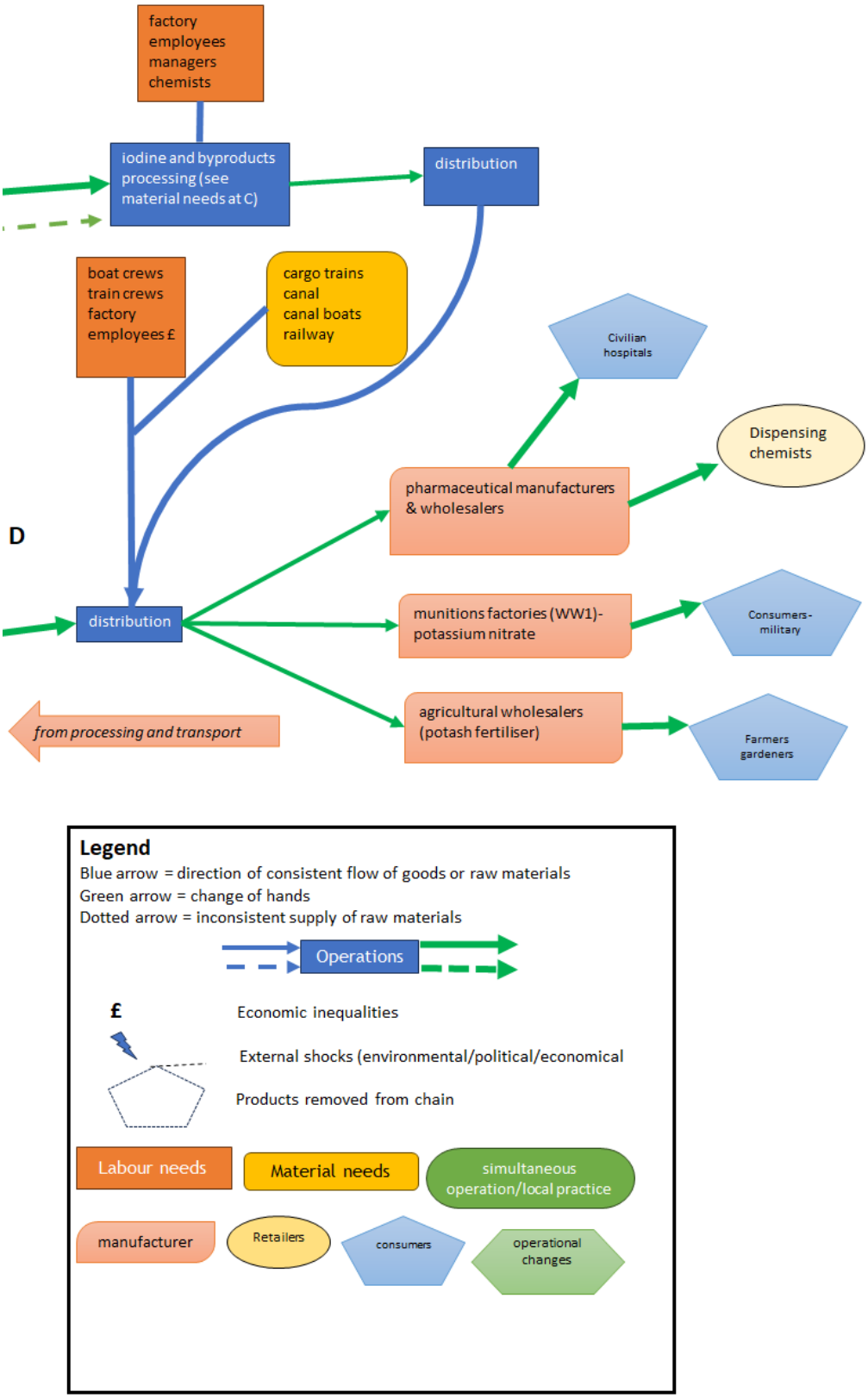


Figure 6-58: D (cont.) Final distribution of products to manufacturers and final consumers.

6.4.2.1 Summer: Seaweed Collection

The *liath mòr*, or fronds, of the laminaria naturally shed between late April and June as part of the growth cycle to allow new growth. In various regions of the British Isles, including Tiree, the term 'wrack' is used in English to refer to various types of seaweed, drawing parallels to the terms *vraic* in the Channel Islands and *varech* (kelp) in French (Arzel 1987: 33). In some of the Tiree TAD recordings, both *liath mòr* and wrack are used interchangeably for these fronds that are thrown up on shore in Spring.

> The wrack that was washed ashore in May, we called it *liath mòr*, it's growing on the tangles. At this time of year, it's ripe and the least shaking in the sea, the *liath mòr* falls off at this time of year. That's why you see so much seaweed ashore at this time. Well, that was the seaweed they were making the kelp out of. It would dry in a jiffy. Just now, even just now, the beaches are full (Sinclair, Donald 1970).

At low tide, as in winter, gatherers would collect the *liath mòr* that had been thrown onto the shore. They would very often use willow creels carried on their backs to haul the fronds to the processing site to dry. The photo taken by Erskine Beveridge photo shows seaweed being brought in a creel on a man's back, strapped with a sheet or blanket across the back and around his chest (Figure 6-33).

6.4.2.2 Drying

The process of making drying walls (*làraichean*) involved using *buthagan* (beach cobbles), which were often placed parallel to the shore edge and near the kilns. These walls were regularly maintained and extended based on the amount of seaweed collected. However, a wet summer could impact the seaweed drying process as the seaweed needed to be completely dry to burn. The rain also initiated natural decomposition, making the seaweed rot and was therefore unusable.

In some cases, natural rock outcrops were utilised by draping the seaweed over them, or the seaweed was spread out if the area was sufficiently large and flat. Once the seaweed was dry, it would be gathered into *rucan* , ricks or small stacks. Here, Dòmhnall Chaluim Bhàin anglicises *rucan*, calling them 'rooks'.

> We was hauling that up and spreading it on stones along the grass and it was drying up. When it was dry, you were making small rooks of it. Then, when it was dry, you had long kilns to burn the seaweed in it. (Sinclair, Donald 1971a)

There used to be a system for dividing the shore into shares to prevent disputes between kelpers, unlike during the winter when gathering tangles. While the specific methods may have varied between townships, a family or group would generally be assigned a share. In Haoidhnis an Iar (West Hynish), this was done by firstly determining which part of the shore would constitute a share. Each share would then be numbered or named, and the assignments would be determined by drawing tickets from a hat, ensuring a fair distribution. Then lines of stones would mark the shares on the shore. During my visit to Haoidhnis an Iar, I could not discern any dividing lines in the shingle, which may have been washed away by the tides over the years. Dòmhnall Chaluim Bhàin (DCB) describes the process to Eric Cregeen (EC):

> **DCB:** The shore was divided in so many shares. Tickets were drawn you know. The name of each share was on the ticket. When you would take your ticket out of the hat, you'd look what name it was. You'd see the name – oh that was you, sir and so that was my share according to the ticket I would lift out. Well, that was keeping peace and everybody had his own share to himself.
> **EC:** A ticket for a part of the shore?
> **DCB:** A part of the shore.
> **EC:** And he wouldn't be allowed to trespass on the other person's…?
> **DCB:** You go to this patch but not further because I wouldn't let you, while I was watching you! I wouldn't let you further than that. There were lines of stones put up between each share. You couldn't go wrong.

Disputes arose when kelpers used the common pasture for spreading and drying seaweed as well as the British Seaweed Company driving their carts through the pasture. This issue was raised in the Napier Commission inquiry (Napier Commission 1884c: 2169), with differing opinions on the matter. The estate factor Hugh MacDiarmid wrote a report to the Duke of Argyll following the inquiry (912-03 (1) 1888):

> I have seen the Delegate (Donald Campbell son of Malcolm Campbell, Crofter, Kilmoluag) who represented Kilmoluag and Balevullin at the sitting of the Commission in Tiree and who complained that the people spread the seaweed and made kelp on the land. I really could not make out that there is any grievance- The people, both crofter and cottars, have always been in the habit of drying the seaweed and making kelp on the common pasture of Balevullin & I see no reason why they shouldn't do so still, if they are stopped from doing this their revenue from the shores is gone-The same thing is done on mostly all the shores of common pasture on the island and I have never heard any complaint about it. The weed is never spread on the arable land.

Sleven testified that it was a lease condition for kelpers to have the authority to use the land for spreading seaweed. He was also of the opinion that spreading seaweed on the land benefited the soil (Napier Commission 1884c: 2182). This is indicative of kelping impinging on a basic necessity of crofting – that of being able to use pasture for grazing cattle. This suggests strained relationships between kelpers and crofters who were not involved in kelping for the Glassary due to competing needs.

6.4.2.3 Burning

Burning would be conducted similarly to the method used in circular pits, but on a larger scale and with improved heat control. Though the kindling for starting the fire was not mentioned in any of the TAD recordings, the kindling fuel would likely have been heather, dried grass or the dried liath mòr itself – whatever was to hand. But not peat. Peat on Tiree had been exhausted since 1801, with the crofters having to undertake a dangerous sailing across to the Ross of Mull to cut their peats for domestic use (Cregeen, Eric 1964: 56). Alick Morrison (1983: 54) describes the use of 'layers of heather and staw' in Berneray, Harris. Like Tiree, the island is characterised by extensive sandy beaches and machair. Here Dòmhnall Chaluim Bhàin describes the burning process in the rectilinear kilns (Sinclair, Donald 1968):

> **DCB**: When that was ready and all your wrack was in dry ricks and was maybe as high as this. You would start burning it then and it was going into kelp.
>
> **EC:** How long did it take to burn down?

DCB: Not very long, according to what you have to burn. I've seen kilns going day and night. That kiln would output two or three tons of kelp.

EC: At Haoidhnis here?

DCB: Yes and at Ceann a' Bharra over there. A b****y job it was working the kelp!

EC: Did they stir it with poles?

DCB: When all the wrack was on it, and it would burn, you would see it like porridge. You was poking it with an iron pole back and forth and making it soft. Then you were leaving that to cool. Tomorrow, when you would come round, it was as hard as that, into kelp. And very tough to break too!

During the first year of constructing and setting up the factory, Stanford decided that kelp should still be burned (TD871/4 1864), although he was of the opinion that many of the valuable compounds and iodine were lost:

> The end of the year showed us nearly ready to commence lixiviation of kelp, at our first manufacture for I determined our shareholders should not lose benefit of the rent paid during our first year of building and therefore stored up kelp.

After the factory closed in 1901, the new managing director of Stanford's firm, W.G. O' Beirne arrived in Tiree to restart kelping, by encouraging the kelpers to burn tangles into loose ash (The Chemist and Druggist 1903). This loose ash was the very method Stanford had tried to encourage kelpers to implement, not only in Tiree but also in Uist and Orkney from the beginning, but it was generally viewed with suspicion and therefore the kelpers resisted. One reason given is that they had always thought of the loose or 'small' kelp as worthless, and it was the heavy blocks that were more valuable (Napier Commission 1884d: 3062; Thomson 1983: 38). This was more of a mindset that the value was in the bulk, rather than as a resistance to change. This mindset changed with O' Beirne's preferred method; they were to receive £4 per ton of kelp or tangle ash in cash and were provided a bonus for kelp of good quality, instead of goods on truck.

> A fellow of the name O' Beirne came in. He was the head of the chemical company too. He told us to dry the seaweed, to dry the tangles and when they were dry, to burn them and that he would supply bags to hold them, "that was a far better job for you". We were filling the bags up and hauling them home, and had them in a byre or in a barn, and when the boat that

> was going to take the kelp away with them… [tape cuts off] (Sinclair, Donald 1971a)

Sometimes, when the kelp burning was going, children would be seen running through the smoke. Sisters Elisa and Margaret MacLean from Còrnaig (MacLean, Eliza and MacLean 1969) recounted doing this as children for 'the fun of it and that we would smell for weeks'. Similarly, Dòmhnall Chaluim Bhàin asserted that there was a belief that if a child was sick, smoke would heal the child. (Sinclair, Donald 1968).

> When the kelp burn was going at full swing, you would see the smoke from hundreds of miles away. It was in the saying that if a child was ailing of anything, if he would go back and forth through the kelp smoke, whatever was wrong with him would be healed. It happened on this island too. Many's a poorly child that was not feeling very well, the smoke from the kelp kiln cured.

After the burning was complete, the kelp needed to be cooled until it was hardened, as had been done for the previous two centuries. The kiln would be covered with seaweed and turfs to protect it while it cooled. The cooling process could take anywhere from one or two days to a week (Figure 6-40).

6.4.2.4 Storing and Transportation to Whitecrook

Once the kelp was cooled, the capstone at one end of the trench would be removed to allow the kelp to be lifted out. Chisels, mallets and crowbars would be employed to break the kelp into blocks and lever it out. The kelp blocks would then need to be taken to storage to protect it from the weather. Carts would be loaded with the blocks and taken to byres or perhaps in some places, there may have been storage sheds. In areas with rough terrain, as seen at *Dùn Shiadair,* where horses and carts cannot operate, blocks may have been carried on backs in creels to the nearest central collection point, such as a purpose-built stone shed or byre (Holliday 2024).

Just as with the tangle gathering, because the Company leased the shores, kelpers were obliged to sell their kelp to the company at whatever rate the company set. They would also receive £4 worth of merchandise per ton of kelp in the shop. This was also a contentious issue for those giving evidence in the Napier Commission,

particularly if they wished to get cash instead. They would then only receive £2 per ton of kelp (Napier Commission 1884c: 2137-2182). The kelpers would transport the kelp or tangle ash directly to the puffers, as in times past, and it would be weighed onboard.

After 1903, two years after the factory had ceased operations, kelpers were given burlap bags to fill either kelp or loose seaweed ash. These would be taken to a central place to take home to byres or barns in readiness for the steamers or 'puffers' to collect. The puffers would come up on Grianal beach and the sacks would be loaded while coal was off-loaded. The truck system had ended, and instead of getting a line in the shop the kelpers would get cash from the North British Chemical Company's agent, Mr Brown. Brown had set up an office at the hotel in Sgàirinis (Sinclair, Donald 1968, 1969d). Sometimes,the puffers would berth at Sgàirinis pier to collect the kelp (Figure 6-59).

Before the First World War, the Scottish iodine industry struggled with declining prices due to the competition from Chile (Childs, Peter E 2022: 206). However, the war temporarily increased demand for iodine in field hospitals, aided by shipping blockades restricting imports from Chile and Germany. This, in turn, brought a temporary boost to kelp production and prices (Thomson 1983: 104). This surge resembled earlier booms driven by conflict, like in the Napoleonic Wars a century earlier.

The Scottish iodine industry suffered the final blow after the 1929 stock market crash and the resultant worldwide Great Depression which caused iodine prices to fall, with transportation costs for kelp outweighing its value. As a result, the Whitecrook chemical works in Glasgow ceased iodine production in 1934, and kelping or tangle burning ceased in Tiree around 1932 (Figure 6-60), followed a little later by Orkney in 1937 (Childs, Peter E 2022: 211; Thomson 1983: 50-51; Wisniak 2001).

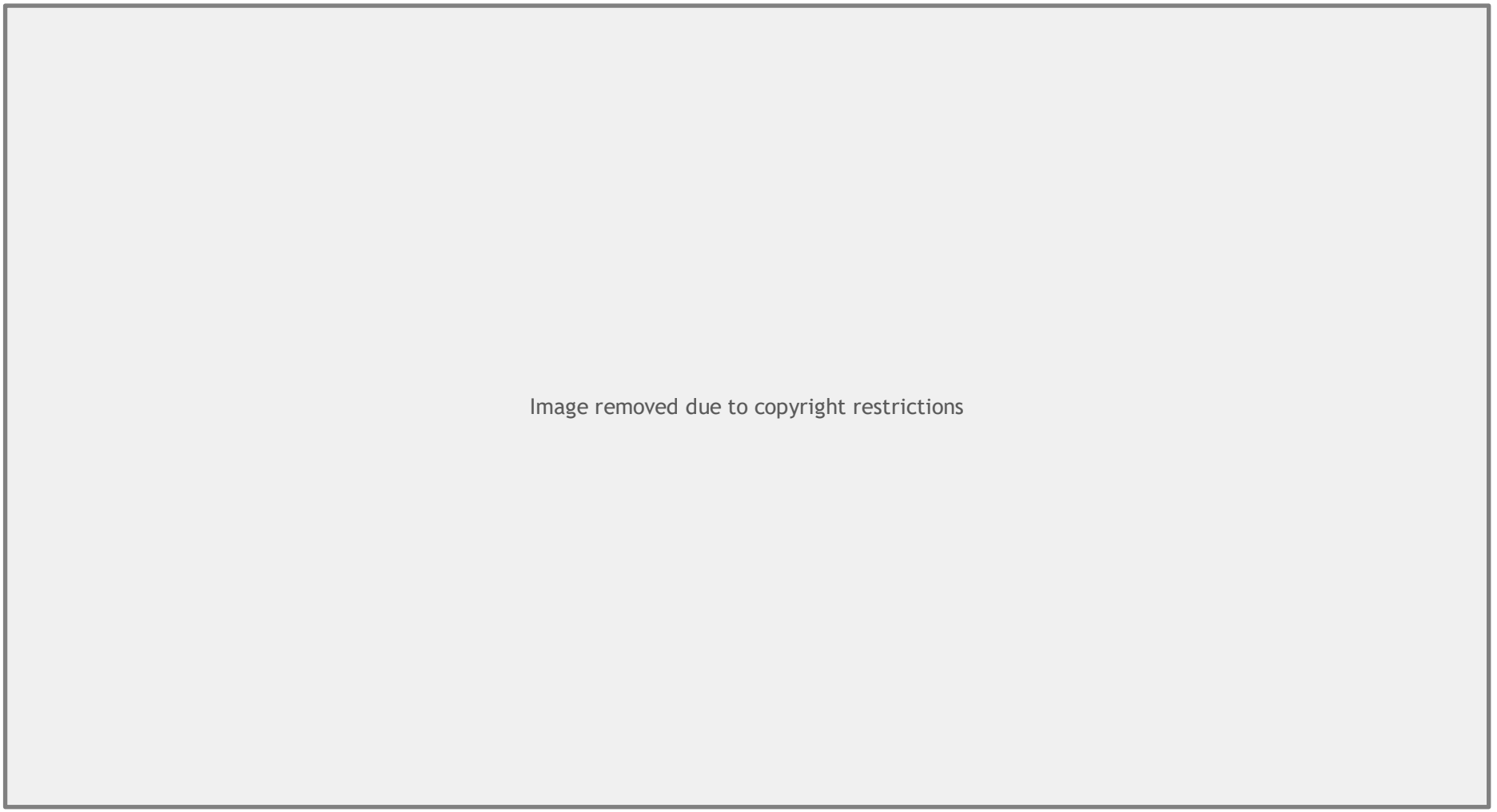


Figure 6-59: Loading kelp from horse-drawn carts, Sgàirinis Pier c. 1930. Image obtained from An Iodhlann, https://www.aniodhlann.org.uk/object/2013-146-1/

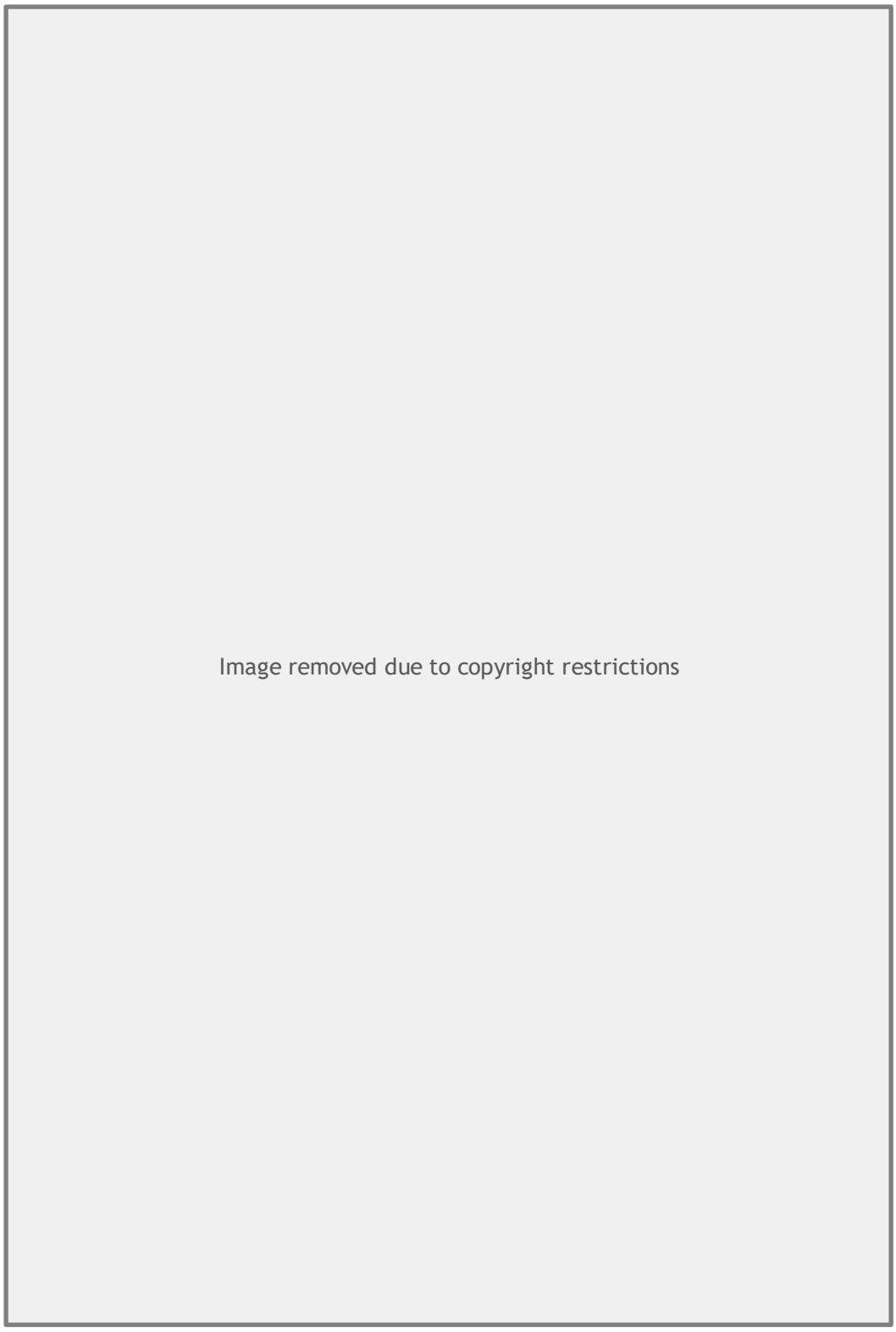


Figure 6-60: The final days of burning tangles on Tiree. Calum and Archibald Lamont burning tangles near Clachan at Còrnaig Mòr in 1932. Image obtained from An Iodhlann, https://www.aniodhlann.org.uk/object/2000-28-17/

6.5 Conclusion

The seaweed industry in Tiree after 1863 represented a significant shift from earlier kelp production for alkali to iodine extraction. Edward Stanford's innovative 'char process' for producing seaweed charcoal aimed to improve iodine yields and provide year-round employment. However, the industry faced numerous challenges, including complex transportation logistics, volatile iodine markets, and tensions between the company, local workers and the estate proprietor.

The commodity chain analysis reveals the complex production process, from tangle gathering on Tiree's shores to final iodine distillation at the Whitecrook works in Clydebank. Local gatherers, often landless cottars, collected seaweed under harsh conditions for meagre pay through a controversial truck system. The factory at Baile Meadhanach processed seaweed into charcoal before shipping it to the mainland. The older way of kelp-making in shore kilns continued alongside the factory operations, demonstrating the coexistence of old and new production methods.

The industry had significant social and economic impacts on Tiree. It provided some employment but also exacerbated existing inequalities and land disputes. The truck system and low wages were significant sources of contention. Land agitation and the formation of the Land League reflected growing tensions between cottars, crofters, and estate management. The industry's presence influenced local power dynamics and contributed to broader debates about land reform in the Highlands and Islands.

Technological innovations and market forces ultimately led to the decline of Tiree's iodine industry. Competition from cheaper Chilean iodine imports in the 1870s forced production changes, eventually leading to the Tiree factory's closure in 1901. However, the industry left lasting impacts on Tiree's landscape, with remnants of kilns and drying walls and the factory site still visible today.

In conclusion, the case study of Tiree's seaweed industry illuminates the complex entanglements between technological innovation, global markets, local labour practices, and social change in a rural island community during the late 19th century and into the early 20th century. It demonstrates how broader economic

and technological shifts could profoundly impact rural areas far from economic and industrial centres, reshaping conventional industries and social structures. The enduring impact of this industry continues to sculpt Tiree's captivating physical and cultural landscape, serving as a poignant reminder of the island's pivotal role in the global seaweed industry during a transformative period in its history.

Chapter 7 Discussion and Conclusion: Scotland's Seaweed Industry and its Coastal Landscapes, Past and Future

The central aim of this thesis has been to transform understanding of Scotland's seaweed industry as a major, long-lived, but understudied coastal industry from the early seventeenth century to the early twentieth century. It has done so by answering three linked questions: how technological innovation and changing markets shaped the industry; what archaeological remains and landscapes reveal about production, scale and management; and how the industry affected coastal communities socially, economically and environmentally. Across these questions, the thesis makes an original contribution by integrating archaeological, archival, cartographic, ethnological and Gaelic oral evidence within the three interpretive frameworks applied comparatively to Calbost, Coigach and Tiree.

The principal contribution to knowledge is fourfold. First, the thesis demonstrates that Scotland's seaweed industry began earlier, and was commercially connected more widely, than previous scholarship has allowed, with evidence for east-coast trade by the late seventeenth-century. Second, it provides the first sustained comparative archaeological analysis of seaweed-processing landscapes across different regions and phases of the industry, adding to the corpus of known sites. Third, it shows that seaweed was not a marginal by-product but a commodity that connected Gaelic-speaking coastal communities to imperial and industrial markets. Fourth, it clarifies that these communities were not passive victims of economic change: they worked within unequal systems, yet exercised skill, negotiation and limited leverage. These findings matter because they revise both the economic history of Scotland and the archaeology of its coasts, while also offering a practical framework for identifying and managing vulnerable coastal heritage.

This chapter begins by bringing together three coastal landscapes through the conceptual framework headings of Commodity, Ecological entanglements and Connections and reflecting on the evidence presented in chapters 4, 5 and 6. Next, the contemporary cases of Coigach (Wester Ross) and Calbost (Isle of Lewis) will be compared and contrasted showing how estate management and industry organisation along the west coast of Scotland were not uniform in

nature. Reflections on Tiree will begin by looking at the impact of the Glassary factory on the island's community, noting the changes and similarities to two other coastal landscapes from earlier phases of the industry. The consequences of the factory's closure will also be discussed.

As the title of this thesis suggests, the three recurrent themes that characterised all the phases of the industry are *Innovation*, such as scientific experimentation and development that drove the industry forward; *Continuity* of production processes and local knowledge; and *Change,* whether political, social or economic. These themes will be reflected upon in relation to the research questions.

Finally, this thesis concludes by looking forward, placing itself in a broader context of the historic environment and how it aligns with the Scottish Archaeology Research Frameworks (ScARF). In addition, the implications of this research for heritage management of these coastal sites in light of rising sea levels due to climate change will be discussed. Suggestions for future research that also align with ScARF will also be presented.

7.1 The conceptual frameworks: bringing together the coastal landscapes under Commodity, Ecological Entanglements and Connections

Chapter 1.3 discussed the research context of Scotland's seaweed industry, highlighting that a new integrated and interdisciplinary approach could effectively address the issues identified in the literature. As a result, this thesis employed three conceptual frameworks consistently: Commodity, Ecological Entanglements and Connections, as outlined in 1.3.6. Used together, they enabled a multi-scalar analysis linking material production, environment and social dimensions. Their value lies in showing that the seaweed industry cannot be understood solely through economic history or archaeology.

7.1.1 Commodity

The initial research question for this thesis focused on how the Scottish seaweed industry has adapted and reinvented itself in response to changing markets and economic conditions over the centuries. It also sought to explore the role of

technological innovations in driving these changes. To understand these changes and adaptations, it was essential to investigate how and when seaweed was initially commoditised.

To explore the industry's beginnings, the historical origins of the early commoditisation of kelp along the Firth of Forth was examined, as discussed in Chapter 3. This process sparked the transformation of a potentially domestic practice of making seaweed ash to its development as a tradable commodity. While the exact timing and location of the shift from domestic seaweed ash to commercial kelp production remain unclear, historical records (Masson, David 1895; Westropp 1920; WYL100/PO/8/IV/26 1619; WYL100/PO/8/VII/22 1620) indicate kelp was being used for glassmaking in Ireland and Scotland, and for alum in the north-east of England around 1620. However, it is unclear which country originally developed the knowledge to use kelp as a flux for glassmaking.

The common narrative has suggested that the Scottish kelp industry began along the Firth of Forth in 1720 or at Anstruther, Fife in the 1690s (Gray 1951; Hunter, James 2010; Thomson 1983: 13; Withers 1988: 283), or even as early as the 1660s (Clow and Clow 1947: 298; Kenicer *et al.* 2009: 19). As stated above, the use of kelp in Scotland may have started as early as 1619 when the first patent to make glass was applied for by George Hay. Innovation in developing coal-fired furnaces for glassmaking, banning wood-fired furnaces in England, and the need for various types of alkali were the primary drivers for using kelp as a locally produced alkali source. The unexpected finding about the early Scottish kelp trade is that international trade routes connecting the Firth of Forth to England and the Netherlands began about forty years earlier than previously thought. Records in the Port Books of Prestonpans indicate that this trade was already taking place as early as 1680, well before 1720 (E72/21/1/46 1681; Smout, T C 1963a).

The coastal landscape of the Firth of Forth was not analysed using the three conceptual frameworks because any archaeological remains associated with kelp-making have long disappeared, as well as any ethnological sources. However, this documentary archival analysis highlights the origins of kelp as a tradable commodity in the burgeoning Scottish economy of the late 17th

century. This demand for kelp eventually expanded into Orkney around 1720 and, by the end of the 18th century, to the rest of Scotland.

Commodity chain analysis (CCA) was employed to understand the role kelp manufacture and trade had within the context of a growing capitalist system. This analysis was focused not only on the production process of making kelp but also on the relationships between the potential actors involved, both human and non-human, and the possible variations that may have shaped the flow of kelp within the entire chain. To help visualise CCA, the production process was mapped in a flowchart diagram, with labour and material needs annotated for each production node. A structured analysis could then be produced using the primary production nodes from this diagram as starting points for discussion. It was found that using this basic structure helped with understanding the production process and the flow of kelp through its various networks, as well as the practices and relationships between the actors in each stage. This in-depth analysis also highlighted potential disarticulations and inequalities that could occur during the specific period of the chain.

Although the production flows seem linear in the flowcharts, the numerous simultaneous phenomena that contributed to a specific situation in time and place were significantly more complex than could be illustrated in two dimensions. Disruptions could be illustrated by the annotations, but these were used as signposts for discussion of their impact on the chain in the analysis. Therefore, the production sequence structure served as a platform to explore the social and material complexities involved. This story was achieved by incorporating ethnological sources with archaeological evidence, such as the Tobar an Dualchais recordings, community memories from *the Comann Eachdraidh* and the Angus MacLeod archives, and perspectives from Gaelic poetry and song connected to the relevant stage of production. These complexities woven into the analysis also implicitly included the other two conceptual frameworks Ecological Entanglements and Connections.

The chains were formed by examining a final consumable product, such as a glass bottle or a bar of soap and tracing the process back that led to its production through space and time. This process stopped at the point where the raw material, in this case seaweed, was harvested. Going back through the

chain, according to Hopkins and Wallerstein (1986: 160), is to see the 'loci of the sources of value in a finished product'. Additionally, for this research, going back from the finished product was not just to see the points of the potential value of the product but a method to understand the complex interactions and relations of those involved in that process. Comparing the CCA diagrams of Calbost and Coigach from the first phase and Tiree from the second showed that as the economic system diversified due to the expanding British Empire and new advances in science, engineering and transport, the complexity of the commodity chains increased. In the case of Tiree, the complexity required the construction of 'sub-chains' to map out simultaneous processes that were occurring after the iodine phase of production ceased in Tiree to the final days of tangle burning in the early 1930s.

The analysis of the three coastal landscapes using CCA has revealed two prevalent themes: social and economic inequalities, and local vulnerabilities to external political and market forces. These vulnerabilities included the risk of over-exploitation of both human and natural resources, particularly as market demands and prices increased. Common to both commodity chains were issues such as pay disparities and insecure land tenure in the initial phases of the industry, which strained local social structures in an already fragile economy and environment. A relevant example of economic disparity was that the value of the commodity increased from its initial harvesting to the time of its sale. Whether sold as bulk kelp to a merchant at a Liverpool dock or in barrels of iodine to pharmaceutical manufacturers, the level of compensation to those who harvested tangles or made kelp did not increase accordingly. Often, payments were made in kind; imported oatmeal was used to offset annual rents in Lewis while in Tiree, the truck system compensated tangle gatherers and kelpers with merchandise on credit. Although these systems provided essential goods, they also perpetuated a cycle of indebtedness, leaving the communities vulnerable should the system collapse. In Tiree, the truck system contributed to land agitation events as well as strained relations not only with the Argyll estate hierarchy but also among the inhabitants of Tiree, as evidenced by the witness statements in the Napier Commission inquiries.

Attention was drawn by the commodity chain analysis to the varying and flexible meanings of value that were accorded to the different actors along the

production sequence. These meanings in value were not solely economic; they also encompassed more nuanced aspects, such as prestige and lifestyle. For example, consider a family in a coastal township adjacent to a kelp shore in Lewis cutting seaweed from rocks and processing it into kelp. For this family, the value of this practice lay in generating income to pay their rent. Many felt compelled to participate in this activity to avoid eviction from their homes and community, helping them navigate a precarious situation. For their tacksman the value lay in rowing a load of kelp from the processing site to an awaiting cargo schooner anchored in a sea loch. This personal attention and control of this task was essential for his income. Weighing the kelp and receiving a slip from the skipper to confirm his tonnage would help calculate what he was owed later in the year. In addition to the income needed to pay rental for his tack, the income from his profits meant that he could enjoy a more comfortable lifestyle and gave him a degree of power over his subtenants.

For the captain and crew who were hired by the kelp agent in Leith to transport the kelp cargo to market, working within the coastal commerce network was the focus of their lives, offering better pay compared to their counterparts in the Royal Navy. The kelp agent, writing letters on quality gilt-edged paper, indicative of his status and wealth, aimed to ensure maximum profits for himself but also for his clientele, the estate landowners, many of whom were former clan chieftains. The value of kelp for the former clan elites meant a means to finance their prestige within the upper echelons of society and within their estates. The privateers based in Dunkirk, who cruised the unprotected coasts of Britain looking for prizes, recognised the value of holding cargoes and crew hostage for ransom, knowing the cargo was insured and, therefore, the ransom would inevitably be paid. This also had the added benefit of disrupting British commerce during conflicts with the French and Americans (Shiels 1971). The McIver brothers, who were merchants and shipowners, awaited consignments at the Liverpool docks of goods and raw materials, including kelp, to be sold to alkali works, alum makers or glasshouses. The McIvers profited from the international trade from Liverpool and from their Hebridean connections along the west coast of Scotland. The processed kelp residue from glassmaking would be sold onto soap boilers or vice versa. Other chemicals then moved onto alum works, linen manufacturers for bleaching and munitions works for gunpowder.

The end of the chain could be a potential customer walking along a high street in one of the towns of Britain, looking through the glass window of a shop (perhaps where kelp was a component in its manufacture), who might see a bar of soap or a glass bottle on display, enticing them in to purchase the item for eventual consumption. This would drive demand for more of these goods, fuelling production along Scotland's shores, thus creating a commodity circuit.

The profit from the sale of kelp to the merchant in Liverpool via the kelp agent would then pay the kelpers and the tacksmen in November, taken off against their rent account and oatmeal provided during the kelping season. This example of a commodity circuit illustrates how the value of seaweed changed as it was transformed from the seaweed growing on rocks along a Scottish shore into products such as bars of soap. Throughout various stages of production and exchange, the meaning of value shifted. Each person involved in the process perceived that value differently, depending on their role within the circuit.

It was noted that some leverage over production was exercised by those who made kelp or gathered tangle as demand increased, despite the unequal power dynamics. This was most evident in Tiree, where extensive oral history evidence has been recorded in both the Napier inquiry witness statements and TAD recordings. The inhabitants of Tiree were not compelled by the Argyll estate to collect tangles or produce kelp when Stanford began his operations at Baile Meadhanach. Instead, they had the option to choose whether or not to participate, although their dire economic situation at the time compelled some to join. Many of the island's crofters chose not to participate in this activity to generate income, preferring to plant crops, rear cattle, or be fishermen. This disparity between crofters and those working along the shore fuelled community tensions and inequalities. This disparity was reflected in the land agitation events of the 1880s, most of whom were not crofters and those giving evidence to the Napier Commission regarding the truck system. This was a marked difference from the initial alkaline phase, during which subtenants, cottars and small tenants were often compelled to produce kelp by their estates or face eviction.

While there do not seem to be stories about kelpers exercising leverage over kelp production in Calbost specifically, leverage over production in Lewis more

generally was expressed in the example of when Uig kelpers began to refuse to travel to Loch Seaforth to make kelp in the 1790s, thus potentially affecting the Lewis output during the highest production years (Chapter 4.3). They understood that they were skilled kelpers and that their expertise was in demand on other estates such as in Harris and the Uists. They may have used this knowledge to negotiate for better pay or to avoid being forced to travel eastward each summer, as they faced the threat of being pressed into the militia if they refused to comply. The result was that they no longer could be compelled to traverse the island each season, resulting in the small tenants along the shores of Lochs Shìophort and Sheilg (Shell) being compelled instead into making kelp. In another instance in Baile Ailein, a township in the Lochs district at the head of Loch Èireasort, the tenants submitted a petition to the Stornoway Sheriff Court in 1818 requesting a reduction in their rents due to a significant production shortfall. The rental rates were determined based on anticipated kelp yield of 69 tons for that season, but actual production only amounted to 19 tons (SC 33/17/3 1818), but the rentals were not reduced accordingly. The period after 1815 marked an important change, as the process of splitting tacks into individual crofts was already in progress. Joint tenancy among the small tenants was abolished, and in Calbost, Weir lost his tacksman role when his lease was not renewed sometime between 1814 and his death in 1821 (Lawson and Comann Eachdraidh na Pàirce 2022: 121). In Coigach's example, with the support of the local minister, the subtenants exercised their customary rights to seaweed in a petition to the Commission for the Annexed Estates, thereby delaying a decision to allow kelp production along the Coigach shores for a few years (Chapter 5.2.1). These examples demonstrate that individuals and communities involved in kelping had some ability to make autonomous decisions despite unequal power dynamics. As Grant (2016) and Adamson (2014) highlighted in their theses, they were not mere 'victims of modernity' being swept along within the broader historical meta-narratives despite facing ongoing exploitation and inequalities. They were, however, communities dealing with fast-changing external market forces within their contexts.

One of the main challenges encountered in developing commodity chain analyses was the difficulty in obtaining enough data to fully understand the processes by which kelp was produced and moved through the chain, as well as the

relationships within that chain, a potential issue that was highlighted by Millhauser and Overholtzer (Millhauser and Overholtzer 2020)in their use of CCA as an approach in archaeology. In all three case-studies, there were gaps in the data, gaps where the questions raised may never be fully answered. This was found to be particularly problematic in the development of a commodity chain for the initial phase of the seaweed industry, where gaps exist in both oral tradition and archival records. This was especially pertinent for Coigach, where the available documentary evidence is, at best, fragmentary. Nevertheless, the lack of documentary and ethnological sources was compensated for by the abundant archaeological evidence, enabling a useful narrative to be constructed that enhanced understanding of the likely scale of kelp production along the Coigach shores. This also illustrated how the inhabitants of Coigach were interconnected with other regions along that stretch of the west coast, the Isle of Lewis, and ultimately, Liverpool. While Calbost had more archival and ethnological data, there were still gaps because the likely scale of kelp produced there can only be estimated from the number of kilns at Eilean a' Ghòdh. As far as currently known, receipts for kelp shipped from visiting cargo vessels at Camas Chalboist do not seem to exist. There are also gaps in knowledge within the later chains of the seaweed industry in Tiree. Detailed accounting records from Stanford's companies are no longer available, making it difficult to understand the financial values and how Stanford's companies were functioning financially after his petition to prolong his patent. Additionally, there is very little information regarding the employees in his Whitecrook factory, including the working conditions they faced, the possible inequalities in terms of pay, and their living conditions as the Clyde Valley became more industrialised. Despite the existing data gaps, the available information was compiled to construct an overall model designed to understand the experiences of individuals connected with kelp, alongside their other activities in their landscapes, how work was conducted within seasonal and tidal rhythms, and the associated choices. It is asserted that an interdisciplinary approach to understanding and interpreting these coastal landscapes was essential, as multiple streams of evidence were integrated to address some of these varied data gaps.

Overall, CCA approach was found to be a useful method for going deeper into each stage of the production process. While Thomson (1983) also looked at the process of kelp-making, it was an overall view of kelping in Orkney, at times

mixing up the alkaline and iodine phases, rather than adopting a tighter temporal and spatial focus. CCA enabled a consideration of the complex intertwining of humans with their environment in the context of the movement of kelp from the shore and across the sea down the western seaboard to its final destination. In doing so, the many social and material links involved in that flow set in a specific time frame were noted. It was more than simply listing the steps of how kelp was produced or presenting sales figures, wages and tonnage. It was about the deeper narrative that illustrated how people at each node were interconnected and their relationships, offering a glimpse into their lived experience within a specific taskscape.

One important aspect that was kept in mind was to focus on the data for each node in the process, as Millhauser and Overholtzer (2020: 226) advised, ‘prioritising neither the political nor domestic economy’. In other words, this adage was a reminder to be mindful of any potential biases and challenge any assumptions at any economic level, such as viewing kelping as a 'monolith' regarding processes, local practices and estate policies. In analysing the contemporary landscapes of Calbost and Coigach, the data showed that although these two places were connected historically and culturally, they were managed rather differently. In addition, the Coigach landscape analysis showed that kelp manufacture was produced at a significant scale although the narrative has implied otherwise.

In understanding the flow of kelp as a commodity, this thesis' original contribution here is to show that seaweed was not simply a raw material but was a historically contingent commodity embedded in capitalist development. The framework revealed recurring patterns across all case studies: unequal reward, insecure tenure, dependence on outside markets and local vulnerability to outside shocks. Commodity chain analysis has limitations: it can imply linearity where lived systems were complex, seasonal and unstable. It also relies on documentary evidence, such as surviving records, which are uneven across the case studies. Coigach, in particular, demonstrates these limits. Nonetheless, this limitation is also productive: by combining CCA with archaeological and oral evidence, the thesis shows how partial records can still yield robust interpretation. The framework proves to be valuable as an analytical tool, provided it is applied with careful and critical consideration.

7.1.2 Ecological Entanglements

Understanding ecological entanglements is a key aspect within the commodity production sequence narrative. Rather than viewing coastal environments as inert backdrops to human activity, this framework reveals how seaweed production was actively shaped by the dynamic interplay among people, species, weather patterns, tidal rhythms, topography and material resources. Coasts emerge not as passive settings, but as co-produced taskscapes - landscapes continually shaped and reshaped by the knowledge and practices of those who lived and worked there.

Archaeological evidence from various regions demonstrates that coastal workers employed specialised techniques to adapt to environmental challenges. Features such as kilns, drying walls, footpaths, cart tracks, and slipways provide concrete examples of these adaptive strategies. The design and location of these structures indicate a high level of ecological understanding and deliberate responses to specific environmental limitations. The placement of kilns demonstrated communal knowledge of sand, tides, wind direction and ground selection. Identifying and augmenting areas suitable for drying reveals a connection between humans, rocks, soil, grass and weather. The more remote processing sites featured temporary shelters that utilised different adaptive techniques, such as using boulders next to storm bars or turf cut from nearby moorland. Well-worn footpaths or cart tracks to the processing sites demonstrate a knowledge of the terrain and perhaps the quickest access to the sites within that terrain. The shaping of landing sites, such as slipways for boats bringing in seaweed (or landing fish) and taking away blocks of kelp during high tides, also reveals the profound relationship between the human inhabitants and the maritime landscape (Figure 7-1). These features materialise the active negotiation between human needs and environmental affordances, underscoring the adaptive nature of seaweed exploitation.



Figure 7-1: Calanais harbour (Isle of Lewis), an example of an intertidal track cleared of stones and seaweed for pulling up boats. Loch Ròg was the main kelp-producing area in Lewis.

By its dependence on the different seaweed species that were used in the different phases, the seaweed industry itself was and continues to be, deeply intertwined with the ecologies of the sea and the coasts in which it has operated. Those who were employed in the industry, therefore, had an awareness of their interdependence with the seasons, rhythms, and patterns of the sea and climate, including tides, winds and waves, and sometimes - even the moonlight. An example of the recognition of this interdependence is the awareness of the seasonality of seaweed itself. In Lewis the northern latitude, along with the North Atlantic climate, dictated that shores growing rockweed that were to be cut were inspected months before the summer season in order to estimate tonnage and arrange suitably sized cargo ships and insurance. The short six-week summer season window impacted decisions within the agricultural calendar. A decision was reached through negotiation between the estate factors and the kelp overseer, all of whom were tacksmen with their own farms. The kelping season was set to run from the beginning of June to mid-July. This timing was set within the agricultural calendar, after the peat-cutting, the

relocation of livestock to the shielings and the planting of crops in early May. Early June was considered the optimal time for harvesting seaweed, as it was at its 'ripest'; the weather was likely to be the most conducive to drying the seaweed fully, and it occurred before the late summer fishing season began. Knowledge of harnessing the powers of nature to best effect also indicates this interdependence with the sea: for the individuals gathering the seaweed, they used natural powers to help their work, such as moonlight to facilitate night-time gathering or using the power of the tides to cut and lift *maoisean* and then tow ashore. Understanding these elements of extractive practices demonstrates a high level of ecological expertise.

However, this expertise also had its limits. Feedback loops, as discussed in Chapter 2.1.2.1, which can be negative and positive, underscore the intricate interdependence between ecological, economic and community sustainability. A positive feedback loop is one that amplifies a process, leading to dramatic changes and instability in a system and a negative loop is one that stabilises or regulates a system. An example of a significant positive feedback loop was the immense scale of seaweed harvesting, particularly during the most profitable years of the first phase of the industry between 1790 and 1815. The competing uses of seaweed in kelp production and in agriculture as a fertiliser led to localised pressures on seaweed resources, particularly on estates where lease agreements prohibited the cutting of seaweed from designated kelp shores. Violation of these provisions carried the risk of eviction. Restrictions on cutting seaweed on kelp shores to commercial use meant communities had to rely on using washed-up seaweed after winter storms, which was unpredictable. This, in turn, led to conflicts between neighbours competing for limited resources. Many communities devised ways to mitigate disputes, such as dividing the shores to ensure equal shares. Overharvesting created positive feedback loops where diminished seaweed availability affected not only the industry's viability but also the resilience of the communities dependent on it. Moreover, the industry created economic incentives for overproduction. Local households intensified kelp production in order to meet rising rents, while estate proprietors sought to maintain their extravagant lifestyles and pay off increasing debts. This cycle contributed to growing pressure on natural resources. As populations grew due to improvements in diet and inoculation coupled with the desire of kelp estate

proprietors to maintain a large labour force for kelp production, the land's ability to support these increasing numbers became further strained. Numerous communities were operating near the boundaries of environmental sustainability, owing to the characteristics of thin, acidic, and rocky soils, coupled with a variable climate prone to sudden shifts that could result in famine triggered by natural occurrences. Examples of these natural events include one of the peaks of the 'Little Ice Age' of the later 17th century and global drop in temperatures following the Laki volcanic eruptions in Iceland in 1783, both causing widespread crop failures. The ecological balances in the kelp industry were at the edge of tipping towards overexploitation – not just of the seaweed, but of the humans and the land, risking ecological and social instability.

One aspect that participating in the experimental kelp burn at Eilean Mhàrtainn revealed was not only the act of digging into the earth and taking suitable beach cobbles to construct the kiln but also the effects of the burning process itself. The acrid smell from burning seaweed, dense smoke that choked, and soot coating both people and the area revealed the harmful nature of this activity, especially considering that hundreds of kilns lined Scotland's shores each summer. Participants noted that any further burns might adversely affect the environment in terms of poisons in the air and ground. Although the kindling fire was sufficient to ignite the dried seaweed, there was not enough dried seaweed available to sustain the burn at the temperature required or to fill the kiln. The supply was exhausted before the process could be completed, demonstrating the immense quantity of seaweed needed for successful kelp production.

Ecological Entanglements as a framework is particularly valuable for connecting archaeological evidence, such as the remains of kilns and harbour infrastructure, to broader patterns in environmental history. It allows the tracing of how adaptation and material practices reflect ongoing negotiations with the coastal environment. However, this approach is less well-equipped to account for the complexities of political economy, such as market structures, labour relations and profit distribution, which are more thoroughly addressed by the Commodity framework. On its own, this framework risks overstating reciprocity and underplaying exploitation. The strength of combining both frameworks lies in their ability to illuminate how ecological pressures and markets demands

intersect, shaping both the lived experience of coastal communities and the historical trajectory of the industry. To conclude, the concept of Ecological Entanglements along with Commodity highlights the seaweed industry as the result of dynamic, mutual interactions between communities and their environment. This viewpoint brings to the forefront both the resourcefulness and the fragility of coastal populations, underscoring the necessity of combining environmental and economic perspectives to gain a more comprehensive understanding of the historical developments.

7.1.3 Connections

When reflecting on coastal landscapes and the seaweed industry, the notion of connections highlights how their communities navigated their environments, economies and relationships. Examining the connections can enhance understanding of the seaweed industry's economic, social and environmental impacts on Scottish coastal communities. The framework of Connections drew attention to movement, kinship, labour organisation and maritime connectivity. It showed that sea industry landscapes were structured by routes: footpaths to shores, cart tracks across machair, slipways, nausts, piers and shipping circuits linking islands and the mainland coasts to Glasgow and Liverpool. It also demonstrated that labour was organised through households, kin groups, neighbours and local hierarchies.

This framework is especially useful in explaining continuity. Across all phases, seaweed work depended upon inherited local knowledge and social cooperation. Even in Tiree's factory phase, formal industrial organisation did not replace familial labour; it reworked it. The framework also highlights how Gaelic oral traditions, songs and local archives preserve these connections long after industry collapse. Routes such as cart tracks through the machair on Tiree, slipways at kelp processing sites and visible paths to the shore demonstrate how connectivity shaped both the physical and social landscape. These routes facilitated not just the movement of people and commodities, but also served as conduits for knowledge, practice and social norms. The persistence of these pathways, some repurposed for leisure in the current era, as in the cases of Eilean a' Ghòdh (Figure 4-20) and Tràigh na Garbhaidh (Figure 5-41), underscores the enduring significance of connection. The persistence of pathways is most

notable in Tiree. The cart tracks through the machair on Tiree connect the townships to the shore, the processing sites and the Glassary factory at Baile Meadhanach. These tracks, still visible on satellite imagery, have shaped the intra-island connectivity, some of them now paved roads. These same cart tracks continued to be used during the Alginates phase, with tangles from the shore being sometimes collected by horses and carts, or after the 1970s, by tractors and trailers, showing a continuity through all the phases of the industry (Figure 7-2).



Figure 7-2: Cart tracks alongside remains of a làrach (drying wall), Ceann a' Bharra.

Material culture associated with the industry, sickles, willow creels, ropes, carts, horses, boats, reinforces the explanatory power of Connections, as these artefacts were integral to the routines of harvesting and processing. The continuity and adaptation of these tools and routes across different phases, from kelp to alginates, highlight inherited knowledge and established practices passed down through generations. Infrastructure such as slipways, docks and processing sites provide tangible evidence of the routes underpinning both local and long-distance connectivity, linking kelpers working on an island shore to international markets. The intangible expertise required for navigation, including reading

weather, using increasingly accurate navigation charts and sextants (MacLean, Gillian and MacLeod 1989; Webster 1989), tides and currents, further demonstrates the complex interplay between adaptation and organisation.

The cutting and gathering of seaweed leave no evidence, and the same applies to the maritime routes used to transport the bulk commodity to markets. Currently, the infrastructure present in bays, harbours, and estuaries, ranging from the slipways of kelp processing sites to docks located at urban points, serves to delineate a distinct route. This route connects a kelper loading a boat with blocks of kelp to be weighed on board an awaiting schooner at anchor in Camas Chalboist, with a porter on the dock unloading that same cargo of kelp in Liverpool a few weeks later. Within that route lay the intangible knowledge of navigating the hazards of skerries, sandbanks and submerged rocks, reading the weather, using a sextant, a compass and landmarks as navigation guides, and understanding the wind, tides and currents along the west coast of Scotland and down to England. These maritime spaces linked the kelp, fishing and trade networks along the northwest coast of Scotland with burgeoning global markets.

The flow of kelp engendered distinct kinds and qualities of relationships within these interconnected spaces. These relationships ranged from the family unit negotiating tasks and resources to those who directly controlled kelp production, such as tacksmen, kelp overseers or a managing director, and the prices they were willing to pay labourers. Although clan chiefs may have initially understood their role in paternalistic terms, with obligations towards their clansmen rooted in *dùthchas,* this relationship was gradually transformed as former chieftains became commercial landlords. This transition is important because it shows how the relationship between clan chief and their people changed over time. Yet the older expectation of *dùthchas* did not disappear (Hunter, James 2010: 76; MacGregor 2025: 135; Macinnes 1996). This tension is reflected in the Lewis and Tiree case studies, from the early period of kelping through to the land struggles of the late nineteenth century, where estate factors often became objects of hatred while the former chiefs or landlord families continued to be regarded with a degree of esteem (MacGregor 2025: 126; Napier Commission 1884e: 36). In Coigach, it was less a case of paternalism than absenteeism and disinterest by either the Commissioners of the Annexed Estates or the Cromarty MacKenzies after 1784, leading to an exploitative

situation under factors and tacksmen managing the estate locally along with the external entrepreneurs controlling the fishing and kelp industries. Whether stemming from a sense of *dùthchas*, a legacy from clan elite social structures or the desire to limit the autonomy of the subtenants based on a so-called belief that such restrictions served the interests of their tenantry, this attitude was pervasive. So-called paternalistic attitudes of the landowners were bound up with profit-making as the economy transitioned to global commerce.

Labour in the seaweed industry was fundamentally collective and rooted in familial and kin-based networks. Households, kin groups, neighbours and local hierarchies collaborated in the demanding tasks of seaweed harvesting and kelp production. Even in Tiree, where Stanford's factory formalised labour relationships, familial labour persisted, with kin groups continuing to negotiate boundaries and agreements to ensure fairness and minimise disputes. Local hierarchies, tacksmen, overseers, estate proprietors, shaped the organisation of work and distribution of resources, revealing how social structures were intimately connected to the functioning of the industry. Rising rents, competing agricultural demands and resource scarcity strained social relationships - and conflicts did arise if resources such as washed-up seaweed were not managed between themselves, as discussed in Section 6.4.2.2. This narrative underscores instances where social cohesion was at risk. Sustaining robust social bonds required concerted effort to withstand, adapt to, or manage evolving economic and environmental pressures. Moreover, these bonds also provided these communities a degree of resilience by distributing labour and resources across family networks.

Gaelic oral traditions, such as songs and stories, passed down through families and recorded by local historians, offer insight into how kinship and social bonds sustained heritage, knowledge and adaptation long after the industry's declines (Cheape 2017). The preservation of these stories, through individuals such as Angus MacLeod in Calbost and contributors to the TAD recordings from Tiree and South Uist, underscores the role of oral tradition and local documentation in maintaining continuity and transmitting the rhythms of life and work embedded in these landscapes.

The limitation of the Connections framework is that 'connection' can become too broad if not tightly defined. In this thesis, it was most effective when grounded in material evidence of mobility and in identifiable social relations. Used in that way, it reveals how local communities were bound into wider worlds without losing sight of place-based practice. Without such grounding, the framework may fail to capture the specificity of local practices or the distinctiveness of community organisation, reducing the complex social processes to vague networks. Its effectiveness depends on careful integration of archaeological evidence, documented practices and oral traditions, which together trace how local communities were woven into broader economic and cultural networks while maintaining their identities and routines.

In conclusion, the *Connections* conceptual framework, when judiciously applied and grounded in tangible evidence and verifiable social relations, offers substantial explanatory power for understanding the seaweed industry landscape. It clarifies the continuity of practices, the organisation of labour and the preservation of knowledge and heritage, while mapping the integration of local communities into broader economic and social networks. Its value is most apparent when used to trace the routes, relationships and rhythms that shaped both the lived experience and historical trajectory of coastal communities engaged in the seaweed industry.

7.2 Reflections on the Coastal Landscapes of Calbost, Coigach and Tiree

This section moves from individual case studies to a comparative synthesis of Scotland's seaweed industry across three coastal landscapes. Comparing Calbost and Coigach, two broadly contemporary sites in the first alkali-producing phase, shows that, although both shared commodity production, ecological knowledge, maritime connectivity and exposure to the same volatile markets, they were shaped by different systems of estate management, labour mobilisation and social control. This comparison underlines the thesis' central finding that the organisation and management across the different kelping estates were not conducted uniformly but was a materially and socially varied process structured by local conditions. It also sharpens the significance of the industry in Tiree,

where the Glassary iodine factory can be understood less as a disruption than as an innovation built upon older coastal practices and relations.

7.2.1 Comparing and contrasting Calbost and Coigach, two concurrent coastal landscapes

Calbost and Coigach exemplify how contemporary kelping landscapes were shaped by divergent estate management, with profound implications for their role as commodity producing sites, their ecological entanglements and their wider connections. This distinction is key to the argument: the seaweed industry in the Highlands and Islands was not a uniform industry.

Both coastal landscapes share important features. Each was a Gaelic-speaking maritime community reliant on mixed subsistence and seasonal labour; each depended on detailed knowledge of tides, weather and littoral ecologies, and each was drawn into wider commodity networks linking local shores to ports such as Leith, Stornoway, Liverpool and Greenock. Yet, as Chapters 4 and 5 have shown, the analyses of their differences reveal more than their similarities. Calbost was incorporated into the more closely managed Seaforth estate system in Lewis, where tacksmen, kelp overseers, ground officers and factors structured production and generated substantial documentation. Coigach, by contrast, was shaped by fragmented and often absentee management, with kelp shores leased to external entrepreneurs and a far thinner archival record as a result.

This contrast matters because it shows that the variable was not simply geography or the quality of the seaweed resources, but the local social and management framework through which production was organised. The comparison thus supports the wider argument that commodification in the Gàidhealtachd proceeded unevenly and not through one single process, but through multiple economic arrangements, power relations and market connections rather than through any single model of Improvement.

Several broader points emerge. First, the kelp industry was highly uneven, in terms of management, prices and long-term outcomes. Calbost represents a more coordinated estate-centred regime, while Coigach illustrates a dispersed, lease-based system whose archaeological footprint exceeds its documentary visibility. Second, resilience and vulnerability were locally produced. As Chapter

4 indicates, Calbost's more integrated township economy, combining kelp, fishing and fish-curing and agriculture under Robert Weir's coordination, appear to have offered greater resilience to external economic shocks. By contract, Chapter 5 shows that in Coigach dependence on external leaseholders both in kelping and herring fishing, exposed a local vulnerability to market volatility, rent pressure and eventual removal. Vulnerability, therefore, was mediated not only by price fluctuations or environmental limits, but by the ways labour, access and responsibility were structured on the ground.

Third, the comparison has methodological significance. Calbost, as part of the broader Seaforth estate system, is more visible in both the estate papers and community memory, while Coigach is more visible archaeologically. Their juxtaposition warns against equating documentary abundance with economic significance, a point that aligns with disarticulations and uneven geographies in the record as presented in Chapter 2. Finally, both places reveal active ecological adaptation rather than environmental determinism. As Chapter 4 and 5 show, infrastructures were fitted to highly specific littoral conditions, from the tied island at Eilean a' Ghòdh to the storm bars and raised beaches of Coigach. In both cases, coastal environments were not passive settings but active participants in production.

Taken together, Calbost and Coigach show that kelping landscapes were distinct yet connected. The comparison moves beyond description to show that the same industry could generate different social worlds, material traces and long-term outcomes depending on how commodity production was organised locally. This analysis goes beyond generalisations about kelping to show how local circumstances produced distinct outcomes, challenging notions of uniformity and advocating for context sensitive interpretations of Gàidhealtachd industry and change.

7.2.2 Reflections on the impact of the Glassary factory on Tiree's coastal community

Tiree marks the second major phase of Scotland's seaweed industry and is the most evident example of industrial change in the coastal landscapes studied. The establishment of the Glassary factory in 1863 marked a decisive shift,

bridging the local seasonal kelping economy with the expanding chemical manufacturing sector in Clydebank. The Glassary factory became the central node through which locally gathered tangles and made kelp were processed into iodine, seaweed charcoal and alkali, integrating Tiree's shore work into global industrial networks. The factory's operations, driven by Stanford's patented method of iodine extraction and the British Seaweed Company, demonstrated how rural island communities were drawn into modern chemical production, extending the history of seaweed beyond the alkali boom into the era of scientific patents, factories, and ultimately deindustrialisation.

Despite the introduction of new technologies and labour structures, the ecological entanglements of Tiree's kelping landscape persisted. Innovation did not erase continuity: customary practices of gathering, drying and burning seaweed endured along the factory's industrial routines. The seasonal rhythms of tangle gathering and the transmission of local ecological knowledge remained essential, illustrating the dynamic interplay between innovation and established methods, a central finding echoed in earlier chapters on Calbost and Coigach. The 'time of the tangles' (Sinclair, Donald and Kennedy 1971), saw the coexistence of formal factory organisation and informal, kin-based labour, with crofters and cottars continuing to rely on inherited skills and communal networks even as the factory model reshaped daily life.

The factory's arrival intensified social and economic inequalities within Tiree's community, making the connections between local labour and external markets more fraught. Crofters, with access to land, livestock and transport, were able to participate in the seaweed economy on more favourable terms than landless cottars, who relied solely on physical labour and had limited options. The truck system, instituted in lieu of banking services, deepened these disparities by tying wages to goods rather than cash, contributing to broader tensions over land rights and employment. These issues surfaced in local agitation and in testimony to the Napier Commission, highlighting how industrial novelty could reinforce, rather than resolve, historical inequalities.

Formal industrial structures were a new feature of the Tiree seaweed industry. In the past, kelpers were paid by tacksmen or the estate. However, under the new limited company structure of the British Seaweed Company, a factory was established, and an industrial framework typically found in urban manufacturing

centres was introduced to a rural island setting. This company structure included a managing director, factory manager, foreman and a workforce directly employed by the company working year-round, with those gathering tangles and burning kelp being paid on a 'self-employed' seasonal basis. Tiree underwent deindustrialisation in 1901 following the factory's closure, which left its employees, including the factory manager, redundant. This closure also meant closure of the shop. For those who gathered tangles or burned seaweed for kelp, the two years following the closure until O' Beirne arrived were financially challenging due to this loss of income, which culminated in losing it entirely by the 1930s. This led to further de-population as many left the island, seeking employment elsewhere. The walls of the factory's stables, the kelp shed, and the numerous kelp kilns and drying walls all over Tiree's shores remain visible as a testament to the significance of Stanford's enterprise.

The establishment of the Glassary factory in Tiree is representative of innovation, not just in the island's economic landscape but also in scientific innovation initiated by Stanford, which pushed the seaweed industry forward. The factory implemented new processes and technologies that demanded additional skills and knowledge, prompting Tiree's residents to adapt, negotiate and even innovate their daily routines in reaction to the evolving economic and societal landscape conditions. The Glassary also embodied broader socio-economic changes occurring in Britain, which were likewise reflected in Tiree. The factory's influence signified a shift in economic structures and dependencies, as their conventional livelihoods of fishing, agriculture and kelping either persisted or declined in response to market demands. The Tiristich redefined their roles and relationships within this new economic landscape illustrating the complex interplay between external forces and the agency of Tiree's people.

In sum, Tiree's case extends the history of the Scottish seaweed industry beyond its initial alkali phase, demonstrating how rural island communities were integrated into modern industrial processes without erasing deep-rooted social and ecological practices. The Glassary factory stands as both a symbol of innovation and a testament to enduring continuity, encapsulating the complex entanglements of commodity production, ecological adaptation and social connection that have defined the evolution of the Scottish seaweed industry.

7.3 Conclusion: Innovation, continuity and change

Three themes recur throughout this thesis: innovation, continuity and change. Together they define the longue durée of Scotland's seaweed industry. Innovation created a new commodity and repeatedly drove the industry into new phases, a process that continues in the preset (APS Group Scotland 2022). Continuity and change, however, were never mutually exclusive. Across the profound political, economic and social transformations that shaped Scotland from the early 17th century to the early 20th century, the seaweed industry changed in purpose, scale and organisation while retaining notable continuities of place, practice technology and community, as discussed in the coastal landscapes of Calbost, Coigach and Tiree (Chapters 4 - 6).

As Chapter 3 showed, the origins of the industry in Scotland lay in technological change within glassmaking. Innovations in glass furnaces, particularly the shift from wood to coal as fuel, prompted the search for alternative alkalis and helped bring kelp into commercial production. The earliest reference to kelp manufacturing in Scotland comes from a letter written by James VI & I in 1621 (Masson, David: 771-72), predating French documentation but coinciding with kelp use in Irish glasshouses and the alum industry in the north-east of England. Yet the question of where and when the knowledge of burning seaweed into kelp first emerged remains unresolved. It may have developed from older domestic practices of burning seaweed into ash in coastal communities in Britain and Ireland. Martin Martin, for example, noted that seaweed ashes were used in the late 17th century in the Outer Hebrides and Skye for preserving cheese, fish and meat, as well as for washing hands, and cleaning and bleaching flax threads (1716: 56, 64, 186).

Innovation remained central during the most profitable period of the alkali phase. As discussed in Chapter 4 andChapter 5, the Highland Society of Scotland promoted Improvement among landowners and encouraged experiments in agricultural and manufacturing technique (Beaton 1799; Walker, Dr. 1799). Through prize essays, they sought to improve the quality and quantity of kelp. In his 1788 essay, Rev. Walker proposed increasing the seaweed crop by placing boulders in estuarine or sandy environments, creating what are now termed 'kelp grids'. These remain visible in aerial imagery in Ireland, Skye, Plockton and

Argyll (McErlean 2007: 87-91; TROVE: 314568 2009; TROVE: 332276 2010; TROVE: 340011 2013; TROVE: 345755 2013; TROVE: 345756 2013; TROVE: 3453100 2016). In the same volume, Angus Beaton outlined the advantages of long sub-rectangular trench kilns, recommending dimensions and techniques that improved heat control, quality and yield. Tiree, one of the principal landscapes examined in this thesis, appears to have adopted this design on an industrial scale, as shown by the numerous kilns that still line Tiree's shores. Orkney did not adopt this improved form, but it appears widely along Scotland's west coast and islands (to include Shetland), and also in Ireland (Forsythe 2006; McErlean 2007) and Brittany (Arzel 1987). The uptake of these innovations in the islands shows that those who worked in the industry were at the frontline of technological innovation, helping to challenge the common narrative that the people of the Gàidhealtachd were backwards and slow to change.

Innovation likewise characterised the later phases of the industry. Courtois's discovery of iodine came through experimentation with kelp during a search for improved saltpetre extraction. As discussed in Chapter 6.2, Edward Cortis-Stanford, already experimenting with seaweed in East Sussex, patented the 'char' process to improve iodine recovery by reducing losses from volatilisation during kelp burning. Near the end of the 19th century, again as explored in Section 6.2, Stanford discovered alginic acid while working to preserve full iodine yields, a discovery that initiated the Alginates phase in the 20th century. Though Scotland's alginates industry no longer operates, Stanford's discovery continues to have global significance in manufacturing.

Alongside innovation runs a powerful thread of continuity. One of the clearest continuities across the different coastal landscapes is continuity of practice: methods of harvesting, bringing it ashore, drying and burning it. In Tiree, all three major industrial phases can still be seen in several large processing sites. At Cràignis, Hògh, for example, the piling of beach cobbles into low, long parallel walls continued through all phases until the end of the alginates phase in the early 21st century (Section 6.3.3). Seaweed harvesting techniques, including the construction of *maoisean* or *ràthan* for towing or floating seaweed ashore, remain in use today. Essential too has been an intimate understanding of tides: whether hauling a *ràth* ashore on a rising tide or cutting wracks from rocks at low water. C*orrain feamad* (serrated sickles) have been used over centuries,

and the techniques of cutting have been handed down over generations. Companies in the Outer Hebrides such as Uist Asco (www.uistasco.com) and Ishga (www.ishga.com) still use hand-cutting methods with *corrain-feamad* and large circular *ràthan* to tow the harvest ashore, the ropes now made with nylon rather than heather, as well as the practice of rotating harvesting shores every two to three years to ensure a sustainable harvest (section 1.3.6).

At the same time, the four centuries covered by this study witnessed profound social and cultural change. In the Highlands and Islands, semi-communal systems gave way to increasingly individualised modes of life. Tacks managed in runrig were divided into individual family crofts as estates became more commercialised, putting pressure on kinship practices. By the time Stanford arrived in Tiree, there was a heightened sense of autonomy and choice. This shift was shaped by earlier decades of industry collapse, clearance, famine, education and external influences, including Irish agitation over land rights. It fostered greater confidence in voicing grievances against exploitative systems such as truck and unfair wages, grievances that came to public notice through the Napier Commission, as seen in Chapter 6. By the end of burning tangles in Tiree in the 1930s, the island was also experiencing further depopulation as young people left in search of better opportunities, a pattern that still marks the Highlands and Islands today.

7.3.1 Implications, Impacts and Thoughts for the Future

This thesis has traced the Scottish seaweed industry across four centuries, revealing a complex history shaped by innovation, continuity and change. By concentrating on the first two phases, from alkali to iodine production over roughly three hundred years, it has shown how coastal communities adapted to rapidly changing economic conditions and industrial processes. The three coastal landscapes, Calbost, Coigach and Tiree in Chapters 4 - 6, demonstrate how technological advances, environmental conditions and social structures interacted differently in each phase.

As argued in Chapter 1.3, an interdisciplinary approach is essential for understanding the seaweed industry's influence on coastal landscapes, communities and economies. While Adamson (2014) and Bratt (2023) also used

interdisciplinary methods to explore Highland and Island commercial practice, this thesis differs in following a single commodity across multiple phases of development. It draws not only on landscape archaeology, the material culture of mobility and world systems theory, but also on environmental consequence, given the scale of past production. The conceptual frameworks developed in Chapter 2, Commodity, Ecological Entanglements and Connections, also incorporates conviviality in landscape archaeology (Given 2013, 2017, 2018), cybernetic perspectives from Gregory Bateson (1972, 1975, 1979) and kinship theory (Durie 2022; Ensor 2011, 2013; Masson, K. 1970; Souvatzi 2017). This holistic framework has enabled the industry's social, cultural, economic and ecological impacts to be contextualised together.

These approaches, first set out in Chapter 2 and revisited at the start of this chapter, drew on varied forms of evidence to establish temporal and spatial context. They included published coastal zone assessments, walkover surveys, site visits, experimental archaeology, archival estate records and ethnological material such as Gaelic oral traditions and oral history. Particularly valuable were examples of *bàrdachd baile*, proverbs and colloquial speech. This linguistic evidence adds colour, humour, perspective and emotional depth to the archaeology and history of the seaweed industry. As John Howieson (2024) suggests, *bàrdachd baile* may be described as 'vernacular versification': poetry composed by local poets, often for performance in the cèilidh house. Used in this way, it provides rare insight into mindsets, relationships and commentary on current events, often with extraordinary wit. Because so much of this material was orally composed and transmitted, it reflects a society in which oral tradition remained strong. The song by John Brown discussed in Chapter 6.4.1.1, for instance, was composed for performance at a cèilidh before kinfolk, friends and neighbours. Most importantly, Gaelic material offers access to voices often absent from the written record. As Grant (2016: 299) argues, it is 'evidence which often represents voices and experiences that are found nowhere else in the archaeological and historical record.' It therefore moves analyses beyond facts and figures, helping recover perspectives of those who actually laboured in the industry.

Although these coastal landscapes were rural, they could, in summer, be understood as 'industrialised' landscapes. The scale of production required to

meet rising demand transformed them seasonally into sites of intense labour. McAteer (2020: 22) describes such places as 'proto-industrial' in that they represented nascent industry within agrarian regions, and, after collapse, often reverted to agriculture. Yet they did not entirely revert. The seaweed industry persisted into the 20th century, even if not on the scale seen before 1830. Moreover, all three coastal landscapes considered here were also involved in fishing from at least the 17th century onward, reminding us that these were never purely agrarian places. The Glassary factory in Tiree, together with its sister factories in North Uist and Co. Clare, Ireland from 1863 onward, reflect a broader shift toward the factory system familiar from urban Britain. Management moved from estate proprietors to limited companies, the factory became the operational hub, corporate systems structured labour and work increasingly followed clock time rather than the rhythms of tide and daylight.

In this sense, the history of Scotland's seaweed industry is not merely one of extraction or decline. It is a history of adaptation, labour, knowledge and connectedness, one that shaped coastal Scotland materially, socially and culturally over centuries.

7.3.1.1 Implications of research.

As discussed in Chapter 1, the identification of former kelp-processing sites has been impeded by a limited archaeological understanding of the structures associated with kelp manufacture. One of the central aims of this thesis was therefore to clarify the diversity of site forms across Scotland and, in doing so, to improve the identification, interpretation and management of these vulnerable coastal remains. In this respect, the thesis makes an explicit original contribution to knowledge. It is the first sustained interdisciplinary study to demonstrate, across multiple Scottish regions and across the first two major commercial phases of the industry, that kelp-processing sites cannot be securely identified through morphology alone, but must instead be understood through the interrelation of structure, landscape context, documentary evidence, oral tradition and coastal connectivity, as set out in Chapter 2.

A notable generalisation in earlier archaeological discussion has been that sub-circular stone-lined pits were characteristic of the Orkney kelp industry, while

the west coast and Hebrides were typified by long rectangular trenches (McAteer 2020). This thesis has shown that such a distinction is too rigid. While long trenches are indeed more frequently encountered on the west coast and adjacent islands, Lewis in particular, demonstrates that both kiln forms may occur within the same island landscape, and even within the same broader regional practice. Round or oval pits occur not only at Calbost, at Eilean a' Ghòdh (Section 4.7) but also at Àird Shìthaig, a small promontory near Ceann Shìophort (TROVE: 336244) where at least five sub-circular structures and a stone bothy suggest a substantial processing site (Burgess 2004; Northamptonshire Archaeology 2004). The same survey also identified comparable 'cellular structures' at Crò Mòr (Cromore), north of Calbost. Conversely, the extensive site at Gabhsann a Deas (South Galson), discussed in the Introduction and revisited here, contains several trench-style kilns previously misidentified as possible burial cists (TROVE: 337559), closely comparable to examples in Tiree (Section 6.3.3) and Sanday, Canna (TROVE: 10758), and the sites at Am Poll Bàn and Achd 'Ille Bhuidhe in Coigach discussed in Chapter 5.3.

The presence in Lewis of both trench-style and sub-circular or oval pit kilns, like that in Coigach, is significant. It supports the argument advanced in Chapter 5.3 that the trench-style kiln represents a later technological development rather than a simple regional type-marker. This interpretation is strengthened by the chronology outlined in Chapter 4.2: the earliest kelping districts in Lewis were Lochs Ròg, Shìophort, Èireasort and Liùrbost, whereas large-scale kelping in the north-west of the island did not develop until after 1810, when the Seaforth proprietors compelled all coastal districts to engage in manufacture (1.3.1). The thesis therefore contributes a more historically sensitive reading of kiln morphology by demonstrating that form may reflect chronology, local adaptation and estate organisation as much as geography. This is one of the clearest original contributions to knowledge of this thesis. It does not merely refine site typologies; it repositions kelp kilns within a wider interpretative framework that links technical variation to estate management, labour regimes and coastal ecology. In so doing, it offers a new basis upon which archaeologists and designations specialists may identify, assess and record these sites.

A second original contribution lies in demonstrating that kelp-processing sites are best understood as complex working landscapes, not as isolated burning

structures. As shown particularly in in Chapter 4 -6, these sites frequently included features connected to multiple stages of production and transport: drying walls, boat nausts, slipways, landing places, cleared working platforms, grassy drying grounds, and, in more remote contexts, seasonal shelters or bothies. At sites such as Loch na Ribhe (Chapter 5.3.1.3) and Ceann a' Bharra (Chapter 6.3.3), these associated features are essential to correct interpretation. A shore-edge structure resembling a 'shieling bothy' may in fact be a kelper's shelter if found in association with pits, drying walls, slipways or other boat infrastructure. This contextual approach is crucial in avoiding misidentification as well as offering a more reliable basis for updating the NRHE and local HERs and for informing designation decisions. The relevance of this work to heritage management was recognised during the HES placement undertaken during the doctorate, and the interest of HES Designations in the final thesis confirms its practical value.

The practical implications for heritage recording are significant. As demonstrated in Chapter 4.7 and throughout the site analyses, low-cost methods such as tape-and-offset survey, photography, note-taking, sketching, and the use of the SCAPE mobile application (Figure 7-3) can produce meaningful records of vulnerable sites, particularly when combined with local knowledge and oral tradition. These methods are especially valuable where excavation, geophysical magnetometry survey or soil analysis is impractical. These low-cost, easy to learn methods also have implications for community archaeology and heritage management. This can also contribute to the development of participatory heritage practice by showing how professional and community-based recording can work in tandem.



Figure 7-3: The SCAPE Trust mobile application for recording coastal sites.

The relevance of this research to wider archaeological agendas is equally clear. Within the Scottish Archaeological Research Frameworks (ScARF) *Modern* framework, the kelp industry has until now received only brief treatment (ScARF 2012). This thesis has demonstrated that it intersects with several major themes set out across the national and regional frameworks. As shown in Chapter 2.1.1, it engages with the theme of *Reformations* theme through the influence of the Scottish Enlightenment on Improvement, economic theory and the political economy, and evidenced in the Calbost and Tiree chapters. It contributes to *Global Localities* by tracing how local acts of gathering, drying, burning and transporting seaweed bound coastal communities into imperial and global markets. Through the application of the conceptual frameworks Commodity, Ecological Entanglements and Connections, this thesis has shown that Scotland's seaweed industry was not a peripheral activity but a materially grounded example of how local labour, environmental knowledge and industrial demand intersected for nearly four centuries. It also speaks directly to the *Modern Person, Materiality and People*, and *Landscape* frameworks through its analysis of changing social relationships and how their identities were shaped during a time of rapid change particularly in regard to labour organisation, technology, movement, identity, and social, environmental and material relationships with their coastal landscapes that extended out into the sea. In the *Thematic* category, as part of the *Marine & Maritime/Coastal intertidal and maritime hinterland*, through its use of published coastal survey data has formed part of the research data for this thesis. At the *Regional* level frameworks, it addresses priorities identified in the Highland Archaeological Research Framework

(HighARF) and Regional Archaeological Research Framework for Argyll (RARFA) and contributes evidence relevant to the research frameworks still in development, such as the Scotland's Islands Research Framework for Archaeology (SIRFA), where the post-medieval period remains under-researched, especially in the Outer Hebrides (Rennell 2024; ScARF 2017, 2021). The findings of this thesis will contribute to the development of SIRFA's coastal archaeological research frameworks, the impact of this research being that it will help to fill some of the post-medieval knowledge gaps.

This thesis also advances the case for integrating Gaelic material into archaeological interpretation. As discussed in the Introduction and throughout the case studies, Gaelic oral histories, placenames, poetry and song, and idiom do more than add colour to an existing archive; they preserve voices, humour, criticism, memory and lived experience often absent from formal documentary records, as argued by Grant (2016). This is particularly important in the Gàidhealtachd where, as the HiARF notes, Gaelic language loss is eroding the ability to understand both written and oral sources fully (ScARF, 2021b). The thesis therefore contributes methodologically as well as substantively: it demonstrates how Gaelic evidence can be mobilised within archaeological research without being reduced to illustration.

Heritage management of coastal areas amid the impacts of tourism and climate change

A further implication concerns coastal heritage management in the context of erosion, tourism, and climate change. Because the sites associated with the seaweed industry are coastal, they are vulnerable to erosion, tidal action and storm damage. Climate change intensifies these risks through rising sea levels and increasingly severe storm events (Harkin *et al.* 2019). As argued in Chapter 3.1 in relation to the eroding pits at Pittenweem, and throughout the case studies, many of these sites may be lost before they are securely identified. In most cases, hard coastal defences to preserve them in situ are neither feasible nor financially viable. The realistic strategy is therefore to identify, record and interpret.

This thesis has shown that a tiered heritage management approach is needed, rapid recording through community and professional survey, enhanced

documentation through drone photography, 3-D modelling; and where necessary, targeted scientific examination such as X-ray fluorescence (XRF) analysis, soil sampling and geophysics survey using magnetometry. Magnetometry has been used in archaeology to detect burning in soils. Exposure of soils and stones to intense heat can result in a detectable magnetic anomaly (Urban *et al.* 2019: 74). Magnetometry survey has been used in Orkney to verify kelp pits without the need to excavate (Brend 2023). Applied to sites such as Loch Poll an Dùnain(Ch. 5.3), Gabhsann a Deas or the unrecorded 'kelp pits' at the Barbhas shore (Ch 1.3.1), magnetometry could test identification non-invasively and refine understanding of site extent. The drone and 3-D modelling of pits at Bàgh na Seann Dòrnaidh in 2023 by a member of the North of Scotland Archaeology Society (NoSAS) is an excellent example, as it revealed flattened cobble working areas that were difficult to recognise from ground level alone (Chapter 5.3.1.2, Figure 5-37). Prospective analytical work at Pittenweem (Ch. 3.1) using XRF analysis to confirm the chemical signature of the eroding pits, is another example of a non-invasive technique. These techniques should form part of proactive coastal heritage strategies, both at the local and national level. In addition, such work outlined in this paragraph would address a broader methodological problem identified throughout the thesis: the persistent difficulty of recognising the varied archaeological signatures of seaweed processing in dynamic coastal environments.

Tourism presents a further threat. Some kelp processing sites, such as Bàgh na Seann Dòrnaigh or Tràigh na Garbhaidh (Chapter 5), are easy to access and are vulnerable to damage by tourists; in this case, damage is due to growing tourism along the North Coast 500 route. Tourists damaged both sites by removing stones from the sides of the kelp kilns at Bàgh na Seann Dòrnaigh to build 'sculptures' within the pit, and at Tràigh na Garbhaidh, the largest pit was used as a campfire site and refuse dump when it was first visited. While increasing footfall will affect these sites, local heritage organisations and community councils can mitigate any damage by adding them to heritage trails, discreet signage that educate and inform visitors to observe without touching the archaeological structures. The example of the heritage trail at Achd an Lochain at Poll Glas near Achd 'Ille Buidhe in Coigach demonstrates how local stewardship can frame

archaeological remains as places of education and memory rather than as anonymous ruins.

Environmental impact of the past informing future and current seaweed exploitation

This thesis has also shown that the historical seaweed industry has implications beyond archaeology. As argued through the Ecological Entanglements framework in Chapter 2, past seaweed extraction altered littoral ecologies, labour relations and seasonal routines. The scale of harvest involved in kelp production, often thousands of tons of wet biomass, demands to be taken seriously in environmental history. Soil and residue analyses may help identify toxic concentrations or combustion signatures at processing sites, but more broadly, this thesis highlights the need to place past exploitation into present debates about biodiversity, carbon storage, environmentally friendly drying methods and sustainable harvesting. In addition, the socio-economic impact on those involved in seaweed harvesting, particularly in low-paid, challenging conditions in coastal regions, warrants consideration. Sustainability should be viewed not just through an ecological lens but also in terms of human welfare and business practices.

Ongoing research and collaboration with researchers beyond archaeology and history, such as blue economy studies at the Scottish Association for Marine Science (SAMS), and ecological surveys included in coastal heritage reports such as the study on the effects of harvesting *Ascophyllum nodosum* (McErlean 2007), are vital for understanding how over-exploitation of seaweed resources impacts biodiversity and contributes to erosion. This aspect became particularly evident during discussions with Dr Anna Nousek-McGregor, Senior lecturer, Biodiversity (University of Glasgow) as the potential connection between intensive seaweed harvesting for the kelp industry and historic oyster bed declines emerged during the drafting of this conclusion. The topic was raised in relation to current work on oyster habitat restoration in Scotland, particularly in Argyll (Nousek-McGregor 2024). Dr Nousek-McGregor observed a reduction in oyster beds in the Firth of Forth in the late 18th century, followed by recovery around 1830. Notably, kelp harvesting persisted in the Firth in the 1790s, coinciding with peak levels of production. It was revealed that kelp harvesting continued during these years in the Firth, coinciding with peak kelp production. The possible impacts of seaweed

harvesting, such as temperature regulation and provision of shelter for oysters, had not previously been considered. As an example of the historic scale of extraction, approximately 2,700 tons of wet seaweed (based on the ration 18:1) were on average harvested in Mull between 1764 and 1771 (Walker, John R. and McKay 1980: 126), which would have influenced hydrodynamics and larval retention. This demonstrates that seaweed extraction should be considered as a historically significant environmental pressure within coastal systems and not solely regarded as an economic activity.

7.3.1.2 Thoughts for the future

This thesis is not an endpoint but a foundation for deeper research into Scotland's seaweed industry. Future work should build on the methodological limits identified in Chapter 2.2, particularly those imposed by the project's scale, chronology and the abundance of surviving evidence in some regions. As noted in Chapter 2 under methodology, archival research was constrained by access limitations due to COVID-19 restrictions, and the practical limits of time and cost within the doctorate. While selective archive work was undertaken successfully, especially for Lewis and Tiree, the thesis was not archivally exhaustive. This is especially important for Lewis. The estate, legal, commercial and household papers discussed in Chapter 4, especially the Gillanders of Highfield papers (GD427) and the Seaforth Muniments (GD46), contain far more material than could be addressed here. This thesis has demonstrated their value for understanding kelp, estate management, labour control, fishing, military recruitment, illicit distilling and the internal political economy of Lewis, but they were necessarily used selectively. The Lewis material alongside collections such as the Stuart & Stuart, Cairns & Co. Papers (GD274) and maritime records from National Museums Liverpool, and the island's extensive archaeological evidence of the kelp industry, underscore the need for a dedicated monograph on its seaweed industry. The Calbost case study in Chapter 4 opened that archive only partially; a fuller study is now needed to do justice to the depth and complexity of the Lewis kelp industry.

Second, the Coigach material points to the need for broader work on mainland kelping. Chapter 5 showed that archaeological evidence for intensive production can survive even where the documentary record is sparse. Coigach demonstrated

that the absence of substantial archival coverage does not indicate a marginal industry; rather, it may conceal one. Further comparative research on other coastal districts such as Caithness, Assynt and Ardnamurchan could refine our understanding of leasing arrangements, labour recruitment, and maritime distribution. Such work would be especially valuable in testing whether Coigach represents an exceptional case or part of a wider pattern in mainland kelping. Related to this is the need for systematic study of Scotland's small ports, piers, and coastal shipping routes. As discussed through the Connections framework in Chapter 2 and glimpsed in Chapters 4–6, the seaweed industry depended on dense maritime networks. A GIS-led reconstruction of 18th- and 19th-century coastal transport, comparable to work undertaken for England and Wales (Dunn *et al.* 2017) would materially strengthen this thesis' argument about connected coastal economies.

Third, the iodine industry deserves fuller treatment in its urban as well as island settings. Chapter 6 necessarily centred Tiree, but Glasgow's iodine works remain under-researched archaeologically and historically. Firms such as William Paterson's shaped the later seaweed industry and connected island extraction to chemical manufacture, distribution, and consumption on a much wider scale. Further work could explore those firms' operational histories, labour structures, environmental impacts, and global market connections. Such research would illuminate more fully the urban-industrial dimensions of seaweed processing and clarify the extent to which island production was embedded in metropolitan chemical economies. Likewise, the alginates phase, touched on only briefly here and in the epilogue, warrants a separate interdisciplinary study. Applying the three conceptual frameworks to alginates, from Hebridean shore to food, medicine, or drink, would be a productive extension of the framework tested here. In this respect, the later phases of the industry should not be treated as epilogues to kelp alone, but as integral chapters in the longer history of seaweed commodification in Scotland.

Finally, there remains urgent scope for further oral-history work in relation to further research on alginates. Many former alginates industry workers are still alive today. Their knowledge of labour, humour, technique, and social relations represents a diminishing archive. This is especially significant given one of this thesis' central claims: that the history of Scotland's seaweed industry cannot be

recovered solely through estate papers, industrial reports or archaeological remains. It depends equally on the lived knowledge retained within coastal communities. In this respect, the thesis returns to one of its core claims: that understanding Scotland's seaweed industry depends on integrating local knowledge with archaeological and documentary evidence. That synthesis is the thesis' principal methodological and original contribution, and it is also the clearest route for future research.

This study of Scotland's seaweed industry has contributed to our understanding of how a potentially domestic practice evolved into a commodity that was a key economic driver over a 300-year period. More precisely, this thesis has shown that this period in the seaweed industry, spanning nearly four centuries, has been characterised by complex entanglements of technological innovations and profound social and economic changes, which have shaped both the landscape and the communities living along the coastlines. Here, local practices and global markets have intersected continuously. From the early production of kelp for glass and soap, to the industrial chemistry of iodine, and onward to the later possibilities of alginates and other seaweed derived products, the industry reveals remarkable patters of continuity, reinvention and adaptation.

The interdisciplinary approach that was adopted has shown not only the historical significance of seaweed as a valuable resource but also revealed the ecological relationships and cultural connections inherent to these coastal environments. By drawing together Commodity, Ecological Entanglements and Connections, the thesis has moved beyond older narratives that reduced the industry to a simple story of boom and bust or to a mere adjunct to landlord exploitation. Instead, it has shown that the seaweed industry was embedded in complex working landscapes in which labour, kinship, mobility, ecological knowledge and maritime infrastructure were all mutually interdependent. Kelp shores, drying grounds, kilns, piers, storage shed, road and factories were not isolated features, but parts of wider systems of production and exchange.

By presenting an exploration that highlights the importance of the interconnectedness between local practices and broader economic trends, it becomes clear that understanding and reflecting on the lessons learned from the past of Scotland's seaweed industry is crucial not only for historical scholarship

but also for the present. This thesis has shown that these coastal landscapes are not inert remnants of obsolete practice; they are vulnerable archives of labour, environment and cultural memory. Their survival is increasingly threatened by coastal erosion, sea-level rise and the accelerated pressures associated with climate change. In that sense, the historical study of seaweed is also relevant to present debates about sustainability, biodiversity loss and the preservation of local knowledge. If the past demonstrates how intimately coastal communities were bound to marine ecologies, it also reminds us that such relationships require careful stewardship rather than extraction alone.

Ultimately, this thesis has sought to demonstrate that the significance of Scotland's seaweed industry is not just a story of economic transformation; it is also a testament to the adaptability and resilience of the people who lived and worked along Scotland's coasts. Their work connected distant shores to imperial and global markets, but it also sustained local households, shaped settlement patterns, altered social relations and left enduring marks upon the landscape. The industry's history is therefore both materially grounded and deeply human. What emerges from this study is a picture of a coastal Scotland in which seaweed was not marginal, incidental or merely supplementary, but at times central to the making of livelihoods, the exercise of power and the articulation of *buntanas* - belonging.

An Alginates Epilogue: Oh, gu bheil òr sna sgeirean sin! – Oh, for there's gold in those rocks!

This thesis ends as it began – with a Gaelic song. Here presented is a humorous song composed in 1964 by John Murdo MacDonald (Iain Murchadh Eachainn) from Lacasaidh (Laxay), Lewis (MacDonald, George 1966) for the opening of the new seaweed factory for alginates production in that same year at Eilean Thabhaidh (Tavay Island) in Ceòs (Keose), Lewis, celebrating the importance of seaweed as a livelihood. Represented within this song are the themes in the title of this thesis: Innovation, Continuity and Change.

SUAS AN FHEAMAINN	*UP THE SEAWEED*
[Sèist]	*[Chorus]*
Suas an fheamainn their na seòid	Up the seaweed, say the lads
Suas an fheamainn gu Fear Cheòis	Up the seaweed to the Man of Keose
Suas an fheamainn their na seòid	Up the seaweed, say the lads
O, gu bheil òr sna sgeirean sin!	Oh, for there's gold in those rocks!
Coma leam an-diugh den dole	I don't care about the dole today,
National no form O	National or form O
Gheibh thu obair ann an Ceòs	You'll get work in Keose
Ged bhiodh tu over 70	Even though you'd be over 70.
Chan eil duine th' ann an Ceòs	There's no one in Keose,
Biodh e beag no biodh e mòr	Whether be they small or be they big,
Nach eil le corran aig' na dhòrn	That doesn't have a sickle in his fist
A' ruith nan òb 's nan cladaichean	Running to the coves and the shores.
Cha bhi guth a-nis air clò	There's no word now of tweed
Cha bhi beairt a' dol an Ceòs	There will be no loom going in Keose
Nì i spiris dha na h-eòin	It will make a perch for the birds
Oir cha tèid clò gu suthainn innt'	Because tweed won't go forever in it.
Chan eil càil a tha san tìr	There's nothing else in all the land
Bho fertiliser gu cìr-mhìn',	From fertiliser to a fine-toothed comb
Nach tèid a dhèanamh air a' Ghlìob	That isn't made on the Glebe
Ma bheir sinn fhìn an fheamainn thuc'	If we bring the seaweed to them ourselves.
Nì iad plastics de gach seòrs'	They make plastics of all sorts
'S gheibh sinn nylons ann gu leòr	We'll get plenty of nylons
Ni iad carpets agus ròp	They'll make carpets and rope
Cremola agus iodine	Cremola and iodine.

Thig an fheamainn às gach ceàrn
À Lacasaidh ’s à Gearraidh a’ Bhàird
Gu bheil feadhainn an-diugh air sàl
Nach aithnich ràmh bho spineacair

The seaweed comes from all corners
From Laxay and Garryvard
There's some at sea today
That can’t tell an oar from a spinnaker.

Chan eil duine beag no mòr
No eadhon cailleach anns a bheil treòir
Nach eil le feamainn ann an ròp
Ga slaodadh chun na factaraidh

There’s no one small or big
Or even energetic old ladies
That isn’t with seaweed in a rope
Pulling it to the factory.

Chan fhacas 'Piseag' riamh san tràigh
Ach tha e ’n-diugh ann leis a’ ghràp,
Is e le ìnean aige ’n sàs
Ri cur an àird an fheamainn thuc’

One never sees ‘Kitten’ at the beach
But he’s there today with a grape
And with his talons stuck in
To put up the seaweed to them.

Bidh 'An Coileach' anns an dùn
Is e na mhullach, sin a chliù,
Is e le spògan ri cur smùid
Den sgùilleach feadh nan cladaichean.

‘The Cockerel’ will be in the dun
And he’s at the top, that’s his repute
To give a thrashing with his paws
To the flotsam along the shores.

Bidh gach aingidh ’s duine naomh
Air a’ chladach taobh ri taobh,
Is iad le chèile dèanamh mhaois
Ged tha caochladh creideamh ac’.

Every angel and saint will be
At the shore side by side
And together they make seaweed rafts
Although they have different faiths.

Chunnacas fear bhon Acha-Mhòr
’S farmad aige ri Fear Cheòis
’S e cur salainn dha na lòin
An dòchas gun tig feamainn annt’

A man was seen from Achmore
He is jealous of the Man of Keose.
He puts salt into the [freshwater] puddles
In the hope that seaweed will come in them.

Appendices

Appendix A - GD46/17/59 – Petition of Alexander MacKenzie, vintner in Stornoway, for sale of effects of the late Robert Weir of Calbost

Stornoway, 23rd Feby, 1821

Unto the Honourable The Sheriff Depute of Ross & Cromarty, by John Mackenzie Esq, his substitute.
The Petition of Alex. MacKenzie, vintner in Stornoway
Humbly Sheweth –

That upon the seventh instant Robert Weir, late tacksman of Calbost, the Petitioner's brother-in-law, departed this life. There at the time of his death the effects mentioned in the Inventory herewith produced were found in his possession.

That in order to defray his funeral expenses and pay off some debts due by him, it is necessary to dispose of those effects, and the Petitioner being the deceased's nearest of kin in this place, begs leave to make the present application to your Lordship hoping that you will be pleased to grant the request thereof.
May it please your Lordship to consider the foregoing Petition and to grant warrant to the Petitioner, as the said deceased's nearest of kin as aforesaid to dispose of the said effects by Public Roup, for behoof of all concerned and that with as little delay as possible.

And your Petitioner shall comply,
Alexander MacKenzie

Stornoway 24th Feby 1821

The Sheriff Substitute having considered the foregoing Petition and Inventory then referred to, grants warrant to the Petitioner at sight of the Clerk of Court or his servant for whom he shall be answerable – to sell off the effects mentioned in the said inventory by Public Roup – upon Monday the 26th Current. Appoints the sale to be intimated in common form at the Parish Church Door of Lochs upon Sunday the 25th appoints the proceeds to be applied in the first place to pay the funeral charges and expenses of this application sale and the residue, if any to be lodged in the hands of the Clerk of Court, together with a sum of sale for behoof all of concerned.

John MacKenzie

A list of the effects left by late Robt. Weir of Calbost of Lochs sold by Sheriff's Warrant 25 Feby 1821

Mr Charles Simpson, Keose	1 cow	£4 / 4 / -
Mr Murdo Macleod, Sheildnish	1 table	- / 9 / -
Ditto, ditto	1 table	- / 3 / -

Ditto, ditto	1 cupboard	- / 7 /
Alexander MacLeod, Calbost	1 chest	- / 5 / -
Donald MacIver, Marvig	1 cupboard	- / 9 / -
Mr Murdo MacLeod, Sheildnish	1 desk	- / 5 / -
Alexander MacKenzie, Marvig	1 chair	- / 1 / -
Duncan MacIver, Marvig	1 chair	- / 1 / 7
Norman MacFarlane, Marvig	1 chair	- / 1 / -
Alexander MacKenzie, Marvig	2 chairs	- / 1 / 9
Mrs Morrison, Lemreway	1 feather bed	1 / 1 / -
Kenneth MacLean, Calbost	1 bed cover	- / 7/ 6
Mr John MacLeod, Valtos	2 candle sticks	- / 4 / -
Ditto, ditto	1 tray	- / 7 / 6
Alexander Mackenzie, Marvig	1 pot	- / 2 / 1
Mr Murdo MacLeod, Sheildnish	1 chest of drawers	- / 14 / -
Mr John MacLeod, Valtos	2 fire irons	- / 1 / 8
Mr Alexander MacKenzie, vinter, Stornoway	1 barrel bean seed	- / 10 / -
Mr Donald MacKenzie, Stornoway	1 barrel bean seed	- / 9 / -
Mr Murdo MacLeod, Sheildnish	1 cask	- / 1 / 6
Ditto, ditto	1 chist	1 /13/ -
Mr John MacLeod, Valtos	1 table cloth	- / 3 / 6
Mr Murdo MacLeod, Shieldnish	1 table cloth	- / 3 / 3
Ditto, ditto	3 hand towels	- / 1 / 6
Lewis Smith, Marvig	1 peat iron	- / - / 11
Donald MacIver,Marvig	1 crooked spade	- / 1 / 6
John MacLeod, Valtos	1 barrel	- / 2 / -
Ditto, ditto	1 tea boiler	- / 5 / -
Mr Murdo MacLeod, Sheildnish	27 barrels potatoes @ 2s/8d	3 /12/ -
Donald Smith, Calbost	The Roof of a House	1 / 5 / -
Norman MacKenzie, Calbost	1 boat	1 /10/ -
Ditto, ditto	1 frock	- /12/ -
		£19/4 / -
Deduct Funeral exp's and servant's wages of amt		9/10/ -
		£ 9/14/ -

I certify that the above is the process of the effects, belonging to the above R Weir.

John MacLeod
Stornoway, 28 Dec 1821

Appendix B – Extract from 'In the Matter of Stanford's Patent: The Petition for Prolongation

Table 1: Accounts showing raw material collection and product sales, 1863-1874 as part of Stanford's application to prolong his patent. Debits/expenditures are indicated with parentheses. Extracted from 'In the Matter of Stanford's Patent: the Petition for Prolongation' (No. 1411.1861 1875: 76-77)-

Table			
Year	**Product**	**Total weight**	**Price (cost) per unit**
1863-1867	Tangles bought	867 tons	(£3 per ton)
	Char (cost to produce)	300 tons	(£3.7.6 per ton)
	Iodine	6000lbs	**7s/6p per lb**
	Muriate of potash	75 tons	£12 per ton
	Salt	37 ½	8s/ per ton
	Waste wet char	300 tons	15s/ per ton
1867-68	Tangles bought	391 tons	(£3 per ton)
	Char	137 tons	(£3.7.6)
	Iodine	2740lbs	**12s/ per lb**
	Muriate of potash	34.5 tons	£9 per ton
	Salt	17.2.2 tons	8s/ per ton
	Waste wet char	137 tons	15s/ per ton
1868-1869	Tangles bought	1148 tons	(£3 per ton)
	Char	402 tons	(£3.7.6 per ton)
	Iodine	8040lbs	**12s/ per lb**
	Muriate of potash	100.2 tons	£9 per ton
	Salt	50.2.2	8s/ per ton
	Waste wet char	402 tons	15s/ per ton
1869-1870	Tangles bought	1400 tons	(£3 per ton)
	Char	487 tons	(£3.7.6)
	Iodine	9740lbs	**12s/ per lb**
	Muriate of potash	121.15 tons	£10 per ton
	Salt	50.2.2 tons	8s/ per ton
	Waste wet char	402 tons	15s/ per ton
July 1870 – Dec 1871	Tangles bought	690 tons	(62s/ per ton)
	Char	232 tons	(£3.11.3)
	Iodine	4640lbs	**13s/10p per lb**
	Muriate of potash	38 tons	£11/10s per ton
	Salt	29 tons	8s/ per ton
	Waste wet char	232 tons	15s/ per ton
Jan 1871 – Dec 1872	Tangles bought	830 tons	(63s/ per ton)
	Char	278 tons	(£4.1.0)
	Iodine	6950 lbs	**20s/9p per lb**
	Muriate of potash	69.10.0 tons	£11.17.6
	Salt	34.15.0 tons	8s/ per ton
	Waste wet char	278 tons	15s/ per ton
1873	Tangles bought	1066 tons	(£3.3.7 per ton)
	Char	318 tons	(£5.1.6 per ton)
	Iodine	7950lbs	**14s/5d per lb**
	Muriate of potash	79.10.0 tons	£10.10.0 per ton
	Salt	39.5.0	20s/ ton
	Waste wet char	318 tons	15s/ per ton
1874	Tangles bought	729 tons	(£3.3.4)
	Char	267 tons	(£4.10 per ton)

	Iodine	6675lbs	**11s/6d per lb**
	Muriate of potash	66.15.0 tons	£10 per ton
	Salt	33.7.2 tons	8s/ per ton

Appendix C – Tiree kelp kiln survey data collected by Dr John Holliday and volunteers, an Iodhlann Heritage Centre, Scarinish, Tiree.

Table 2: The highlighted entries refer to the Haoidhnis an Iar site examined in Chapter 6.3.3. (Holliday and An Iodhlann Heritage Centre 2023)

Township	OS	Easting	Northing	Width P	Width I	Length	Orientation	Comment
East Hynish 1	NL	97536	38525	110	50	360	260	Parallel (to coast edge)
East Hynish 2	NL	97517	38526	NR		330	350	Parallel
East Hynish 3	NL	97482	38523	NR		320	270	Parallel
East Hynish 4	NL	97108	38698	100	55	410	330	Parallel
West Hynish 1	NL	96193	738920	105		380	285	Parallel
West Hynish 2	NL	96213	38914	145		380	270	
West Hynish 3	NL	96213	38913	NR		350	230	
West Hynish 4	NL	96244	38913	110	60	350	260	
West Hynish 5	NL	96313	38906	110		340	300	
West Hynish 6	NL	96361	38868	95		230	300	Parallel
West Hynish 7	NL	96361	38868		60	340	220	Right angles
West Hynish 8	NL	96425	38833		50	410	230	Right angles
Kenvara 1	NL	94013	40467	120		500	290	Right angles
Kenavara 2	NL	93973	40396	130		480	280	Right angles
Vaul 1	NM	04518	49214		70	350	265	Parallel
Vaul 2	NM	04507	49210	120		280	260	
Vaul 3	NM	04502	49217	120		290	270	
Vaul 4	NM	04498	49206	NR		NR	250	
Soay 1	NM	07427	46250	170		260	NR	
Soay 2	NM	07416	46218	140	80	440	255	
Soay 3	NM	07433	46163		130	320	260	
Soay 4	NM	06859	46037		70	350	265	
Soay 5	NM	07001	46325		70	340	205	Parallel

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